

Sultanate of Oman



Ministry of Health

Manual on Communicable Diseases

**Ministry of Health policies and guidelines
on priority communicable disease
surveillance and public health response**

**Third Edition
2017**

Directorate General for Disease Surveillance and Control

Revision history

The first manual on **Communicable Disease Surveillance and Control Manual** was published in December 1994. After substantial revisions a second edition was released in January 2005. This third edition in December 2016 was built on the contents of the second edition that introduces further changes to the list of priority communicable diseases and conditions under surveillance in Oman.

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This manual is designed to provide general guidance on surveillance and public health response for the priority communicable diseases in Oman and is primarily aimed at the health care professionals at ALL levels of health care including the private sector. Because some recommendations may change over time, readers should refer to the latest circulars and revised guidelines issued by the Ministry of Health from time-to-time.

This manual is not intended to be a therapeutic guide or a comprehensive treatise on communicable diseases. Therefore, while dosages of antimicrobials are discussed in the context of prophylaxis and treatment for cases and contacts, physicians and other health care professionals should determine appropriate dosages based on clinical judgement and manufacturer's recommendations.

Readers are encouraged to suggest changes to improve the quality of the contents of this manual. Constructive suggestions will be gratefully received and acknowledged.



*Message from
H.E. the Minister of Health*

Globally many countries today face a broad range of emergencies and challenges in health sector resulting from various hazards, differing in scale, complexity and with international consequences.

During the recent outbreak of Ebola virus disease in the countries of West Africa or the Zika virus in Americas, the entire world was preparing themselves for possible importation. These outbreaks came to an end but we still feel the impact of the H1N1 influenza pandemic in 2009 on our community and the health system.

Similar threats can appear at any time and such emergencies can have extensive political, economic, social and public health impact with potential long-term consequences. These may be caused by natural disasters, disease outbreaks, food contamination or chemical or radio-nuclear spills, among other hazards.

Therefore preparing for and responding effectively to such emergencies are among the most pressing challenges facing the international community. The Ministry of Health thus considers such threats seriously and thrives to develop resources to engage effectively and efficiently.

This 'Communicable Diseases Manual, 3rd Edition' provides the revised guidelines of the Ministry of Health for preparing and training of the human resources in Oman in facing the current and the future threats of communicable diseases to public health.

My best wishes for the successful implementation of these guidelines.


Dr. Ahmed Al-Saidi
Minister of Health

Forward

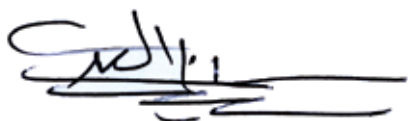
Communicable diseases continue to comprise a major cause of suffering, disability and death in the world, despite great progress towards their control. The threat of new emerging diseases like severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), highly pathogenic avian influenza, and Ebola and other haemorrhagic fevers are constant reminders that the fight against communicable diseases is far from over. We therefore must be in a constant state of alert and preparedness to face such global challenges, while continuing the surveillance and control of the already known local priority diseases.

The Ministry of Health (MoH) in Oman launched the formal communicable disease surveillance system in March 1991. The first edition of the policy manual was released in December 1994 describing the standard operating procedures (SOP) for the surveillance and control of priority communicable diseases. Due to the changing nature of the infectious diseases and accompanying diagnostic and surveillance methods in the following years, a major revision was made in the second edition of the manual released in January 2005. The earlier 2 editions of the manual elicited many constructive suggestions for which we are grateful. These have led to the revision of practically every element in the chapters of this third revision.

The purpose of this manual is to be a handy reference for all the key partners in the surveillance network. It also includes the current MoH policies and the related guidelines as well as pertinent information on communicable diseases and syndromes which are currently taking priority. It is envisaged that this edition of the manual would prove to be a useful instrument for all stakeholders in the MoH to maintain a sensitive surveillance system and ensuring an effective and rapid response.

I take this opportunity to thank His Excellency the Minister of Health for his immeasurable support in introducing quality and innovation at all levels of health care. I also thank His Excellency the Undersecretary of Health Affairs for his relentless encouragement, support and appreciation.

Lastly I congratulate the members of the national surveillance team for their excellent work dedication as well as their valuable contribution to this manual.



Dr Seif Al Abri
Director General
Disease Surveillance and Control
Ministry of Health

1. Health Administrative Divisions of the Sultanate of Oman

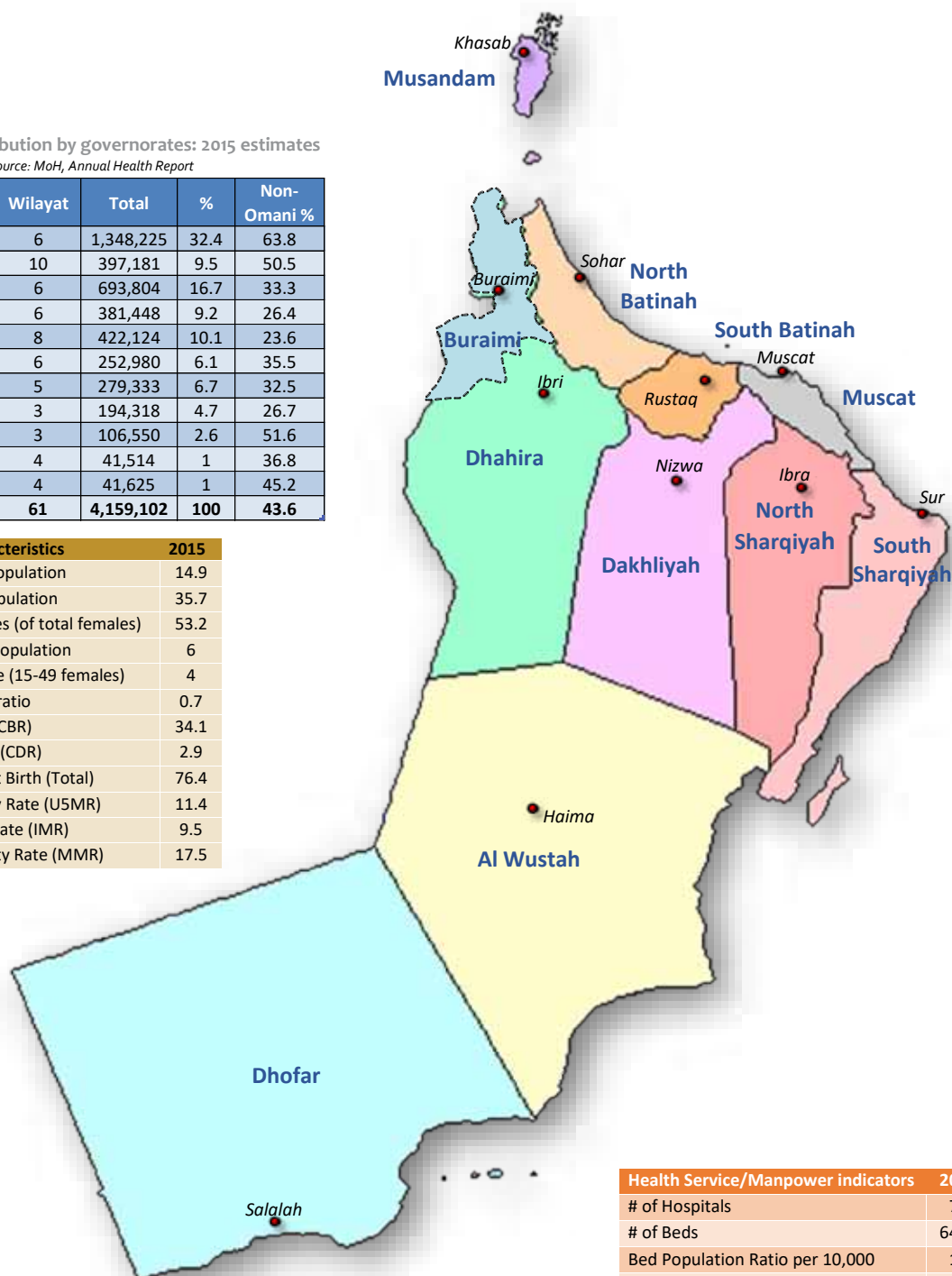
11 governorates (provinces) and 61 wilayat

Population distribution by governorates: 2015 estimates

Source: MoH, Annual Health Report

Governorates	Wilayat	Total	%	Non-Omani %
Muscat	6	1,348,225	32.4	63.8
Dhofar	10	397,181	9.5	50.5
North Batinah	6	693,804	16.7	33.3
South Batinah	6	381,448	9.2	26.4
Dakhliyah	8	422,124	10.1	23.6
North Sharqiyah	6	252,980	6.1	35.5
South Sharqiyah	5	279,333	6.7	32.5
Dhahira	3	194,318	4.7	26.7
Buraimi	3	106,550	2.6	51.6
Musandam	4	41,514	1	36.8
Al Wustah	4	41,625	1	45.2
Oman	61	4,159,102	100	43.6

Population characteristics	2015
% of under-five population	14.9
% of under-15 population	35.7
% of 15-49 females (of total females)	53.2
% of over 60 yrs population	6
Total Fertility Rate (15-49 females)	4
Age dependency ratio	0.7
Crude Birth rate (CBR)	34.1
Crude Death rate (CDR)	2.9
Life Expectancy at Birth (Total)	76.4
Under-5 mortality Rate (U5MR)	11.4
Infant Mortality Rate (IMR)	9.5
Maternal Mortality Rate (MMR)	17.5



Public health manpower for communicable disease surveillance and Control

(Medical graduates with postgraduate/master's degree in Community Medicine MD/PhD/DPH/MPH/FETP)

HQ	MC	DF	NB	SB	DK	NS	SS	DH	BU	MD	AW	Total
7	3	1	2	3	3	1	2	1	1	1	2	27
Rate per 10,000 population 0.067												

Health Service/Manpower indicators	2015
# of Hospitals	70
# of Beds	6468
Bed Population Ratio per 10,000	16
# of HC, clinics (Government)	254
# of Private Clinics	1045
Doctor Population Ratio per 10,000	21.4
Nurse Population Ratio per 10,000	46.3
Dentist Population Ratio per 10,000	2.8
Nurse Doctor Population	2.2

2. Abbreviations

AES	Acute encephalitis syndrome
AFB	Acid-fast bacilli
AFP	Acute flaccid paralysis
AGE	Acute gastroenteritis
AMR	Antimicrobial resistance
ARI	Acute respiratory infection
ART	Ant-retroviral therapy
ARV	Anti-rabies vaccine
BAL	Broncho-alveolar lavage
BCG	Bacille Calmette-Guérin (tuberculosis vaccine)
BSL	Biosafety Level
CCHF	Crimean-Congo haemorrhagic fever
CDC	Centers for Disease Control and Prevention
CFR	Case-fatality rate
CPHL	Central Public Health Laboratory
CRS	Congenital rubella syndrome
DCD	Department of Communicable Diseases
DSC	Department of Disease Surveillance and Control (at the Governorate DGHS office)
DGDSC	Directorate General of Disease Surveillance and control
DF/DHF	Dengue/dengue haemorrhagic fever
DGHS	Directorate General of Health Services
DIC	Disseminated intravascular coagulopathy
DOTS	Directly observed treatment, short-course
ELISA	Enzyme-linked immunosorbent assay
EMR	Eastern Mediterranean Region
EPI	Expanded Programme on Immunization
GBS	Guillain-Barré syndrome
GCC	Gulf Cooperation Council
HAI	Health care-associated infections
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HCW	Health care workers
ICD-10	International Classification of Diseases, 10th Revision, WHO
IHR	International Health Regulations (Revised 2005)
ILI	Influenza-like-illnesses
IPC	Infection prevention and control
MENA	Middle East and North Africa
MMR	Measles, mumps and rubella
MOIC	Medical officer in charge
OP/NP	Oropharyngeal/nasopharyngeal
PEP	Post-exposure prophylaxis
PHC	Primary health care
PLHIV	People living with HIV
PPE	Personal protective equipment
rRT	Real time reverse transcription
RRT	Rapid response team
SARI	Severe acute respiratory infection
SQUH	Sultan Qaboos University hospital
STI	Sexually transmitted infection
VPD	Vaccine-preventable diseases
VTM	Viral transport medium
WHO	World Health Organization
WNV	West Nile virus
YF	Yellow fever

3. Acknowledgements

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Manual Concept and Design
Shyam Bawikar

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Important note

Following listed diseases (notifiable earlier) that are no longer considered a public health problem in Oman due to either their elimination or rare occurrence should also be reported to the national surveillance system if they emerge again
e.g. Diphtheria, leprosy, tetanus (neonatal and adult), active trachoma (TF and TI), leprosy, anthrax etc.
Similarly any unusual occurrence of communicable disease not previously reported or a cluster or an outbreak should also be notified to the national surveillance system.

**Communicable Disease
Surveillance and Response
System in Oman**

Introduction

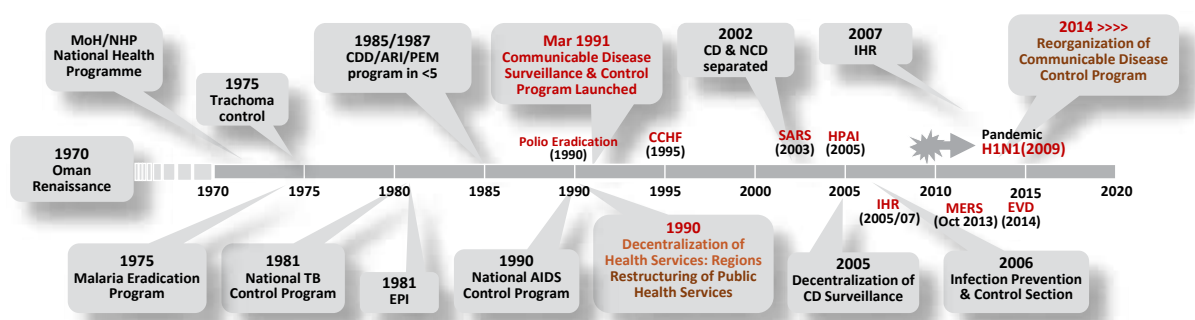
5. Communicable Disease Surveillance and Response System in Oman

1. Background

The Sultanate of Oman witnessed a renaissance in 1970. The public health services were launched in the country in late seventies with establishment of the National Health Program. The health programs were mainly in the high priority area of communicable diseases surveillance and control.

The formal communicable disease surveillance and control program was launched in March 1991 (Fig.1). The Law of Prevention and Control of Communicable Diseases was issued by the Royal Decree No. 73/92 (Annexe 2), which regulates the surveillance and control of communicable diseases and specifies the role of the concerned health organizations in implementing measures and procedures required to protect the community from communicable diseases.

Fig.1: Historical milestones – public health services and communicable disease control in Oman



Global, demographic and socioeconomic changes facilitate the emergence of new diseases (e.g. SARS, avian influenza, MERS and Ebola), the emergence of some diseases which were eradicated (or thought to have been eradicated) or those which were on decline (e.g. TB, West Nile fever and dengue fever [DF]) continue to increase in incidence. Spread of such diseases has serious economic, political and health implications. Therefore, the presence of a reliable, effective and highly sensitive disease surveillance system is considered an essential prerequisite for generating information required for planning and decision-making within the 'Integrated Disease Control' framework. In addition, this system functions as an early warning system to predict outbreaks and epidemics.

Substantial progress has since been made in Oman in the control of several of the priority diseases in the past four decades that include the vaccine-preventable childhood diseases; for example, the last case of poliomyelitis was reported in December 1993, diphtheria in 1992, neonatal tetanus in 1993 and measles/rubella/congenital rubella syndrome (CRS) has been eliminated. However, despite great progress in their control and management, infectious diseases continue to pose a threat to humans. Morbidity, disability and mortality attributed to communicable diseases still constitutes a huge burden and challenge worldwide.

2. Introduction

Effective communicable disease control relies largely on efficient surveillance. A functional national surveillance system is essential for appropriate actions and eventual control of priority communicable diseases and it is the key component of public health decision-making.

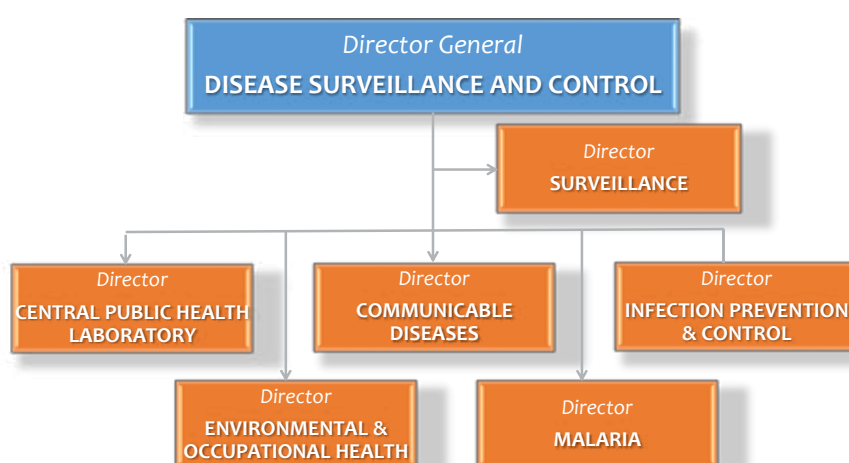
The disease prioritization is being changed a second time to reflect their current trends and altered surveillance requirements. More emphasis is placed on syndrome reporting and event-based surveillance to strengthen its sensitivity.

The VPDs from the EPI manual have been added to this manual to provide a single reference SOP manual on communicable diseases.

The diseases, namely malaria, TB, leprosy, STIs, including HIV/AIDS, are being managed either by another section within the department or another department within the MoH. The detailed surveillance guidelines for these diseases have been issued as standalone manuals that should be referred for further details. However a short summary of these diseases has been included in this manual.

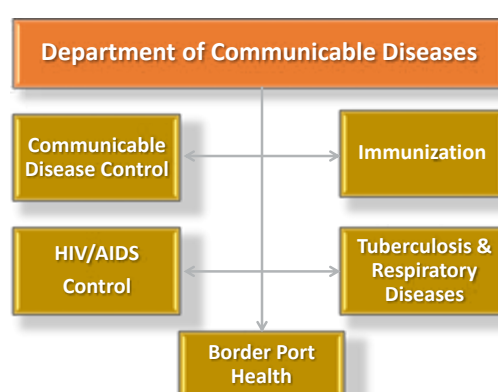
The communicable disease surveillance system is planned, monitored and managed by the Department of Communicable Diseases (DCD) and the Department of Surveillance under the Directorate General for Disease Surveillance and Control (Fig.2).

Fig.2: Organogram of Directorate General for Disease Surveillance and Control



At the national level the communicable diseases department has 5 sections (Fig.3) namely Communicable Disease Control, Respiratory Diseases including TB, HIV/AIDS and STI control, Immunization (formerly EPI) and Border Port Health (formerly Quarantine) section. The surveillance policies and guidelines on communicable diseases are formulated at the national level and are applicable to all the health services.

Fig.3: Sections of Communicable Disease Department



3. The national surveillance system

3.1 Objectives

- To collect systematically data on priority communicable diseases by all health institutions in public and private sector
- To collate, analyse and provide feedback of collected information to those responsible in disease control programmes at the governorate (provincial) and national levels
- To implement prompt coordinated and effective response for disease outbreak investigation and its control
- To evaluate the effectiveness and the impact of interventions and control measures
- To provide data for the purpose of health service planning

3.2 Principals of disease surveillance and response

“Surveillance” refers to the monitoring of the occurrence and distribution of disease, events or conditions, which increase the risk of disease transmission. Surveillance is an ongoing, continuous and systematic process of collection, compilation, collation and the analysis of disease-related data to generate action in order to control the disease.

Disease surveillance is based on collecting only the information that is required to achieve the primary objective of control i.e. **information for action**. The data required may differ from disease to disease. Specialized surveillance systems are important, especially where surveillance is complex and has specific needs. Eradication and elimination programmes may require active and case-based surveillance with the aim of detecting every case. In other situations, information on outcome may be important. For example, the rate of treatment completion and the cure rate are essential indicators in TB surveillance. Some diseases may require surveillance only in a few representative sentinel sites.

Despite the variety of information needs, many elements of data collected in surveillance are very similar and the data source often comes from the same individual or health care facility. There may, however, be some differences in:

- *The specific case detection method used (active vs. passive case detection)*
- *The speed at which data need to flow through the system (immediate reporting vs. routine)*
- *The rapidity of response required (immediate investigation of cases or clusters of cases vs. analysis of data on a regular basis to monitor the disease trend)*

For the system to function as an early warning system the reporting, confirmation, decision-making and response, must be rapid.

3.3 Types of surveillance

There are essentially 2 broad categories of national surveillance systems. One is based on reporting or identifying health-related events and other on routine system of reporting with defined indicators and thresholds for response.

The event-based surveillance complements the indicator-based surveillance. Therefore, both systems should be seen as essential components of a single national surveillance system. A well-implemented, event-based surveillance system serves as an early warning for the national surveillance system.

There are a number of different types of surveillance types used within these systems based on specific needs such as active vs. passive surveillance, exhaustive vs. sentinel surveillance, disease specific vs. syndromic surveillance etc.

3.3.1 Event-based surveillance

Event-based surveillance is the organized and rapid capture of information about events that are a potential risk to public health. This information can be rumours and other reports transmitted either through formal channels, i.e. established routine reporting systems, or through informal channels, i.e. media, health workers and nongovernmental organizations reports, including:

- Events related to the occurrence of disease in humans such as clustered cases of a disease or syndromes, unusual disease patterns or unexpected deaths as recognized by health workers and other key informants in the country and
- Events related to potential exposure for humans such as events related to diseases and deaths in animals, contaminated food products or water, and environmental hazards including chemical and radio-nuclear events
- Information received through event-based surveillance should be rapidly assessed for the risk the event poses to public health and responded to appropriately.

a. Characteristics of event-based surveillance

Definitions	Definitions are broad, such as a cluster of deaths in the same village during the same time period. Definitions are more sensitive than those used in indicator-based surveillance
Timeliness	All events should be reported to the system immediately
Data/information	The data format is not pre-defined. For each event as much information as possible is collected and recorded (i.e. time, place, person) to assist with event confirmation and assessment
Reporting structure	Loose structure. Reports are unstructured. Forms are used to capture the event information, but the format is sufficiently flexible to collect qualitative and quantitative data. A designated unit, a rapid response team (RRT), is assigned to confirm and assess each reported event and trigger a response
Reporting	Open, sometimes undefined (i.e. the general public can report directly to the system)
Trigger for action	A report that is confirmed and assessed as a potential risk to public health
Analysis	Rapid risk assessment
Response	Immediate. The response to an event is built into the surveillance system

When it comes to the timely detection of outbreaks and important public health events, indicator-based surveillance systems are often inadequate. Furthermore, the systems are not suited to the detection of rare but high-impact outbreaks (SARS, avian flu) or emerging and unknown diseases. On the other hand event-based surveillance systems rely on the immediate reporting of events and are designed to detect:

- Rare and new events that are **NOT** specifically included in indicator-based surveillance
- Events that occur in populations which do **NOT** have access to health care through formal channels

b. Reporting sources

Health care setting

Health care staff, such as general practitioners, nurses, medical orderlies, etc. from government or private health clinics, hospitals, pathology and laboratory services, traditional healers, ambulance services, health quarantine officers, etc.

Community setting

Designated community members – Wali and sheiks, volunteer/charity groups, members of the community, Majlis Al Shura members (health and environment), community support groups,

environmental health officers (Ministry of Environment), Omani Women's Association, religious organizations, nurseries, schools (Ministry of Education), pharmacies, police, public authorities (water, sanitation, environmental health, consumer protection), other nongovernmental organizations/associations, veterinary services (Ministry of Agriculture and Fisheries), Baladiyah (municipality).

Media and published sources

Media (newspapers, radio, television), academic press, Internet

Others

Military organizations (Ministry of Defence), Embassies, Universities (Sultan Qaboos University and private)

c. Event definitions

The following event definitions are examples of those used in countries with existing event-based surveillance systems.

- **Symptom-based definitions for diseases in humans**
 - **Clusters of deaths** in a health care facility, village, community, construction site, mine, school or other institution over a period of 2 weeks
 - **Cluster of disease of unknown aetiology:** 3 cases or more of a disease of unknown aetiology in a health care facility, village, community, construction site, mine, school or other institution over a period of 2 weeks
- **Any unusual event in the community which may affect human health**
 - Any public health event that raises concern, fear and alarm in the community
 - An event which may have a known, suspected or possible impact on human health

d. Rumour notification

All health-related rumours concerning infectious diseases should be recorded and investigated to verify the facts. A register should be maintained in the office of the Directorate General of Health Services (DGHS) of the respective governorate for documentation and future reference.

Definition of Rumour (Oxford dictionary)

A currently circulating story or report of uncertain or doubtful truth

Following details should be noted in the registry – date of report, source of the rumour, date of investigation, names of investigators, place of occurrence and a short summary of findings.

e. Minimum data elements

Systematic, structured data collection is a critical component of any surveillance system including event-based surveillance. For event-based surveillance, data collection has to be rapid and capture enough information to allow for an initial assessment of the event. Event information should be sent to the Local Health facility or to Director of Disease surveillance and control in the respective governorate.

A successful event-based surveillance should identify events that are a potential risk to human health. Therefore disease events in animals (i.e. unexpected die-offs in poultry) and environmental events (i.e. discoloration of water sources, chemical spills) should also be reported, confirmed, assessed and responded to.

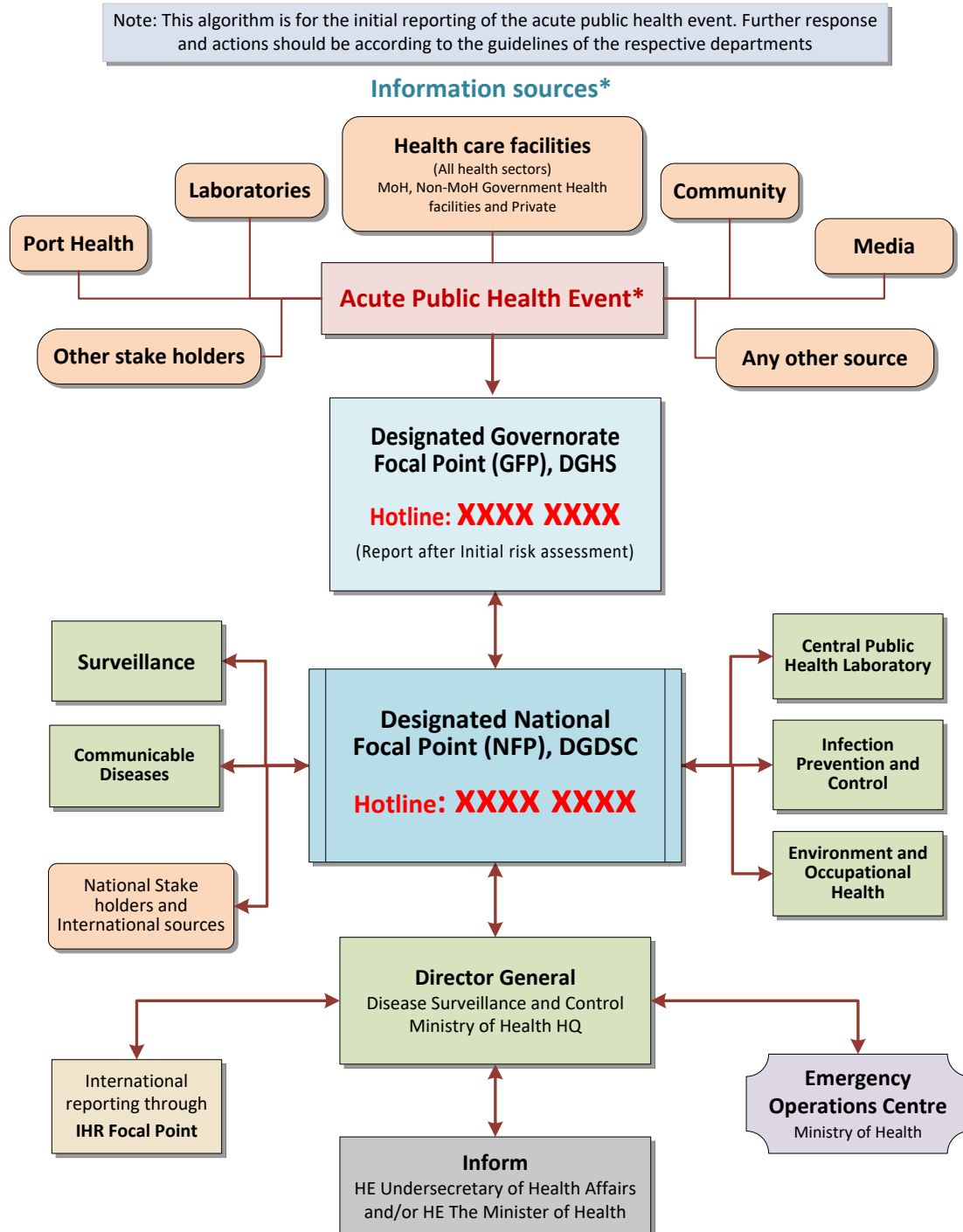
The rapid and effective assessment of, and response to, these events will require close links with other departments, ministries and agencies (intersectoral coordination).

- **Ministry of Agriculture and Fisheries:** Surveillance of, and response to, disease/s in animals e.g. CCHF, rabies, brucellosis, etc.

- **Municipality (Baladiyah):** Local or regional office for response to environmental hazards including food poisoning episodes

f. The communication pathway for acute public health event/incident

Fig.4: The Incident-Command-Chain for reporting an acute public health event



g. Health event report – Process of event verification

Data recorded during event confirmation and assessment

1. Report date and time (when was the health event reported?)
2. Confirmation date (when was the health event confirmed?)
3. Health event (what happened?)
4. Location (municipality/city, province, region)
5. Start date (date of onset of first case)
6. Number of cases (how many were affected? attack rates?)
7. Description of cases (who were affected? When? Where?)
8. Number of deaths (of the cases, how many died?)
9. Description of deaths (who? When? Where? Why?)
10. Actions taken (who? What? When?)
11. Status of health event (ongoing or controlled?)
12. Who has been informed? (Local health departments, etc.)
13. Source of information (name, office number, mobile number)
14. Is assistance needed? (If yes, please specify)
15. Remarks (other important information)

h. Response to event

Responding to an event is an integral part of event-based surveillance. Once an event is confirmed and is considered to be a potential risk to public health, the investigation and response should be organized.

The level of response and the mix of skills required are determined in the first instance by risk assessment. **Not all assessments will result in a full-scale investigation during the initial response.**

The director of disease surveillance and control in the governorate should clearly define the procedures for responding to an event, including definition of roles and responsibilities of key responders and other stakeholders.

Routine feedback, monitoring, supervision, evaluation and reporting to national level should be an integral part of event-based surveillance.

3.3.2 Indicator-based surveillance

The indicator-based surveillance relies on collecting data on morbidity and mortality of a disease through an established national system of reporting. There are various types of systems that complement the national surveillance network.

For example, an exhaustive surveillance system is implemented at all health facilities while sentinel system focuses on few representative sentinel sites. More resources are required for running an exhaustive system while a sentinel system is cheaper and good at revealing trends, but may likely to miss a rare disease or event.

Most national surveillance systems are passive, where in a case is detected when an individual case visits a health facility and the clinician suspects a notifiable disease based on the national guidelines and case definition. An active case finding is preferred when you are planning to find every possible contact of a highly infectious and fatal disease.

Active surveillance of contacts is usually conducted for the period lasting for double the maximum incubation period of the disease from the last exposure

The **core functions** of surveillance are

- Case detection
- Reporting
- Investigation
- Analysis and interpretation
- Actions (include policy, intervention and feedback)

The **support functions** that improve the core surveillance functions are:

- Setting of standards e.g. case definitions, reporting forms, protocols and SOPs
- Training and supervision
- Laboratory support
- Effective communication system
- Resource management

The key decisions in development of surveillance system are those that relate to case definitions and surveillance methods. In some situations a **syndromic approach** is considered appropriate whereas in others a **disease specific approach** is preferred. There may be a requirement to report the disease or syndrome immediately on suspicion. This is especially true for epidemic-prone diseases. Similarly the diseases under elimination or eradication programme may have entirely different surveillance needs that are more specific and focused.

Data compiled at the national level are sent after verification to the relevant departments in the regional office of WHO (EMRO). However it is also important to provide feedback to the peripheral health institutions where the data are generated. The **feedback loops must therefore be built into a good surveillance system** to make it more effective and efficient.

It is also crucial that the personnel involved in surveillance are trained for their tasks by the regional health authorities. The ongoing in-service training of all those involved and at all levels of health system is therefore an essential component of a functional system.

3.4 The Surveillance organization

The DGDSC in the MoH is the apex body at the national level responsible for formulating policies, planning, organization, supervision and evaluation of the communicable disease surveillance programme in Oman.

Decentralization process

From the year 1990, the process of decentralization was initiated in the Sultanate with a division of the country into 8 administrative regions (provinces). The decentralization of health services followed with further division of Batinah and Sharqiyah regions into north and south that led to the establishment of 10 health regions. In 2012 Buraimi was added as a new region and all the 11 provinces were re-designated as governorates. The governorates are further divided into 61 wilayat (districts) as the second administrative division.

The process of decentralization of health services was also started leading to a 3 tier administrative structure. A regional surveillance unit was created within the provincial office of the Director/ Director General of Health Services.

From the year 1990 to 2005 the communicable disease surveillance system was also decentralized in a phased manner and the complete responsibility of surveillance and disease control was handed over to the sub-national (provincial health authorities). In 2015 an independent department of disease surveillance and control was established at the governorate level under the directorate general of health services in the 11 governorates.

Technical manpower (epidemiologists/public health specialists) have been recruited in the regional directorates. Regular seminars, workshops and training sessions are conducted at the national level and in the governorates for the staff as a component of continuous professional development.

Thus the disease surveillance system in Oman became functional, effective and sensitive at the peripheral primary health care level. On several occasions, the visiting consultants assessed and documented a well-designed and implemented program of communicable disease surveillance and control in the Sultanate.

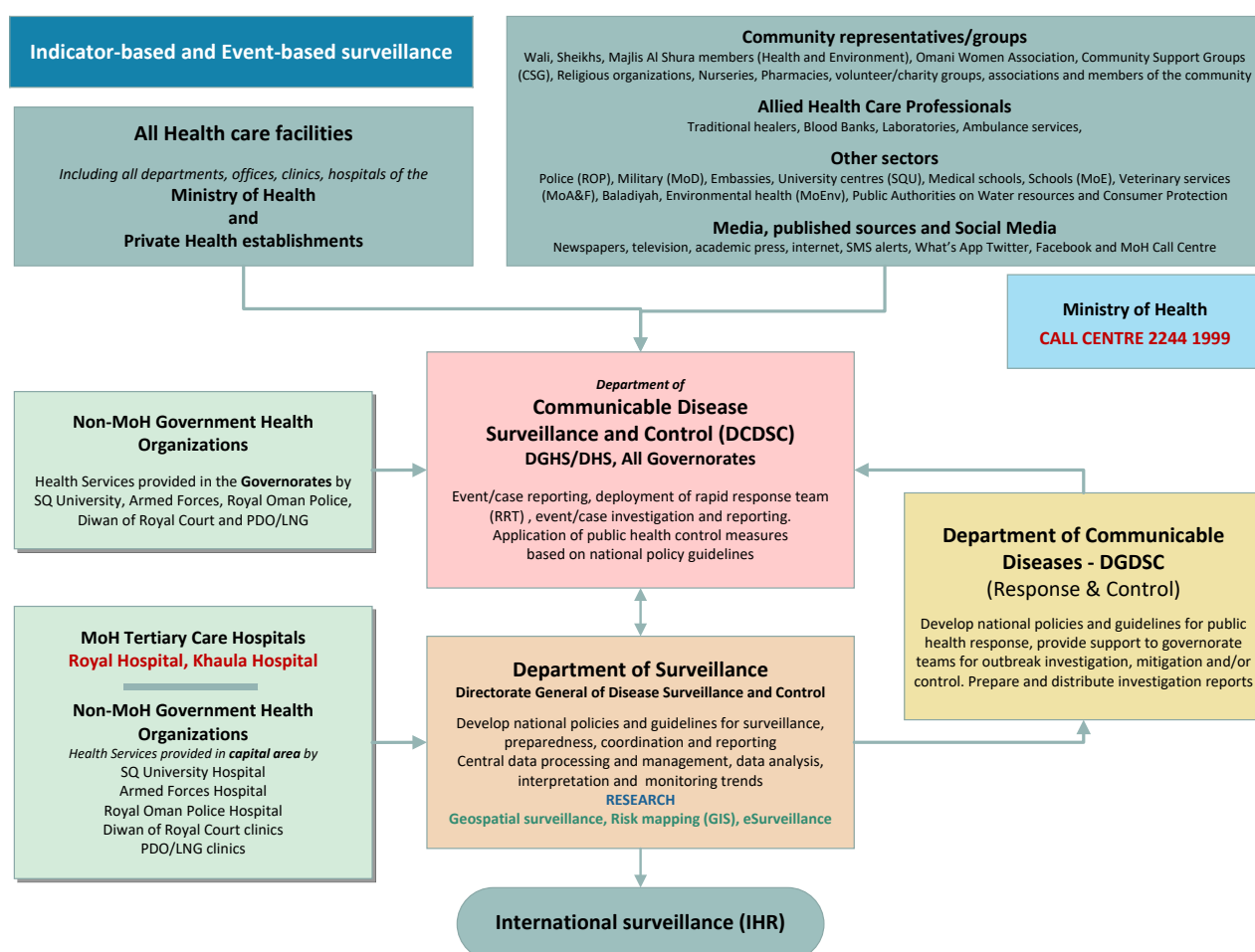
Health institutions network

At the peripheral level health centres, extended health centres, polyclinics and wilayat or local hospitals provide elements of primary health care. The 'Regional Referral Hospital' offers secondary health care services in the governorate and is located in the wilayat headquarter. Thus the information from the periphery flows to the centre through the regional headquarters.

The non-MoH health organizations, such as, Sultan Qaboos University Hospital (SQUH), PDO, ROP, Health Services provided by the Diwan of Royal Court are also included in the surveillance organization that are mostly located in the Muscat governorate. Similarly the private health sector in Oman has also developed mainly in the capital area. In the provinces the non-MoH health organizations and the private health institutions are required to report to the governorate DGHS office.

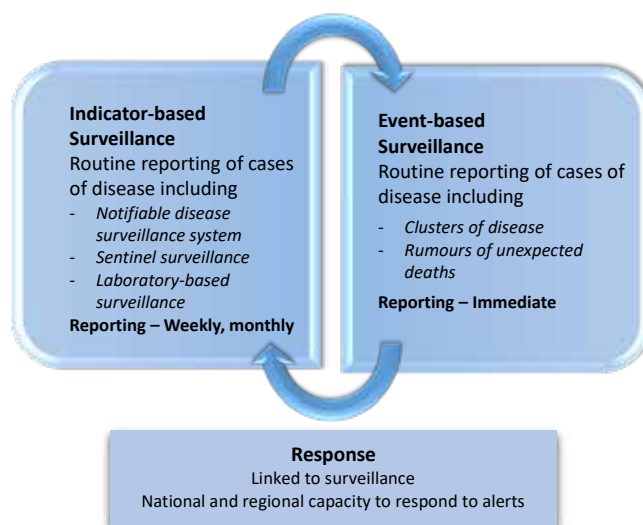
Following schematic diagram represents the surveillance organization in the Sultanate.

Fig. 5: The communicable disease surveillance organization in Oman



The national surveillance system should essentially use an integrated approach where both an indicator-based and event-based system are utilized for capturing events/data on the diseases of priority for a timely and effective public health response.

Fig. 6: The integrated communicable disease surveillance and response system



3.5 Setting priorities

Every country decides on the list of priority communicable diseases and conditions appropriate to the disease epidemiology, infrastructure and the available resources. National surveillance systems should also reflect national and global goals for communicable disease control. The rationale for prioritizing diseases depends on the responses to the following series of questions:

- Is the disease notifiable under the IHR? (e.g. cholera, plague)
- Is it a specific disease targeted for national, regional or international control/ elimination/ eradication programme? (e.g. Global Polio Eradication)
- Does the disease result in a high impact? (High morbidity, disability or mortality)
- Does the disease have a significant epidemic potential? (e.g. cholera, meningococcal meningitis)
- Will the information collected leads to significant public health action and impact? (e.g. immunization campaign or other specific control measures)

Based on the above principals some changes are introduced in the list of the priority diseases or the grouping. As patterns of disease and their epidemiology change, they may be moved from one group to another. Similarly a new disease/syndrome is added to the priority list due to its emergence or re-emergence.

Following listed diseases although no longer considered a public health problem in Oman due to their status of elimination or due to their rare occurrence (hence, taken out of the priority list) should also be reported to the national surveillance system.

Diphtheria, leprosy, tetanus (neonatal and adult), active trachoma (TF and TI), leprosy

Similarly any unusual occurrence of an infectious disease, not previously reported in Oman should also be notified to the national surveillance system.

Grouping of diseases for notification

The type of information required and the speed with which it needs to be reported is dependent on the disease including the action that would be taken for its control. The grouping system was designed and utilized for surveillance since 1991. The grouping has now been extensively revised for the second time with emphasis on event-based and syndrome reporting.

The following is the current categorization of communicable diseases/conditions under surveillance in Oman (effective from 2017):

- **Group ‘A’ diseases and syndromes**

All diseases and syndromes under group A are of high priority and should be notified and investigation initiated within 24 hours for immediate actions to control the spread of the disease. Some of the diseases and syndromes under this group are also required to be notifiable internationally or are under elimination or eradication programme.

- **Group ‘B’ diseases**

This group represents an intermediate priority. Every case under this group is **notified and investigated, but with less urgency of action i.e. usually within one week**, due to the less immediate actions required to control the spread of the disease.

- **Group ‘C’ health conditions under surveillance**

This group includes some of the important health conditions under surveillance. The surveillance for some is conducted at the sentinel sites while for others data are compiled electronically from the patients’ records (Al Shifa).

“Al Shifa” is a customized electronic patient record system developed over the past 2 decades by the Directorate General of Information Technology in MoH. In the process of development various versions of the software are installed in health care facilities the latest being Al Shifa-3Plus.

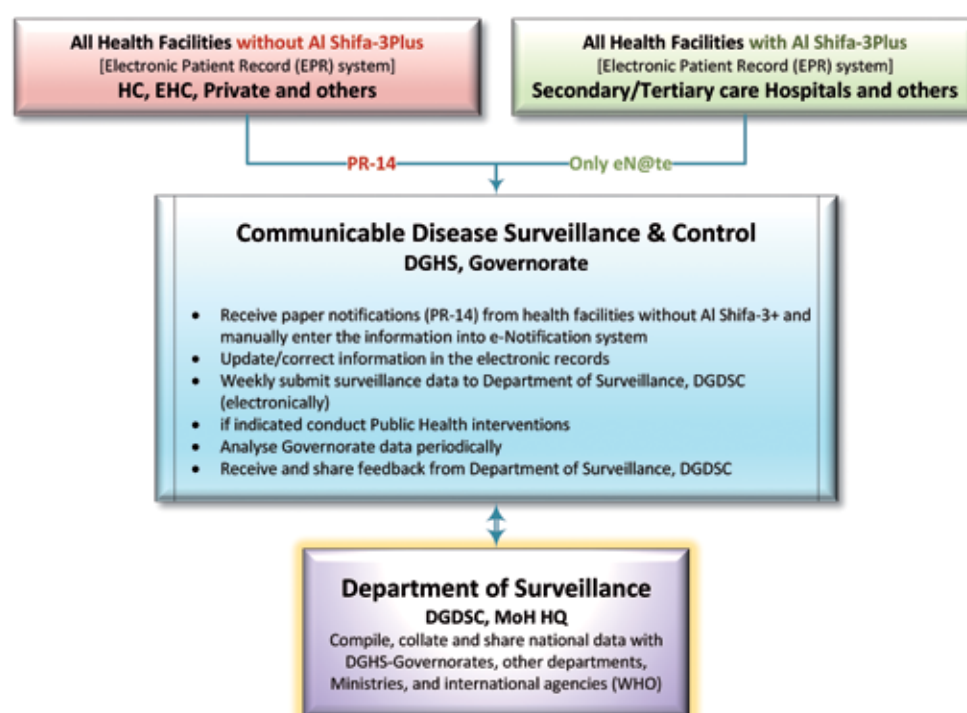
The laboratories are also involved in the surveillance activities that relate to antibiotic resistance or surveillance of selected indicator organisms for diarrhoea. A long-term follow-up of chronic diseases is done through establishment of registries at the institutional level.

3.6 Notification and reporting

Who should notify?

Although the major responsibility for reporting lies with the doctors making the diagnosis, others such as laboratory staff must also notify any positive results related to priority diseases and/or isolation of an unusual organism. Thus in effect all health care workers including the nursing staff, health information officers, and medical records officers are also contributors to the surveillance system.

Fig. 7: The e-reporting system



The final responsibility of notification according to the protocol of reporting however lies with the **head of the health institution**. He/she should ensure the appropriate systems are in place and all the concerned staff are aware of the reporting system.

The **head of the health institution** may in larger health facilities delegate the responsibility of reporting to a designated **Focal Point**.

Reporting forms

The paper-based notification form was introduced nationally in March 1991 (PR-14). This form will eventually be replaced by an electronic notification system for the priority communicable diseases commencing from 2016 in a phased manner.

The e-Notification

All the major hospitals are expected to be connected to the central data warehouse by the end of 2016 with an ambitious plan to connect all polyclinics and primary health care facilities in the country to the network.

1. This system will generate an alert for notification transmitted to the registered mobile phones. The electronic patient record will then be accessible to the data manager at the governorate and national level through different levels of permission.
2. The notification form will pop up automatically once the specific diagnostic International Classification of Diseases (ICD) code is entered into the 'Al Shifa-3Plus' electronic patient record system. The form will fetch personal particulars and contact information from the patient's record.
3. The disease details are filled up by the notifying doctor through various dropdown/selection menus on the Al Shifa system. Some fields in the form will be mandatory such as immunization details for a vaccine-preventable disease.

In institutions with earlier version of Al Shifa, the paper-based notification forms will be in use until the upgrade is complete. Similarly, in the MoH institutions without Al Shifa, private clinics and hospitals, and other governmental sister health organizations using a different computer system for patient records, paper-based notification will continue until such time a web-based system is developed and implemented.

Forthcoming in Oman, Al Shifa-3Plus system will be installed in all the health institutions linked to the central data warehouse. Such system would also allow to generate SMS alerts to registered mobile numbers thus improving the component of effective and quick communication desired in a good surveillance system.

The web-based system of notification

The long term aim is to introduce a web-based notification system for the e-notification. The regional Focal Points would access the password protected website and complete data entry online. It is envisaged that up-to-date data on communicable disease would be available to all concerned in real time thus fulfilling the important criteria of an ideal surveillance system.

Such an online system would be accessible through internet from anywhere within and outside the country and will be available to all health institutions including private and non-MoH governmental organizations with or without Al Shifa system.

Other case investigation forms

The paper-based form for epidemiological investigation (PR-15) has been discontinued and should no longer be used. For epidemiological investigation reports, standard MS-Word templates should be used from January 2017 (see annexe #5 and 6). These include:

- a. Situation Report (SitRep) # 1,2, 3, etc. - template
- b. Final report template
- c. Contacts follow-up templates

Other forms for specific communicable diseases or health-related events are:

- **Animal Bite:** notification form (for rabies) – e-Notification form in Al Shifa under ‘Injuries and Poisoning’
- **Fever and rash illness:** Mandatory Information Form (under ‘Measles And Rubella Elimination Initiative’)
- **AFP:** Acute Flaccid Paralysis Case Notification Form (WHO) and 60-day follow-up form under the ‘Polio Eradication Initiative’

These forms will be eventually integrated into the Al Shifa system

The notification procedure

Whenever a provisional diagnosis of a notifiable disease is made, it is the responsibility of the doctor or nurse making the diagnosis to ensure that an appropriate notification is made. It should also be ensured that all relevant information and details are entered in the e-notification form.

Group ‘A’ and ‘B’ diseases and syndromes

- For some of the diseases and syndromes of group A should be notified to the national surveillance unit at the earliest (within 24 hours) by fastest means of communication
- In addition occurrence of all group A diseases and syndromes should be informed to the Medical officer in charge (MOIC) or director of the hospital at the earliest and also to the Department of Disease Surveillance and Control (DSC), DGHS in the governorate by telephone or other rapid means
- For Group B diseases notifications, enter the relevant laboratory results and submit within one week to the DSC
- Indicate on the patient’s medical record that the case has been notified

Group C - Health conditions under surveillance

- Data of each new case should be collected at the sentinel sites only and in a specially designed format
- Dispatch compiled data worksheets to the DSC in the governorate

Role of Laboratories

The laboratory plays a key role in surveillance since usually it is the first point at which a suspect priority disease/s are usually confirmed. Four categories of laboratories are available in the Ministry of Health: Referral Laboratories (CPHL, Royal Hospital, SQUH, and Armed Forces Hospital); Regional Hospital Laboratories; Regional Public Health Laboratories and Primary Health Care laboratories.

Important

Referral laboratories regional or national should **directly inform** any positive laboratory results of diseases under **Group ‘A’** to the regional and national surveillance sections by the fastest available means of communication

3.7 Levels of diagnosis

The cases of infectious diseases should be reported as either suspect or confirmed. The case definition provided for the respective disease or syndrome should be used. Note that the **surveillance case definitions may differ from the clinical and laboratory definitions**. These definitions will be either broad (sensitive) or narrow (specific) depending upon context and the rarity of the disease and possible concerns over false negative cases.

Suspect	Signs and symptoms compatible with the case definition
Confirmed	‘Definitive’ laboratory evidence of (recent) infection and/or epidemiological evidence or link

- Health staff in primary health care would normally report cases as ‘suspect’ based on case definition. This category is extremely important since it expresses the sensitivity of the surveillance system. It is inconsequential if the case is discarded later. In case of doubt, it’s always a good practice to report
- From the secondary and tertiary care hospitals, cases of specific diseases should usually be reported as ‘confirmed’ based on the strength of clinical, laboratory or epidemiological evidence.
- Group B diseases should normally be reported as ‘confirmed’ as these are to be notified within 7 days, hence providing sufficient time for the essential laboratory investigations. In some diseases, such as pertussis, definitive laboratory diagnosis may not be always possible
- Final classification of diseases under elimination or eradication will be done at the national level after weighing all the available evidence by the National Expert Committee appointed for that specific purpose. The final classification of a reported syndrome would also be done after a national level assessment

3.8 The surveillance responsibilities at the peripheral or primary health care level

(Includes government health centres, extended health centres, local and wilayat hospitals and private clinics)

From the year 2005, the regional directorate/directorate general’s office (Health Affairs) was the designated first responder to disease outbreak in the governorate. The office was responsible for routine surveillance activities, outbreak or case detection, reporting and deployment of RRT, compiling an investigation report, and to implement control measures. From 2015 the office of the director for disease surveillance and control (DSC) was established in the office of the DGHS in the governorate.

In most cases the first point of contact of an ill person with infectious disease with the health services tends to be at a peripheral or primary health care institution. This level of institution thus also represents the FIRST opportunity for epidemiological surveillance. Therefore the sensitivity of the surveillance system depends largely on the knowledge, awareness and training of the staff working at the primary health care (PHC) level.

The collection of information must be simple and the principle is to report a suspect case immediately to the governorate level, rather than wait for confirmation of diagnosis.

Note: Every health institution, government or private should designate a **Focal Point** for communicable diseases for the health facility and should be made responsible for the accuracy, timeliness and completeness of reporting of health related events.

Tasks at the peripheral level (monitored by the institutional Focal Point)

- Health event: Diagnosis (based on case definition) of a case/outbreak of notifiable disease/condition or unusual occurrence of disease of infectious origin
- Initial case management and/or referral
- Notification to DSC in the governorate DGHS office
- Collection of appropriate clinical specimen/s if indicated
- Support RRT investigation
- Active case finding and contact investigation in the community and follow-up
- Support preventive interventions such as vaccination or chemoprophylaxis
- Simple analysis of local data (tables and graphs) and weekly negative reporting

From the perspective of surveillance requirements at the governorate level the ongoing routine analysis of data from the periphery is crucial to recognize outbreaks or monitor the changes in disease trends and/or patterns. These analyses must be associated with public health responses such as investigation and/or intervention. Effectiveness of interventions can also be monitored using the same data sources.

Tasks at the governorate level (DSC)

- Deployment of RRT to investigate case/outbreak of notifiable disease/condition or unusual occurrence of event/disease of infectious origin
- Epidemiological investigation of suspected outbreak or event
- Case management that cannot be done at the peripheral level
- Provision of laboratory support
- Monitoring disease trends
- Feedback to the peripheral level and reporting of suspected and/or confirmed outbreaks to national level
- Achievement of control, elimination or eradication targets
- In-service training through continuing medical education (CME)

Specific responsibilities

The regional surveillance and response department is headed by the Director who is the public health expert in the governorate. He/she is the designated Focal Point for communicable diseases in the governorate with following responsibilities:

- To receive notifications of cases/events from the health institutions of the region
- To scrutinize and monitor timeliness, completeness, and accuracy of notifications and other reports
- To maintain relevant records, important circulars, registers and files
- To maintain a regional database on communicable diseases
- To monitor trends and to evaluate programme performance
- To lead a case or outbreak investigation and then to plan and conduct containment activities in compliance with the national guidelines
- To prepare and distribute to all concerned, the case/outbreak investigation reports
- To provide regular feedback to regional health institutions
- To function as an epidemiological intelligence link with the national surveillance
- To conduct training and orientation programmes for the new and the staff through CME, seminars, symposia and workshops on regular basis
- To supervise and monitor surveillance-related activities in the region by conducting regular institutional visits
- To provide technical support and expert advice in the area of communicable disease surveillance and control to the policy makers in the DGHS
- To undertake relevant operational research in order to strengthen the surveillance-related activities
- To monitor regional targets specified under the 5-year health development plan of the MoH
- To function as a technical resource person for any other assigned responsibilities
- To participate in the national CME activities and share regional data.

Important note

The Director of communicable disease surveillance and control in the governorate should ensure that a **Focal Point** is designated for communicable diseases in every health care institution in the governorate including the private. His/her contact details should be available in the directorate so that a communication can be established quickly in emergencies at any time.
In case the **Focal Point** is unavailable substitute arrangements should be made.

3.9 The responsibilities at the secondary and tertiary care level

(Includes government regional referral hospitals and tertiary care hospitals in the capital area, SQUH, AFH, ROP and private hospitals)

Non-MoH government health organizations: Non-MoH Government health institutions namely ROP Hospital, Armed Forces Hospital, SQUH and PDO clinic, etc. are the major partners in the National Communicable Diseases Surveillance System and are required to notify diseases according to the policy guidelines in this manual.

Private clinics and hospitals: Participation of private clinics and hospitals in the National Communicable Disease Surveillance System is critical.

Any suspect group 'A' diseases or syndromes should be notified immediately by fastest available means of communication to the governorate (DSC) and national surveillance departments (DCD) within 24 hours of detection. Similarly for group 'A' diseases, referral to the nearest MoH health institution for management and investigations is desirable. **Clinical samples should be collected and dispatched according to the stated protocol.**

The private health institutions are required to submit a monthly communicable disease report to the MoH through DSC.

The secondary and tertiary care hospitals

The director/director general of the hospital has the primary responsibility to ensure all the staff are aware of the national requirements of surveillance and reporting. In order to ensure compliance with the MoH policies he may delegate the responsibilities to a qualified and responsible member of the staff in the hospital.

The head of the hospital is also responsible for taking actions to prevent spread of infection from the patient to the hospital staff. He must therefore ensure that the appropriate IPC precautions are followed and the PPEs, medications, and vaccines are available, staff is vaccinated and the exposed contacts are managed according to the protocol.

The coordination of communicable disease related activities in the hospital should be done by the infection control department.

Specific responsibilities (hospital FP and IPC department)

- Reporting of national notifiable diseases should be done according to specified policies in this manual
- Ensure accuracy, completeness and timeliness of reporting
- Ensure appropriate laboratory samples are collected and sent to referral laboratory following specified biosafety levels
- Update laboratory results of case and the contacts
- In case of an infection that has the potential to spread nosocomially following actions should be undertaken
 - Ensure appropriate IPC guidelines are followed during examination, performing procedures, managing suspect case, sample collection and transport and disposal of the dead body (refer to annexe # 7)
 - Ensure adequate supply of PPEs are available including plastic body bags
 - Enlist the exposed health care workers, visitors, other patients (hospital contacts)
 - Categorise contacts into the risk categories of high, moderate and low (follow guidelines in annexe # 6)
 - Follow-up contacts for appropriate time (usually double the maximum incubation period from the last contact)
 - Provide vaccination or chemoprophylaxis to exposed contacts wherever indicated
 - Prepare and send report to DSC of all the actions done including constraints

- Communicate, consult and coordinate with the Director of DCDSC in the governorate DGHS office

3.10 The responsibilities at the national level (DCD)

At the national level, where policies on infectious diseases are set, plays a key role in supporting the intermediate level by additional services that are not available elsewhere, such as the provision of referral laboratory facilities. The central level must also deal with outbreaks of national importance in a standardized and coordinated manner. In addition, overall national disease trends are analysed and resources are directed towards the high-risk areas. Based on these national data priority notifiable disease list is revised on periodic basis.

The central level also liaises with other countries and international agencies in response to outbreaks of international significance and in the management of diseases specified under the IHR.

Tasks at the National Level

- Develop policies appropriate to the priority diseases
- Coordinate all the national surveillance activities
- Supervise and monitor national surveillance activities
- Revise periodically the priority infectious disease list for surveillance
- Provide laboratory support if unavailable at the intermediate level (regional or international reference laboratory network)
- Provide support to the intermediate level for outbreak control, case management, epidemiological skills, education and training activities, and logistics
- Analyse data from the intermediate level for monitoring trends and achievement of targets
- Monitor 'zero' reporting from sentinel sites of priority diseases or syndromes
- Provide feedback to intermediate and peripheral levels
- Report to WHO-EMRO as required under IHR or specific needs of control programmes
- Collaborate with other departments within the MoH
- Collaborate with non-health sectors such as agriculture, veterinary services, Municipality and environment wherever appropriate (e.g. water or foodborne diseases, vector-borne diseases, human zoonoses)
- Develop and monitor key performance indicators (KPI)

3.11 The feedback

It is essential that feedback loops are built into the system without which the surveillance system will not function efficiently.

Weekly compiled feedback reports on notified communicable diseases are electronically distributed to all concerned by the Department of Surveillance, DGDSC (Epi-Week Newsletter).

3.12 Training and orientation

Training is the key element of surveillance. All health care staff, especially those providing primary health care, must know all the essential elements of surveillance. They should have a clear idea of the priority communicable diseases, their case definitions, outbreak thresholds besides the need and importance of their role in the national surveillance network. Only then they would be able to fulfil their share of responsibility of effective and efficient surveillance. It is the fundamental responsibility of the regional health authority to orient and to impart the necessary knowledge to the new recruits joining the MoH. The task should not be considered as a onetime activity but as a continuous ongoing process of in-service training.

3.13 Supervision and monitoring

None of the health care activity would be complete without supervision and monitoring. This process begins at the national level and continues to the peripheral level to the point where the health services interface with the beneficiaries. At the primary health care level, it is the senior staff who supervises the performance of the junior staff, teaching and training in the process. The supervisory process should be at the sectional and institutional level and should include technical and administrative aspects. The ultimate objective should be to improve system performance and provide quality care.

3.14 Epidemic preparedness and response

Epidemic preparedness is an integral component of good surveillance. The surveillance system monitors the known communicable diseases of public health importance in the community. It also envisages a mechanism to quickly detect any unusual health-related events indicating an emerging or re-emerging disease.

Good surveillance should be sensitive, should have a standard reporting protocol, awareness among all health staff in the system, laboratory support services and above all, it should be responsive to an unexpected event. Preparedness is one of the most important and cost-effective measures that should utilize resources efficiently in such situations. In a good surveillance system, the responsibilities of the established task force members are clearly defined and this avoids a panic reaction.

During the First National Workshop on Epidemic Preparedness in 2000, the following recommendations were made and adopted:

- All governorates should take necessary steps to review and to develop their **human resources** in surveillance and epidemic management
- All governorates should **strengthen their surveillance system** in order to function as an early warning system. They should develop their local epidemic thresholds and indicators to anticipate the occurrence of outbreaks
- All governorates should establish an RRT to respond to outbreaks within hours of their occurrence. Epidemiological investigations should be undertaken as soon as possible to identify the causes and to prevent further spread of disease
- All governorates should develop their generic '**Regional Plan of Action for Epidemic Preparedness and Response**'. These plans of action should be updated on a regular basis (every year)
- All governorates should develop an efficient **public information system** capable of mobilising the decision makers, the media and the community in order to support public health initiatives to effectively manage outbreaks

Components of the regional public health emergency response plan (PHERP)

- The plan consists of the administrative and health services structure of the region, composition of the task force (RRT) and technical committees who are responsible for epidemic preparedness. The regional administration should identify the members of committee by their names. The plan also should address certain critical issues, such as priority diseases in the region, availability of diagnostic tests, protocols of referral, etc.
- **Intersectoral collaboration** is a vital component of epidemic preparedness. A task force of the representatives of all related ministerial departments should be established so that assistance could be sought directly, whenever required and without administrative delays
- **Timely actions** from all concerned health care personnel are important in epidemic preparedness and response. Therefore it is essential to realize: the responsibilities, the resources available at different levels and how best these can be utilized
- The **Focal Point (Director)** should conduct meetings of the regional task force twice a year. The proceedings of the meetings should be documented and a copy should be sent to DCD. The regional plans should also be revised regularly on annual basis

3.15 The format of disease chapters in this manual

The communicable diseases and syndromes appear in this manual according to their priority. The name and ICD-10 codes for the diseases are mentioned in the title. The description has been restricted to the issues related to surveillance, notification, diagnostic criteria and public health implications and is not meant to be an exhaustive treatise on the disease. Interested readers may refer to text books or access the internet. A list of relevant websites is given in the annexe 13.

The diseases and syndromes are discussed under the following headings. Details on the diseases have been included only if consequential to public health:

1. **Epidemiological Background:** A brief summary on the global situation and importance of the disease with its peculiarities are mentioned as an introduction
2. **Epidemiological characteristics:** Tabulation of disease agent, incubation
3. **Situation in Oman:** A brief description on the disease situation in Oman since the formal launching of surveillance system is given. Additional graphs to highlight the past decade have been included if relevant
4. **Case definition:** The recommended surveillance case definition with classification into suspect and confirmed is given. Note that it may not exactly be the textbook case definition since sometimes a broader definition is required for capturing rare cases e.g. syndrome reporting in polio, measles and rubella (AFP, fever and rash)
5. **Mode of transmission:** Only a brief mention is made that may be useful for eliciting probable exposure history
6. **Laboratory criteria:** To classify a case as a confirmed case are described in brief
7. **Case management:** A short description of the main elements of case management
8. **Surveillance and reporting:** The recommended surveillance type that would be influenced by the disease situation in Oman and whether or not the goal of control, elimination or eradication has been adopted by the MoH
9. **Prevention and control:** A brief description if applicable on recommended contact management and community action including relevant aspects of prevention are mentioned as a guideline
10. **Laboratory investigation protocol:** At the end of the chapter a table is given that summarizes the procedures recommended for the essential laboratory investigations that are available for surveillance at various levels of health care in Oman

3.16 The future plans

GeoSentinel network (Travel Health)

In 2012, the number of international tourist arrivals worldwide was projected to reach a new high of 1 billion arrivals. Travelers have contributed to the global spread of infectious diseases, including novel and emerging pathogens. Travel-related morbidity can occur during or after travel. Therefore, surveillance of travel-related morbidity is an essential component of global public health surveillance and will be of greater importance as international travel increases worldwide.

GeoSentinel is a clinic-based global surveillance system that tracks infectious diseases and other adverse health outcomes in returned travellers, foreign visitors, and immigrants. GeoSentinel comprises 54 travel/tropical medicine clinics worldwide that electronically submit demographic, travel, and clinical diagnosis data for all patients evaluated for an illness or other health condition that is presumed to be related to international travel. Clinical information is collected by physicians with expertise or experience in travel/tropical medicine. Data collected at all sites are entered electronically into a database, which is housed at and maintained by CDC.

The GeoSentinel network membership program comprises 235 additional clinics in 40 countries on six continents. Although these network members do not report surveillance data systematically, they can report unusual or concerning diagnoses in travellers and might be asked to perform enhanced surveillance in response to specific health events or concerns.

Thus the GeoSentinel Global Surveillance System is the largest repository of provider-based data on travel-related illness.

GeoSentinel surveillance data have helped researchers define an evidence base for travel medicine that has informed travellers' health guidelines and the medical evaluation of ill international travellers. Health-care providers should help prepare travellers properly for safe travel and provide destination-specific medical evaluation of returning ill travellers. Training for health-care providers should focus on preventing and treating a variety of travel-related conditions.

It is planned to introduce the concept of travel health in Oman. In Muscat governorate Royal hospital and Al Khuwair HC will be registered for the GeoSentinel surveillance.

Geospatial mapping

In near future the geographic information system (GIS) would be utilized for mapping of communicable diseases cases including risk mapping. Appropriate training will be organized for the concerned staff on GIS to introduce them to the technology.

Revision and SOP manual update

This SOP manual would be updated every 5 years.

3.17 The revised “International Health Regulations” – IHR (2005)

The IHR 2005, which entered into force among the member states in June 2007, takes an all-risks approach to the management of global threats to public health.

While all potentially serious hazards are covered (all hazards approach), in practice the day-to-day focus remains on communicable diseases.

Under the IHR 2005, all member states including Oman (signatories) must fulfil the following obligations.

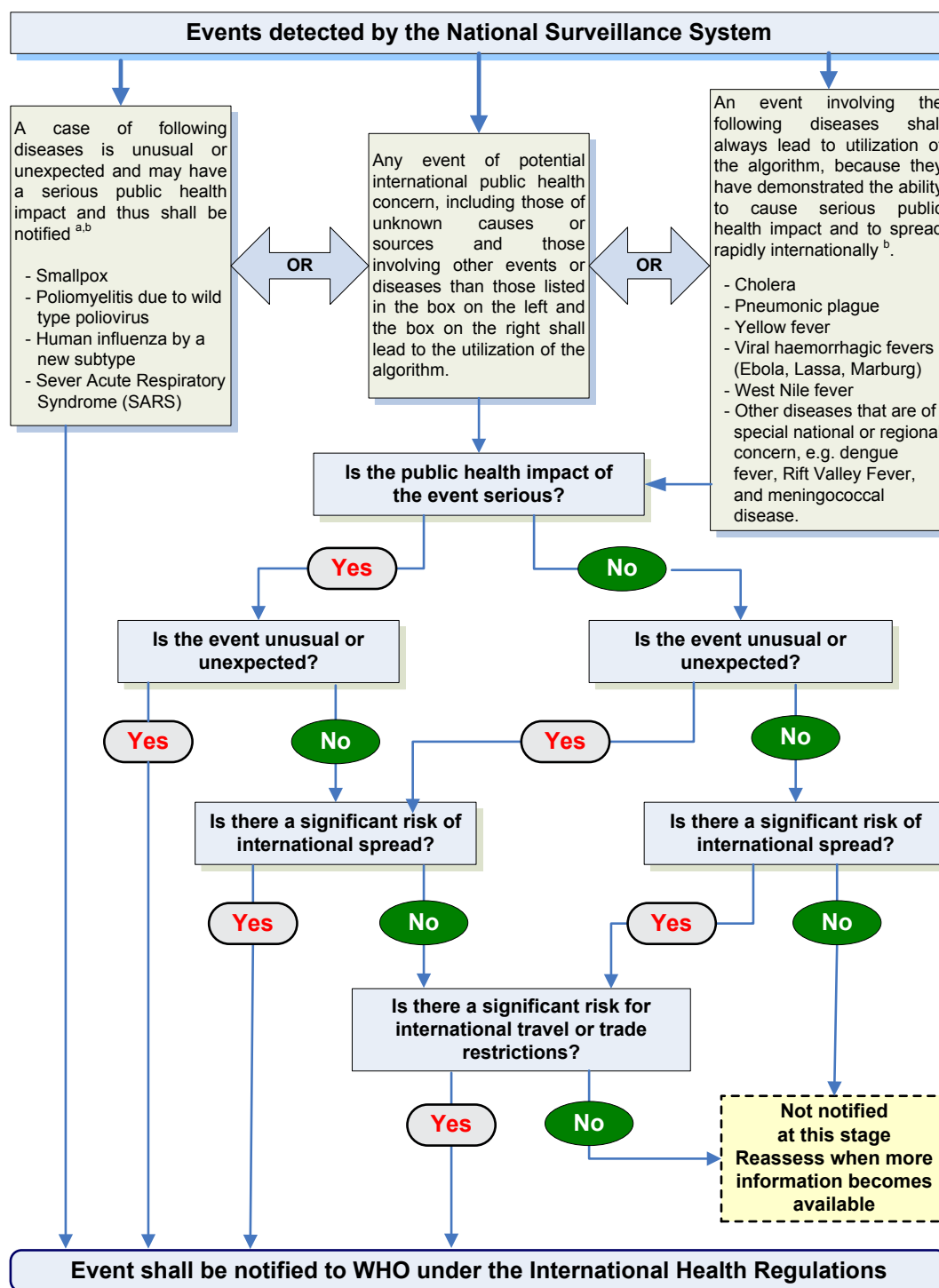
1. Oman must develop and maintain the capacities to detect, investigate, manage and report all potentially serious disease-related events. These capacities must be in place locally/regionally, nationally and at the border such as international airports
2. Oman must establish an IHR national Focal Point (NFP) to provide a single point of contact between the country and the WHO. This NFP performs a whole-of-health-sector, whole-of-government role in collating and dissemination relevant information.
3. The MoH must receive and rapidly assess the significance of any reports of potentially serious public health events to determine whether or not the NFP should report the event urgently to WHO. Such assessments include using the 'Decision Instrument' as provided in the IHR 2005, Annexe 2 (Fig.8)
4. Within 72 hours of the Ministry receiving relevant information the NFP must notify WHO of events involving any case of smallpox, poliomyelitis, SARS or human influenza caused by a new subtype
5. Within 48 hours of the MoH receiving information of any event involving cholera, pneumonic plague, yellow fever (YF), viral haemorrhagic fevers, West Nile fever, or any unusual or potentially serious public health event, the NFP must have assessed the event using the Decision Instrument, and, where notification is required, notify WHO within a further 24 hours

The Directorate General for Disease Surveillance and Control is the National Focal Point (NFP) for the purpose of the International Health Regulations (IHR). The responsible officers are Director of Communicable Diseases, the Director of Surveillance and a designated staff from Department of Environmental and occupational health.

Designated officers and health care institutions play a vital role in ensuring that Oman meets the obligations listed above and, in particular, they should maintain close communication with the MoH to ensure that the requirements listed under points 4 and 5 above are able to be discharged in a timely manner.

In the event of serious PHEIC, communications between IHR-NFPs and WHO takes place on disease cases and contacts that are of relevance to other countries, for example, where someone has been identified as being infectious while staying in another country or aboard a plane. Designated officers who are alerted to such instances should send this information to the Office of the IHR-NFP for Oman.

Fig. 8: Decision instrument for international reporting of PHEIC
IHR (2005) Annexe 2



^a as per the WHO definitions

^b The disease list shall be used only for the purpose of these Regulations

Source: Revised IHR (third report of committee A): 58th World Health Assembly

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Group 'A'

Diseases

Group 'A' Diseases

Introduction

The diseases included in this group are considered a high priority and require notification within 24 hours, by the most rapid means of communication. The list includes internationally notifiable diseases, such as cholera, plague and YF under the IHR. Highly fatal diseases like rabies or meningococcal infections which have a potential of widespread outbreak are also included in this group.

- Neonatal tetanus elimination target was achieved in the year 1992, hence has been deleted from the list of priority diseases. Although the last case was reported from Mussanah (South Batinah) in 1995, the elimination criteria were not affected. The elimination is expected to sustain in the forthcoming years due to high coverage of maternal TT5.
- The last case of diphtheria in Oman was reported in 1992 and was omitted from the priority list
- Acute Flaccid Paralysis surveillance was launched from 1990 and will continue until the global eradication of poliomyelitis
- Louse-borne typhus was never reported and only 3 cases of relapsing fever were reported during the last decade of surveillance, hence both have been deleted from group A
- With the introduction of *Haemophilus influenza* type B (Hib) and pneumococcal vaccine in EPI and in order to strengthen their case-based surveillance these diseases have been moved to Group 'A'
- The emerging diseases due to coronavirus namely SARS-CoV and MERS-CoV are being added to priority list from 2016
- Globally, influenza A with novel subtype has been responsible for several pandemics in the past. Due to the threat of re-emergence of a new subtype, every country should have an ongoing surveillance in place

Chapter 1

Aoo

Cholera

1. Background

Cholera remains a global threat to public health and the number of cases reported to the WHO continues to rise. Many more cases could be unaccounted for due to limitations of surveillance systems and fear of trade and travel sanctions.

Fig. 9: Countries reporting cholera deaths and imported cases in 2015 (WHO 2016)



Cholera transmission is closely linked to inadequate environmental management. Typical at-risk areas include periurban slums where basic infrastructure is not available, as well as camps for internally displaced people or refugees where minimum requirements of clean water and sanitation are not met.

The ever-increasing size of vulnerable populations living in unsanitary conditions is a potential risk to re-emergence of cholera. Manmade and natural disasters compound the situation.

Extensive experience has shown that the introduction of cholera into a country cannot be prevented. However it's spread within a country can be contained by appropriate control measures. Control of the disease requires sensitive and effective surveillance. Globally, cholera is prevalent in over 48 countries. The case reporting is universally required under the IHR.

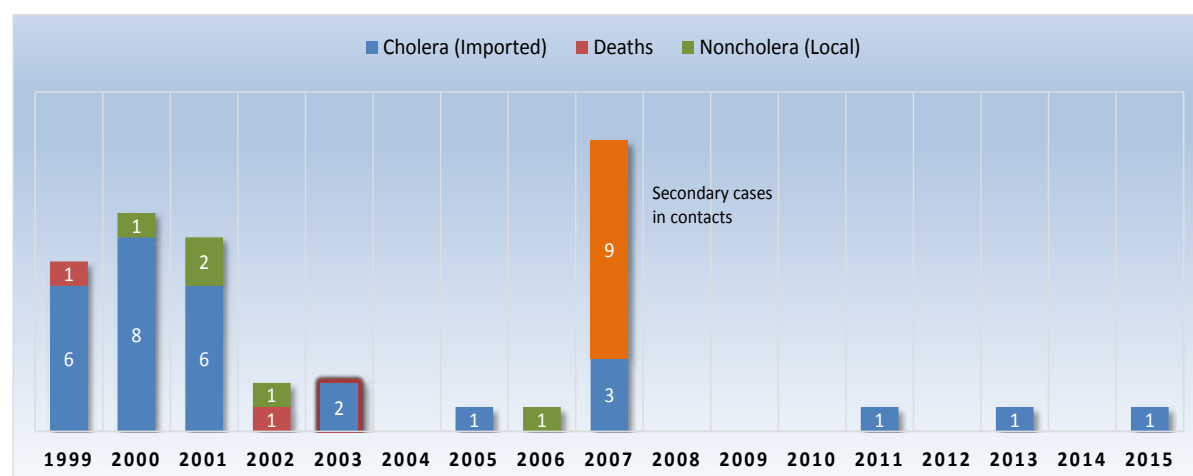
In over 90% of cases, cholera is mild and may therefore be difficult to distinguish from other types of acute diarrhoeal diseases. Asymptomatic carriers of the disease are also common. Improved symptomatic treatment with oral rehydration therapy and/or IV fluids can reduce case fatality rate to less than 1%.

2. Epidemiological characteristics

Infectious agent	<i>Vibrio cholerae</i> . Two serogroups of O1 and O139. O1 has 2 bio types, classical and El Tor. Each biotype has 3 subtypes, Ogawa, Inaba and Hikojima
Reservoir	Humans. Environmental reservoirs also exist
Transmission	Faeco-oral route. Contaminated water and food are the most common vehicles of transmission
Incubation	Usually 2-3 days, varies from a few hours to 5 days
Communicability	Until organisms are present in stool. Occasionally a carrier state may persist for months
Susceptibility	Variable. An O1 subtype tends to provide protection against reinfection

3. Cholera in Oman

Fig. 10: Incidence of cholera in Oman: 1999-2015



Few imported cases of cholera were reported in Oman (Fig. 9, Table 1) prior to launching of surveillance in 1991. The first cluster of 7 cases with one death was reported in 1999 among immigrants entering illegally into the country. *Vibrio cholerae* O1, Ogawa, El Tor were isolated. The cases presented with a classical clinical picture. Heightened surveillance did not reveal either additional cases or spread within the local population. Few sporadic cases continued to be reported among Asian workers acquiring infection abroad and travelling to Oman during the incubation period.

In 2000, 8 cholera cases were reported in the local population in the wilayat of Ibri (Dhahira region). Although *Vibrio cholerae* O1, Ogawa, El Tor was isolated, the clinical presentation in all the cases was very mild and atypical (semisolid stool without dehydration). Subsequently, additional cases were reported in 2001 (6 cases) and in 2002 one case was reported from the same area. *Vibrio cholerae* O1, biotype El Tor and serotypes Ogawa, Inaba and Hikojima were isolated from cases, from asymptomatic contacts as well as from various environmental sources. Similarly, on a number of occasions, non-O1/O139 strains were isolated either from the contacts of the cases or from the environmental samples.

Table 1: Line list of cholera cases reported in Oman: 1999-2015

Month/ year	Region	Place	#	V cholerae sero/biotype	Presenta- tion*	Outcome	Classification
Oct 1999	N Batinah	Sohar	7	O1, Ogawa, El Tor	Typical	6 recovered, 1 died	Imported – Afghani/Iranian migrants
Jun-Oct 2000	Dhahira Dakhliyah	Ibri Bahla	7 1	O1, Ogawa, El Tor	Mild or no diarrhoea	Recovered	Local (non-Cholera)
	N Batinah	Hilat Al Burg	1	O1, Hikojima, El Tor	Typical	Recovered	Imported (Bangladesh)
Jun-Oct 2001	Dhahira	Ibri	3 1	O1, Inaba, El Tor O1, Hikojima, El Tor	Mild or no diarrhoea	Recovered	Local (non-Cholera)
	Dhahira	Ibri	2	O1, Ogawa, El Tor	Typical	Recovered	Imported (Pakistan)
	N Batinah	Hilat Al Burg	2	O1, Ogawa, El Tor	Mild or no diarrhoea	Recovered	Local (non-Cholera)
Jun-Sep 2002	N Sharqiyah	Ibra	1	O1, Ogawa, El Tor	Typical	Died**	Imported (India)
	Dhahira	Ibri	1	O1, Ogawa, El Tor	Mild or no diarrhoea	Recovered	Local (non-Cholera)
Sep 2003	S Batinah	Al Sawadi	2	O1, Ogawa, El Tor	Typical	Recovered	Local cases (?) ? sheltering migrant
2005	Dhofar	Salalah	1	O1, Ogawa, El Tor	Typical	Recovered	Imported (Pakistan)
Sep 2006	Dhahira	Yankul	1	O1, Ogawa, El Tor	Mild or no diarrhoea	Recovered	Local (non-Cholera)
Aug and Nov 2007	Muscat	Al Amerat	1 + 7	O1, Ogawa, El Tor	Typical	Recovered	Imported (Pakistan) 7 secondary cases
	Muscat	Ghala	2 + 2	O1, Ogawa, El Tor O1, Inaba, El Tor	Typical	Recovered	Imported (India)
Mar 2011	Muscat	PDO	1	O1, Ogawa, El Tor	Typical	Recovered	Imported (India)
Dec 2013	Transit passenger Muscat (Dhaka to Dubai)		1	O1, Ogawa, El Tor	Typical	Recovered	Imported (Bangladesh)
Dec 2015	Muscat	Seeb	1	O1, Ogawa, El Tor	Typical	Recovered	Imported (Iraq)

*Typical presentation = Severe diarrhoea, dehydration

**Recovered from cholera but died due to HAI (methicillin-resistant *Staphylococcus aureus* [MRSA])

The epidemiological evidence suggests presence of a **non-toxigenic and non-epidemic** strain of *Vibrio cholerae* firmly established in the local environment. Monitoring of this local strain is ongoing.

In 2003, two cases of cholera were reported from Al Sawadi village, wilayat Barka, South Batinah region. The presentation in both cases was classical with profuse watery diarrhoea leading to severe dehydration. The family contacts showed complete spectrum of the disease. *Vibrio cholerae*, serotype O1, subtype Ogawa, biotype El Tor was isolated from the cases and contacts. The cases were confined to a single household. The source of infection was not found. The water supply system was not contaminated. Non-O1/O139 strains were isolated from few environmental samples. In 2007 a cluster of 7 secondary household cases around an imported case was reported from Al Amerat of the Muscat Governorate. Another similar incident was also reported from a Ghala worker's camp with 2 secondary cases linked to 2 imported cases.

Imported cases of cholera will continue to be reported from many countries including Oman. However the secondary transmission in the local community should not occur. It can be prevented by early detection and management.

Note: Some strains of O1 and O139 do not possess the cholera toxin gene and some strains of non-O1 non-O139 do possess the cholera toxin gene.

Illness caused by these strains is not defined as 'cholera'

(Source: Communicable Disease Control Manual, New Zealand, 2012).

Case classification: Oman reported total 45 cases of cholera from 1999 to 2015. According to case definition 5 cases were discarded as non-cholera. Of the 40 typical cases, 29 were classified as imported (includes 2 deaths), 9 cases were from a secondary chain originating from 3 imported cases. In 2003 cholera affected 2 siblings in an Omani family living in coastal village of Al Sawadi. The local source of infection was neither discovered nor did any other cases occurred. Hence infection was presumed to be acquired from an imported case (probably an illegal immigrant sheltered in the house).

4. Case definition (WHO)

Suspect

In an area where the disease is not known to be present (as in Oman), a patient aged 5 years or more who develops severe dehydration or dies from acute watery diarrhoea or has a history of travel from country with ongoing outbreak of cholera (symptoms within 5 days of arrival).

Confirmed

A suspect case in whom *Vibrio cholerae* O1 or O139 has been isolated from the stool (The suspect case must be clinically compatible).

5. Mode of transmission

Cholera is acquired through ingestion of an infective dose of contaminated food or water and can be transmitted through many mechanisms. Vegetables and fruit “freshened” with untreated sewage wastewater have also served as vehicles of transmission. Outbreaks or epidemics, as well as sporadic cases are often attributed to raw or undercooked seafood. Cases have been traced to eating shellfish from coastal and estuarine waters which is a natural reservoir of *Vibrio cholerae* O1, serotype Inaba.

6. Laboratory criteria

- **Macroscopic appearance:** Rice-water stool – watery stool with flecks of mucus precipitated at the bottom of the container that resemble rice grains
- **Gold standard:** Isolation and identification by culture of *Vibrio cholerae* O1 or O139 from stool or vomitus and **confirmation that the organism is toxigenic**, i.e. can produce the cholera toxin

7. Case management

- In health care facilities only standard precautions are indicated in most cases. Enteric precautions are recommended while ill and concurrent disinfection of faeces, urine and soiled articles
- Strict isolation in a separate room is not necessary, however, a separate toilet is advisable
- The case should be referred and admitted in the regional hospital
- Assess the dehydration, rehydrate, monitor frequently, reassess hydration
- Antibiotic (doxycycline, tetracycline, ciprofloxacin, furazolidone) treatment is indicated for severely dehydrated patients who are over 2 years old
- Maintain proper nutrition of the patient

8. Surveillance and reporting

- Case report universally required under IHR
- Immediate mandatory case-based and event-based reporting
- Initiate epidemiological investigation.
- **Point-source epidemic** – active search for unreported cases and possible source of infection

9. Prevention and control

- Locate family and house and enlist all members of family, age, sex and relationship to index case. Investigate clinically for similar signs and symptoms in family members and/or neighbours
- Obtain stool samples from contacts for culture and sensitivity
- Educate the community about the importance of personal hygiene especially hand hygiene and sanitation, sanitary disposal of waste, safe water and housefly control
- Chlorine tablets can be used for small scale drinking water purification during emergency situation
- Vaccination and mass chemoprophylaxis are NOT effective in preventing or controlling cholera outbreaks
- NO routine screening/quarantine and NO restriction on travel/trade is recommended
- NO proof of cholera vaccine is required for international travel
- **Outbreak:** even a single case or cases with secondary transmission is important. Surveillance should be intensified with the introduction of active case finding. Laboratory confirmation should be performed as soon as possible. Initiate immediate epidemiological investigation
- **Assessment of drinking water quality:** Water samples collection for bacteriological examination on daily/weekly basis from various locations and sources
- Assessment of sewage disposal system and appropriate actions in coordination with local Baladiyah

10. Oral cholera vaccines

Two types of safe and effective oral cholera vaccines are currently available in the market. Both are whole-cell killed vaccines, one with a recombinant B-subunit, the other without. Both have sustained protection of over 50% lasting for 2 years in endemic settings. Both vaccines are WHO-prequalified and licensed in over 60 countries.

Dukoral has been shown to provide short-term protection of 85-90% against *V. cholerae* O1 among all age groups at 4-6 months following immunization. The other vaccine, *Shanchol*, provides longer-term protection against *V. cholerae* O1 and O139 in children under 5 years of age. Both vaccines are administered in 2 doses given between 7 days and 6 weeks apart. The vaccine with the B-subunit, *Dukoral*, is given in 150 ml of safe water.

The WHO recommends that immunization with currently available cholera vaccines be used in conjunction with the usually recommended control measures. Vaccination should target vulnerable populations living in high-risk areas and should not disrupt the provision of other interventions to control or prevent cholera epidemics.

Immunization with either of the oral vaccines may be recommended for individuals travelling to areas of endemic or epidemic cholera but should not replace the need to ensure the safety of the drinking water.

11. Laboratory investigations

Type of test	Culture	Serotype, serogroup, biotype
Sample	<ul style="list-style-type: none">• 5 to 10 ml stool or vomit samples• Isolate from stool specimen on selective medium• Enrichment of stool in alkaline peptone water can increase sensitivity of culture	<ul style="list-style-type: none">• Stool sample• Pure culture on nutrient agar slope
Storage		
Transport	Use transport media (Cary Blair)	
Biosafety level (BSL)	BSL-2 practices	
Laboratory	Regional and tertiary hospital	CPHL

Note:

- Collect stool and vomitus sample before antibiotic administration
- Cary Blair media is ideal for transport, and the selective thiosulfate-citrate-bile salts-sucrose agar (TCBS) is ideal for culture
- For every reported case of suspect cholera complete identification of the *Vibrio* isolate is mandatory
- Genetic sequencing (toxin gene) can be done in an international reference laboratory

Chapter 2

A95

Yellow Fever

1. Background

This mosquito-borne viral disease occurs in the tropical regions of Sub-Saharan Africa and tropical South America, where it is endemic and intermittently epidemic. The virus is maintained by sylvatic transmission in forest-dwelling mosquitoes and monkeys. Transmission to humans may occur in forest transition zones and may subsequently enter an urban cycle through *Aedes aegypti*. Many cities are now threatened with epidemics as YF is undergoing a major resurgence, especially in the African region.

Table 2. Countries with risk of YF virus transmission

AFRICA			CENTRAL AND SOUTH AMERICA
Angola	Equatorial Guinea	Mauritania ²	Argentina ²
Benin	Ethiopia ²	Niger ²	Bolivia ²
Burkina Faso	Gabon	Nigeria	Brazil ²
Burundi	Gambia, The	Rwanda	Colombia ²
Cameroon	Ghana	Senegal	Ecuador ²
Central African Republic	Guinea	Sierra Leone	French Guiana
Chad ²	Guinea-Bissau	Sudan ²	Guyana
Congo, Republic of the	Kenya ²	South Sudan	Panama ²
Côte d'Ivoire	Liberia	Togo	Paraguay
Democratic Republic of the Congo ²	Mali ²	Uganda	Peru ²
			Suriname
			Trinidad and Tobago ²
			Venezuela ²
¹ WHO definition: countries or areas where "yellow fever has been reported currently or in the past, plus "vectors and animal reservoirs currently exist			
² These countries are not holoendemic (only a portion of the country has risk of YF transmission)			

Source: WHO 'International travel and health' publication

The following maps shows countries with risk of YF virus transmission.

Fig. 11: Yellow fever endemic countries requiring vaccination



Source: WHO

Note: (Recent update: Feb. 3, 2015)

- **Somalia, Zambia and Eritrea** classified as “low potential for exposure to YF” in only some areas
- **São Tomé and Príncipe, Tanzania** classified as “low potential for exposure to YF” in entire area
- Vaccination proof should not be required if traveling from one to another country unless that country requires it from all arriving travellers.

2. Epidemiological characteristics

Infectious agent	Yellow fever virus (Flavivirus)
Reservoir	Urban area: humans and <i>Aedes</i> mosquitoes Forest area: monkeys, non-human primates and forest mosquitoes
Transmission	Vector-borne. Bite of <i>Aedes aegypti</i> (extrinsic incubation period 9-12 days)
Incubation	3 to 6 days
Communicability	Blood of patients is infective for mosquitoes shortly before onset of fever and for first 3-5 days of illness. Not communicable through contact or common vehicles
Susceptibility	Recovery from infection results in lifelong immunity

3. Yellow fever in Oman

Until the present date, YF case/s either local or imported have **NOT** been reported in Oman since the surveillance system was launched in 1991. However, the risk of importation exists.

Yellow fever vaccination is available in Oman for international travellers to endemic countries. The WHO generally does not recommend vaccine for travellers to Tanzania. However, in Oman the YF vaccine is generally recommended for travellers to Tanzania.

4. Case definition

Suspect

- An illness characterized by acute onset and constitutional symptoms followed by a brief remission and a recurrence of fever, hepatitis and albuminuria. In some cases, leading to renal failure, shock and generalized haemorrhages
- Epidemiological evidence (*history of travel to endemic countries within 1 week*)

Confirmed

Suspect case which is laboratory confirmed, i.e. a 4-fold or greater rise in YF antibody titre with no history of recent YF immunization and no evidence of cross-reactions to other flaviviruses.

5. Laboratory criteria

- **Liver function tests:** hypoalbuminaemia, serum antibiotic sensitivity testing (AST) exceeds alanine aminotransferase (ALT) levels, elevated direct bilirubin
- **Serology:** presence of YF specific IgM capture enzyme immunoassay.
 - During the acute phase, 3-10 days from onset of symptoms, a positive IgM enzyme-linked immunosorbent assay (ELISA) provides a probable diagnosis
 - A 4-fold or greater rise in YF antibody titre in paired sera (in acute and convalescent) is suggestive in the absence of recent YF vaccination in the preceding 3 months
- **Molecular diagnosis:** Detection of YF virus genomic sequences in blood or organs by polymerase chain reaction (PCR)

Note: By the time more toxic symptoms are recognized, the virus or viral RNA is usually undetectable. Therefore, nucleic acid amplification should not be used for ruling out a diagnosis of YF.

6. Case management

No specific treatment for YF. Symptomatic and supportive care is critical. The majority of cases are asymptomatic, however case fatality of severe cases can be 20-50%. Management consists of vasoactive medications, fluid resuscitation, ventilator management, and treatment of disseminated intravascular coagulopathy (DIC), haemorrhage, secondary infections, and renal and hepatic dysfunction.

7. Surveillance and reporting

- Yellow fever has never been reported in Oman since the surveillance began. It should be noted that it is one of the acute haemorrhagic fevers syndromes with a risk of importation through travellers
- Case report universally required under IHR
- Immediate mandatory case-based reporting

8. Prevention and control

The risk of transmission in Oman from an imported case is minimal as the vector for transmission has not been reported. However it is important to note that YF has been reported to be transmitted to infants if YF develops in a breastfeeding mother. The following are some of the prevention and control measures if and when a case gets imported to Oman.

- Tracing the contacts of the patients
- Environmental reassessment for potential for transmission and vector control measures
- The risk for a traveller for acquiring YF is determined by multiple factors
- Travellers to endemic areas should be vaccinated. A single subcutaneous injection of live attenuated 17D YF vaccine confers near lifelong immunity in 95% of recipients. It can be given any time after 9 months of age. It is not recommended during pregnancy or breastfeeding. A booster dose is only recommended in exceptional circumstances after 10 years
- A valid international certificate of immunization against YF is required by many countries for entry of travellers coming from or going to recognized YF zones of Africa and South America. The certificate is valid 10 days after the date of immunization. The quarantine measures are applicable for up to 6 days

9. Laboratory investigation protocol

Type of test	Real time reverse transcription (rRT)-PCR	Serology
Type of sample	Ethylenediaminetetraacetic acid (EDTA) blood 5 ml blood (specimens anti-coagulated with heparin are not suitable for PCR) Unfixed tissue sample (e.g. liver biopsy)	Serum : 3-5 ml serum
When to collect	Collect during acute phase (the first 3-6 days)	Collect acute and convalescent sera (4 weeks after onset)
Storage	At 2-8°C and ship on icepack (do not freeze)	At 2-8°C and ship on icepack
Transport	Category B	
BSL	BSL III practice	
Laboratory	Not available (to be sent abroad to an international reference laboratory through CPHL)	

Note: Inform CPHL in advance before sending sample/s

A20

Plague

1. Background

Plague is primarily a zoonotic disease involving rodents and fleas, which transfer the bacteria to various animals including humans. Human plague occurs in 3 forms: **bubonic**, **septicaemic** and **pneumonic**. Initial signs and symptoms may be nonspecific with fever, chills, malaise, myalgia, nausea, prostration, sore throat and headache. Lymphadenitis often develops in lymph nodes that drain the site of the bite. The bubonic plague occurs more often (90%) in lymph nodes in the inguinal area. All forms may progress to septicaemic plague with bloodstream dissemination. Endotoxic shock and DIC may occur without localizing signs of infection.

Fig. 12: Notified cases of plague to WHO: 2002-05



Secondary involvement of the lungs results in pneumonia, mediastinitis or pleural effusion. Secondary pneumonic plague is of special significance since respiratory droplets may serve as the source of person-to-person transmission which can lead to localized outbreaks or devastating epidemics. Untreated bubonic plague has a case fatality rate of about 50%-60%.

The disease is endemic in many countries and often has epidemic potential. The WHO reports that, in 2003, 9 countries reported a total of 2118 plague cases and 182 deaths, nearly 98% of which were reported from Africa.

2. Epidemiological characteristics

Infectious agent	(<i>Yersinia pestis</i> (plague bacilli
Reservoir	Wild rodents, Lagomorphs, wild carnivores and domestic cats
Transmission	(More often by bite of infected fleas (<i>Xenopsylla cheopis</i> , the rat flea
Incubation	Bubonic and septicaemic plague: 2-7 days, pneumonic plague: 1-3 days
Communicability	Fleas remain infective for months under suitable conditions. In pneumonic plague respiratory droplets may transmit infection
Susceptibility	Susceptibility is general. Immunity after recovery is relative and may not be protective against a large inoculum

3. Plague in Oman

Plague either local or imported, in animals or humans has **NEVER** been reported in Oman since the surveillance began in 1991.

4. Case definition

Suspect

An illness characterized by rapid onset of fever, chills, headache, severe malaise, prostration and presents in 2 forms:

- **Bubonic form:** extremely painful swelling of lymph nodes (buboes)
- **Pneumonic form:** cough with blood-stained sputum, chest pain and difficult breathing
- Both forms can progress to a **septicaemic** form with toxemia. Sepsis without evident buboes is rare
- History of wild rodent exposure or occupational exposure or travel to a plague endemic area.

Confirmed

Suspect case that is laboratory confirmed.

5. Mode of transmission

Wild rodents (ground squirrels, mice, gerbils and skunks) are the natural vertebrate reservoirs of plague. Lagomorphs (rabbits and hares), wild carnivores and domestic cats may also be a source for human infection. Human plague is most frequently contracted from:

- The bite of an infected fleas
- By droplet infection from cases of pneumonic plague. May be highly communicable under appropriate conditions and overcrowding facilitates transmission
- Direct contact with infected animal tissues especially rodents and rabbits
- Rarely: Scratches or bites from infected domestic cats and exposure to aerosols contacting plague bacilli

6. Laboratory criteria

Leucocytosis (neutrophil predominance), thrombocytopenia, elevated serum transaminase and bilirubin, proteinuria, abnormal renal function test, hypoglycaemia may be observed.

Microscopic appearance: Demonstration of gram-negative coccobacilli in the clinical material (bubo aspirate, sputum, tissue, blood). Giemsa stain reveals rod shaped bacteria. Wayson stain demonstrates 'safety pin' appearance (bipolar staining).

Culture: Isolation of *Yersinia pestis* in cultures from buboes, blood, cerebrospinal fluid (CSF) or sputum transported in Cary Blair medium.

7. Case management

- Infectious patients should be placed in strict respiratory isolation and concurrent disinfection of articles soiled by discharges from the nose and throat
- Disinfection of articles and surfaces and aseptic handling of animal and human tissues and carcasses
- General supportive therapy
- Refer the case to the regional hospital or higher centre depending on the condition
- Any of the antibiotics such as streptomycin, gentamycin, doxycycline, chloramphenicol, levofloxacin can be used

8. Surveillance and reporting

Surveillance of human and animal disease is important to predict and detect epidemics and to monitor control measures. Plague has never been reported in Oman. Any suspected case based on the above case definition should be immediately notified to the regional and national surveillance unit.

Pneumonic plague case report is universally required under IHR.

9. Prevention and control

Control of rodents: environmental sanitation, rodent trapping, rodenticides (barium carbonate/zinc phosphide). Effective rat control practices implemented in buildings (especially close to sea ports) such as warehouses and other port facilities.

Control of fleas: environmental control (habitat reduction – filling of burrows, dwellings and cracks), discourage people from sleeping outdoors, use of repellents (diethyltoluamide [DEET]), insecticides against fleas DDT / HCH / carbaryl / Malathion.

Chemoprophylaxis:

- **Post-exposure:** doxycycline + ciprofloxacin x 7 days or levofloxacin for 10-14 days for individuals with temperature $\geq 38.5^{\circ}\text{C}$ during pneumonic plague epidemic exposure. Chemoprophylaxis must be initiated within 7 days of exposure
- **Pre-exposure:** Doxycycline for 14-21 days or ciprofloxacin for 7 days

Vaccine: Although live and killed vaccines are available and different vaccination strategies have been used by various countries, it is to be noted that vaccination is effective only against bubonic plague

Outbreak: All public health actions for prevention and control of spread, including the environmental control, will be managed from the central level. Laboratory diagnostic tests and case management guidelines will be issued as and when applicable

10. Laboratory investigation protocol

Type of test	Microscopy	Culture	PCR
Sample	Bubo aspirate, sputum, CSF	bodily fluids and tissues including bubo aspirates, blood, sputum and tracheal/bronchial washings	clinical specimen (e.g., whole blood in EDTA, biopsy tissue, CSF)
When to collect	Immediately on clinical suspicion		
Storage	Specimens should be refrigerated. Avoid repeated freeze-thaw cycles		
Transport	Transport as early as possible in cold chain		
BSL	BSL 2 precautions for clinical sample handling. BSL 3 for manipulations of pure culture		
Availability	Regional and tertiary hospital and CPHL		CPHL

Note:

- Inform CPHL in advance before sending sample/s
- Sputum, aspirate and blood in culture bottle should be sent in cold chain and CSF in plain box including isolates should be sent to CPHL

Chapter 4

J10-11

Novel Influenza A

Influenza A due to identified novel subtype

1. Background

Influenza is a highly infectious viral illness. Influenza A causes moderate to severe illness and affects all age groups. Viruses are perpetuated in nature by wild birds and animals such as swine. The first recorded pandemic of influenza was in 1580. At least 4 pandemics of influenza have occurred in the 19th century and 3 occurred in the 20th century. The pandemic of “Spanish” influenza in 1918-1919 caused an estimated 21 million deaths worldwide. The first pandemic of the 21st century occurred in 2009-2010. Inactivated vaccines were introduced in the 1950s. The first live attenuated influenza vaccine was licensed in 2003.

2. Epidemiological characteristics

Infectious agent	Influenza virus – RNA virus, <i>Orthomyxoviridae</i> family. Three antigen types: A, B and C. Type A has several subtypes determined by the surface antigens haemagglutinin (H) (and neuraminidase (N
Reservoir	Humans are reservoir of influenza types B and C. Influenza A viruses may infect both humans and animals. There is no chronic carrier state
Transmission	Person-to-person by droplets. Transmission may also occur through direct contact or indirect contact with respiratory secretions. Probably airborne
Incubation	Usually 2 days but can vary from 1-4 days
Communicability	Virus shed in respiratory secretions for 5-10 days. Adults can transmit influenza a day before onset to approximately 5 days after. Children can transmit influenza to others for 10 or more days
Susceptibility	General for a new type and subtype. The number of influenza-associated deaths varies substantially by year, virus type and subtype, and age group

Antigenic changes

Type A influenza virus surface antigens hemagglutinin and neuraminidase periodically change due to sequential evolution within immune or partially immune populations. These changes may take the form of antigenic drift or antigenic shift.

- **Antigenic drift:** drift occurs in all 3 types of influenza virus (A, B, C). These are minor changes, the subtype remaining the same and is caused by point mutations in gene segments that may result in epidemic
- **Antigenic shift:** evolution of a new subtype caused by exchange of gene segments in one or both surface antigens (H or N) that may result in a pandemic. Antigenic shifts are probably due to genetic recombination (an exchange of a gene segment) between influenza A viruses that affect humans and/or animals. An antigenic shift may result in a worldwide pandemic if the virus is efficiently transmitted from person-to-person

3. Influenza in Oman

Outbreak of Influenza A due to novel subtype (H1N1) pdm09 in Oman

In 2009 the world witnessed a global pandemic due to a novel variant of influenza A H1N1 (swine flu) within few months of originating in the North American continent.

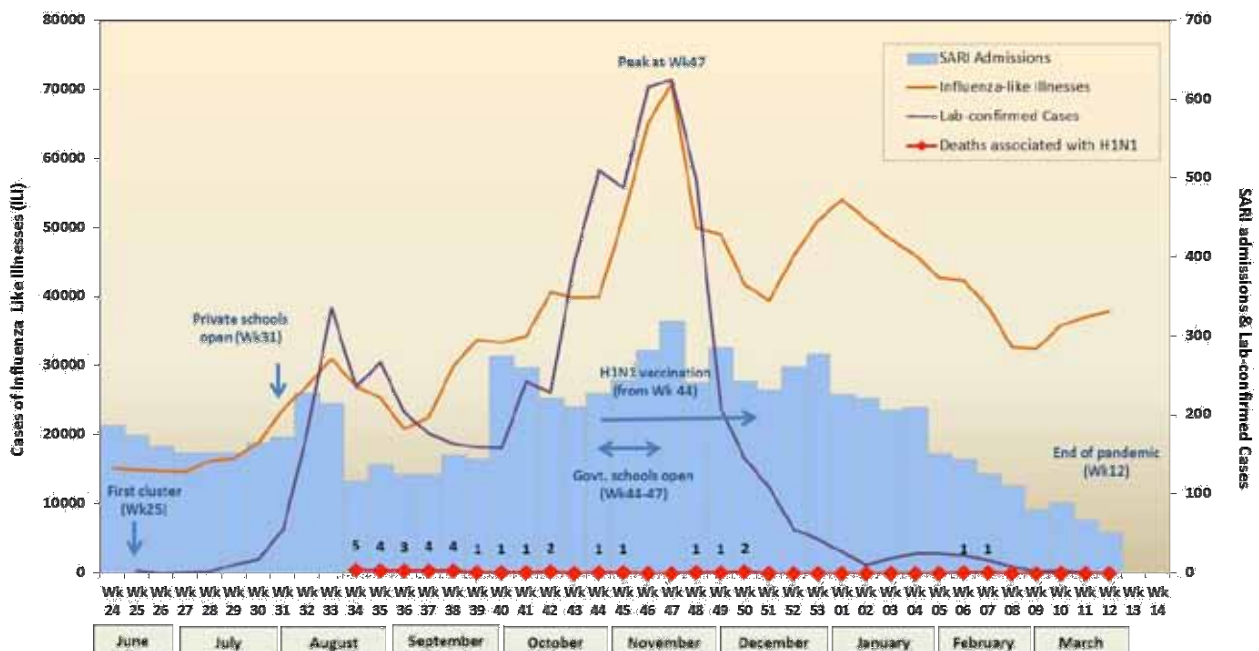
The first case of the pandemic influenza infection in Oman was confirmed among the students returning from an educational tour to Washington DC on 16th June 2009. In the year 2009, as in the rest of the world pandemic influenza A (H1N1) pdm2009 swept throughout Oman in 2 successive waves (Fig. 9). The peaks coincided with the opening of schools.

As of week #12, 6347 cases were laboratory confirmed while 33 cases had died following influenza A (H1N1) infection. Week #33 of 2009 witnessed the first surge of the pandemic while the second was in week #47 (Fig. 9). A decreasing trend was evident thereafter.

During the pandemic, capturing the daily data on admitted cases of severe respiratory illnesses from 14 sentinel hospitals in the country and monitoring influenza-like-illnesses from outpatients proved to be effective epidemiological tools in the assessment of the severity and the progress of the pandemic.

The last laboratory confirmed case was reported from Ibri hospital in Dhahira region on 16th March 2010 indicating the end of the first wave of influenza pandemic in Oman.

Fig. 13: Weekly reported cases of influenza-like-illnesses, severe acute respiratory infection inpatients, laboratory-confirmed H1N1 cases and ARI-associated deaths in Oman: 2009-2010



The influenza activity continued to simmer thereafter in the community. A surge in cases in the summer of 2010 was noted as reported elsewhere in the world. However the expected surge of severe disease in the following winter of 2010 was not observed.

The influenza A (H1N1) pdm09 has now established itself as one of the seasonal influenza viruses in Oman as in the rest of the world. The 'National ARI Surveillance' programme continues to monitor its trend in the community.

Important Note: The infections due to influenza A (H1N1)pdm09 virus need not be reported now to the national surveillance system. However any other emerging novel influenza virus subtype, if detected must be reported. National ARI surveillance will routinely monitor the trend of influenza viruses at the sentinel sites.

4. Case definition

(Novel influenza A virus infection, CDC 2014)

Suspect

- An illness compatible with influenza virus infection (fever $>37.8^{\circ}\text{C}$ with cough and/or sore throat) **and**
- Any case of human infection with an influenza A virus that is different from currently circulating human influenza H1 and H3 viruses is classified as a suspected case until the confirmation process is complete **and/or**
- Epidemiological link to a confirmed case

Criteria for epidemiologic linkage

- The patient has had contact with one or more persons who either have or had the disease, **AND**
- Transmission of the agent by the usual modes of transmission is plausible

A case may be considered epidemiologically linked to a laboratory-confirmed case if at least one case in the chain of transmission is laboratory confirmed. Currently, only viral isolation, reverse transcription (RT)-PCR, gene sequencing, or a 4-fold rise in strain-specific serum antibody titres are considered confirmatory.

Confirmed

A case of human infection with a novel influenza A virus confirmed by influenza laboratory or using methods agreed upon.

Note: Laboratory testing was restricted on two occasions. Once during the surge of cases in the first peak (week 3233-) which coincided with the tourist season (Khareef) in Dhofar and opening of private expatriate schools. Overwhelming cases were reported. Another instance was in week #4447- after the opening of governmental Omani schools with focal outbreaks and subsequent increase in number of cases leading to the second peak.

5. Laboratory criteria

A human case of infection with an influenza A virus subtype that is different from currently circulating human influenza H1 and H3 viruses is considered as a novel subtype. These include but are not limited to H2, H5, H7 and H9 subtypes. Influenza H1 and H3 subtypes originating from a non-human species or from genetic re-assortment between animal and human viruses are also novel subtypes.

Novel subtypes can be predicted (non-typable) with methods available for detection of currently circulating human influenza viruses at the CPHL, i.e. by rRT-PCR.

Confirmation of an influenza A virus as a novel virus will be initially performed by an international influenza reference laboratory. Once a novel virus has been identified further testing will be done at the CPHL following approved primers and protocols for that specific virus.

6. Surveillance and reporting

Immediate reporting to national surveillance (within 24 hours). Case-based and event-based reporting of all suspect cases or clusters.

7. Prevention and control

All public health actions for prevention and control of spread including the environmental control will be managed from the national level. Laboratory diagnostic tests and case management guidelines will be issued as and when applicable.

8. Laboratory investigation protocol

Type of test	RT-PCR	Culture	Subtyping and sequencing
Sample	Oropharyngeal / nasopharyngeal (OP/NP) swab in viral transport medium (VTM). Tracheal aspirate and Broncho-alveolar lavage (BAL) are preferred samples		
When to collect	During symptomatic illness (within 3 days of onset until end of second week)	Virus growth is optimal if sample is collected during the first 5 days of illness	
Storage	Specimens should be refrigerated. Avoid repeated freeze-thaw cycles		
Transport	Transport in cold chain in triple packaging		
BSL	BSL 3 precautions		
Availability	CPHL and SQUH	CPHL and International Influenza Reference Laboratory	

A98.0

Crimean-Congo Haemorrhagic Fever

CCHF, Central Asian haemorrhagic fever, Asian Ebola

1. Background

Crimean-Congo haemorrhagic fever is a tick-borne viral disease with sudden onset of fever, malaise, weakness, irritability, headache, severe pain in limbs and marked anorexia. There may be bleeding from gums, nose, or haemorrhagic exanthema of soft palate, uvula and pharynx and a fine petechial rash. Thrombocytopenia is common. The reported case fatality rate ranges from 2% to 50%.

Observed in Eastern Europe e.g. Crimea, Russia, Albania, Bosnia and Herzegovina, Bulgaria as well as in Afghanistan, Western China, Iran, Iraq, Kazakhstan, Pakistan, Turkey, Uzbekistan, the Arabian Peninsula, and sub-Saharan and South Africa.

The ticks, once infected, remain infective for life. Moreover they transmit the virus to other ticks (venereal), their progeny (transovarial)

Fig. 14: Global distribution: CCHF endemic areas (CDC, 2014)

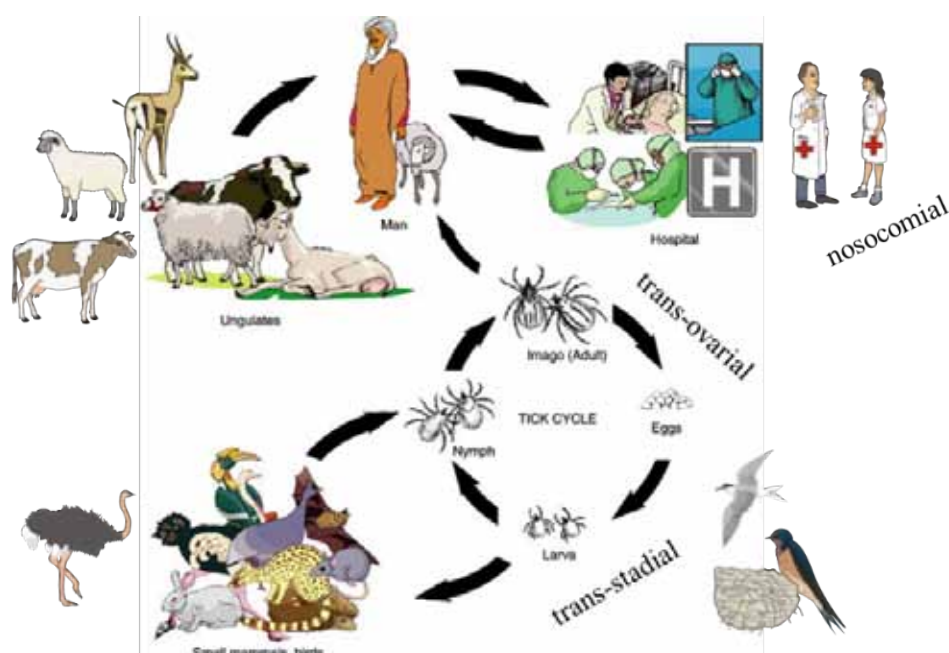


and to nymphs (transstadial). The virus thus survives in the ticks for generations. Nosocomial transmission in humans may take place in a hospital environment. Birds may carry infected ticks to distant places.

There is no evidence that the virus causes a disease in animals, the only symptom being a transient, mild elevation in body temperature. In meat, CCHFV is usually inactivated by post-slaughter acidification. It is also killed by cooking. However unpasteurized milk should not be consumed.

The environmental, ecological and climatic factors influence the CCHF transmission. However their causal relationship is poorly understood. Vector control measures are of limited success in control and there is no effective vaccine for use in humans and animals.

Fig. 15: Life cycle of vector tick and modes of virus transmission



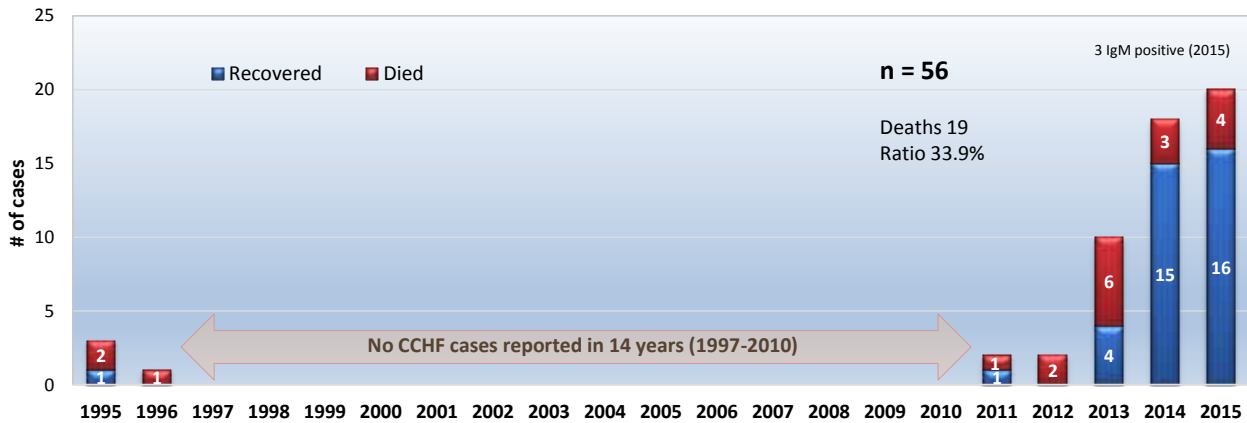
2. Epidemiological characteristics

Infectious agent	CCHFV, <i>Nairovirus</i> (<i>Bunyaviridae</i>)
Reservoir	Small animals such as hares, birds and rodents and the <i>Hyalomma</i> spp. ticks are the main reservoirs. Domestic animals (sheep/goats/cattle) may act as amplifying hosts
Transmission	Bite of infective adult tick of <i>Hyalomma</i> spp. or by crushing the ticks. Infection is also associated with butchering infected animals. Nosocomial spread through exposure to blood and secretions from patients
Incubation	Usually 1 to 3 days, with a range of 1-12 days
Communicability	Highly infectious in the hospital setting
Susceptibility	Immunity after infection probably is lifelong

3. Crimean-Congo haemorrhagic fever in Oman

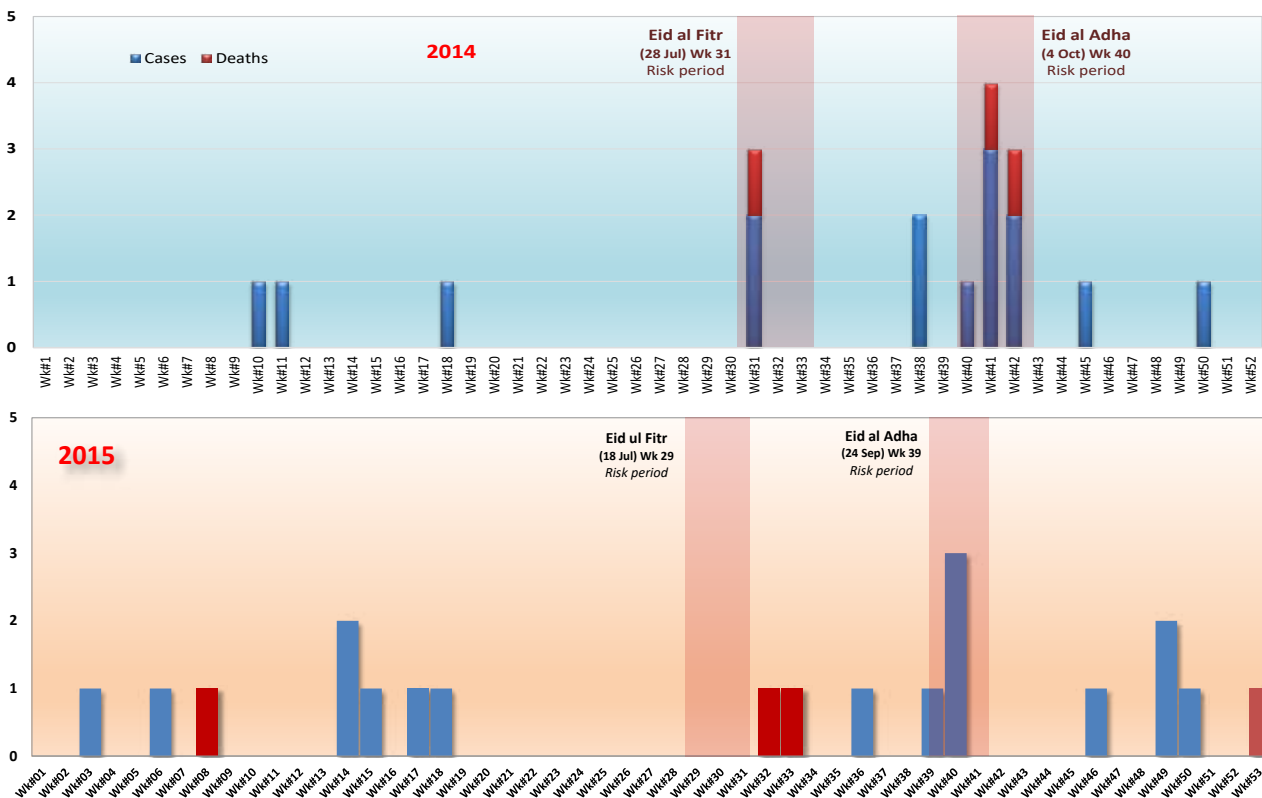
In Oman, CCHF disease was first reported in 1995. Since then, sporadic cases have been diagnosed in different areas of the country. A survey conducted in 1995-1996 by a team from CDC in the Sultanate revealed seroprevalence among occupational groups and presence as well as evidence of infection in the vector ticks. Various species of ticks of genus *Hyalomma* including the major vector *Hyalomma anatolicum anatolicum* were identified. Recent survey and observations by the Ministry of Agriculture and Fisheries suggests CCHF virus infection in domestic animals including goats, cattle and camels is high and hence presumed to be endemic in Oman. However, from 1997 to 2010 CCHF cases were reported in the Sultanate. Since 2012 globally a rising trend has been observed in the endemic countries. The surveillance system recorded 10 cases in 2013, 18 in 2014 and until the end of 2015, 20 cases have been reported in Oman.

Fig. 16: Incidence of CCHF in Oman: 1995-2015



The cases in 2014 and 2015 showed a distinct pattern of clustering coinciding with the Eid celebrations that include festive slaughtering.

Fig. 17: Weekly cases of CCHF in Oman in relation to identified period of risk in 2014 and 2015

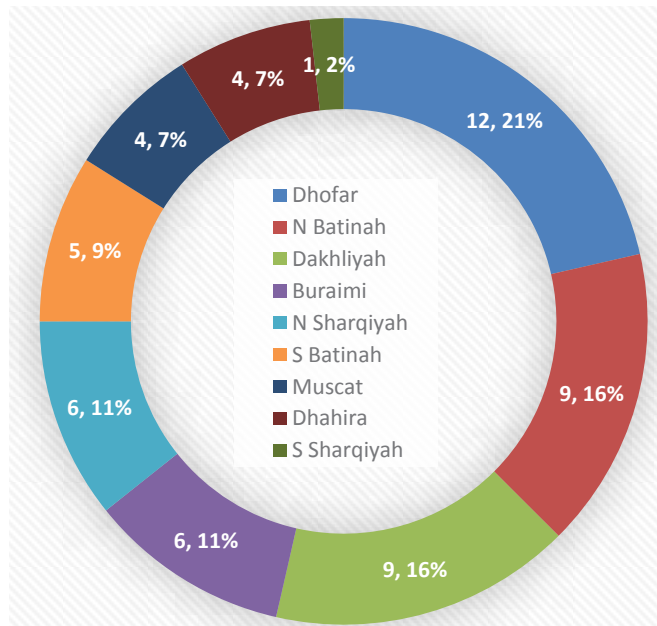


The mean age of the total reported cases until end of 2015 (n=56) was 35.5 years, with a range of 15 to 68 years, suggesting young adults and adults were affected the most. No cases were reported in children. The men were the most affected, 50 out of the 56 cases (89.3%) since traditionally men are engaged in the slaughtering of animals either as a profession (animal handlers, milking, slaughterhouse workers) or otherwise slaughtering during Eid festivities. Of the 56 cases, Omanis were 32 (57.1%) while Bangladeshi were the second most affected (13, 23.2%) followed by Pakistani (5, 8.9%) and Yemeni (3, 5.4%). One each case was reported from other nationalities, namely Indian, Somali, and Sri Lankan. In 2015, the Omanis comprised a large proportion of cases (12 out of 18, 66.7%).

In 2015 cases outside the risk period mentioned above, were due to occupational exposure. They were either employees in the slaughter house or an animal handler engaged in milking of animals. Slaughtering of animals and subsequent exposure to fresh blood or tissues was seen as the most important single factor responsible for the virus transmission. From 1995 until the present, NO secondary transmission has been observed in the contacts, either the health care workers taking care of the patient or the family members and other community contacts. The overall proportional mortality (n=56) was 33.9%.

In 2014 and 2015 the case fatality was lower than in the previous years. Of the 20 cases reported in 2015, 4 died (case-fatality rates [CFR] 20%). Probably the low mortality is due to sensitization of HCWs and detection of mild cases.

Fig. 18: CCHF cases by governorates: 1995- 2015



All governorates in the country since 1995 until 2015 (n=56) reported cases of CCHF except Musandam and Al Wustah. Maximum cases were from Dhofar (12), North Batinah (9), and Dakhliyah (9). Governorates of Buraimi and North Sharqiyah reported 6 cases each in the same period. The distribution of cases suggests increased incidence in areas closer to UAE and Yemen border.

Realizing the risk of CCHF infection associated with the festive slaughtering, the MoH has undertaken a number of activities and initiatives to educate and inform the community. The joint strategic initiative was developed in collaboration with the Ministry of Agriculture and Fisheries and the Ministry of Regional Municipality.

4. Case definition

Suspect

- An illness with sudden acute onset with the following clinical findings:
 - a fever $\geq 38.5^{\circ}\text{C}$ (>72 hours to <10 days) associated with severe headache, myalgia, nausea, vomiting, and/or diarrhoea
 - Thrombocytopaenia $<50,000/\text{mm}^3$
 - Haemorrhagic manifestations develop later and may include petechial rashes, bleeding from gums, nose, lungs, gastrointestinal tract, etc.
 - History of tick bite, occupational exposure, contact with fresh tissues, blood, or other biological fluids from an infected animal

Confirmed

Suspect case which is laboratory confirmed.

5. Laboratory criteria

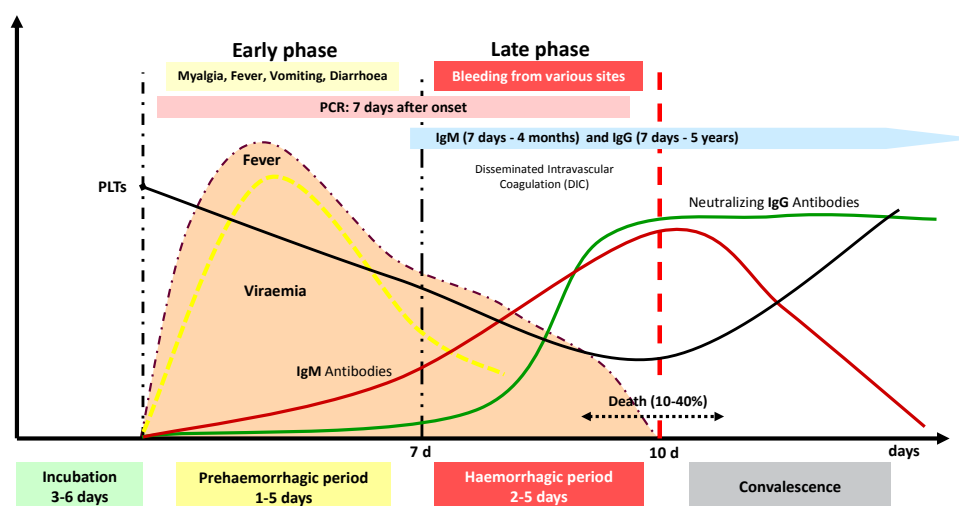
- Thrombocytopaenia, prolonged prothrombin time and clotting time
- Serology: ELISA (IgM and IgG)
- Virus detection by RT-PCR

Following figure and table shows the various biological markers in the clinical course that are useful in the management of CCHF disease

Table 3: Clinical progression of CCHF with laboratory parameters

Category	Fever $^{\circ}\text{C}$	Bleeding	SGPT, SGOT	Platelet count / mm^3
Category A	< 38.5	No systemic bleeding	<150 IU, <200 IU	$>50,000$
Category B	> 38.5	Local and systemic bleeding	≥ 150 IU, ≥ 200 IU	$<50,000$ APTT > 60 Seconds
Category C	> 38.5	Terminal stage with DIC and multi-organ failure		

Fig. 19: Typical clinical course of CCHF infection with laboratory parameters



Source: O Ergonul, Lancet ID 2006;om Ksiazek, CDC

6. Case management

- Isolation under strict droplet, blood and body fluid precautions needed
- Concurrent disinfection of blood and body fluid discharges
- Use personal protective equipment (PPE) at all times

Supportive therapy

Table 4: Supportive care in the management of Crimean-Congo Haemorrhagic Fever

(Ref.: Leblebicioglu H, Bodur H, Dokuzoguz B, et al. Case management and supportive treatment for patients with Crimean-Congo hemorrhagic fever. Vector Borne Zoonotic Dis 2012; 12(9):805-11)

Treatment	Indication	Dose
Fluid replacement (crystalloid or synthetic colloid)	Fluid deficiency, restricted oral intake	
Platelet suspension	Haemorrhage and thrombocytopenia Presence of clinically- significant bleeding (e.g., hematemesis, melena, or epistaxis) and platelet count < 50,000/mm ³ Platelet count < 10,000/mm ³ in patients with no fever or abnormalities in coagulation parameters Platelet count < 20,000/mm ³ with fever or systemic haemostatic defect Platelet count < 50,000/mm ³ in patients who are to undergo an invasive intervention	1 U platelets by apheresis or 1 U random platelets/15kg
Fresh frozen plasma	Synthesis defect PT/INR 1.5 times the upper limit of normal or aPTT upper limit of normal	10–15 mL/kg/ day, divided into two doses
Fluid replacement and erythrocyte suspension	Haemorrhage	
Rapid fluid replacement (crystalloid or synthetic colloid) and erythrocyte suspension	Grade 4 Blood loss > 40% (> 2000 mL) Grade 3 Blood loss 30–40% (1500–2000 mL)	
Fluid replacement (crystalloid or synthetic colloid), erythrocyte suspension (in anaemia, continuing blood loss or in cardiac reserve deficiency)	Grade 2 Blood loss 15–30% (750–1500 mL)	
Erythrocyte suspension administration is not needed (excluding anaemia and secondary fluid loss, cardiac and respiratory complications)	Grade 1 Blood loss < 15% (< 750 mL)	
Paracetamol	Fever, pain	10 mg/kg at 4-6 h intervals
Antibiotics (of corresponding spectrum)	Secondary infection (e.g. sepsis/ pneumonia)	
Haemodialysis	Renal insufficiency Hyperpotassaemia Severe metabolic acidosis Uraemic pericarditis Fluid load	
Mechanical ventilation	Respiratory failure PAO ₂ < 55mm Hg (FIO ₂ ≥ 60% O ₂) PACo ₂ > 45mm Hg pH < 7.3	

aPTT – Activated partial thromboplastin time; INR – International normalized ratio; FIO₂ – Fraction of inspired oxygen

Recommended specific treatment: IV Ribavirin (if available in central medical store) is recommended by WHO for treatment of confirmed case(s) of CCHF

Administration

- Dilute IV ribavirin in 150 ml of 0.9% saline and infuse slowly
- Ribavirin is most effective if given in the first 6 days of illness
- Reduce the dose in persons known to have renal insufficiency (creatinine clearance <50 ml/minute)

Table 5: Intravenous Ribavirin dose for treatment of CCHF

Route	Dose	Interval
Intravenous	30 mg/kg (Max 2 grams)	Loading dose followed by
	15 mg/kg (Max 1 gram)	6 hourly X 4 days followed by
	7.5 mg/kg (Max 500 milligrams)	8 hourly X 6 days

(Ref: Clinical management of patients with viral haemorrhagic fever - **A pocket guide for front-line health workers Interim emergency guidance for country adaptation** WHO, Feb 2016)

Chemoprophylaxis for contacts

- Oral formulations of ribavirin should be restricted to **post-exposure prophylaxis for symptomatic high-risk exposures** to CCHF
- The prophylaxis dose is oral ribavirin 35 mg/kg loading dose (maximum 2.5 g) followed by 15 mg/kg (maximum 1 g) every 8 hours for 10 days

7. Surveillance and reporting

Immediate reporting to regional and national surveillance (within 24 hours). Case-based and event-based reporting of all suspect cases or clusters. Liaison with the Ministry of Agriculture and Fisheries is important to know the disease status in animals and tick control activity. Liaison with *Baladiyah* for the disease surveillance among certain occupations (butchers, slaughter house worker).

8. Prevention and control

Contacts management

- Investigation of contacts and source of infection: Search for missed cases and the presence of infected animals and tick infestation
- Prepare a line list of hospital and community contacts. The health care workers' (HCW) contacts are listed and followed by the head of infection prevention and control in the hospital. Similarly, the regional Epidemiologist is responsible for the community contacts. The contacts should be categorised according to the exposure risk into high, moderate and low risk (annexe# 6).
 - All contacts of the case should be followed for a period of 14 days from the last exposure.
 - High risk contacts should be followed daily by a responsible staff while other categories should self-monitor their temperature
 - Contacts developing symptoms during follow-up period should be tested
 - There is no approved antiviral treatment and prophylaxis for CCHF. Ribavirin prophylaxis for those with a high-risk exposure may be beneficial and should be considered from a case-to-case basis.
- There is currently no vaccine available against CCHF

a. Controlling CCHF in animals and ticks

The control and prevention of CCHF in the animal host and tick vector is difficult. This is because the infection in animals is asymptomatic and ticks are widespread and abundant in endemic regions. Acaricides are useful for tick control when applied prior to animal slaughter along with a 14-day period of quarantine prior to slaughter. Presently there are no vaccines available for animal protection.

b. Reducing risk of infection in people

The key to protecting people from CCHF is raising awareness and education targeted at high-risk groups. At present there is no proven and safe vaccine for humans.

c. Reducing risk of tick-to-human transmission

Except during the egg stage, all other biological stages of ticks feed on blood from animals and humans. Ticks do not show hosts specificity. Ticks are generally active between April and September in Northern Hemisphere.

Agricultural workers and others working with animals should wear light coloured protective clothing that allows rapid identification of ticks. Insect repellents can also be used and skin and clothing regularly examined for the presence of ticks.

After a tick attaches it should be removed using fine-tipped tweezers as soon as possible and the bite area and hands should be thoroughly washed with soap and water and an antiseptic applied.

d. Reducing risk of animal-to-human transmission

Animals play a crucial role in the life cycle of ticks and therefore in the transmission and amplification of the virus. Viraemia or antibodies have been detected in a broad range of wild and domestic mammals. Gloves and PPE must be worn by people handling animals in endemic areas. Necessary protective measures must also be taken when in contact with animal carcasses and body fluids of animals. The waste and blood of animals should not be indiscriminately disposed.

e. Prevention of CCHF during festivals

As the disease is asymptomatic in animals, control and prevention is difficult especially during festive period when animal trade and movements are uncontrolled within and between countries. The suggested measures by the relevant sector include: strict regulation of animal movements, tick control by enhanced checking of animals, acariciding and practicing animal slaughtering in abattoirs instead of backyard. Use of appropriate clothing and PPE during animal handling and slaughtering is recommended.

f. Safe dead body disposal

Follow guidelines given in annexe #9

9. Laboratory investigation protocol

Type of test	Platelets	Serology	PCR
Sample	Blood	Serum	Whole blood in EDTA
When to collect	As required during illness	Convalescent serum 14 days after first sample	Within 5-7 days from onset
Storage	Specimens should be refrigerated.		
Transport	Transport in cold chain in triple packaging (category A)		
BSL	BSL 3 precautions		
Laboratory	Regional/tertiary hospital	CPHL	

Note: Inform CPHL in advance before sending sample.

Chapter 6

A90-91

Dengue Fever

Dengue fever and severe dengue (WHO)

1. Background

Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO in recent years. Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti* and, to a lesser extent, *Aedes albopictus*. The disease is widespread throughout the tropics, with local variations in risk influenced by rainfall, temperature and unplanned rapid urbanization.

Fig. 20: Dengue risk areas, 2009 (WHO)



The incidence of dengue has grown dramatically around the world in recent decades. The actual numbers of dengue cases are underreported and many cases are misclassified. Before 1970, only 9 countries had experienced severe dengue epidemics. The disease is now endemic in more than 100 countries in the regions of Africa, the Americas, the Eastern Mediterranean, South-East Asia and the Western Pacific. The countries affected in the Eastern Mediterranean Region (EMR) are Sudan, Djibouti and Somalia (DEN-2), Saudi Arabia (DEN-2), Yemen (DEN-2 and 3) and Pakistan (DEN-3).

2. Epidemiological characteristics

Infectious agent	Dengue virus (DENV) Flavivirus, serotypes DENV-1, -2, -3 and -4)
Reservoir	Humans (with or without symptoms) and <i>Ae. aegypti</i> mosquitoes cycle
Transmission	Bite of infective mosquito – <i>Aedes aegypti</i>
Incubation	From 3-14 days, commonly 4-7 days
Communicability	No person-to-person transmission. Bloodborne (infected blood/tissues) and perinatal (infected mother-to-child) transmission is possible
Susceptibility	All ages in endemic areas. Dengue is a leading cause of febrile illness in travellers to endemic areas

3. Dengue in Oman

Dengue vector: Due to concerns over the possibility of the introduction of dengue in Oman, a 12 months entomological survey was conducted by the Department of Malaria Eradication in 2006-07 in the governorate of Muscat. Three *Aedes* mosquito species were discovered, namely *Ae. arabiensis*, *Ae. granti* and *Ae. vittatus*. However the vector of dengue (*Ae. aegypti*) was not found.

A similar survey was conducted in the Dhofar Governorate in 2008. The *Aedes aegypti* was observed to breed in Deem village. The survey was repeated in August. Three species of *Aedes* were discovered, *Ae. aegypti*, *Ae. vittatus* and *Ae. arabiensis*. *Aedes aegypti* was observed in Sarfayt, Deem and Dhalqut village, while in Salalah port area (Raysut) was free of mosquitoes.

The vector breeding was observed during *Khareef* season (rains in July-August) in the surveys of 2008 and 2010. It was considered as a cause of concern due to the possibility that the local vectors may become infective. Following actions were implemented:

Fig. 21: Travel-related Dengue cases reported in Oman (n=78): 2001-2015

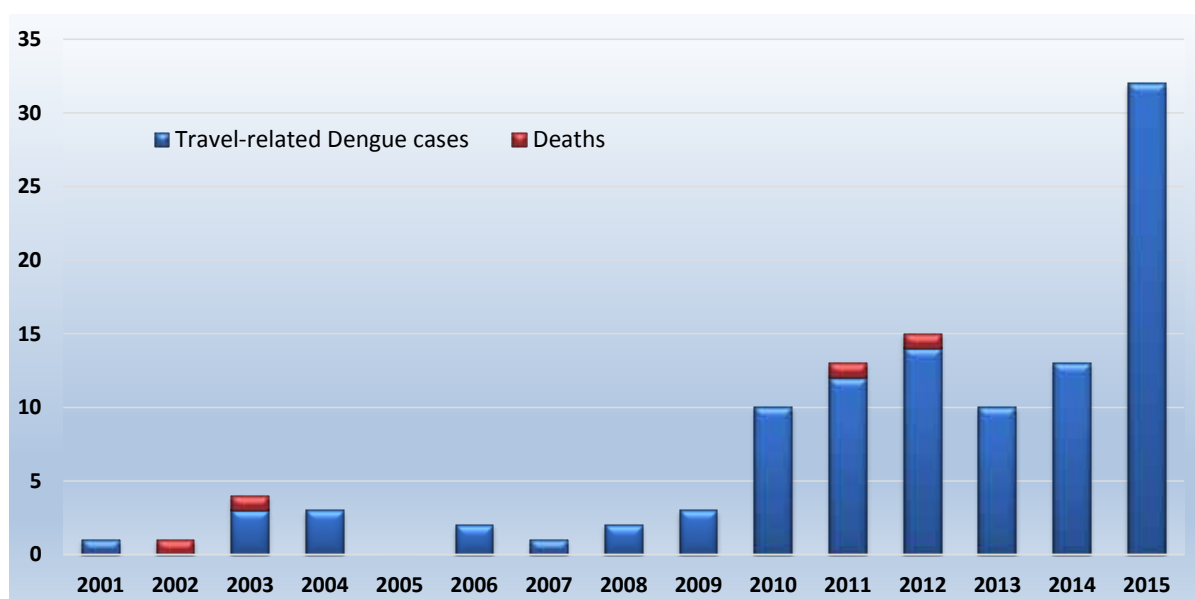
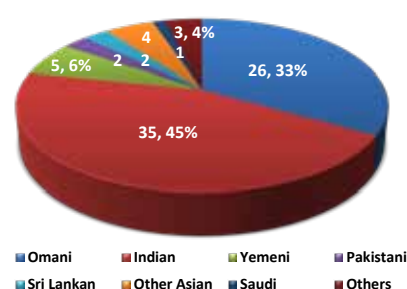


Table 6: Travel-related dengue cases by Governorates: 2001-15

Governorate	Cases	%
Muscat	61	55.5
Dhofar	22	20.0
N Batinah	7	6.4
Buraimi	7	6.4
Dakhliyah	5	4.5
S Sharqiyah	3	2.7
S Batinah	2	1.8
N Sharqiyah	2	1.8
Dhahira	1	0.9
Total	110	

Table 22: Dengue cases by Nationality (n=78) : 2001-15



- Periodic entomological surveillance will be an ongoing activity in the identified risk areas
- The seasonality of the vector breeding and insecticide sensitivity will be monitored
- Strengthening core capacity in the area of medical entomology
- The vector control strategies focus on community involvement

As of 2014, indigenous cases of DF have not been reported in Oman. However travel-related dengue cases are reported routinely. The trend appears to be on the rise. The majority of the resident non-Omani population in the country is from the Indian subcontinent where dengue is endemic.

4. Case definition

The earlier dengue case definition had limitations in terms of its complexity and applicability. The new WHO/CDC classification (2009) for dengue severity is divided into dengue without warning signs, dengue with warning signs and severe dengue.

Fig. 23: Dengue warning signs

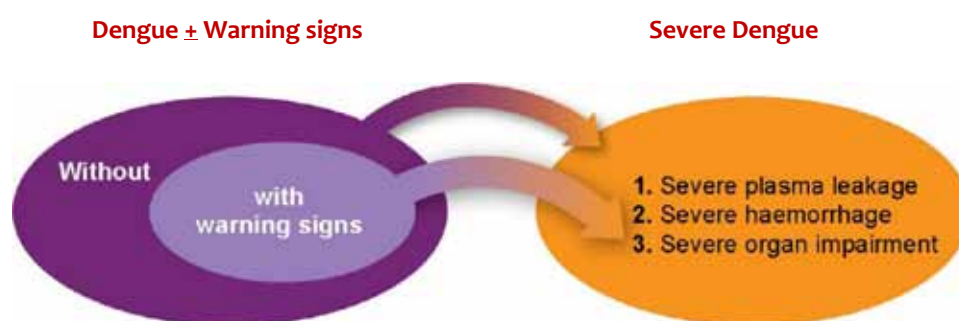


Table 7: Clinical parameters of severe dengue

Criteria for dengue with or without warning signs		Criteria for severe dengue
Probable dengue	Warning signs*	Severe plasma leakage
Live in/travel to dengue endemic area.	– Abdominal pain or tenderness	Severe plasma leakage leading to:
Fever and 2 of the following:	– Persistent vomiting	o Shock (DSS)
– Nausea, vomiting	– Clinical fluid accumulation (ascites, pleural effusion)	o Fluid accumulation with respiratory distress
– Rash	– Mucosal bleeding	Severe bleeding as evaluated by clinician
– Aches and pains	– Lethargy, restlessness	Severe organ involvement
– Leukopenia	– Liver enlargement >2 cm	– Liver: AST or ALT ≥ 1000
– Any warning sign	– Laboratory: increase in HCT concurrent with rapid decrease in platelet count	– CNS: impaired consciousness
Laboratory-confirmed dengue		– Heart and other organs
If no signs of plasma leakage	<i>*requires strict observation and medical intervention</i>	

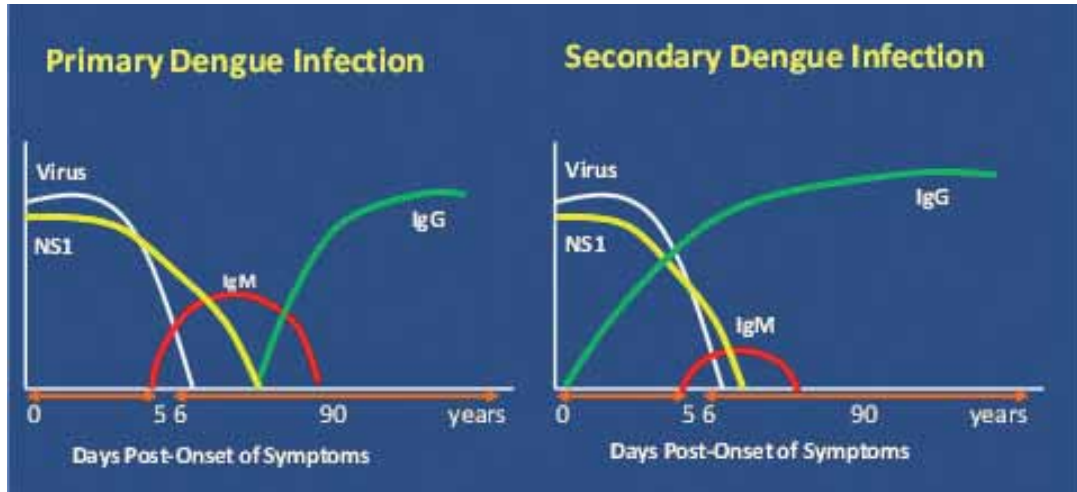
ALT=alanine aminotransferase; AST=aspartate aminotransferase; DSS = dengue shock syndrome; HCT = haematocrit

Source: Dengue Guidelines for Diagnosis, Treatment, Prevention and Control WHO/TDR 2009

5. Laboratory criteria

The immune response to natural dengue primary and secondary infection along with diagnostic markers are shown in following figure.

Fig. 24: Immunological response in dengue (source: CDC)



IgM and IgG: The immune response varies depending on whether the individual has a primary (first dengue or other flavivirus infection) versus a secondary (had dengue or other flavivirus infection in past) dengue infection.

A primary infection is characterized by a slow and low titre antibody response. IgM antibody is first to appear. Anti-dengue IgG is detectable at low titre at the end of the first week of illness and slowly increases. In contrast, during a secondary infection antibody titres rise extremely rapidly. High levels of IgG are detectable even in the acute phase and they rise dramatically over the following 2 weeks. IgM levels are significantly lower in secondary dengue infections and as a result some false negative reactions are observed. By day 6 to 10 of illness, 93-99% of cases have detectable IgM which may then remain detectable for over 90 days.

Fig. 25: The diagnostic algorithm for dengue

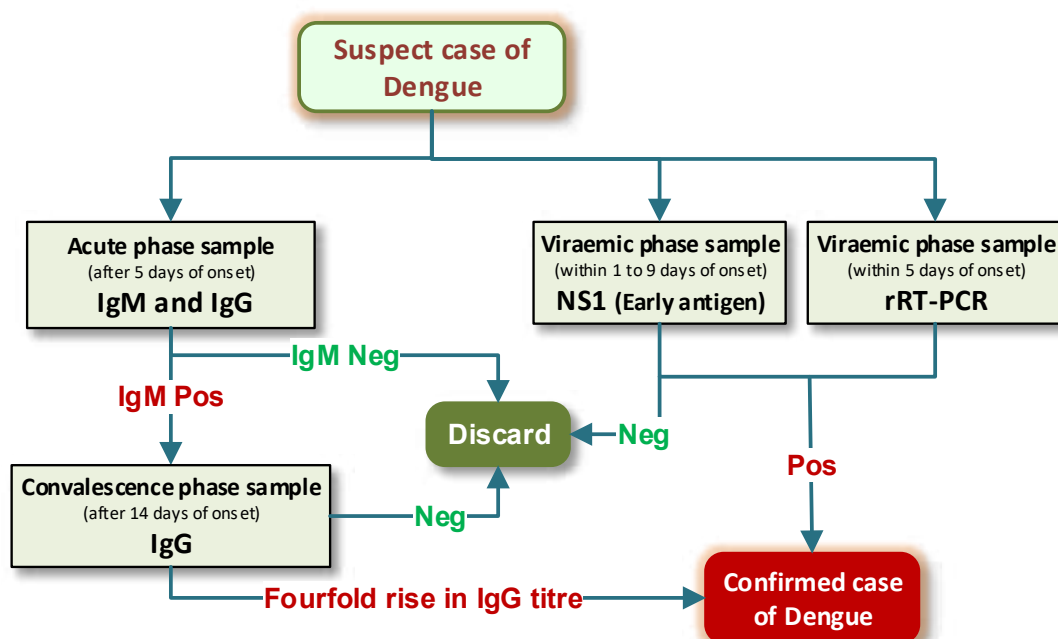
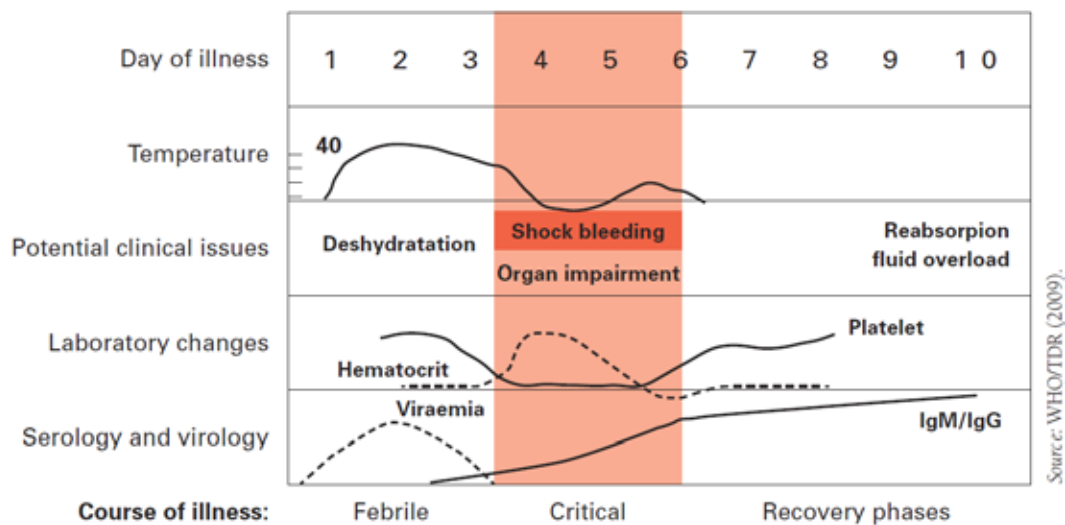


Fig. 26: The clinical course of primary dengue illness



Source: Dengue Guidelines for diagnosis, Treatment, Prevention and Control, WHO, 2009

NS-1: The non-structural protein 1 (NS1) of the dengue viral genome has been shown to be useful as a tool for the diagnosis of acute dengue infections. Dengue NS1 antigen has been detected in the serum of DENV infected patients as early as 1 day post onset of symptoms and up to 18 days following.

PCR: DENV can be detected in the blood (serum) from patients for approximately the first 5 days of symptoms. Because antibodies are detected later, RT-PCR has become a primary tool to detect virus early in the course of illness. Current tests are 80-90% sensitive and more than 95% specific. A positive PCR result is definite proof of current infection.

6. Case management

- There is no specific antiviral treatment currently available
- Supportive care is a mainstay for case management including bed rest and oral rehydration symptomatic treatment and prevention of complications
- Acetylsalicylic acid (aspirin) is contraindicated because of its haemorrhagic potential

7. Surveillance and reporting

Immediate reporting to national surveillance (within 24 hours). Case-based and event-based reporting of all suspect cases or clusters.

8. Prevention and control

- No vaccine or chemoprophylaxis drug is currently available to prevent dengue infection. Prevention of bites from vector mosquito is the only means of prevention
- Survey the community to determine the abundance of vector mosquitoes, identify the most productive larval habitats, promote and implement plans for their elimination, management or treatment with appropriate larvicides
- **Vector mosquito control:** eliminate breeding places – educate the community and promote behaviours to remove, destroy or manage mosquito vector larval habitats, which for *Ae. aegypti* are usually artificial water-holding containers close to or inside human habitations, e.g. old tyres, flowerpots, discarded containers for food or water storage
- Personal protection against day biting mosquitoes through repellents (*Diethyltoluamide*), screening and protective clothing

9. Laboratory investigation protocol

Type of test	Platelets	Serology: NS1, IgM, IgG	PCR
Sample	Blood	Serum 5 ml	Plasma
When to collect	As required during illness	NS-1: 1-9 days Acute: 0-7 days after onset Convalescent: 7-14 days after first sample	Within 5 days of onset
Storage	N/A	Do not freeze and thaw for NS-1 and PCR	
Transport	Transport in cold chain (category B)		
BSL	BSL Level 2 precautions		
Laboratory	Regional hospital	Tertiary hospital and CPHL	

Chapter 7

G00.1

Pneumococcal Invasive Disease

Streptococcus pneumoniae (pneumococcal) meningitis

1. Background

Pneumococcal disease spectrum of illness ranges from otitis media to meningitis and some of these infections are “invasive.” Pneumococcal meningitis has a high case fatality rate. It can be fulminant and occurs with bacteraemia but not necessarily with any other focus although there may be otitis media or mastoiditis. Onset is usually sudden with high fever, lethargy or coma and signs of meningeal irritation. It is a sporadic disease in young infants, the elderly and other high-risk groups. Receipt of a cochlear implant and basilar fracture causing persistent communication with the nasopharynx are predisposing factors.

Pneumococcal infections are more common during the winter and in early spring when respiratory diseases are more prevalent. The spread of the organism within a family or household is influenced by such factors as crowding, the season, and the presence of upper respiratory infections or pneumococcal disease such as pneumonia or otitis media. The spread of pneumococcal disease is usually associated with increased carriage rates. However, high carriage rates do not appear to increase the risk of disease transmission in households.

Pneumococci are common inhabitants of the respiratory tract and may be isolated from the nasopharynx of 5% to 90% of healthy persons. Rates of asymptomatic carriage vary with age, environment and the presence of upper respiratory infections. Capsular polysaccharides are one determinant of the pathogenicity of the organism. They are antigenic and form the basis for classifying pneumococci by serotypes. Most *Streptococcus pneumoniae* serotypes have been shown to cause serious disease but only a few serotypes produce the majority of pneumococcal infections. The 10 most common serotypes are estimated to account for about 62% of invasive disease worldwide. The ranking and serotype prevalence differ by patient age group and geographic area.

2. Epidemiological characteristics

Infectious agent	<i>S. pneumoniae</i> (Pneumococcus)
Reservoir	Asymptomatic humans harbour organisms in nasopharynx
Transmission	Direct person-to-person contact via respiratory droplets
Incubation	Unknown; probably short, 1-4 days
Communicability	Unknown, but presumably transmission can occur as long as the organism appears in respiratory secretions
Susceptibility	Assumed to be universal. Immunity is associated with the presence of circulating bactericidal and/or anticapsular antibody, acquired transplacental, from prior infection or from immunization

3. Pneumococcal disease in Oman

Meningitis was included in group B diseases; however, the aetiological diagnosis was not always practiced. Hence, the surveillance data on invasive pneumococcal disease in Oman are scarce.

Moreover there are 2 additional factors that influence the availability of information on specific aetiological agents in the broad group of bacterial meningitis.

- There is high refusal for lumbar puncture procedure for CSF examination by the parents. (Anecdotal estimate is over 40%)
- The Integrated Management of Childhood illnesses programme was implemented in Oman from 2003. Under its guidelines, the primary health care doctors were instructed to start the antibiotics before referral of a suspect case of meningitis to secondary/tertiary care hospital reducing the yield of CSF/blood culture.

Fig. 27: Bacterial meningitis in Oman: 2003-2004

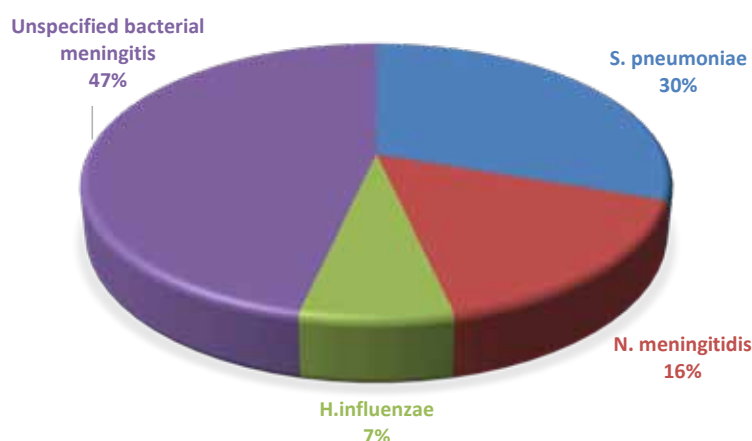


Table 8: Incidence (per 100,000 pop) of bacterial meningitis by age groups in Oman: 2003-2004

Age groups	0-4 yr	5-14 yr	15-24 yr	25-34 yr	33-55 yr
<i>S. pneumoniae</i>	4.53	0.82	0	0	0.41
<i>N. meningitidis</i>	3.71	0	0	0	0.41
<i>H. influenzae</i>	2.47	0.41	0	0	0
All bacterial causes	7.41	2.06	0	0	1.24

4. Case definition

Suspect

Not relevant for surveillance purpose. However, high fever, lethargy, signs of meningeal irritation or coma are some of the clinical manifestations of meningitis.

Confirmed

Isolation of the organism from a clinical specimen.

5. Laboratory criteria

CSF:

- Increased cells and protein, decreased glucose levels
- Gram stain: gram-positive diplococci
- Isolation of *S. pneumoniae* by culture
- Detection of *S. pneumoniae* nucleic acid by PCR

Blood: Isolation of *S. pneumoniae* by culture

6. Case management

- Concurrent disinfection of articles soiled by discharges from the patient
- Supportive therapy and stabilization of the patient
- Antibiotic (penicillin, cephalosporin, vancomycin) use based on the sensitivity report
- Steroids if required

7. Surveillance and reporting

Immediate reporting to regional and national surveillance (within 24 hours). Case-based reporting of all cases or clusters. In the event of refusal for lumbar puncture, the clinical presentation should be further assessed and recorded in details.

8. Prevention and control

Pneumococcal vaccines

Both polysaccharide and conjugate vaccines are licensed in Oman.

Pneumococcal polysaccharide vaccine (PPV23) is composed of purified preparations of pneumococcal capsular polysaccharide. Pneumococcal vaccine is given by injection and may be administered either intramuscularly or subcutaneously. The vaccine has been included in the adult vaccination schedule for high-risk groups.

Pneumococcal conjugate vaccine, the first pneumococcal conjugate vaccine (PCV7) was licensed that included purified capsular polysaccharide of 7 serotypes of *S. pneumoniae* (4, 9V, 14, 19F, 23F, 18C and 6B) conjugated to a nontoxic variant of diphtheria toxin known as CRM197. In 2010 a 13-valent pneumococcal conjugate vaccine (PCV13) was introduced with additional serotypes 1, 3, 5, 6A, 7F and 19A. In Oman currently PCV13 is included in the infant immunization programme.

Investigation of contacts and their management is not generally useful except in epidemic situations. Such clusters can occur in institutional settings. In these situations also widespread antibiotic prophylaxis is generally not recommended. An outbreak due to a non-vaccine strain may require such prophylaxis with proven sensitivity to antimicrobial agents.

9. Laboratory investigation protocol

Other sterile sites include joint fluid, pleural effusion, pericardial effusion, peritoneal fluid, subcutaneous tissue fluid, placenta and amniotic fluid

Type of test	Microscopy	Antigen test	Culture and antibiotic sensitivity testing (AST)	PCR	Serotype
Type of sample	CSF	CSF	CSF, Blood, other sterile site culture	Isolate	
When to collect	On or soon after admission				
Storage	Process within an hour then store 4°C			4°C	
Transport					
BSL	BSL II in a class II BSC				
Laboratory	Regional and tertiary care hospital			CPHL	

Chapter 8

G00.0

Haemophilus Influenzae Type B

Invasive disease: meningitis due to Haemophilus influenzae type b

1. Background

Haemophilus influenzae serotype B meningitis is the most common bacterial meningitis in children aged 2 months to 5 years. Other serotypes rarely cause meningitis. Due to the widespread use of Hib vaccine in early childhood, the cases have decreased in young children. More cases now occur in older age groups than in young children.

Beside meningitis, Hib is also responsible for causing pneumonia, epiglottitis, cellulitis, and bone and joint infections. Asymptomatic colonization of upper respiratory tract is frequent and provides the focus from which the infection spreads.

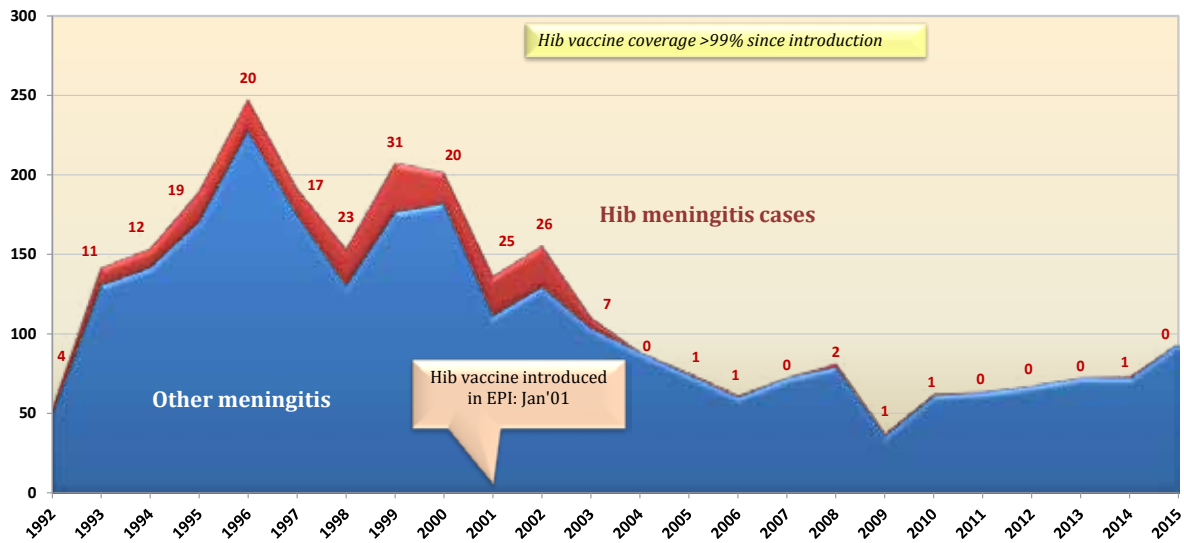
2. Situation in Oman

Haemophilus meningitis type b was included under group 'B' notifiable disease from July 1992. No reliable surveillance data are available on its incidence due to the high refusal rate for lumbar puncture, pre-referral use of antibiotics and relative difficulty in isolating the organism in the laboratory.

In a hospital-based study at the Royal Hospital it was found that Hib accounted for 45% of all bacteriologically proven meningitis cases admitted over a one year period (1990/91).

The laboratory surveillance of Hib meningitis was strengthened from the year 2000. The Hib vaccine has been in the EPI schedule since October 2001. It was replaced with 'Penta' vaccine (diphtheria, tetanus and pertussis [DTP]+Hib+HepB) from July 2003.

Fig. 28: Reported cases of *Haemophilus type b* meningitis in Oman: 1991-2014



3. Epidemiological characteristics

Infectious agent	Hib
Reservoir	Humans
Transmission	Transmission is by direct contact, including droplets and discharges from nose and throat of infected persons, more often from carriers than cases
Incubation	2-4 days
Communicability	As long as organisms are present, which may be for a prolonged period even without nasal discharge. Noncommunicable within 24-48 hours of starting effective antibiotics
Susceptibility	Universal, prevented by immunization in childhood

4. Case definition

Invasive disease may manifest as pneumonia, bacteraemia, meningitis, epiglottitis, septic arthritis, cellulitis or purulent pericarditis and less common infections include endocarditis and osteomyelitis.

A case with signs and symptoms of meningitis **AND**

- Detection of antigen in CSF and/or
- Positive culture of *H. influenzae* from CSF or blood

5. Laboratory criteria

CSF:

- Increased cells and protein, decreased glucose levels
- Gram stain: gram-negative organism
- Detection of antigen
- Isolation of *H. influenzae* by culture
- Detection of *H. influenzae* nucleic acid by PCR

Blood: Isolation of *H. influenzae* by culture

6. Case management

- Concurrent disinfection of articles soiled by discharges from the patient
- Supportive therapy to stabilize the patient
- Antibiotics (penicillin, cephalosporin, vancomycin) use based on the sensitivity report

- Steroids if required
- The patient should also be given rifampicin in the recommended dosage prior to discharge from hospital to ensure elimination of nasopharyngeal carriage

7. Surveillance and reporting

- Immediate reporting (within 24 hours), case-based reporting of all cases. In the event of refusal for lumbar puncture, the clinical presentation should be further assessed and recorded in details
- Epidemiological investigation to detect additional cases, source of infection to plan further action

8. Prevention and control

- Vaccination program has a direct impact on the incidence of infections with *Haemophilus influenza* type B. The vaccine has been included in the childhood vaccination program. The Hib vaccine is not recommended for children older than 5 years since the severe disease is rare in older age groups.
- **Contact management and chemoprophylaxis**
 - Locate the family and house of the index case
 - Identify all family members, close relatives in other houses, and the immediate neighbours especially children who are playmates or a non-residents who cumulatively spent 4 or more hours with the index case for at least 5 of the 7 days prior to the day of hospital admission of the index case and keep them all under observation. Refer any suspect case to the hospital immediately
 - Give chemoprophylaxis immediately with rifampicin to the close household contacts (including adults) to prevent infection in siblings and to eliminate the carriage in others. Children younger than 12 years should receive 20 mg/kg once daily for 4 days and adults should receive 600 mg once daily for 4 days
 - In households with any children younger than 1 year (other than index case) and any inadequately immunized child aged 1-3 years should also receive chemoprophylaxis
 - When 2 or more cases are reported with a common setting such as child care homes where there are children who may not be adequately immunized the adults of that facility should receive prophylaxis
- **Chemoprophylaxis is not recommended for:**
 - Occupants of households with no children younger than 4 years of age other than the index patient
 - Occupants of households when all household contacts 12 to 48 months of age have completed their Hib immunization series and when household contacts younger than 12 months of age have completed their primary series of Hib immunizations
 - Nursery school and child care contacts of single index case especially those older than 2 years of age
 - Pregnant women
- In all instances, children younger than 5 years of age who are unimmunized or incompletely immunized against Hib disease should be given doses of Hib vaccine until their immunizations are up to date

10. Laboratory investigation protocol

Type of test	Microscopy	Antigen test	Culture and AST	Serotyping
Type of sample	CSF	CSF	CSF, Blood, other sterile site culture	Isolate
When to collect	On or soon after, admission			
Storage	Process within an hour. Store at 4°C			4°C
Transport				
BSL	BSL II in a class II BSC			
Laboratory	Regional and Tertiary Hospital			Tertiary and CPHL

Note:

- Other sterile sites include joint fluid, pleural effusion, pericardial effusion, peritoneal fluid, subcutaneous tissue fluid, placenta, and amniotic fluid
- All *H. influenzae* specimens taken from invasive sites should be sent to CPHL for serotyping

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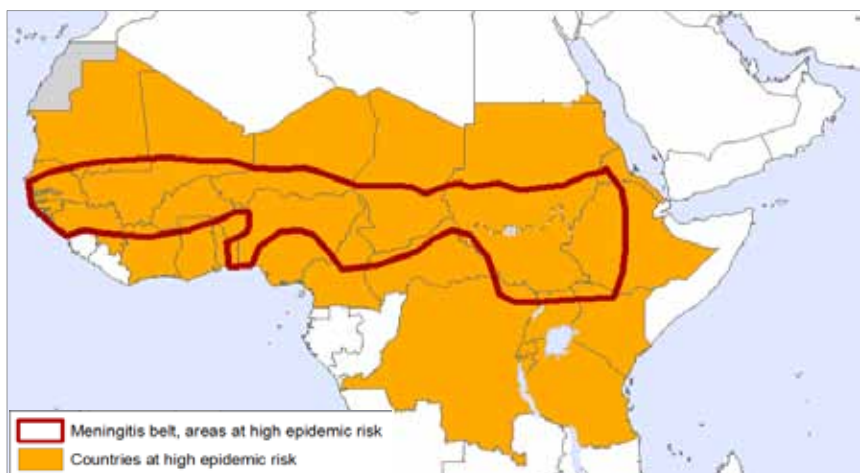
Meningococcal Infection

Meningococcal meningitis, meningococemia

1. Background

Neisseria meningitidis is the most common cause of acute bacterial or pyogenic meningitis. It has a short incubation period and has the potential of causing outbreaks or epidemics resulting in fatalities. Several serotypes have been identified i.e. groups A, B, C, D, X, Y, W135, etc. Of these group A and C and to lesser extent group B are capable of causing major epidemics. CFR remains high at 8%-15% and 10%-20% of survivors will suffer long-term sequelae including mental retardation, hearing loss, etc. Invasive disease is characterized by one or more clinical syndromes including bacteraemia, sepsis or meningitis. Meningococemia is the most severe form of infection with petechial rash, hypotension, DIC and multi-organ failure. Other forms of meningococcal disease such as pneumonia, purulent arthritis and pericarditis are less common.

Fig. 29: The extended African meningitis belt of 26 countries: 2014 (WHO)



Meningococcal meningitis occurs sporadically and in small outbreaks in most parts of the world. The zone lying between 5° and 15° North of the equator in tropical Africa is called the “meningitis belt”, because of the frequent epidemic waves that have been occurring in that region. The countries in this

belt are Benin, Burkina Faso, Chad, Côte d'Ivoire, Ethiopia, Gambia, Ghana, Guinea, Mali, Mauritania, Niger, Somalia, Sudan, Senegal, Tanzania and Togo.

2. Epidemiological characteristics

Infectious agent	<i>Neisseria meningitidis</i> , the meningococcus, is a gram-negative, aerobic diplococcus
Reservoir	Humans
Transmission	Transmission is by direct contact including droplets and discharge from nose and throat of infected persons, more often from carriers than cases. Asymptomatic colonization of upper respiratory tract is frequent and provides the focus from which the organism spreads
Incubation	2 to 10 days (commonly 3 to 4 days)
Communicability	Until live meningococci are no longer present in discharges from nose and mouth. Meningococci usually disappear from the nasopharynx within 24 hours after antimicrobial treatment
Susceptibility	Susceptibility to the clinical disease is low and decreases with age; this induces a high ratio of carriers to cases. Persons deficient in certain complement components are especially prone to recurrent disease; splenectomised persons are susceptible to bacterial illness. Group-specific immunity of unknown duration follows even after subclinical infections

3. Meningococcal infection in Oman

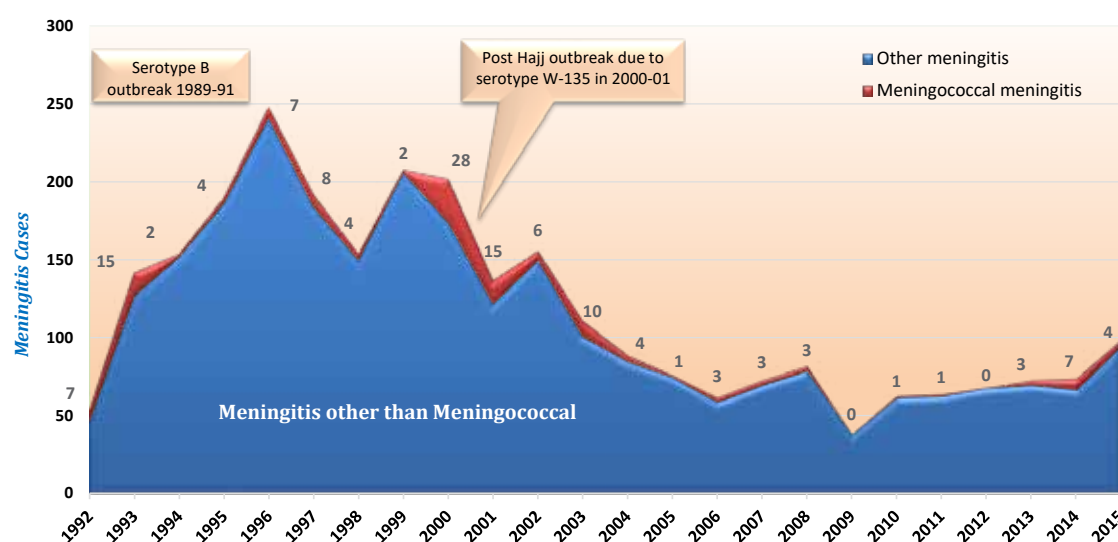
Meningococcal meningitis is an important notifiable communicable disease in Oman due to the associated mortality and a potential risk of epidemic. Cases occur throughout the year with clustering during the period when the *Hajj* pilgrims return. The monthly morbidity patterns in 1988 to 1991 showed that there was an increase in the number of cases reported in the months coinciding with the return of *Hajj* pilgrims, who may have been carriers of meningococcal strains and may have introduced the infection into the community. Outbreaks related to the return of *Hajj* pilgrims in the past have been due to serogroup A. This period therefore requires close surveillance and quick action every year to prevent and control the potential outbreaks. The meningococcal vaccination is mandatory for all pilgrims for Hajj and Umrah. Although vaccination prevents the disease in the pilgrims, it does not prevent the nasopharyngeal carrier state.

In the 1987 outbreak, the majority of cases occurred in the month of August. The prevalent serotype was group B (WHO carrier survey December 1987). Similarly another outbreak occurred after the *Hajj* pilgrimage of 2000 (March/April) in which for the first time the serotype W-135 was implicated. Cases occurred in several countries and the pandemic was associated with high mortality. In Oman 28 cases were reported in the global outbreak of year 2000 due to serotype W135.

As a result of this pandemic from the Hajj of 2001 the quadrivalent (A, C, Y, W-135) vaccine was made mandatory for the pilgrims attending Hajj and Umrah.

The data available on the incidence of meningococcal disease in Oman are given below:

Fig. 30: Incidence of meningococcal infections in Oman: 1991-2015



4. Case definition

Suspect

A sudden onset of febrile illness (fever > 38.5°C), AND **at least 2** of the following criteria:

- signs and symptoms of meningitis
- petechial rash
- hypotension (systolic blood pressure < 80 mm Hg)
- epidemic situation

Confirmed

Suspect case which is laboratory confirmed.

5. Laboratory criteria

CSF:

- Increased cells and protein, decreased glucose levels
- Gram stain: gram-negative diplococci
- Detection of specific antigen
- Isolation of *N. meningitides* by culture
- Detection of *N. meningitides* by PCR

Blood: Isolation of *N. meningitides* by culture

6. Case management

- Concurrent disinfection of articles soiled by discharges from the patient
- Supportive therapy to stabilize the patient
- Antibiotics (penicillin, cephalosporin, vancomycin, doxycycline) use based on the sensitivity report
- Steroids if required
- The patient should also be given ciprofloxacin chemoprophylaxis in the recommended dosage prior to discharge from hospital to ensure elimination of nasopharyngeal carriage

7. Surveillance and reporting

- Immediate reporting (within 24 hours) case-based reporting of all cases. In the event of refusal for lumbar puncture, the clinical presentation should be further assessed and recorded in details
- Epidemiological investigation to detect additional cases, source of infection and planning further action

8. Prevention and control

8.1 At-risk groups

Travellers to countries where disease is epidemic, *Hajj* pilgrims, military groups, and individuals with underlying immune dysfunctions such as asplenia and a deficiency of complement components. Crowding, low socioeconomic status, active or passive exposure to tobacco smoke, and concurrent upper respiratory tract infections also increase the risk of meningococcal disease. Infants are at the highest risk but rates decrease after infancy and then increase in adolescence and young adulthood. Group-specific immunity of unknown duration follows even a subclinical infections.

8.2 Meningococcal vaccination policy

- Pilgrims planning to go for **Hajj** and **Umrah** are required to be vaccinated with quadrivalent meningococcal (A, C, Y, W-135) polysaccharide vaccine at least 10 days prior to their departure
- Once vaccinated the protection is valid for a period of 3 years
- Effective vaccination does **NOT** prevent nasopharyngeal carriage state. Hence the person may transmit infection to others
- Meningococcal vaccination is **NOT** recommended in pregnancy
- Immunization is recommended for persons travelling to countries where outbreak of meningococcal meningitis is ongoing (*status notified by WHO or other international health agencies*)
- It is recommended that high-risk persons in specific occupations such as military recruits/ army personnel should receive vaccination routinely

8.3 Contact management

- Family contacts management
 - Locate the family and house of the index case
 - Enlist all family members, close relatives in other houses and the immediate neighbours especially playmates of children
 - Keep contacts under surveillance. Refer any suspect case to the hospital immediately
 - Provide chemoprophylaxis immediately with **ciprofloxacin** 500 mg single dose to the close household contacts (including adults). Children younger than 12 years should receive a single IM injection of **ceftriaxone**
- Effective chemoprophylaxis should be given to intimate contacts of military personnel sharing the same sleeping area and people socially close enough to have shared utensils e.g. close friends at school but not the whole class. Also to young children in day care centres even if not close friends, after an index case has been diagnosed
- **Chemoprophylaxis is not recommended for:**
 1. Casual contacts including HCW's who have not given mouth-to-mouth resuscitation
 2. Pregnant women. However ceftriaxone can be given if the risk of exposure is high
 3. During epidemics because of multiple sources, prolonged exposure, logistic problems and the high cost

Outbreak may occur in situations of overcrowding (pilgrimages). In such instances emphasis is placed on surveillance, early diagnosis, identification of serogroup, vaccination if appropriate and immediate treatment of suspected cases.

9. Laboratory investigation protocol

Type of test	Microscopy	Antigen	Culture and AST	PCR	Serotype
Type of sample	CSF	CSF	CSF, Blood, other sterile site culture	CSF, blood, other sterile site culture	Isolate
When to collect	On or soon after, admission. Preferably before starting antibiotic				
Storage	Process within 1 hr then store at 4°C			4°C for 48 hrs then at -20°C	
Transport	As soon as possible				
BSL	BSL 2 in class II BSC				
Laboratory	Regional hospital			CPHL	

Note:

- Delay in processing of CSF leads to cell disintegration which may produce a false cell count
- Do not refrigerate specimen until after microscopy and bacterial culture have been performed

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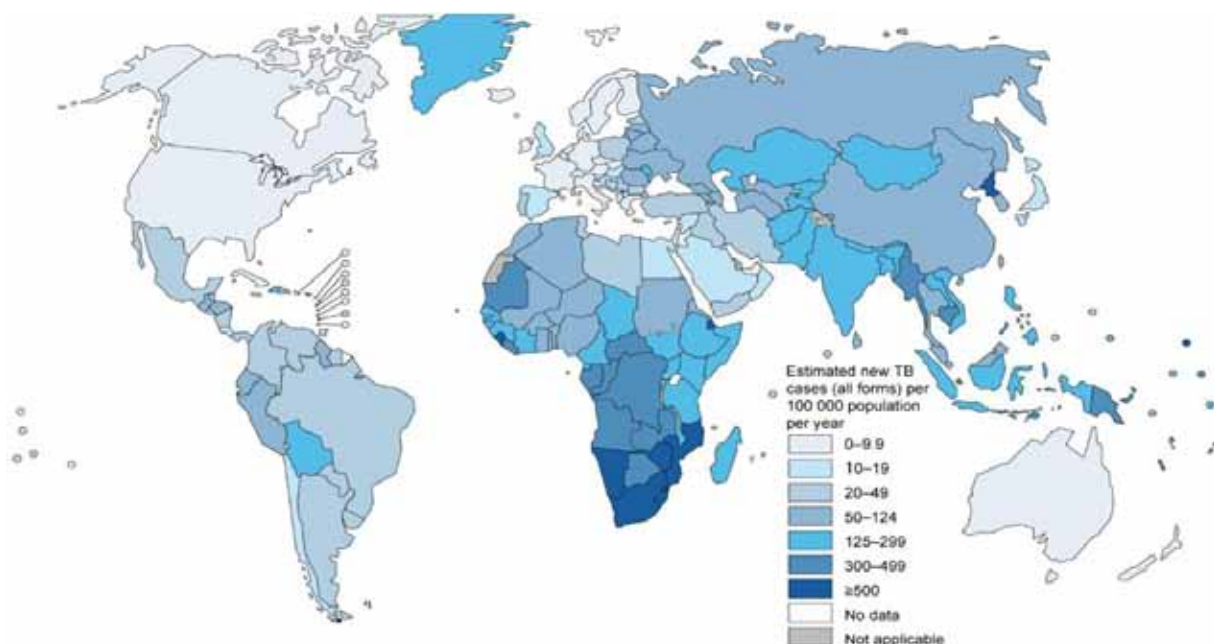
Tuberculosis

Pulmonary tuberculosis sputum positive / negative and extra-pulmonary

1. Background

The National TB Control Program in Oman was launched in 1981. The objectives of the program are to reduce mortality, morbidity and transmission of the disease through implementation of patient centred case management including “directly observed treatment, short-course (DOTS)” and other strategies. The final goal is to apply ‘The End TB Strategy’ for TB elimination from the country.

Fig. 31: Global incidence of tuberculosis: 2014 (WHO)



The implementation of the reduction of TB incidence is through a standardized system of surveillance, diagnosis, contact screening and treatment. The programme is integrated into the primary health care to achieve a high standard of care at all levels.

Tuberculosis is a notifiable disease under groups A and B, i.e. all cases of TB (pulmonary and extra-pulmonary) must be reported. The sputum positive pulmonary case should be notified within 24 hours of diagnosis (group A) and sputum negative and extra-pulmonary cases within a week of diagnosis (group B).

2. Epidemiological characteristics

Infectious agent	<i>Mycobacterium tuberculosis</i> (MTB)
Reservoir	Primarily human (rarely other primates)
Transmission	Airborne by droplets and droplet nuclei (sputum positive case)
Incubation	2-10 weeks for primary lesion. Weeks to months or years for disease depends on quantum of exposure and agent-host relations
Communicability	As long as viable bacilli in sputum. 2-4 weeks on ATT, ATT reduces 90% infectivity in 48 hours
Susceptibility	Universal, not related to genetic factors

3. Situation in Oman

The rate of all forms of TB cases (nationals) decreased from 21.4 in 1991 to 7.3 8 per 100,000 population in 2015, whereas for sputum positive TB (nationals) decreased from 8.6 to 2.35 in the same period. Thus NTBCP of Oman is considered as one of the most successful programs among the 23 states of Eastern Mediterranean Region. The proportion of sputum positive, negative and extra pulmonary TB among nationals in 2015 was 32% 18% 50% respectively. Muscat, Dhofar and North Batinah Governorates makes up almost 60-70% of total cases annually. Proportion of paediatric (<12 years) cases among nationals is around 5% or less for the past ten years. In the year 2015 the proportion was 2.2%.

Fig. 32: Reported cases of Tuberculosis in Oman: 1991-2015

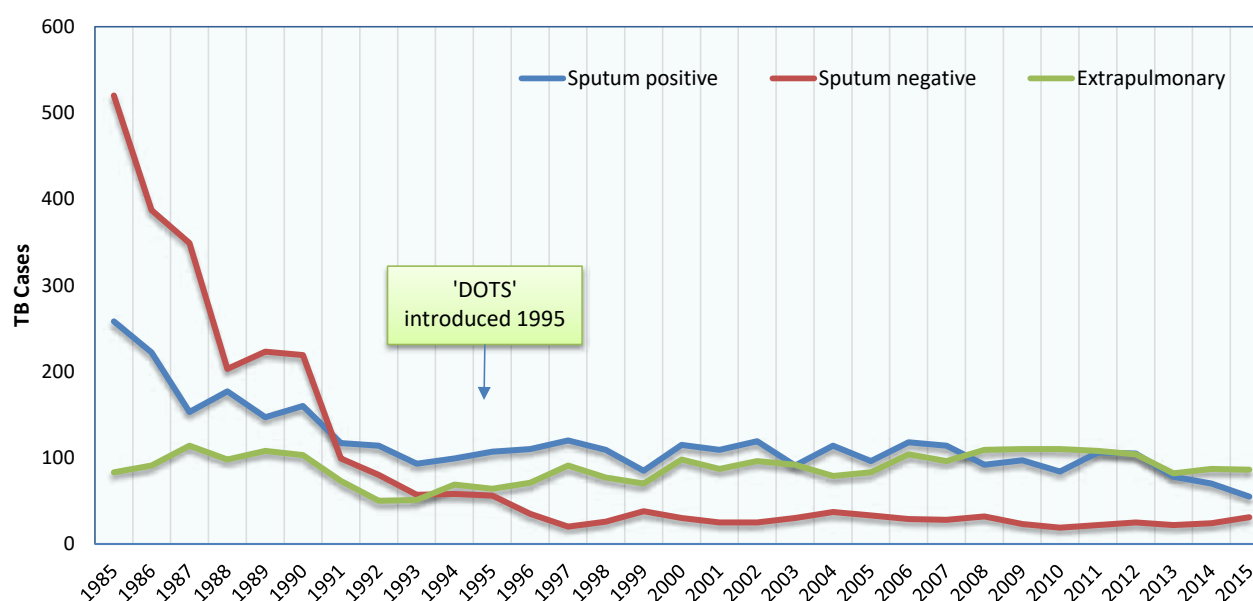
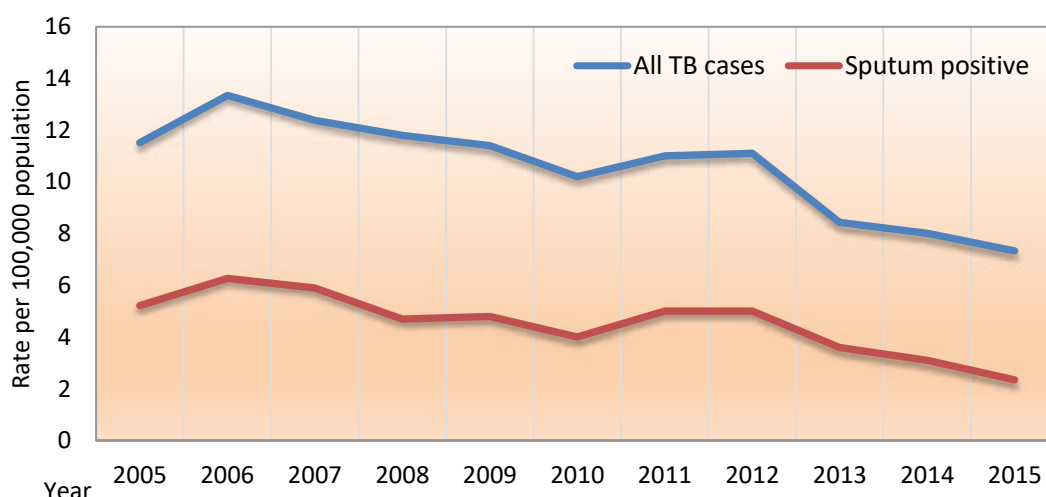


Fig. 33: Tuberculosis rates (per 100,000 pop) in Oman: 2005-2015



4. Policy on tuberculosis in Oman

1. DOTS is the strategy adopted to control TB in the country since 1995
2. All primary health care institutions in the MoH and other sister health organizations including the private health sector are responsible for early diagnosis of TB and referral for treatment
3. Any patient with persistent chest symptoms of more than 2 weeks should be investigated to rule out pulmonary TB with sputum microscopy or Nucleic Acid Amplification Test or NAAT (e.g. GeneXpert®), chest X-ray and Mantoux test or IGRA (QuantiFERON-TB). A TB suspect register should be maintained in every health facility. In case of uncertain diagnosis the patient should be referred for expert opinion to regional medical/chest clinic in the governorate as soon as possible
4. Contact tracing should be done and followed by PHC or Private Medical Centre (PMC) in the catchment area of the patient's residence. All contacts with positive Mantoux test or IGRA (QuantiFERON-TB) but with no evidence of active TB disease should be treated for latent TB infection with isoniazid (INH)
5. All PHCs and PMCs in a region should send monthly TB reports to the regional Epidemiologist of the respective governorate. In turn the regional Epidemiologist will send the consolidated report of the governorate to NTBCP
6. The regional TB team is responsible for training of NTBCP Focal Points in the governorate on regular basis
7. The treatment of TB cases are free-of-charge for all (nationals and non-nationals)
8. No TB cases, especially sputum positive cases should default from treatment. Sputum positive defaulters represent a potential source of infection to the community and EVERY effort must be made to retrieve such patients and to ensure that they continue their treatment until they are 'cured'
9. All TB patients should be screened for HIV infection. Similarly all HIV cases should be screened for TB (active or latent)
10. In order to monitor the Multidrug resistant TB (MDR-TB) in the community, National Reference Laboratory and NTBCP will coordinate to conduct anti-TB drug resistance surveillance
11. Private pharmacies are prohibited from selling anti-TB drugs including rifampicin to private clinics or individuals

5. Responsibilities of Public and Private Health Institutions

It is the responsibility of the all institutions to follow the policies and guidelines of NTBCP

- Designate a Focal Point in the institution to manage NTBCP
- Thoroughly investigate every suspect
- Refer all diagnosed TB cases to the nearest hospital for treatment

- Maintain records of all suspected and diagnosed cases and
- Perform contact screening of the diagnosed cases

6. Case definitions

Suspect

Pulmonary TB should be suspected in the following:

- **Adults:** persistent cough for 2 weeks or more with or without expectoration with or without haemoptysis, night sweats, shortness of breath, loss of appetite or weight
- **Children:** persistent cough for 3 weeks or more with or without expectoration

Extra-pulmonary tuberculosis

The symptoms of the extra-pulmonary TB depends on the organ involved and may present with pleural effusion, enlarged lymph glands, pain and swelling of the joints or spine.

Confirmed

Case classification

1. **Presumptive:** refers to a patient who presents with symptoms or signs suggestive of TB (previously known as suspect)
2. **Bacteriologically confirmed:** refers to a case from whom a biological specimen is positive by smear microscopy, culture or by NAAT (e.g. GeneXpert® MTB/RIF system)
3. **Clinically diagnosed:** The case diagnosed with active TB by a clinician or other medical practitioner who has decided to give the patient a full course of anti-TB treatment

Classification by anatomical site

- **Pulmonary tuberculosis (PTB):** refers to any bacteriologically confirmed or clinically diagnosed case of TB involving the lung parenchyma or the tracheobronchial tree
- **Miliary tuberculosis:** is classified as PTB because there are lesions in the lungs
- **Extra-pulmonary tuberculosis (EPTB):** refers to any bacteriologically confirmed or clinically diagnosed case involving organs other than the lungs

Patients who suffer from both PTB and EPTB should be classified as a case of PTB.

Drug resistance classification

- **Mono-resistance:** resistance to one first-line anti-TB drug only.
- **Poly-drug resistance:** resistance to more than one first-line anti-TB drug (other than both isoniazid and rifampicin).
- **Multidrug resistance (MDR):** resistance to at least both isoniazid and rifampicin.
- **Extensive drug resistance:** resistance to any fluoroquinolone and to at least one of 3 second-line injectable drugs (capreomycin, kanamycin and amikacin), in addition to MDR.
- **Rifampicin resistance:** resistance to rifampicin detected using phenotypic or genotypic methods, with or without resistance to other anti-TB drugs. It includes any resistance to rifampicin, whether mono-resistance, MDR, poly-drug resistance or extensive drug resistance.

7. Investigation of suspect case

Every TB suspect should be examined by a physician and investigated. Following investigations are recommended for any suspect case:

- Mantoux or IGRA (QuantiFERON-TB)
- Erythrocyte sedimentation rate (ESR)
- Chest X-ray

- Sputum Acid-fast bacilli (AFB) smear x 3
- NAAT (e.g. GeneXpert® MTB/RIF system)
- Sputum AFB culture
- Bronchoscopy
- Biopsy of a specific organ for suspected extra-pulmonary TB
- Culture of a specific organ for suspected extra-pulmonary TB

8. Surveillance and reporting (Referral)

If a case of PTB is diagnosed in a public or private institution:

- The case should be referred immediately to the nearest MoH hospital for treatment
- The hospital to which the patient is being transferred should be informed before transfer
- Complete details of the patient should be recorded (home address, telephone and mobile number, name of sponsor, etc.) and the notification form should be sent to the regional Epidemiologist and to NTBCP
- A copy of civil ID (for national) and copy of passport and resident card (for non-national) should be taken before the transfer
- Patient and relative/friend should be counselled about the disease before transfer

9. Tuberculosis treatment

The decision to initiate combination chemotherapy for tuberculosis is based on multiple factors including clinical, radiographic, laboratory, patient, and public health factors. Clinical judgment and index of suspicion also play a critical role in deciding to initiate treatment.

Objectives of tuberculosis therapy

1. To reduce the bacillary population rapidly thereby decreasing severity of the disease, preventing death and halting transmission of M tuberculosis
2. To eradicate persisting bacilli in order to achieve durable cure (prevent relapse) after completion of therapy and
3. To prevent acquisition of drug resistance during therapy

Treatment supervision: Patient centred approach will be the new strategic approach for TB case management both in the hospital and in the community based on DOTS

Recommended treatment regimen

The preferred regimen for treating adults with tuberculosis caused by organisms that are not known or suspected to be drug resistant is a regimen consisting of an intensive phase of 2 months of INH, RIF, PZA, and EMB followed by a continuation phase of 4 months of INH and RIF. To reduce the risk of relapse, the continuation phase of treatment is extended for an additional 3 months for patients who had cavitation on the initial (or follow-up) chest radiograph and in addition are culture positive at the time of completion of the intensive phase of treatment.

For treatment of extrapulmonary tuberculosis refer to TB manual (4th Edition, Apr 2007)

Table 9: Recommended first-line anti-tuberculosis treatment

DRUG	Recommended dose (daily)		
	Dose and range	Maximum	Body weight
INH (100 mg)	5 mg/kg	300 mg	
Rifampicin (150/300 mg)	10 mg/kg	600 mg	< 50 kg = 450 mg > 50 kg = 600 mg
Ethambutol (400 mg)	25 mg/kg (> 2 months) 15 mg/kg (< 2 months)	–	
Pyrazinamide (500 mg)	25 mg /kg (first 2 months)	–	

Drug resistant tuberculosis

A drug susceptibility tests is done for all patients at the start of treatment, so that the most appropriate therapy for each individual can be determined.

In the treatment of patients newly diagnosed with MDR-TB (i.e. not previously treated for MDR-TB), a total treatment duration of up to 24 months is suggested for most patients, and the duration may be modified according to the patient's response to therapy. Consult TB specialist in **Al Arrahma** Hospital.

Latent TB Infection Treatment Regimens

Isoniazid preventive therapy helps prevent progression of latent TB infection (LTBI) to active TB disease among people living with HIV (PLHIV), decreases incidence of TB and deaths from TB among PLHIV with positive tuberculin skin test. It is recommended for patients with positive tuberculin skin (Mantoux) test, no evidence of active TB and no prior history of treatment for active or latent TB.

Table 10: Drug regimen for LTBI

Drug	Dose	Frequency	Duration
Isoniazid alone	Adult: 5 mg/kg Children: 10-20 mg/kg Maximum dose: 300 mg	Daily	9 months
Isoniazid (INH) and Rifapentine (RPT)	Adults and children 12 years and over: INH* : 15 mg/kg (900 mg max) RPT* : 10.0–14.0 kg 300 mg 14.1–25.0 kg 450 mg 25.1–32.0 kg 600 mg 32.1–49.9 kg 750 mg ≥50 kg 900 mg (max)	Once every week*	3 months

*Must be provided under the DOTS strategy

10. HIV and TB co-infection

Every patient with TB should be screened for HIV and vice versa. It is recommended that in case of co-infection, both infections are addressed together. Sequential treatment of TB followed by HIV treatment is not recommended. However co-treatment of HIV and TB is complex and challenging.

11. Contact management

TB is a disease that is transmitted from person-to-person by close personal contact. The aim of contact tracing is to diagnose any source of TB infection, detect any secondary TB infection on LTBI.

Contact screening

- Compile list of close contacts that include household contacts, accommodation contacts (sharing same room) and workplace contact (sharing same room)
- Screen contacts by history for symptoms, Mantoux test or IGRA (QuantiFERON-TB) and chest X-ray

Management

- Contacts with evidence of active TB should be referred to MoH health institution for ATT
- Contacts with evidence of LTBI should be treated with INH
- Contacts with no symptoms, normal chest X-ray and negative Mantoux. Repeat Mantoux test after 6-12 weeks

Outcome and the plan of action should be sent to the regional Epidemiologist and NTBCP

Defaulter

On receiving the notification for defaulter the respective public health staff from the wilayat or

governorate should visit the address of the defaulter immediately to locate the defaulter and persuade him/her to re-visit the hospital for reassessment/treatment.

12. Treatment outcome

- **Cure:** sputum smear/culture positive case at the beginning and was converted last month of treatment and at least one previous occasion
- **Treatment completed:** patient completing treatment but without negative sputum smear or culture in last month of treatment and on at least one previous occasion
- **Treatment failure:** patient with sputum smear or culture positive at 5 months or later during treatment including those with MDR strain at any point during treatment
- **Died:** patient who dies for any reason during the course of treatment
- **Defaulter:** patient whose treatment was interrupted for 2 consecutive months or more
- **Transfer out:** patient transferred to another reporting unit with unknown outcome
- **Treatment success:** a sum of cured and completed treatment

13. Laboratory investigation protocol

Type of test	AFB Microscopy	Culture and AST	GeneXpert
Type of sample	Sputum smear and other samples according to organ involvement		
When to collect	On clinical suspicion		
Storage	Keep samples refrigerated until transport to laboratory		
Transport	In cold chain		
BSL	BSL 2	BSL 3	BSL 2
Laboratory	Polyclinics/Hospitals	Regional public health and CPHL	Royal, SQUH and CPHL

Note: Swabs are not an optimal sample for *Mycobacteria*. (Refer to National TB manual 4th Edition, Apr 2007)

Note

For further information or details on diagnostic tests, treatment alternatives, contact management and follow-up, refer to MoH 'Manual on Tuberculosis (4th Edition, Apr 2007)'

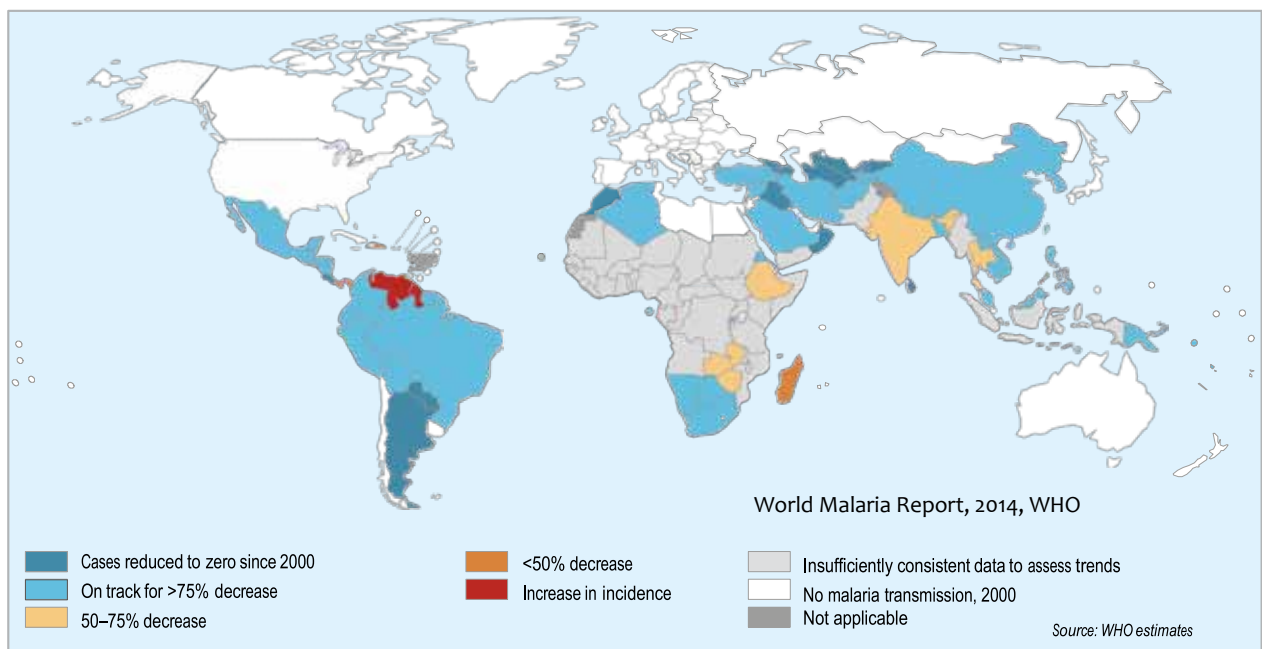
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Malaria

1. Background

Malaria is an entirely preventable and treatable mosquito-borne illness. In 2014, 97 countries and territories had ongoing malaria transmission. An estimated 3.3 billion people are at risk of malaria, of whom 1.2 billion are at high risk. In high-risk areas, more than one malaria case occurs per 1000 population. There were an estimated 198 million cases of malaria worldwide in 2013, and an estimated 584 000 deaths. Ninety percent of all malaria deaths occur in Africa (WHO 2015).

Fig. 34: Projected changes in malaria incidence rates, by country, 2000–2015



2. Epidemiological characteristics

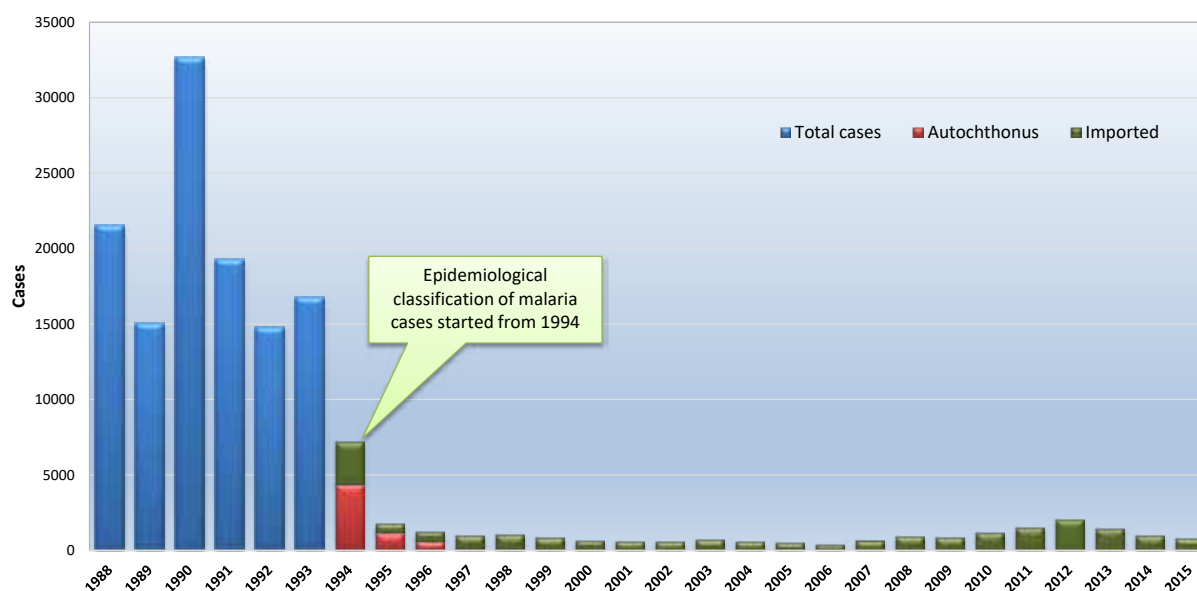
Infectious agent	<i>Plasmodium species</i> (<i>falciparum</i> , <i>vivax</i> , <i>malariae</i> and <i>ovale</i>)
Reservoir	Humans (<i>P. knowlesi</i> – non-human primates)
Transmission	Major mode of transmission: The bite of an infected female anopheline mosquito. Others: accidental transmission via blood transfusion or needlestick injury and mother-to-child during pregnancy or parturition
Incubation	<i>P. falciparum</i> 9-14 days; <i>P. vivax</i> 12-17 days
Communicability	Humans infective to mosquito vector as long as infective gametocytes are present in blood, i.e. in untreated or partially treated patients. Infective period varies with species up to 1 year in <i>P. falciparum</i> and 5 years in <i>P. vivax</i>
Susceptibility	Universal except in humans with specific genetic traits (natural resistance to infection by certain species). Attenuated clinical disease observed in highly endemic populations due to partial immunity. Severe disease in high-risk groups

3. Situation in Oman

In the past, Malaria was one of the major public health problems in Oman. The National Malaria Eradication Program (NMEP) was launched in Sharqiyah (North and South) governorates as a pilot project in 1991, to stop local transmission and eliminate the reservoir of infected cases. The strategies applied were: vector control (mainly larviciding) and early case detection and prompt (radical) treatment.

After the successful achievements of the pilot project in reducing the number of malaria cases, it was extended to the other governorates in phases, with the goal of reaching to annual parasite incidence (API) of 1/10,000 population by the year 2000.

Fig. 35: Malaria cases in Oman: 1988-2015



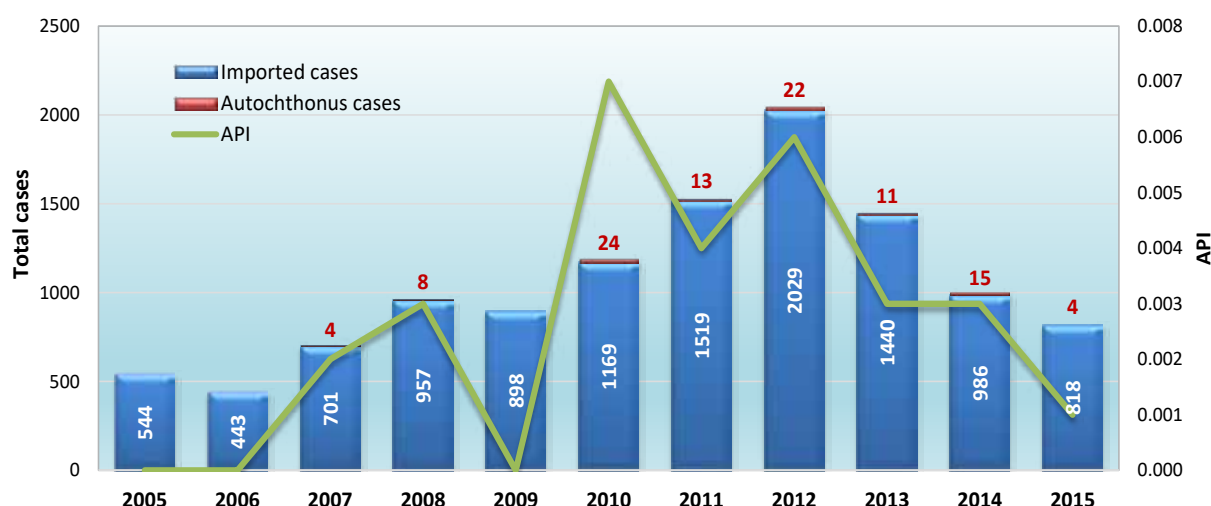
After the remarkable drop in the number of malaria cases from 1993, investigation and epidemiological classification of all the cases was started. Data analysis showed that the main sources of importation of malaria to Oman were East Africa and the Indian subcontinent. Accordingly appropriate strategies were implemented including distribution of the prophylactic drugs for the travellers and screening of passengers arriving from Africa at the airport. Also the private health institutions were involved in the early case detection strategy to cover the cases from the Indian subcontinent.

Interruption of malaria transmission was achieved in 2004 and maintained until September 2007 when a focus of local transmission was detected in Dakhliyah Governorate. In 2008 another focus of local

transmission occurred in North Batinah Governorate. In 2009 no local transmission occurred. However, due to the high receptivity and increased vulnerability of the country due to the increase in the number of imported cases foci of local transmission were detected the following years which were controlled immediately. In 2013, foci of local transmission were detected in Dakhliyah, North Batinah and South Sharqiyah governorates.

In 2014, a total of 1001 cases were recorded. The majority (86.4%) of the diagnosed cases were due to *P. vivax* and the rest (13.4%) of the cases were *P. falciparum*.

Fig. 36: Imported and autochthonous malaria cases and API: 2005-2015



4. Case definition

A malaria case is a person in whom, regardless of the presence or absence of clinical symptoms, malaria parasites have been confirmed by quality-controlled laboratory diagnosis.

5. Incubation and transmission

The parasite incubation period, known as the intrinsic incubation period, differs for each parasite species. The following table shows the time factor for the main species of human malaria parasite (WHO 2012).

Table 11: Characteristics of plasmodium species

Characteristics	<i>P. falciparum</i>	<i>P. vivax</i> ¹	<i>P. malariae</i>	<i>P. ovale</i>
Prepatent period ²	5-5 days	8 days	15 days	9 days
Incubation ³	9-14 days	12-17 days	18-40 days or longer	16-18 days or longer
Time of appearance of gametocytes	8-15 days	0-5 days	5-23 days	5 days
Asexual cycle in blood	48 hours	48 hours	72 hours	48 hours
Duration of untreated infection	1-2 years	1 ½-5 years	Up to 50 years	Probably same as <i>P. vivax</i>

1. Except those strains with prolonged incubation period

2. From infection to the appearance of detectable parasitaemia

3. From infection to the appearance of parasitaemia

6. Surveillance and reporting

The criteria for selecting patients who should be examined for malaria are:

1. Fever (current or recent, during the last 4 weeks) with suspected malaria manifestation
2. Recent travel history (during the last 3 months) to a malaria endemic country
3. Past history of malaria
4. Fever of unknown origin

All microscopically confirmed malaria cases should be notified within 24 hours. The notification form should be sent to the malaria section in the governorate. The case investigation and follow-up of malaria case will be conducted by the malaria section. All the cases to be reported to the Malaria Section upon receiving the notification.

7. Contact management and community actions

Malaria case investigation will be conducted for each case and based on that the contacts will be identified and screened. In addition, health education and awareness about the disease will be delivered to the families in the community as well as sensitization of nearby health institutions in case of suspected local transmission.

8. Case management

General guidelines

- All cases must be confirmed microscopically before treatment
- All referred cases from private health institutions must be confirmed before treatment
- No treatment on the basis of clinical diagnosis
- No presumptive treatment of malaria

9. Malaria treatment

Uncomplicated *P. falciparum*

• Artemether + lumefantrine

The recommended treatment is a 6-dose regimen over a 3-day period. The dosing is based on the number of tablets per dose according to pre-defined weight bands (5-14 kg – 1 tablet, 15-24 kg – 2 tablets, 25-34 kg – 3 tablets, and > 34 kg – 4 tablets), given twice a day for 3 days.

Table 12: Treatment regimen: artemether + lumefantrine dose

Body weight in kg (age in years)	No. of tablets and approximate timing of dosing					
	0 hr	8-10 hr	24 hr	36 hr	48 hr	60 hr
5-14 (< 3)	1	1	1	1	1	1
15-24 (≥ 3-8)	2	2	2	2	2	2
25-34 (≥ 9-14)	3	3	3	3	3	3
>34 (> 14)	4	4	4	4	4	4

*The regimen can be expressed more simply as follows: the second dose on the first day should be given any time between 8 h and 12 h after the first dose. Dosage on the second and third days is twice a day (morning and evening)

• Primaquine (anti-gametocytes)

- Single dose of 0.75mg/kg of base (maximum of 45mg of base in adults)
- The dose of primaquine (0.75mg/kg) used in *P. falciparum* is **well tolerated and prior testing for glucose-6-phosphate dehydrogenase (G6PD) deficiency is not required**

Uncomplicated *P. vivax*, *ovale* or *malariae*

- **Chloroquine** (chloroquine-sensitive infections)
 - **Chloroquine** tablet 250mg (150mg base):
Loading dose of 10 mg/kg (of base) (600 mg in adults) then a single dose of 5 mg/kg (300 mg in adults) after 6-8 hours, then a single dose of 5 mg/kg (300 mg in adults) once daily for 2 days.
- **Artemether + Lumefantrine** (chloroquine-resistant infections)
 - See dose above as for *P. falciparum* malaria
- **Primaquine** (anti-relapse treatment) – all cases of *vivax* and *ovale*
 - The **G6PD status of the patient should be verified** before the start of Primaquine at the dose it is used as anti-relapse treatment
 - **Primaquine** (tablets of 7.5 mg base)
 - **Normal G6PD activity:** Adult: 15 mg daily for 14 days. Children: 0.25 mg/kg daily for 14 days
 - **G6PD-deficient or partial activity:** Adult: 30 mg once a week for 8 weeks. Children: 0.75 mg/kg once a week for 8 weeks
 - **Primaquine** is contraindicated in pregnant women, infants (< 1year of age) and conditions predisposing to granulocytopenia including active rheumatoid arthritis and lupus erythematosus

Mixed infection including *P. falciparum*

- **Artemether + lumefantrine** (see dose above)
- **Primaquine** (14 days anti-relapse treatment) for mixed infection that includes *P. vivax* or *P. ovale* (see dose above)
- **Primaquine** (single dose anti-gametocyte treatment) for mixed infection of *P. falciparum* and *P. malariae* (see dose above)

Severe malaria

- Severe malaria is a medical emergency. Following a rapid clinical assessment and confirmation of the diagnosis, full doses of parenteral antimalarial treatment should be started without delay with whichever effective antimalarial is first available
- **Artesunate** is the recommended treatment (all age groups including in pregnant women)
 - **Artesunate:** 2.4mg/kg body weight is given as IV injection on admission (time=0 hours), 12 hours and 24 hours, then once a day (IV treatment should continue for a minimum of 24 hours, even if the patient could tolerate oral medication earlier)
 - If artesunate cannot be administered by IV injection, it can be given in the same dosages by (intramuscular) IM injection preferably in the anterior thigh.
- Once the patient is able to tolerate oral medication or after 24 hours of parenteral treatment, complete treatment with a complete 3 day course of **artemether + lumefantrine** (dose is same as above for uncomplicated *falciparum* malaria)
- Remember to give single dose **primaquine** (anti-gametocyte treatment)

10. Chemoprophylaxis for travellers

- All travellers to malaria endemic areas should be educated on the need and use of adequate protective measures against malaria
- Young children, pregnant women, PLHIV/AIDS, people who are immunosuppressed and elderly travellers are particularly at risk
- Malaria, particularly *P. falciparum*, in pregnant travellers increases the risk of maternal death, miscarriage, stillbirth and neonatal death
 - Pregnant women should be advised not to travel to malaria endemic areas if possible, however if travel is necessary, appropriate preventive measures must be used including prevention of mosquito bites. See below for the use of chemoprophylaxis in pregnancy under each drug section

- The following are the options available as chemoprophylaxis
 - **Doxycycline (DOX)**
 - (100mg capsule/tablet) dose: 1.5 mg/kg. Adults dose – 100 mg daily
 - DOX should be started the day before arrival in the risk area, and continued for 4 weeks after return
 - DOX is contraindicated in pregnancy, breastfeeding mothers and children under 8 years of age
 - **Mefloquine (MQ)**
 - (250mg tablet) dose: 5 mg/kg /weekly. Adults 250 mg /weekly

Table 13: Treatment regimen: mefloquine dose

Weight (kg)	Age (years)	Number of tablets
< 5	< 3 months	NR**
5-12	3-23 month	1/4
13-24	2-7	1/2
25-35	8-10	3/4
36-50 +	11-14 +	1

**NR - Not recommended

- MQ should preferably be started 2-3 weeks before departure, to achieve higher pre-travel blood levels and to allow side effects to be detected before travel so that possible alternatives can be considered
 - MQ should also be continued for 4 weeks after return from the risk area
 - MQ is not recommended for use in the first trimester of pregnancy, but can be safely used in the second and third trimesters of pregnancy.
- **Chloroquine (CQ)** for vivax only
 - CQ (150 mg base) 5 mg/kg weekly
 - CQ should be started 1 week before arrival to the malaria risk area and continued for 4 weeks after return
 - CQ can be used during pregnancy

Table 14: Treatment regimen: chloroquine dose

Weight (kg)	Age (years)	Number of tablets
5-6	< 4 months	1/4
7-10	4-11 month	1/2
11-14	1-2	1/2
15-18	3-4	3/4
19-24	5-7	1
25-35	8-10	1
36-50	11-13	2
50 +	14 +	2

For more details about malaria case management please refer to the MoH “**Guidelines for the Treatment of Malaria and Prevention of Malaria in Travellers.**”

11. Environmental control

Selective vector control aiming at suppression of the vector component of the mosquito population in strategically selected areas based on entomological surveillance.

Larviciding, which was one of the main tools in the successful elimination of transmission continues to be the main intervention. With the parasite reservoir eliminated from the local population, it is the aim of NMEP to slowly phase out larviciding in most areas of the country with the notable exception of areas which have particular propensity for harbouring imported cases. Environmental management and biological control replaced chemical larviciding in many areas. In addition space spraying can be used in outbreak situations.

All studies related to arthropod vectors will be done in Entomology Section.

12. Laboratory investigation protocol

Prompt parasitological confirmation by microscopy is recommended in all patients with suspected malaria before starting treatment.

Type of test	Microscopy	PCR*
Sample	Peripheral blood smear	
Storage	NA	
Transport	NA	
BSL	BSL 1 and 2	
Laboratory	Primary Health Care	CPHL

*PCR will be done only for selected cases. Discuss and consult CPHL before sending sample

For further details kindly refer to the **Malaria manual** e.g. case and contact management, surveillance and reporting, and prevention and control

For more information on laboratory procedures please refer to the “**Malaria Diagnostic Operations Manual.**”

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Rabies

Hydrophobia, Lassa fever

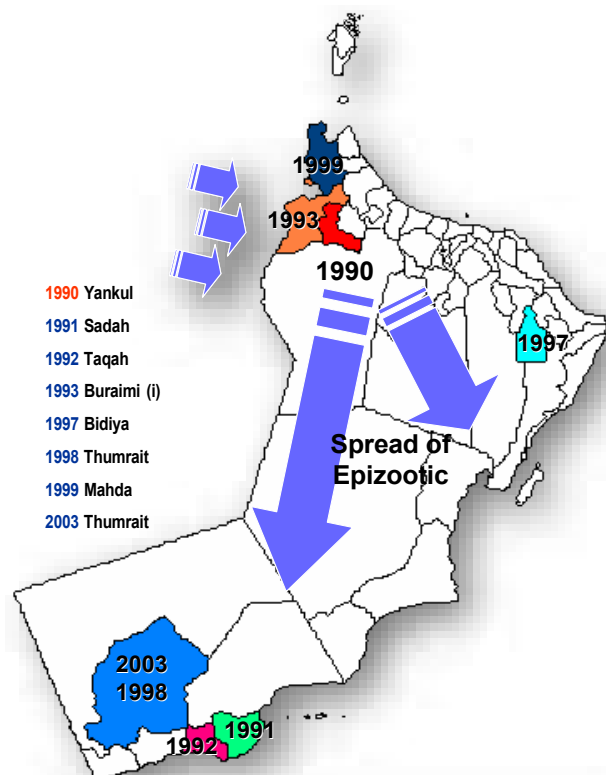
1. Background

Rabies is an acute, highly fatal viral infection of the central nervous system. It is primarily a zoonotic disease of warm-blooded animals, particularly carnivores such as dogs, cats, wolves, foxes and jackals. It is transmitted to humans mainly by the bite of a rabid animal. There is no known cure. The infection pool is maintained by the presence of sylvatic rabies among a variety of wildlife. These wild animals transmit the infection to peridomestic and then to the domestic animals. Humans occasionally contracts rabies from this cycle in whom it is an **'end infection'** and hence cannot be transmitted further.

The WHO estimates that rabies is responsible for 35,000-50,000 deaths annually worldwide. An estimated 10 million people receive post-exposure prophylaxis (PEP) each year after being exposed to animals with suspected rabies.

Currently the list of rabies-free countries includes Australia, New Zealand, and the South Pacific islands including Guam, Hawaii, Singapore, the United Kingdom, Ireland,

Fig. 37: The Rabies Map of Oman: 1990-2015



Belgium, the Netherlands, Norway, Sweden, Finland, Iceland, Japan and Taiwan (ROC).

Rabies, besides its high public health importance due to its invariable fatal outcome, represents an economic burden for both developed and developing countries. The costs of post-exposure prophylaxis (PEP), surveillance of human and animal rabies, the immunization and control of domestic and wild animals including quarantine, and provision of diagnostic facilities are significantly high. Thus the priorities include efficient animal bite surveillance and sustained commitment for rational use of vaccines.

2. Epidemiological characteristics

Infectious agent	Lyssavirus type 1 (RNA virus), <i>Rhabdoviridae</i> family
Reservoir	Wild and domestic canines (dogs, foxes, coyotes, wolves, jackals, skunks, racoon (dogs, mongooses and other carnivores
Transmission	Bite of a rabid animal. Dogs are mainly for human transmission. Saliva is the source of infection
Incubation	Highly variable (from a few days to years), usually 3-8 weeks
Communicability	days before onset of clinical signs and throughout the course of disease. Communicability period is 10 days with intermittent shedding preceding clinical onset in dogs
Susceptibility	All mammals with varying degree. Veterinarians and wild life exposure are at risk groups

3. Rabies in Oman

Prior to 1990, the Sultanate of Oman was considered to be virtually free from rabies. All previously suspected animals examined were found to be negative. Likewise no human rabies cases were reported. The disease was prevented from entering the country by strict veterinary quarantine regulations where only canines and felines from rabies-free countries were allowed to enter Oman. Those from infected countries were discouraged and if allowed were quarantined for 6 months. In August 1990 a school boy developed human rabies after a fox bite in the village of Yankul, Dhahira Region. Sylvatic rabies due to foxes was established as the cause and within one year, the disease had spread to cover the entire country except the Musandam peninsula. In Oman, the reservoir of infection of sylvatic rabies was found to be the red desert fox (*Vulpes vulpes arabica*). **Since 1990, 8 cases of rabies are on record including one imported case.**

Fig. 38: *Vulpes vulpes arabica*
(Red desert fox)



Following policies and SOP were established.

- **Animal bite surveillance** was launched from December 1990. The bites were required to be notified within 24 hours with immediate management. According to the Ministry policy, rodent bites should neither be notified nor should be offered anti-rabies PEP

Anti-rabies vaccination policy was implemented in 1990 with the use of human diploid cell culture vaccine in PEP. In Oman **modified Essen regime** (WHO) was adopted consisting of total 4 doses. Two doses are given on day 'zero' one on each deltoid regions. The third dose is given on day 7 and the forth on day 21. All doses should be administered on deltoid regions in adults and older children or the anterolateral aspect of thigh in very young children. In addition, human rabies immunoglobulin (HRIG) is also offered in specific situation

- **Change in vaccine:** From 2004 in place of human diploid cell culture vaccine, Purified Vero cell (i.e. kidney cells from African green monkey) rabies vaccine (PVRV) was introduced. It is equally effective and the same modified Essen regime of 2:1:1 as described above should be followed for PEP.

4. Case definition

Suspect

A history of animal bite leading to an acute encephalomyelitis that almost always progresses to coma or death within 10 days after the appearance first symptom.

Confirmed

Suspect case which is laboratory confirmed.

5. Mode of transmission

Saliva of rabid animals is the main source of infection. Rabies is transmitted to man by the bite of a rabid animal. Licks on abraded skin, scratches and on mucosa can also transmit the disease. Person-to-person transmission is extremely rare (e.g. corneal transplant).

6. Laboratory criteria

The diagnosis is based almost always on clinical presentation.

Availability of laboratory tests is limited. The Veterinary Research Laboratory, Rumais in Batinah under the Ministry of Agriculture and Fisheries may provide the antigen detection by immunofluorescence test.

7. Case management

History of provocation of the animal (that led to bite), strange animal behaviour and the vaccination status of the animal (usually for pets) is important.

- Patient should be isolated in a quiet room protected from external stimuli
- Strict IP&C measures especially in handling saliva
- There is no specific treatment for rabies
- Symptomatic and support therapy

8. Surveillance and reporting

The case should be notified immediately (within 24 hours). Immediate Investigation by a senior public health staff/administrator with specific emphasis on the circumstances of the exposure, eliciting detailed history. It is important to record the details of PET offered to the case.

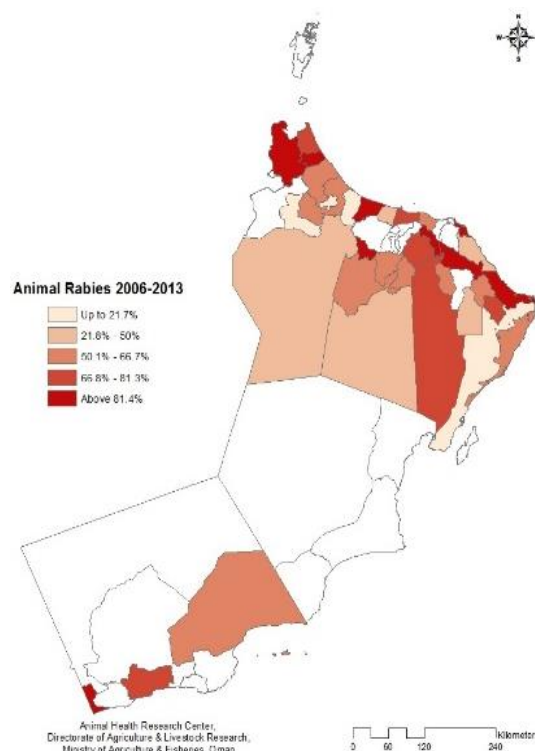
9. Prevention and control

Post-exposure prophylaxis

9.1. Local treatment of wound

Elimination of rabies virus at the site of injection by chemical or physical means is the most effective (can reduce 80% chance of developing rabies) mechanism to protect against rabies before vaccination for rabies-prone animal bites.

Fig. 39: Sylvatic rabies distribution 2006-2013

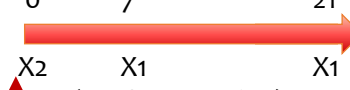


Courtesy : Ministry of Agriculture & Fisheries

- **Cleansing** – immediate flush and washing by soap and running water for 15 minutes
- **Chemical treatment** – viricidal agents – alcohol (400-700 ml/l) tincture or 0.01% aqueous solution of iodine or povidone
- **Suturing** – Suturing of wounds should be avoided for at least 24-48 hours. However, if suturing is absolutely necessary to secure haemostasis, anti-rabies immunoglobulin should be infiltrated around the wound
- Where indicated, institute anti-tetanus treatment and administer antibiotics to control bacterial infections at the site of bite

9.2. Immunization with purified Vero cell rabies vaccine

Modified Essen regimen (abbreviated multisite IM regimen) 2-1-1 has been adopted by the MoH, i.e. 2 doses on day '0' on either deltoid (anterolateral thigh for children < 2 years old), 1 dose on day 7 and the last dose on day 21.

Dose:	ARV	0.5 ml	
Day:	0	7	21
Sites:	X2	X1	X1
(If indicated)	 HRIG (20 IU/kg body weight)		

Note: Anti-rabies vaccine is available in all Government institutions and provided free of charge to all individuals in Oman by the MoH.

Table 15: Categories of contact and PEP measures

Category	Contact with suspected rabid animal	PEP measures
I	Touching or feeding animals, licks on the skin	None
II	Nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin	Local wound treatment PEP
III	Single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks, exposure to bat bites or scratches	Local wound treatment PEP, HRIG

All category I and II exposures carry a risk of developing rabies and require PEP. This risk is increased if:

- The biting mammal is a known reservoir (wild animals, e.g. fox, wolf) or vector species
- The animal looks sick or has an abnormal behaviour
- The bite was unprovoked (bite without teasing, physical harm, beating, etc.)
- The animal has not been vaccinated or unknown
- The animal cannot be traced or identified
- The site of bite is in proximity to brain (head and neck area)
- The victim is an infant? (less than 1 year)

If any of the above risk factors are identified, then the animal bite should be labelled as rabies-prone and HRIG must be given along with PEP.

a. PEP can be discontinued if the suspected animal is:

- previously fully vaccinated
- culled then rabies-free status proved by veterinary laboratory
- a domestic animal and remains healthy throughout 10 day observation starting from the day of bite

b. PEP in previously immunized persons

- Local treatment of wounds should always be carried out
- If animal bite is within 6 months of completed PEP there is no need of further vaccination
- If 6 months have elapsed after the last dose of the complete vaccination course (PEP) then offer 2 doses (D₀ and D₃) for minor bites and 3 for rabies-prone bites (D₀, D₃ and D₇)
- After 3 years of previous vaccination offer full course of PEP

Notes:

- PEP should be considered as an emergency procedure
- There are **'NO' contra-indications to PEP including pregnancy or infancy or immunodeficiency.** The risk of rabies overrides all considerations
- The vaccine should be administered exclusively by the intra-muscular route into the deltoid muscle in adults or the anterolateral aspect of thigh in small children. Vaccine should **NEVER** be administered into the gluteal region
- **HRIG** – half dose should be infiltrated into the depth and around the wound and other half should be given intra-muscularly at a site distant from that of vaccine inoculation. If case seen after 48 hours of bite but within 8 days of bite, offer full dose intra-muscularly

c. PEP should NOT be given

- **For bites of rats, mice, squirrels, rabbits or other small rodents**
- For the minor bites or scratches by animals in which skin **is not punctured** (category I)
- Provoked bites by **vaccinated pets**
- **Contacts of human rabies case**, e.g. relatives or health care staff attending the case including doctors, nurses and the paramedical staff

d. When HRIG is NOT recommended

- Do **NOT** give immunoglobulin if seen after 7 days after starting PEP as there is no protective value
- Bites of vaccinated animals
- Minor bites or scratches on extremities (skin not punctured)

e. Public health actions

- NO action, including administration of PEP, is required to be taken for the close family contacts as well as for the health care or hospital staff engaged in rabies patient care
- Pre-exposure prophylaxis is recommended for those at permanent risk of exposure such as laboratory workers, veterinarians and animal handlers. The WHO recommends a 3 dose schedule at D₀, D₇ and D₂₈. Check for antibodies every 6 months. If titre falls below 0.5 IU/L, offer a booster dose
- Public awareness campaigns on prevention of animal bites and rabies
- Liaise with Ministry of Agriculture and Fisheries for observation of animal and if the animal killed or dies to take brain tissue samples for demonstration of Negri bodies. Animal rabies data are shared with the surveillance department in the MoH
- Registration and licensing of domestic dogs and their vaccinations
- Surveillance of the animal rabies situation in Oman through an animal bite surveillance programme. Encourage update and exchange of information with the health care workers through CME especially in primary health care. It should be noted that although cases of human rabies have not been reported in Oman since 2003, the risk exists due to endemic sylvatic rabies

- Human rabies elimination requires elimination of sylvatic rabies reservoir. Mass immunization of wildlife with baits containing vaccine had achieved elimination of rabies in some European countries

10. Laboratory investigation protocol

Type of test	Florescent antibody test	Florescent antibody test	Real-time and conventional PCR	Histopathology (Negri bodies)
Type of sample	Corneal Impression	Nuchal skin	Nuchal skin	Nuchal skin
When to collect	On presentation			
Storage	At 4°C	Fresh at 4°C or frozen at -20°C		Only fresh samples at 4°C
Transport	Category B			
BSL	BSL II			
Laboratory	Animal Health Research Centre (Rumais, Muscat)			

Note:

- The samples (corneal impressions and nuchal skin) are collected on request by the local veterinary staff and sent to the centre either fresh at 4°C or frozen
- If human rabies is suspected please contact the Animal Health Research Centre, Ministry of Agriculture and Fisheries by phone: +968 2689 3157

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Group A Syndromes

Group A Syndromes

Introduction

The syndromes included in this group are considered a high priority and are required to be reported by telephone or fax and investigated within 24 hours.

The WHO recommends syndrome reporting over specific diseases to avoid the inevitable delay in the laboratory diagnosis, e.g. acute haemorrhagic fevers. These are especially prone to explosive outbreaks and the public health actions are required to be undertaken in shortest possible time.

- The recent outbreak of **SARS** is another classical example of applying the public health actions based on a symptom complex without the laboratory confirmation. Although laboratory tests are available these would not be helpful for containment of the outbreak.
- Some of these syndromes are also integral components of the national eradication or elimination programmes. The case-based surveillance for **AFP** presumes that all such cases are polio unless proved negative by virus culture of the stool sample from the case as well as the contacts. The rate of AFP cases reported among individuals under 15 years of age is considered as an indicator of a sensitive surveillance system of a country.
- Similarly every case with fever and rash (rash illness) would be a presumptive either measles or a rubella case. Examining the blood sample for both these diseases by serological test (IgM) would either accept one of the diagnoses or discard the case. Oman has adapted the goal of CRS elimination as well as elimination of measles and rubella.
- **Food poisoning** has been upgraded from a group B to group A Syndrome due to the desired quick response. The case management is more or less similar and is independent of culture reports. The epidemiological investigation is fundamental that would provide the clue to diagnosis. The laboratory, on certain occasions, provides the supporting evidence.
- **Acute haemorrhagic fever syndrome** replaces viral haemorrhagic fever in the revised list to include haemorrhagic fevers of non-viral origin, explicitly rickettsial.

Acute Flaccid Paralysis

A syndrome under surveillance for the Poliomyelitis Eradication Initiative

1. Background

Poliomyelitis is a highly infectious viral disease. It invades the nervous system and causes total paralysis in a matter of hours especially in < 5 years children. Polio elimination initiative was launched in 1988. Since then, cases have decreased by over 99% from an estimated 350,000 cases, to 359 reported cases in 2014. The reduction is the result of the global effort to eradicate the disease. Globally from 125 polio-endemic countries in 1988, today only 2 countries (Afghanistan and Pakistan) remain endemic.

Eradication strategies: Achieving and maintaining high routine coverage, conduct mop-up vaccination campaigns, supplementary immunization campaigns, viz. national immunization days and the surveillance of AFP cases.

For every case of polio there may be 1000 subclinical cases in children and 75 in adults. Hence to ensure that case/s of polio in the community are not missed the AFP surveillance has been advocated by WHO as the global strategies to validate absence of wild poliovirus circulation in the community and thus an evidence of poliomyelitis eradication. It is presumed that all notified cases of AFP are poliomyelitis unless proved otherwise by absence of laboratory isolation of poliovirus from the stool of the case and/or contacts. WHO has estimated that an AFP rate of 2 per 100,000 under 15 years population is adequate to consider that the surveillance system of the country is sensitive enough to capture a case of poliomyelitis in the community. Therefore AFP surveillance is vital nationally and also globally.

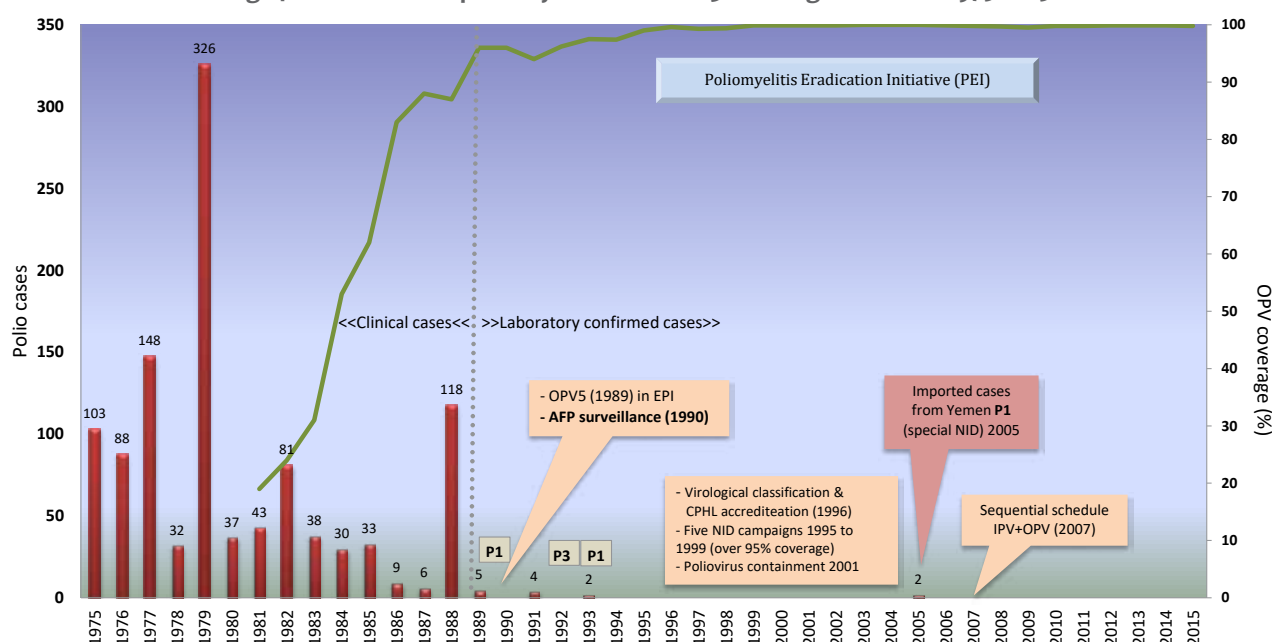
2. Epidemiological characteristics

Infectious agent	Poliovirus Type 1 and 3, type 2 (globally eradicated since Oct 1999)
Reservoir	Humans, children with inapparent infection, no long-term carriers
Transmission	Faeco-oral, droplet infection may occur in acute phase when the virus is seen in throat
Incubation	Usually 7-14 days (range 3-35 days)
Communicability	Cases are most infectious 7-10 days before and after onset of symptoms. In faeces, the virus is excreted for 2-3 weeks, sometimes as long as 3-4 months
Susceptibility	Children more than adults

3. Polio in Oman

The graph below shows incidence of polio cases in Oman and oral poliomyelitis vaccine (OPV) coverage from 1975 to 2014.

Fig. 40: Incidence of poliomyelitis and OPV3 coverage in Oman: 1975-2015



Polio eradication initiative in Oman

AFP surveillance was launched in Oman in 1990 after the last polio outbreak in the country in 1988-1989. The MoH adapted the goal of polio eradication. The last case of poliomyelitis due to type 1 was reported in Oman on 14 December 1993.

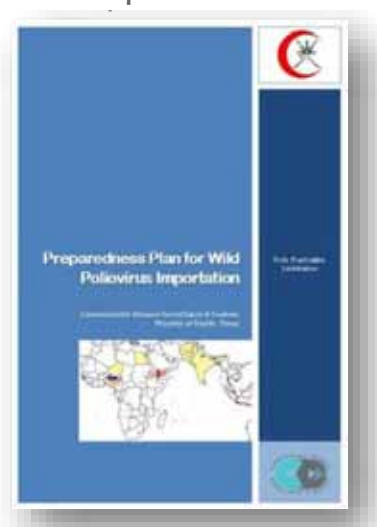
Polio importation in 2005

Importation of wild poliovirus in any country cannot be prevented until global polio eradication is achieved, but its spread within the country can be controlled.

The 2 main pillars of preparedness for importation of wild poliovirus and which prevent the spread of the virus include:

- High quality surveillance, which is key for early detection of importation. There is absolute necessity of maintaining high quality AFP surveillance at least until global eradication

Fig. 41: The National Preparedness Plan

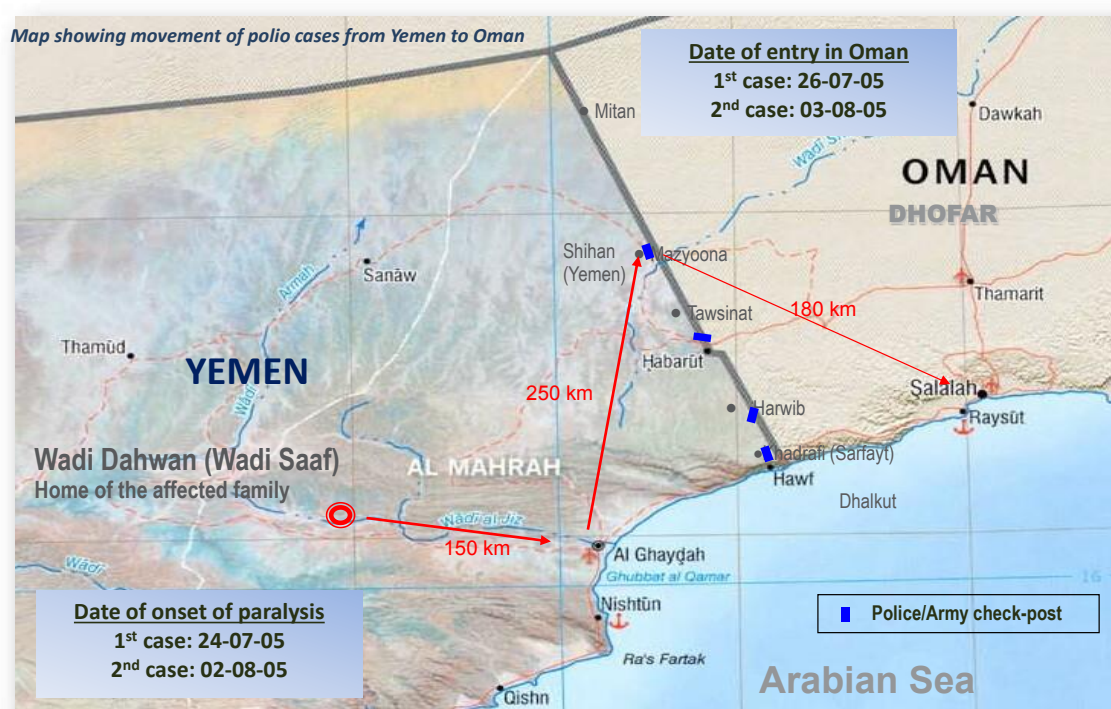


- High population immunity achieved by routine and supplementary immunization activities. Countries should monitor population immunity (e.g. using coverage data or vaccination status of AFP cases) to detect immunity gaps and address them
- Special attention should be given to high-risk areas/populations (e.g. border areas, minority groups/ internally displaced populations/ mobile population/ refugees/chronic refusals to immunization)

Objectives of the Importation response plan

- To reduce the risk of polio virus importation/outbreaks
- Early detection of wild poliovirus importation
- Appropriate containment measures to control spread in a timely manner

Fig. 42: Map showing importation of poliomyelitis cases from Yemen in 2005



4. Case definition (AFP)

Any person less than 15 years of age with AFP for which no other cause can be immediately identified including GBS should be considered as a case of AFP. Also includes those in whom a clinician suspects poliomyelitis irrespective of age.

Acute flaccid paralysis is defined as sudden onset of weakness and floppiness in any part of the body in a child < 15 years of age or paralysis in a person of any age in whom polio is suspected.

Acute – rapid progression or short, brief duration

Flaccid – floppy or soft and yielding to passive stretching during illness

Paralysis – loss of motor strength. Severe loss of motor strength is called paralysis or paraplegia and paraparesis indicates slight loss of motor strength

Even a single case of poliomyelitis is considered as an epidemic or outbreak in a polio-free country like Oman.

Clinical spectrum of polio includes: Subclinical infection, minor illness, non-paralytic polio, paralytic polio, bulbar polio.

5. Laboratory criteria

All AFP cases are presumed to be of poliomyelitis unless proved otherwise by virus culture from the stool samples. Hence collection of 2 stool samples from every case taken 24-48 hours apart is mandatory. The samples will be processed for poliovirus isolation in the reference laboratory (CPHL). The virus will be typed, sequenced and classified to rule out wild and vaccine derived poliovirus infection.

6. Case management

Referral protocol

- All AFP cases are required to be assessed and investigated thoroughly. The case should be discussed with the neurologist in the SQUH or Royal hospital, Muscat and may be referred if required
- It should be ensured that the case is clinically stable before referral
- Enteric precautions at all levels and concurrent disinfection of faeces and throat discharges should be practiced

Follow-up of AFP cases

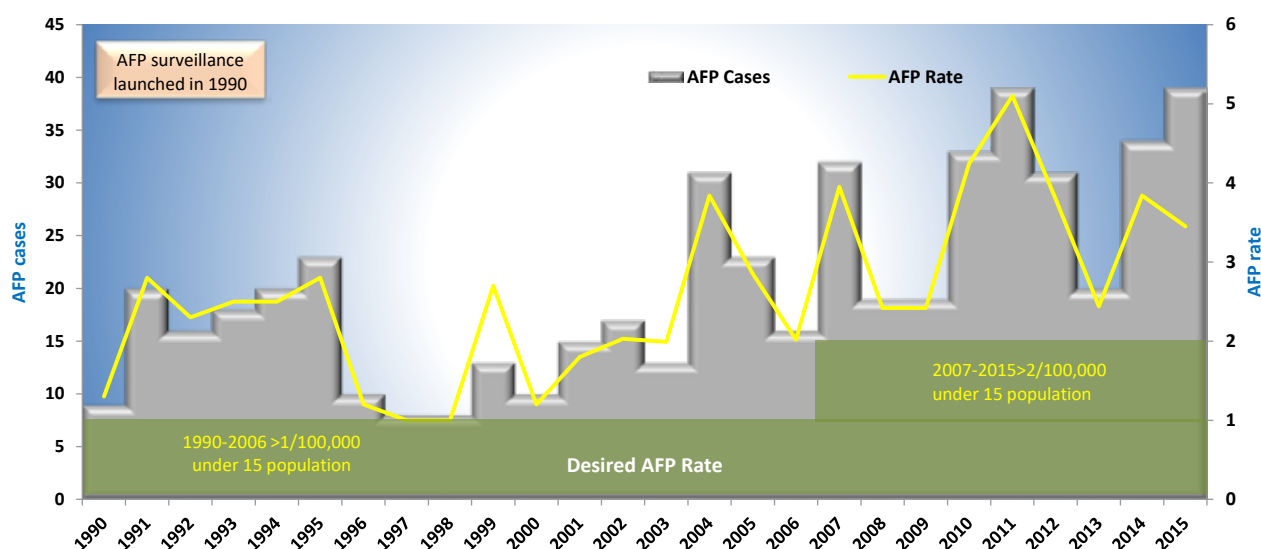
- The case after discharge should be recalled to the nearest health facility for clinical assessment by a paediatrician or physician after 60 days
- Determine whether residual paralysis is present after 60 days of onset and send a written report to the national surveillance unit

7. Surveillance and reporting

All indicators of AFP surveillance are monitored at regional, national and international level. Until such time that the country is certified as polio-free by the international commission on eradication the AFP surveillance activities will continue.

The following graph shows the AFP cases reported in Oman since its surveillance began in 1990 until 2015.

Fig. 43: Incidence of AFP cases and rate/100,000 under 15 year population: 1990-2015



Program performance

Following table shows the WHO recommended key performance indicators (KPI) of the poliomyelitis surveillance, AFP case investigation and laboratory services which, all countries are required to comply with.

Table 16: Performance indicators for AFP surveillance, investigation and laboratory

	Performance indicators	Target
Disease surveillance	% of routine reports received	> 80%
	% of reports received on time	> 80%
	Non-polio AFP rate/100,000 < 15 years (national and governorate level)	2
	Weekly negative reporting from sentinel sites	> 90%
AFP case investigation	% of AFP cases detected within 7 days of paralysis	> 80%
	% of cases notified to public health authorities < 24 hours	> 80%
	% of cases investigated within 48 hrs	> 80%
	% of cases with 2 samples collected 24-48 hrs apart < 14 days of paralysis	> 80%
	% with 1 sample from each of 5 contacts	> 80%
	% of AFP cases detected within 7 days of paralysis	> 80%
Laboratory services	% of specimens received < 3days	> 80%
	% of specimens arriving at the lab in acceptable condition (no leakage/desiccation)	> 80%
	% of result sent < 28 days of receiving the specimen	> 80%
	Proficiency test	> 80%
	Isolation rate for NPEV	> 10%
	Accreditation – CPHL	Yes

Polio case classification

Imported case of poliomyelitis: exposure to wild virus outside and onset of paralysis outside or inside the country which reports.

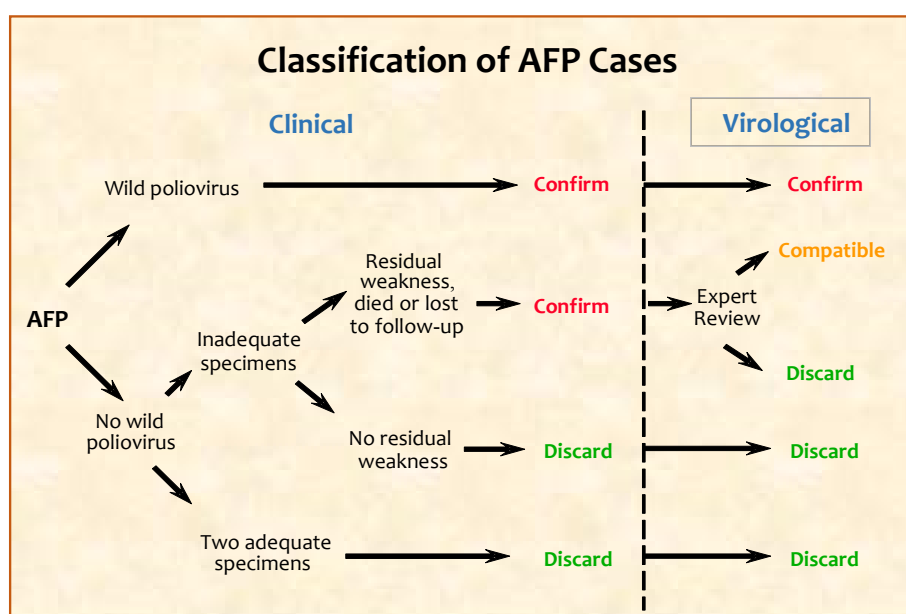
Indigenous case of poliomyelitis: exposure and onset of paralysis within the country, even if virus was recently imported.

Vaccine-derived polioviruses (VDPV): if the sequence diversity in the VP1 of poliovirus genome is > 1% compared with the corresponding parent Sabin strain, i.e. more than 10 nucleotide change, classifies the type 1 and type 3 Sabin virus as VDPV of the same serotype. While for type 2 VDPV it is more than 0.66%, i.e. more than ≥ 6 nucleotide changes in in VP1 of polio virus genome.

Vaccine-derived polioviruses can be classified further based on epidemiological background as:

- **cVDPVs (circulating vaccine-derived poliovirus)** if more than one case of AFP can be associated with related but non-identical VDPVs. The cVDPVs represent an outbreak and should be responded to as if there was an outbreak of wild poliovirus in a non-polio-endemic area

Fig. 44: The algorithm for final classification of AFP cases



- **iVDPVs (immunodeficient vaccine-derived poliovirus)** if VDPVs have been isolated from an individual with an immunodeficiency disorder and long-term excretion of the virus from the same patient
- **aVDPV (ambiguous vaccine-derived poliovirus)** when clinical, epidemiological and virological data insufficient to identify source, like from an environmental sample without cases or single isolate with no immunodeficiency in a patient

Vaccine-associated paralytic poliomyelitis (VAPP)

Countries have relied primarily on OPV for control and eradication of poliomyelitis through routine and supplementary immunization. However, one disadvantage associated with OPV is the rare occurrence of VAPP. The overall risk of VAPP has been estimated at 1 case per 1.4- 2.5 million administered doses of OPV.

Definition of VAPP: any case of AFP with onset of paralysis 4-30 days following receipt of OPV and the presence of neurological sequelae compatible with poliomyelitis 60 days following paralysis onset, isolation of vaccine poliovirus (Sabin-like virus) from the stool and negative for wild poliovirus, for criteria and further information.

The following criteria must be fulfilled before a diagnosis of VAPP is established:

1. The paralytic illness should be clinically compatible with poliomyelitis with residual paralysis at 60 days after paralysis onset and there should be no epidemiological links with wild virus confirmed or outbreak-associated cases of poliomyelitis
2. 'Adequate' stool specimens tested negative for wild poliovirus in a WHO-accredited laboratory but positive for vaccine-related virus
3. Ruled out other illnesses, which can cause flaccid paralysis, such as Guillain-Barré syndrome (GBS), transverse myelitis, neuritis, tumour, and trauma
4. The National Expert Committee will endorse final classification of an AFP case, based on detailed exposure history, clinical, evaluates the patient and virological data

8. Community action

The Epidemiologist should visit the home of AFP case and conduct a thorough field investigation with focus on following tasks:

- To complete the case investigation form
- To elicit detailed travel history in the past one month
- To determine any other exposure history
- To collect 10 to 15 stool samples from children under 5 years of age from the family and immediate neighbourhood along with details of the OPV doses received (photocopy child health card) and forward samples to CPHL immediately

9. Laboratory investigation protocol

- Send 2 stool specimens from a suspect case of AFP to the CPHL as described in the algorithm – **minimum 2 stool specimens within 14 days of paralysis onset, in adequate quantity (8-10 g), taken 24-48 hours apart and in good condition**
- Similarly stool samples are required to be collected from contacts as mentioned above
- Stool samples will be subjected to virus culture, identification, typing and sequencing

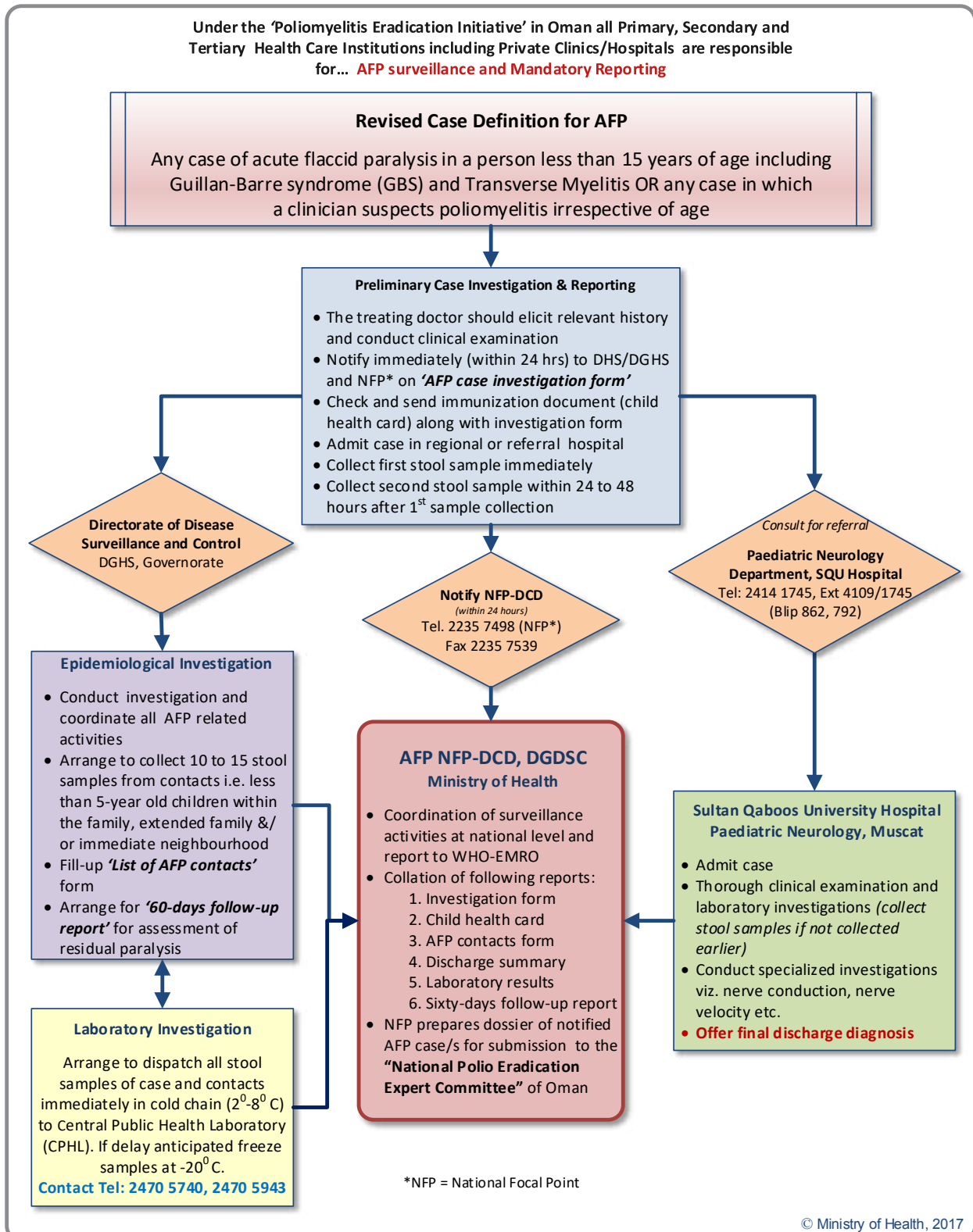
Type of test	Virus culture	Polio intratypic differentiation/ sequencing
Type of sample	Stool: 4-8 g (If it is impossible to obtain stool sample, a rectal swab may be collected)	Virus culture
When to collect	Collect stool samples within 14 days of onset (preferably within 7 days of onset)	
Storage	Stool should be immediately placed at 4-8°C and shipped to the laboratory in cold chain within 72 hours of collection. (If delay anticipated the specimen must be frozen at -20°C)	
Transport	Category B for stool samples / category A for polio cell culture	
BSL	BSL II	
Laboratory	CPHL	

Fig. 45: The algorithm for AFP case investigation



Directorate General for Disease Surveillance and Control, Ministry of Health HQ, Oman
Departments of Surveillance and Communicable Diseases (DCD)

Acute Flaccid Paralysis (AFP): Case Investigation Algorithm



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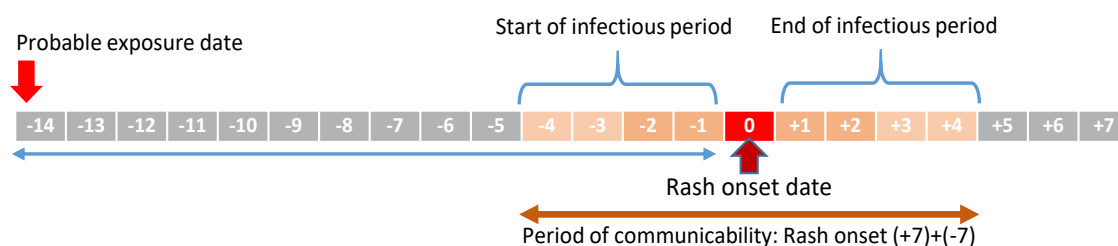
Fever and Rash Illness

Syndrome under surveillance for the program on elimination of measles and rubella

1. Background: measles and rubella

Measles: an acute, highly communicable viral disease with prodromal fever, conjunctivitis, coryza, cough and Koplik spots on the buccal mucosa. A characteristic red maculopapular rash appears on the third to seventh day. The disease is more severe in infants and adults than in children. It is also more severe disease in the very young and in malnourished children in whom it may be associated with haemorrhagic rash, protein-losing enteropathy, otitis media, oral sores, dehydration, diarrhoea, blindness and severe skin infections. Malnutrition is a risk factor. Subacute sclerosing panencephalitis (SSPE) develops very rarely (about 1/100 000) several years after infection. In 2011, globally 354,922 cases were reported and an estimated 157,700 children died of measles, 99% in Asia and Africa.

Fig. 46: Schematic representation of the clinical course of measles



Rubella: a mild febrile viral disease with a diffuse maculopapular rash. Clinically, rubella is usually indistinguishable from febrile rash illness due to measles or other viral diseases. Postauricular, occipital and posterior cervical lymphadenopathy is the most characteristic clinical feature that precedes the rash by 5-10 days. Up to 50% of rubella infections are subclinical. Children usually present few or no constitutional symptoms but adults may experience a 1-5 day prodrome of low grade fever, headache, malaise, mild coryza and conjunctivitis. Encephalitis is a more common complication than generally

believed and occurs with a higher frequency in adults. Rubella is important because of its ability to produce anomalies in the developing foetus (chapter on CRS). In 2001, globally 123 countries reported a total of 836,356 rubella cases.

2. Epidemiological characteristics

Measles

Infectious agent	Measles virus, family <i>Paramyxoviridae</i>
Reservoir	Humans
Transmission	Airborne by droplet spread, direct contact with nasal or throat secretions of infected persons and less commonly by fomites (clothes, toys, surfaces soiled with secretions)
Incubation	10 days, varies from 7 to 18 days
Communicability	A week before to, a week after onset of rash. Measles is one of the most highly infectious diseases
Susceptibility	All persons who did not get the disease or who have not been successfully immunized are susceptible. Acquired immunity after illness is permanent. Maternal antibodies may protect the newborn for 6-9 months or longer

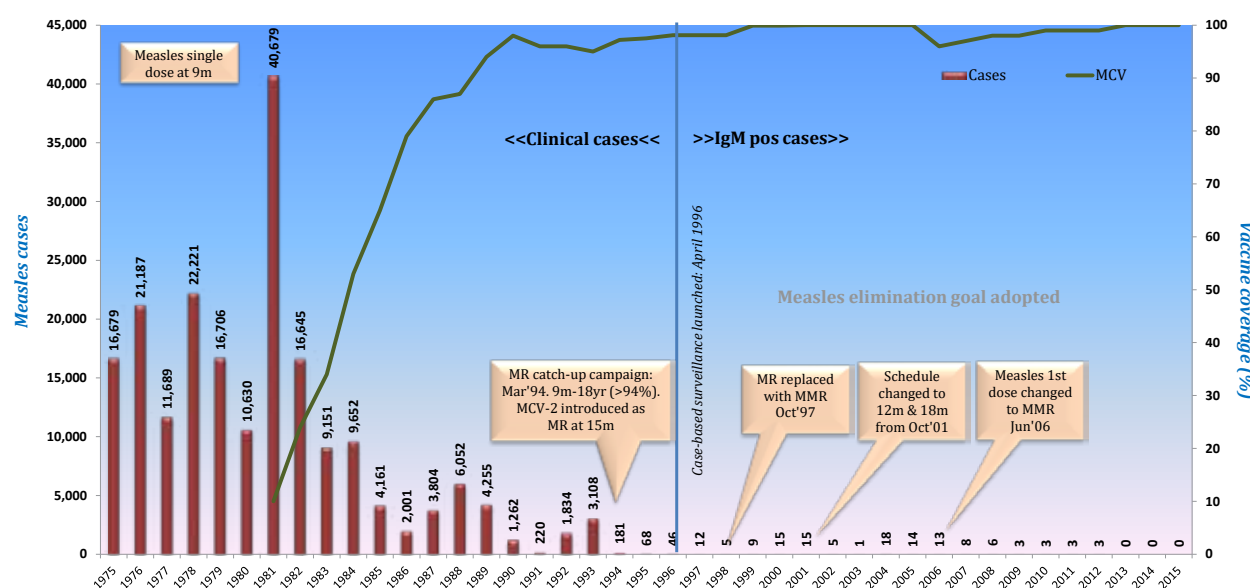
Rubella

Infectious agent	Rubella virus, family <i>Togaviridae</i>
Reservoir	Humans
Transmission	By droplet spread or direct contact with nasopharyngeal secretions of infected people. Infants with CRS shed large quantities of virus in their pharyngeal secretions and urine, and serve as a source of infection to their contacts
Incubation	14-17 days with a range of 14-21 days
Communicability	1 week before and at least 4 days after onset of rash; highly communicable. Infants with CRS may shed virus for months after birth
Susceptibility	All persons who did not get the disease or who have not been successfully immunized are susceptible. Immunity is usually permanent after natural infection and probably lifelong. Maternal antibodies may protect the newborn for 6-9 months or longer

3. Measles and rubella in Oman

Measles and rubella (including CRS) are notifiable diseases under group “A” (since 1993). The WHO recommends adopting case-based surveillance for fever and rash illness as a proxy for measles and rubella at the country level in the phase of elimination.

Fig. 47: Incidence of measles and vaccination coverage: 1975-2015

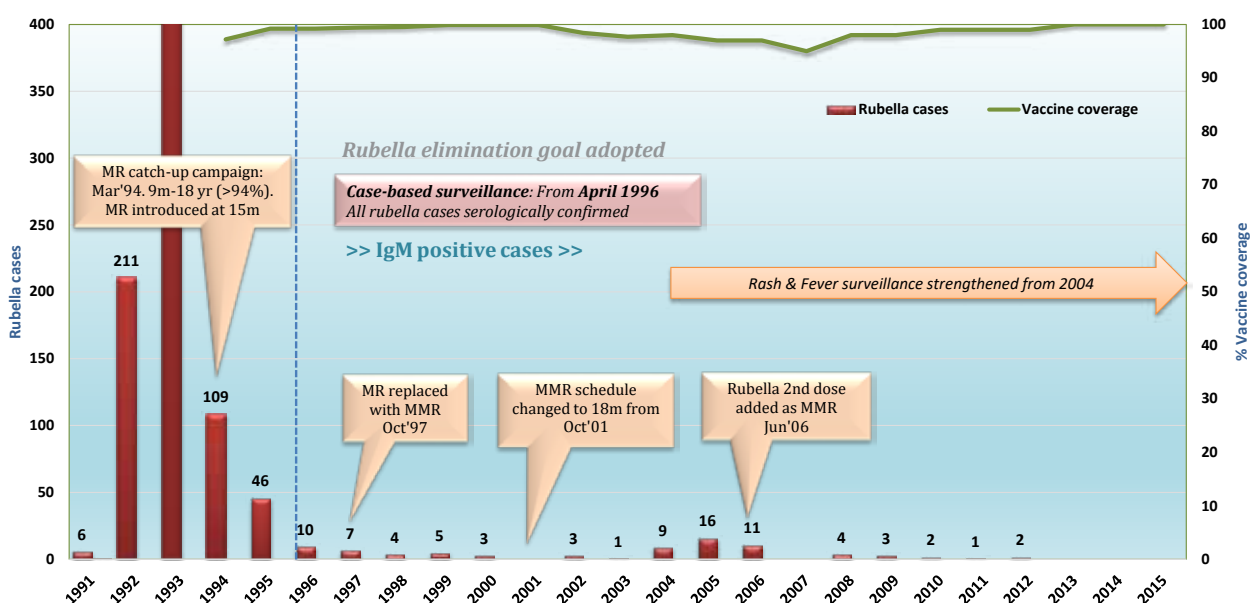


Countries nearing elimination of measles and/or rubella like Oman, should investigate all suspected cases and obtain a clinical specimen for laboratory testing. Once the case investigation form has been completed and laboratory test results are available, the suspected cases should be classified. In some cases, interpretation of the laboratory results are challenging (e.g. in persons with a recent history of vaccination, false positive results because of cross reactivity with other infections, equivocal test results or positive results for both measles and rubella).

The strategies leading to the success in the elimination of indigenous measles and rubella transmission in Oman are summarized below.

- **High routine immunization coverage (EPI):** measles vaccine was introduced in early eighties at 9 months and the coverage has been above 90% since 1989. Similarly rubella vaccine was introduced along with second dose of measles at 15 months as measles-rubella (MR) in 1994. From the year 1994 rubella coverage has been above 95%
- **Prioritization:** the priority status for measles and rubella was upgraded. Both diseases were shifted from group B to A in 1993
- **Catch-up campaign:** A mass campaign with MR vaccine was conducted in Oman in March 1994 following the last nationwide concurrent outbreak of measles and rubella in 1992-1993. The target population was 9 months to 18 years. A single dose of MR was given irrespective of the previous immunization status and in this campaign over 94% coverage was achieved
- **Case-based rash illness surveillance** was launched in April 1996. All rash illness cases were subjected to serological tests for measles as well as rubella (IgM ELISA). If a blood sample was not taken, then the case was classified as clinical or epidemiologically-linked. Urine samples were collected from all rash illness cases for measles virus isolation
- **Weekly negative reporting:** measles/rubella (rash illness) weekly negative reporting was launched January 1995 for 22 sentinel sites distributed all over the country. The existing infrastructure for AFP and neonatal tetanus surveillance was utilized for this purpose. The number of reporting sentinel sites was increased to 168 in January 2013
- **Epidemiological investigation:** all outbreaks of measles were investigated with particular reference to age, vaccination status and history of travel. Attempts were made to find out the index case and data were analysed for evaluation of the programme
- **Fever and rash illness surveillance:** further strengthened from 2005 onwards with development of standardized case definition and laboratory investigation protocol

Fig. 48: Incidence of rubella and vaccination coverage: 1991-2015



4. Case definition

A patient in whom a health care worker suspects measles or rubella infection or a person with fever and non-vesicular maculopapular rash.

5. Laboratory criteria

Laboratory-confirmed measles or rubella: suspected case of measles, or rubella that has been confirmed by a proficient laboratory.

Note

A proficient laboratory is one that is WHO-accredited and/or has an established quality assurance programme with oversight by a WHO-accredited laboratory. CPHL has been designated by WHO as a regional reference laboratory for measles.

A measles, or rubella, virus strain is identified by sequencing the WHO standard 450 nucleotide region of the N gene for measles, or the 739 nucleotide region of the E1 gene for rubella.

6. Case management

No specific treatment. Supportive and symptomatic treatment with respiratory precautions.

7. Surveillance and reporting

- Case-based surveillance with epidemiological investigation of all reported cases and look for secondary cases in the community
- Report immediately to regional Directorate for case investigation and to national surveillance unit with a copy of Child Health Card (immunization record) and Rash illness Mandatory Information Form.

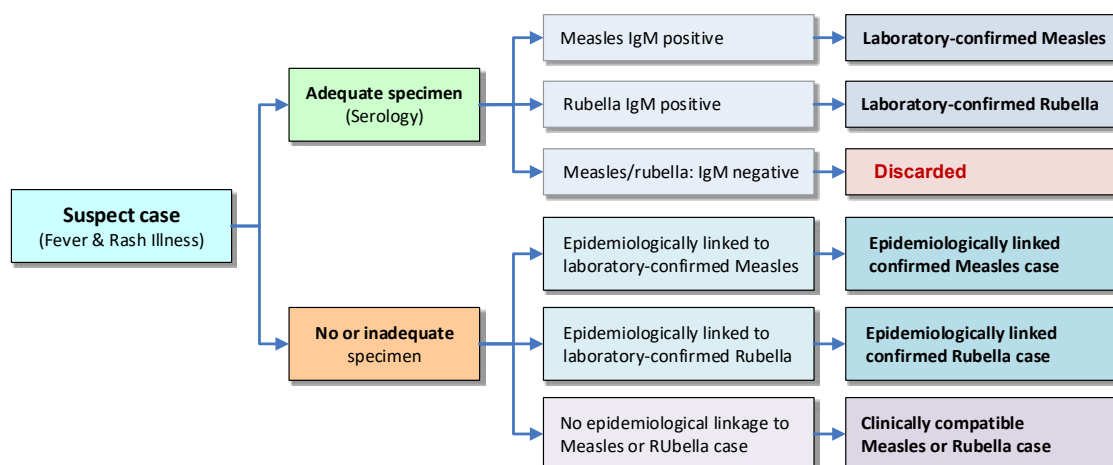
Outbreak situation: Small outbreaks or clustering of cases can occur during the elimination phase. An outbreak is defined as a chain of transmission including 3 or more cases linked in time and space.

8. Definitions for measles/rubella elimination

All cases of measles and rubella should be fully investigated. The 'National Expert Committee for Measles and Rubella Elimination' will meet periodically and assess the available evidence and decide on the final classification of the cases.

The following flow chart will be utilized for the final classification.

Fig. 49: Flowchart for classification of suspect case of measles and rubella



Selected WHO definitions used in context with elimination

1. **Measles elimination:** the absence of endemic measles transmission in a defined geographical area (region/country) for ≥ 12 months in the presence of a well-performing surveillance system
Note: verification of measles elimination takes place after 36 months of interrupted endemic measles virus transmission.
2. **Rubella elimination:** the absence of endemic rubella virus transmission in a defined geographical area (region/country) for > 12 months and the absence of CRS cases associated with endemic transmission in the presence of a well-performing surveillance system
Note: verification of rubella elimination takes place after 36 months of interrupted rubella virus transmission.
3. **Endemic measles or rubella case:** laboratory or epidemiologically linked confirmed cases of measles, or rubella, resulting from endemic transmission of measles or rubella virus
4. **Re-establishment of endemic transmission:** occurs when epidemiological and laboratory evidence indicates the presence of a chain of transmission of a virus strain that continues uninterrupted for ≥ 12 months in a defined geographical area (region or country) where measles or rubella had been previously eliminated
5. **Measles or rubella outbreak in an elimination:** a single laboratory-confirmed case
6. **Epidemiologically linked confirmed measles or rubella case:** a suspected case of measles or rubella, that has not been confirmed by a laboratory but was geographically and temporally related, with dates of rash onset occurring -21 days apart for measles (or $12-23$ days for rubella) to a laboratory-confirmed case or in the event of a chain of transmission to another epidemiologically confirmed measles or rubella case
7. **Measles vaccine-associated illness:** a suspected case that meets all the 5 following criteria:
 - a. The patient had a rash illness with or without fever but **did not have** cough or other respiratory symptoms related to the rash
 - b. The rash began 7-14 days after vaccination with a **measles-containing vaccine**
 - c. The blood specimen which was positive for **measles IgM** was collected 8-56 days after vaccination
 - d. Thorough **field investigation** did not identify any secondary cases
 - e. Field and laboratory investigations failed to identify other causes. Alternatively a suspected case from which virus was isolated and found on genotyping to be a **vaccine strain**
8. **Imported measles or rubella case:** a case exposed to measles or rubella outside the country during the 7-21 days ($12-23$ days for rubella) prior to rash onset and supported by epidemiological or virological evidence or both
9. **Importation-related measles or rubella case:** a locally acquired infection occurring as part of a chain of transmission originating from an imported case as supported by epidemiological or virological evidence or both.
Note: if transmission of measles or rubella from cases related to importation persists for ≥ 12 months, cases are no longer considered import-related but endemic.
10. **Unknown source measles or rubella case:** a confirmed case for which an epidemiological or virological link to importation or to endemic transmission cannot be established after a thorough investigation

Ref: <http://www.who.int/wer/2013/wer8809/en/>

9. Prevention and control

Initiate immediate investigation upon confirmation of the case.

Outbreak situation:

- Use the steps of outbreak investigation and assess the situation. Consider age distribution of cases, search for index case, active case finding in the community, and determine immunization status of the case – whether ‘due’ or immunized (MCV 1 and/or MCV2). Date of receiving vaccine (measles/rubella) is crucial since it may lead to false positive serology
- Strategic isolation of cases in institutional settings (e.g. day care, schools)
- All children who lack prior vaccination should be vaccinated
- Susceptible contacts can be protected with measles vaccination if given within 72 hours of exposure. **Immunization or IgG for contacts is not indicated in rubella**
- Immunization campaign of target population should be based on the susceptibility profile of population as per the age distribution and target area
- In case supplementary immunization activities are indicated estimate vaccine requirements and order vaccine urgently
- Health education regarding the modes of transmission and prevention

10. Laboratory investigation Protocol

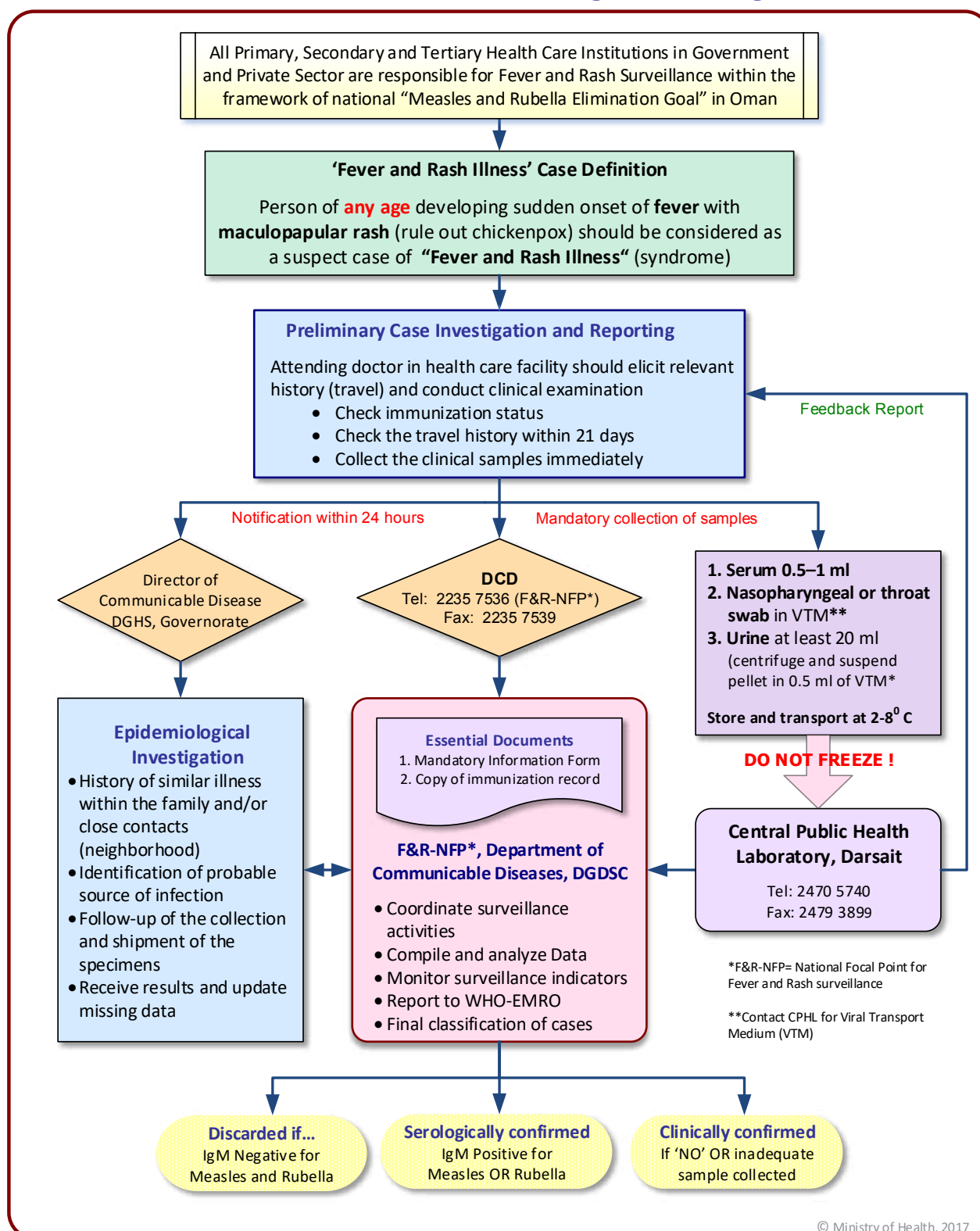
Type of test	Serology	rRT-PCR, virus isolation, sequencing
Sample	Serum (in SST): 1-3 ml	1. OP/NP swab in VTM in screw cap tubes 2. 10-50 ml of urine (process before sending)
When to collect	1. First contact- negative IgM in a sample collected less than 4 days of onset should be retested 2. Second sample after 28 days of onset	At first contact, preferably first 5 days of rash 1. OP/NP swab : acute samples within 4 to 14 days of onset 2. Urine : within 5 days of onset
Storage	At 4-8°C. Do not freeze	OP/NP : at 4-8° C and send with 48 hours Urine : process and store urine sediment at 4-8° C and send within 48 hours
Transport	Transport within 48 hours (category B)	
BSL	BSL II practices	
Laboratory	CPHL	

Fig. 50: Case investigation algorithm for Fever and Rash Illness cases



Directorate General of Surveillance & Disease Control, Ministry of Health HQ, Oman
Departments of Surveillance and Communicable Diseases

Fever & Rash Illness Investigation Algorithm



B35-0

Congenital Rubella Syndrome

Includes congenital rubella infection.

1. Background

Worldwide, it is estimated that each year there are more than 100,000 infants born with CRS. In 2001, 123 countries reported a total of 836,356 rubella cases. Rubella is otherwise a mild childhood illness that presents with fever and rash. The public health importance of rubella relates to its teratogenic effects when rubella infection is acquired in early months of pregnancy. In utero rubella infection can result in either foetal death or serious congenital birth defects.

Congenital rubella syndrome is cause of blindness, congenital heart disease and mental retardation. In 1998, standard case definitions for surveillance of CRS and rubella were developed by WHO. In 2010, an estimated 103,000 CRS cases occurred worldwide.

The elimination of CRS cannot be achieved with only the inclusion of rubella vaccine in the infant immunization programme and subsequent achievement of high coverage. Moreover additional strategies such as postpartum immunization need to be adapted to prevent transmission of infection in susceptible adult population.

2. Situation in Oman

Historically, 2 outbreaks of rubella are on record in Oman. The first was in 1988-1989 and the last nationwide outbreak occurred in 1992-1993. Following these outbreaks a large number of cases of CRS were reported (WHO, Weekly Epidemiological Record Vol. 69, #45, dated 17th November 1994).

The MoH embarked on the elimination target for measles and rubella. A nationwide mass catch-up campaign was conducted in March 1994 in schools. A single dose of MR vaccine was administered to

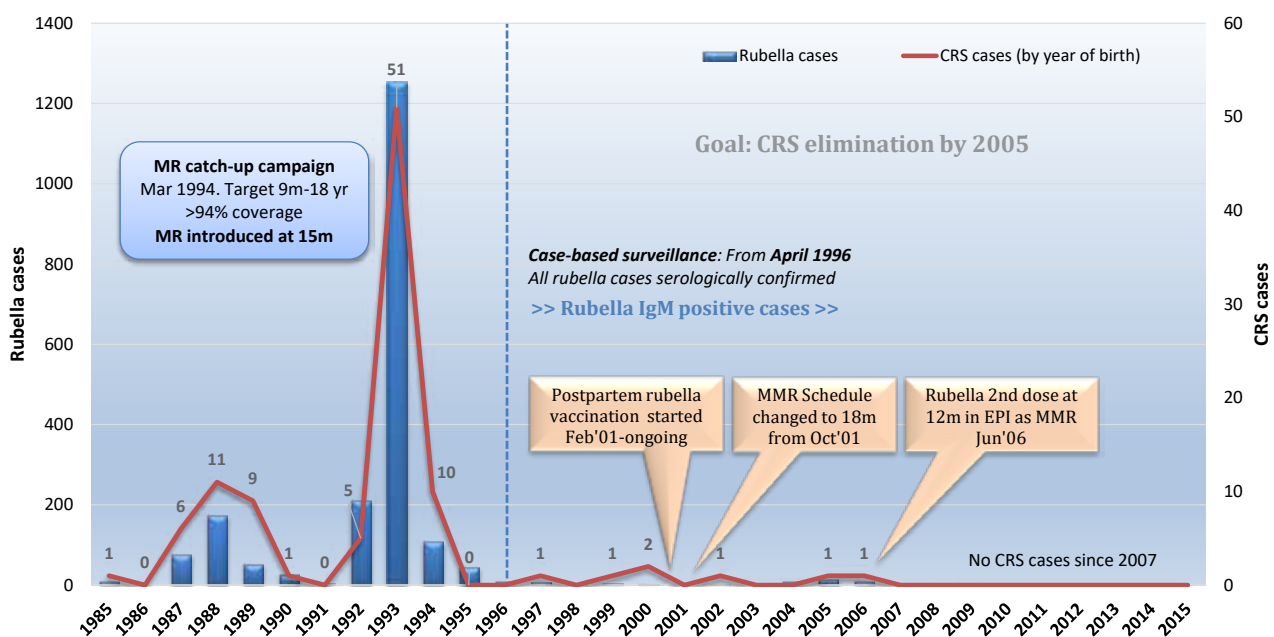
all children and adolescents between the ages of 15 months to 18 years irrespective of their previous immunization status. Successful coverage of 94% was achieved throughout the country. Following the campaign the rubella vaccine was introduced in the routine infant immunization programme (EPI).

As a result of these initiatives the incidence of rubella declined dramatically after 1994. From April 1996 all suspected cases of either measles or rubella (fever with rash) were subjected to serological confirmation for both the diseases under the elimination initiatives. The case-based surveillance then further focused on “fever and rash illness” surveillance along with weekly negative reporting from sentinel sites.

The occurrence of CRS cases in the country followed closely that of the 2 rubella outbreaks in the past 2 decades (Fig. 14). The largest numbers of CRS cases (48) were notified in 1993.

Table 14 shows the rubella and CRS cases reported after the catch-up campaign and introduction of rubella vaccine in EPI in 1994. The immunization coverage with rubella vaccine has been always above 97% since its introduction. As of 2003 the last case of CRS on record was born in 2001.

Fig. 51: Incidence of rubella and CRS in Oman: 1985 to 2015



3. National CRS Registry

The National CRS Registry was established in the Department of Communicable Disease Surveillance and Control in the year 2000 and the cases were registered on the basis of their year of birth.

Since 1985, 93 cases of CRS are on record. An attempt was made to trace these cases and to verify their current status and then to include them in the registry. Of these, 42 (45%) are currently surviving while 27 (29%) have died. No information was available for 24 (26%) cases. Of these, 14 cases (58%) belonged to the first 1988-1989 outbreak (Fig.14). These cases are now either presumed dead or lost to follow-up.

The objective of the national registry was to facilitate surveillance of CRS cases and to undertake a long-term follow-up to detect late sequelae. Initial assessment of the registered cases was conducted by the paediatrician, ophthalmologist, ENT specialist and, in case of cardiac or neurological problems, by the respective specialists. Among the surviving children, the most common clinical presentation was deafness in 64%, microcephaly in 47%, heart disease in 45% and cataract in 31%. A follow-up of these cases would be conducted biennially.

Susceptibility to rubella in women of childbearing age: a study conducted in 1998-1989 among 207 pregnant women in different regions of Oman has shown that 8% of women were seronegative for rubella. While another similar study in 2000 showed 2% were susceptible among a sample of 604 women attending antenatal care (ANC) clinics.

4. Elimination of CRS by 2005

After the establishment of National CRS Registry in 2000 and subsequent strengthening of CRS surveillance a national goal of elimination of CRS by 2005 was adapted by the MoH.

The policy of rubella vaccination of postpartum women was introduced in Oman from 1st February 2001. A single dose of rubella vaccine was administered if documentation of previous immunization was not available or if protective IgG antibodies were not detected during pregnancy, i.e. when tested in high-risk pregnancies. The postpartum period of 40 days after childbirth was considered the safest period for vaccination of the mother.

With around 45,000 deliveries annually of which 92% are institutional and an efficient system of delivering the vaccine in hospitals as well as to those delivered at home, it was envisaged that within a period of 4 to 5 years all women of child bearing age would be protected against rubella. Thus effectively stopping the occurrence of cases and thereby achieving the elimination of CRS in Oman.

Maternal Rubella Vaccination

As a major strategy of eliminating CRS in Oman, maternal immunization was introduced from February 2001. A single dose of rubella vaccine would be administered to mothers during the postpartum period if there is NO documentation of vaccination or serological evidence (protective IgG antibodies).

The rubella vaccine could pose a theoretical risk to the developing foetus; however, WHO categorically maintains a position that there is no evidence to suggest that the vaccine would adversely affect the developing foetus if given during pregnancy. The MoH in Oman has therefore taken a decision to offer the vaccine to eligible mothers within 40 days after delivery. The chances of pregnancy during this period are extremely low therefore this period is considered the safest.

Note: serologic screening is not essential before maternal rubella immunization during the post-partum period.

Table 17: Rubella and CRS cases and vaccine coverage: 1994-2015

Year	Vaccine coverage	Rubella cases	CRS cases
1994	97.2	109*	10
1995	99.2	46*	0
1996	99.2	10*	0
1997	99.4	7	1
1998	99.5	4	0
1999	99.9	5	1
2000	99.9	3	2
2001	99.9	0	0
2002	98.4	3	1
2003	97.7	1	0
2004	98	9	0
2005	97	16	1
2006	97	11	1
2007	95	0	0
2008	98	4	0
2009	98	3	0
2010	99	2	0
2011	99	1	0
2012	99	2	0
2013	100	0	0
2014	100	1	0
2015	100	0	0

*Note: Rubella cases prior to April 1996 are clinical

5. Case definition

Suspect case of CRS

A child less than 1 year with

- maternal history of rubella in pregnancy and/or
- heart disease, deafness or eye signs (cataract, diminished vision, nystagmus, squint, microphthalmia, congenital glaucoma)

Clinically confirmed case of CRS

A child **less than one year** with **2 complications in group A or one condition each from group A and B.**

- Cataract(s), congenital glaucoma, congenital heart disease, loss of hearing, pigmentary retinopathy
- Purpura, hepatosplenomegaly, microcephaly, mental retardation, meningoencephalitis, radiolucent bone disease, jaundice with onset within 24 hours after birth

Laboratory-confirmed CRS case

An infant with a positive blood test for rubella IgM who has clinically confirmed CRS.

Congenital rubella infection (CRI)

An infant with a positive blood test for rubella IgM who does not have clinically confirmed CRS.

Note: there may be time lag (up to 9 months) in occurrence of CRS cases after interruption of rubella virus transmission has occurred. Evidence of the absence of continuing rubella transmission from CRS cases, is needed because CRS cases excrete rubella virus for up to 12 months after birth.

6. Surveillance and reporting

- **Notification of cases:** all suspect cases should be notified immediately and blood samples should be collected from both the mother and child for rubella IgM. Cases which are detected at a later age which fit into the case definition should also be notified and investigated
- **CRS initial assessment form:** initial assessment of the registered cases should be conducted by the paediatrician, ophthalmologist, ENT specialist and, in case of cardiac or neurological problem, by the respective specialists
- **National CRS Registry and follow-up:** the National CRS Registry was established in the Department of Communicable Disease Surveillance and Control in the year 2000 and cases are registered on the basis of their year of birth. The objective of the national registry is to facilitate surveillance of CRS cases and to undertake a long-term follow-up to detect late sequelae. A follow-up of these cases should be conducted biennially

7. Laboratory investigation protocol

Type of test	rRT-PCR			Serology
Type of sample	Nasal and throat swab	Urine: 10 ml in sterile container	Plasma (EDTA blood): 5-10	Serum (in SST): 5-10 ml
When to collect	Before 1 year of age		On presentation	Before 1 year of age: Preferably IgM at age of 1-2 months. IgG at 3, 6, and 12 months
Storage	At 4°C up to 48 hours. Freeze at -70°C if exceeding 48 hours			
Transport	Category B			
BSL	BSL II			
Laboratory	CPHL			

Note:

- All congenitally infected infants may shed virus for up to at least one year of age
- Some infants do not test positive at birth. If there is a clinical suspicion a second IgM test should be repeated between 3-6 months of age

Chapter 16

A92, 96, 98.1-99

Acute Haemorrhagic Fever Syndrome

Other than DHF, YF and CCHF

1. Background

Dengue/dengue haemorrhagic fever, YF and CCHF have been discussed under the category A diseases.

Other acute haemorrhagic fever syndromes include viral, bacterial (meningococcal, staphylococcal septicaemia) or Rickettsial (Rocky Mountain spotted fever, Typhus fever and Q fever) diseases with a potential to produce epidemics. Mainly 4 families of RNA viruses have been recognized as being able to cause haemorrhagic fevers.

Table 18: Families of RNA virus causing haemorrhagic fever

Family	Diseases
Arenaviridae	Lassa, Lujo, Argentine (Junin), Bolivian (Machupo), Brazilian (Sabia) and Venezuelan (Guanarito) virus
Bunyaviridae	Hantavirus, CCHF, Rift Valley virus
Filoviridae	Ebola and Marburg virus
Flaviviridae	Dengue, YF, tick-borne encephalitis, Omsk virus, Kyasanur Forest disease (KFD), Al Khumra virus

All cases of acute haemorrhagic fever syndrome whether single or in clusters should be notified early without waiting for the causal agent to be identified. This syndromic approach has been recommended under the revised International Health Regulations (IHR2005). Surveillance of acute haemorrhagic fever syndrome is aimed at early detection of cases in order to avoid large scale outbreaks and the possible international spread of the disease.

2. Epidemiological characteristics

Infectious agent	Commonly viruses and rarely bacterial, rickettsial or protozoal
Reservoir	Rift Valley fever (RVF) – sheep and other; WNF – birds and vertebrate mammals; KFD, Omsk – tick; Ebola, Marburg – fruit bats; Hanta, Lassa – rodents
Transmission	Vector-borne: mosquito/tick bite (no person-to-person transmission) Direct contact: infected animal/reservoir or meat via slaughter or raw consumption, exposure to rodent excreta, exposure to infected body fluids
Incubation	Usual: RVF/WNF – 2-7 days; KFD/Omsk – 3-7 days; Ebola – 2-21 days; Marburg – 3-9 days; Hanta – 1-4 weeks; Lassa – 6-21 days
Communicability	Mainly by the bite of vector and infected blood/tissues. Most of these viruses are highly infectious
Susceptibility	Mainly adult males are susceptible because of the exposure possibilities

3. Situation in Oman

Rift Valley fever: in the year 2000, outbreak of RVF was reported for the first time outside the African continent. The affected area was the northeast of Yemen (Al Hodaiah) and the southeast of Saudi Arabia (Jizan) along the Red Sea coast. The epidemic raged for a number of days with high mortality. The possibility of emergence of RVF in Dhofar Governorate was real due to the fair movement of animals from the affected areas.

The MoH staff was put on heightened surveillance and diagnostic tests were acquired. However from year 2000 until the date of publication, no cases of RVF either local or imported have been reported in the Sultanate.

West Nile fever: most of the Arabian Peninsula including Oman falls in the transmission belt of the West Nile virus (WNV). However, until now no human cases were reported in the country. In March 2003, 4 horses in wilayat Seeb area developed neurological symptoms and died. Post mortem examination of the brain tissue confirmed the diagnosis of West Nile fever in a overseas reference laboratory.

4. Case definition

Clinical case description

Acute onset of fever of less than 3 weeks duration in a severely ill patient **AND** any 2 of the following

- Haemorrhagic or purpuric rash
- Epistaxis
- Haematemesis
- Haemoptysis
- Blood in stool
- Other haemorrhagic symptoms **AND** no known predisposing host factors for haemorrhagic manifestations

Note: During epidemics, most infected patients do not show haemorrhagic symptoms and a specific case definition, according to the suspected or proven disease should be evolved.

5. Laboratory criteria

Serological and molecular diagnostic facilities are available in the CPHL for CCHF, RVF, WNV infection and dengue/dengue haemorrhagic fever (DF/DHF).

- All blood samples from acute haemorrhagic fever syndrome cases as a routine would be subjected to all available tests
- At present the diagnostic kits for other haemorrhagic fever are not available in Oman. None of the

other haemorrhagic fevers have been reported in the last decade of surveillance. If in future need arises then the specific diagnostic kit would be made available

- If bacterial/Rickettsial origin is suspected, suitable sample should be taken and sent to CPHL

6. Case management

Isolation, disinfection and infection control

- Some of the haemorrhagic fevers are highly infectious, namely CCHF, and notorious for nosocomial spread. Therefore, until the sample has been proved negative, all barrier nursing precautions should be followed. The case must be isolated and the samples should be handled with great care
- For further details on isolation, disinfection and infection control refer to the relevant Annexes in this manual
- No specific measures of isolation, disinfection or infection control are recommended for DF/DHF or RVF since there is NO person-to-person transmission
- There is no specific treatment available, only supportive and symptomatic treatment. If bacterial/Rickettsial organism is confirmed or to prevent secondary infection, treat with recommended antibiotics. The main aim of treatment is to prevent complications and death as well as prevent spread of the disease in the hospital or community

7. Surveillance and reporting

Immediate case-based reporting of acute haemorrhagic fever syndrome, whether occurring singly or in clusters, from peripheral to intermediate and central level, in order to ensure rapid investigation and laboratory confirmation.

All cases must be investigated with contact tracing. Blood samples and appropriate clinical specimens must be collected to confirm a diagnosis as rapidly as possible.

8. Laboratory investigation protocol

Type of test	Serology IgM	rRT-PCR, virus isolation, sequencing
Sample	Serum (in SST): 3-5 ml	EDTA blood: 5-10 ml blood
When to collect	Collect acute and convalescent sera (4 weeks after onset)	Collect during acute phase (within 5 to 10 days of onset)
Storage	At 4 to 8°C ship within 48 hours	
Transport	Depends on disease agent	
BSL	BSL II or III practices	
Laboratory	CPHL	

Note:

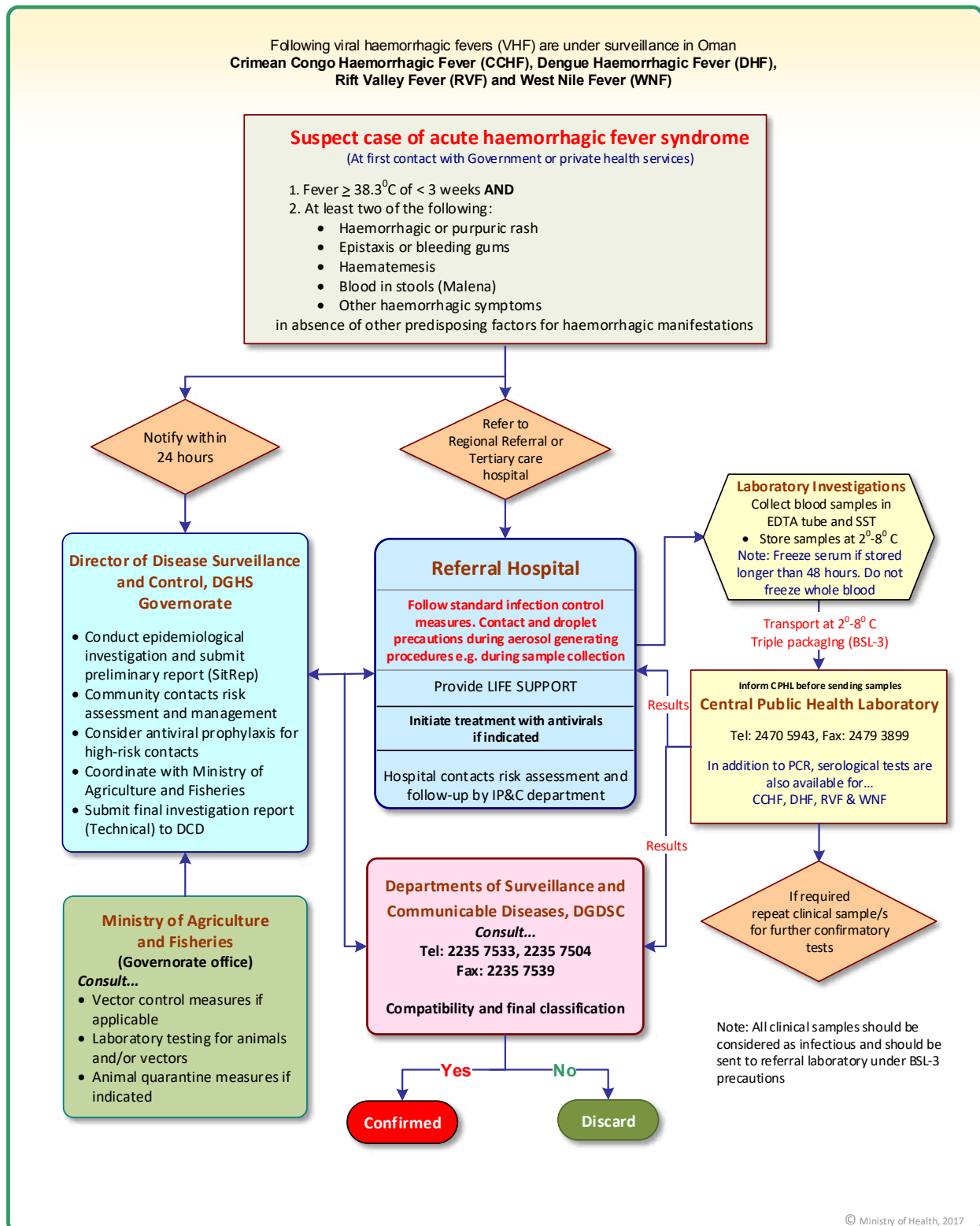
- Serological and molecular diagnosis is available at CPHL for CCHF and RVF
- For other AVHF agents (mentioned above), testing will be done through CPHL at international reference laboratories with more advanced biosafety level according to a previous agreement with these laboratories

Fig. 52: Investigation algorithm for acute haemorrhagic fever syndrome



Directorate General for Disease Surveillance and Control, Ministry of Health, Oman
Departments of Surveillance and Communicable Diseases

Acute Viral Haemorrhagic Fever: Laboratory Investigation Algorithm



ICD-10-U04.9 (provisional)

Coronavirus Respiratory Syndrome

Includes emerging infections due to SARS-CoV and MERS-CoV

1. Background

Severe acute respiratory syndrome (SARS)

Severe acute respiratory syndrome was first recognized in February 2003 in Hanoi, Viet Nam and since then more than 30 countries in the world have reported cases. The disease spread from Asia to American continent and Europe through international travel. Infection leads to atypical pneumonia and is the new emerging disease of the 21st century. A worldwide alert on SARS was issued by the WHO on 12th March 2003. The disease spread internationally along major airline routes and resulted in 8,096 cases in 29 countries with 774 deaths (9.6%).

Middle East respiratory syndrome (MERS)

Another viral respiratory illness novel to humans is MERS. First reported in Jeddah in Saudi Arabia in June 2012. The earliest outbreak occurred in March/April 2012 in Jordan with 9 laboratory-confirmed cases. The outbreak was retrospectively linked to MERS-CoV. MERS is a zoonotic disease with dromedary camels the likely animal reservoir. Transmission risk factors include respiratory exposure to camel secretions, drinking raw camel milk or eating undercooked camel meat. Studies report increased risk in individuals with occupational contact with camels. MERS-CoV is transmissible person-to-person but sustained community transmission has not been observed. Like SARS-CoV, health care settings pose the highest risk. Yet MERS-CoV is less contagious than SARS-CoV and has higher fatality rates. Hospital-related outbreaks have occurred in multiple countries including substantial nosocomial transmissions across Saudi Arabia.

Globally, since 2012, WHO has been notified of 1,595 laboratory-confirmed cases of infection with MERS-CoV, including at least 571 related deaths (October, 2015). Nearly 26 countries have reported cases of

MERS-CoV, including Saudi Arabia, Oman, Jordan, UAE, Qatar, the South Korea, China, Germany, Iran, the Philippines and Thailand. The first major outbreak outside Saudi Arabia occurred in 2015 in Korea, a total of 186 cases, including 36 deaths (July, 2015).

Clinical spectrum of SARS/MERS: early signs and symptoms are nonspecific and consistent with influenza-like illness with a spectrum ranging from mild illness to severe respiratory illness. The disease can quickly progress with about 20-30% requiring intensive care.

2. Epidemiological characteristics

SARS

Infectious agent	Severe acute respiratory syndrome coronavirus (SARS-CoV)
Reservoir	Palm civet animal and bats are the animal reservoirs. Symptomatic human case for human-to-human transmission. There is no evidence of asymptomatic healthy carrier
Transmission	Droplet rather than airborne transmission and close contact with a symptomatic case
Incubation	2-10 days, sometimes longer
Communicability	Only during illness and increases with severity. No evidence of transmission during incubation or convalescence. Maximum period is less than 21 days
Susceptibility	All age groups and both sexes are susceptible. Post-infection immunity is unknown

MERS

Infectious agent	Middle East Respiratory Syndrome coronavirus (MERS-CoV), Beta-corona virus
Reservoir	Egyptian tomb bats (Suspected) and dromedary camels
Transmission	Probably droplet and/or contact infection. The route of transmission from animals to humans is not fully understood (WHO). However sustained person-to-person transmission appears to be low
Incubation	5 days (range 2-14 days)
Communicability	Not yet fully understood
Susceptibility	Elderly patients with chronic diseases (Diabetes, heart disease, chronic kidney disease)

3. SARS and MERS in Oman

SARS-CoV

During the global spread of SARS, Oman did not report any cases. In fact no cases were reported from the GCC countries except in Kuwait.

MERS-CoV

Seven sporadic cases of MERS have been reported in Oman in 2013 to 2015. Case #1 and #2 were reported from Dakhliyah (Adam) and North Batinah (Saham) governorates, respectively. Both were fatal infections. In December 2014 a cluster of 3 cases was reported near Nizwa in Dakhliyah. The index case died but the other 2 contacts were asymptomatic and recovered (Case # 3, 4 and 5). The sixth case who recovered was reported from Bidiyah (N Sharqiyah) in 2015. Another non-fatal case was reported also from the same governorate but was diagnosed outside Oman (Thailand). In 2015 the seventh case was reported from

Fig. 53: Cases of MERS-CoV infection in Oman: 2013-15

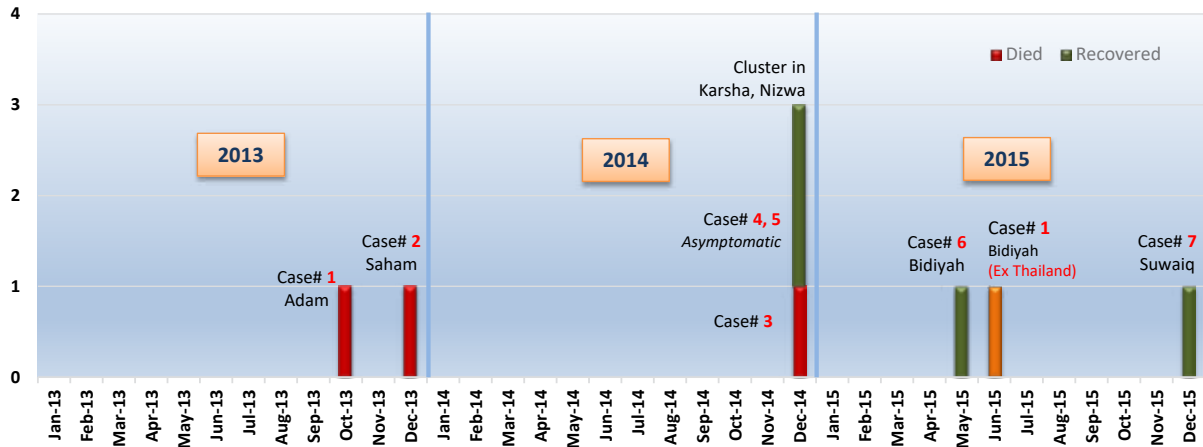


Suwaiq (N Batinah) with non-fatal outcome. The cumulative fatality rate was 43% (3 out of 7).

None of the contacts in the community or among health care workers developed the infection indicating application of appropriate infection prevention and control measures.

Oman, along with other countries of the Middle East, is considered endemic for MERS-CoV infection. Field studies have demonstrated antibodies to MERS virus in the Omani dromedary camels. Despite heightened surveillance no other human cases were detected in the population.

Fig. 54: Epi curve of MERS-CoV cases in Oman: 2013 to 2015



4. Case definitions

SARS-CoV/MERS-CoV

Suspect

1. **A person presenting with history of high fever ($>38^{\circ}\text{C}/100.4^{\circ}\text{F}$) AND cough and breathing difficulty (acute febrile acute respiratory illness) with or without radiological, or histopathological evidence of pulmonary parenchymal disease (e.g. pneumonia or acute respiratory distress syndrome [ARDS])**

OR

2. **A case of unexplained acute respiratory illness resulting in death** but on whom no autopsy has been performed

AND

One or more of the following exposures during the 14 days prior to onset of symptoms (direct epidemiologic link):

- Close contact with a person who is suspect/confirmed case of SARS/MERS
- History of travel to an area with recent local transmission of SARS/MERS
- Residing in an area with recent local transmission of SARS/MERS
- Animal reservoirs SARS/MERS
- Health care-associated

Note:

Close contact: having cared for, lived with, or had direct contact with respiratory secretions or body fluids of a suspect/confirmed case of SARS/MERS. A contact also include institutional exposure with a confirmed case.

Recent local transmission of SARS/MERS: an area in which local chain(s) of transmission of SARS/MERS is/are occurring as reported by the national public health authorities (NFP/IHR).

Kindly note that Oman is considered as endemic for MERS-CoV infection due to the indigenous cases detected in the country without any evidence of importation.

Confirmed case

A person with laboratory confirmation of SARS-CoV/MERS-CoV infection, irrespective of clinical signs and symptoms.

5. Laboratory criteria

The CPHL has been identified as the National Reference Laboratory where the diagnostic tests would be available. It is advised that under no circumstances clinical samples should be collected by any other laboratories in Oman for diagnosis of SARS/MERS.

Serology

- Paired sera taken 14 days apart
- Single sample after 14 days of onset of symptoms

RT-PCR

- Upper respiratory tract: nasopharyngeal and oropharyngeal swab, wash/aspirate
- Lower respiratory tract: sputum, aspirate or lavage
- For asymptomatic contacts collect samples within 14 days of last documented contact
- Store and transport at 4°C and within 72 hours to CPHL

Laboratory confirmation: A case may be laboratory confirmed by detection of viral nucleic acid or serology. The presence of viral nucleic acid can be confirmed by either a positive RT-PCR result on at least 2 specific genomic targets or a single positive target with sequencing of a second target. A case confirmed by serology requires demonstration of seroconversion in 2 samples ideally taken at least 14 days apart, by a screening (ELISA, IFA) and a neutralization assay. However, the interim recommendations for laboratory testing for MERS-CoV should be consulted for the most recent standards for laboratory confirmation

6. Case management

a. Patient triage

- Triage staff should assess and evaluate the patient based on the suspect case definition with a fever over 38°C and one or more of the respiratory symptoms. The patient should be interviewed immediately to determine their travel history or contact with a person diagnosed with SARS/MERS
- Staff should wear an N95 respirator (mask) or equivalent when assessing a patient suspected of having SARS/MERS
- If the person meets the definition, the triage staff should immediately inform the infection control department that a patient is under investigation for SARS/MERS
- The suspect case should be given a surgical mask to wear and moved to a separate assessment area. The patient should be moved to a single room with the door closed
- Patients under investigation should continue to wear surgical mask until they are admitted to the isolation room
- The patient, close contacts and staff/those who are taking care should use PPE
- Persons accompanying/attending a suspect case should be given a surgical mask. If the decision is made that this is a suspect or probable case that requires admission, the attendant should be given an N95 respirator (mask) or equivalent and instructed on use
- A consultation with an infectious disease specialist is recommended. The case should be reviewed by either the head of the Department of Internal Medicine or Paediatrics or the designated Focal Point in the regional referral hospital as applicable
- A log should be kept for all cases (as well as family, friends or volunteers accompanying them) at the health institution of the local and national public health authority. The Epidemiologist should be notified immediately of the case
- Patients under investigation should be separated from those diagnosed with the syndrome

- Eye protection (i.e. goggles) is strongly recommended when working with a suspect or probable case when there is a potential for spattering or spraying of body substances, and when providing direct patient care (within one metre of the patient) unless the patient is wearing a mask
- Patients should not be left sitting in the waiting room area. The local public health authority may have to perform contact tracing if a suspect case was in close contact (see case definition) with other people in the waiting room
- A suspect case should be transported immediately to the designated hospital. The hospital should be notified of the patient's pending arrival
- All suspect cases should leave via the shortest route causing the least degree of person-to-person contact (e.g. through a back entrance rather than through the waiting room area)
- A suspect case should wear a surgical mask during transport

b. Referral protocol

Anyone (e.g. family members, friends, volunteers) who accompanied the suspect case to the outpatient setting should be given written information on infection prevention and control measures.

The essential arrangements for strict barrier nursing and isolation should be available in all the regional hospitals. A specially equipped ward has been designated in regional referral hospitals for admission and management of all suspect and probable SARS/MERS cases in the country. Hence all suspect cases should be immediately transferred to this destination at the first available opportunity.

c. Treatment

There is no specific antiviral treatment recommended for SARS/MERS infection. Early supportive therapy and monitoring is key. The aim of the treatment is management of ARDS, management of septic shock, the prevention of complications, support to vital organ functions and to prevent the spread of the disease.

Identify asymptomatic positive persons, isolate and follow-up until 2 consecutive samples taken 24 hours apart are negative.

General guidelines adopted in hospitals for the control of nosocomial transmission of infectious diseases like viral haemorrhagic fever, MRSA, etc. should be adhered to in dealing with cases of suspect SARS/MERS. All staff including ancillary staff should use IP and C measures.

- Use disposable material and equipment as often as possible
- Hand washing and respiratory precautions is crucial
- Concurrent disinfection of secretions
- Soiled gloves, stethoscopes and other equipment have the potential to spread infection

Confirmed SARS/MERS cases should be isolated and accommodated as follows in descending order of preference:

1. Negative pressure ventilation room with the door closed
2. Single room with its own bathroom facility
3. Cohort placement in an area with an independent air supply, exhaust system and bathroom facilities

For details on the disinfection procedures to be adopted refer to 'Infection Prevention and Control Manual.'

7. Surveillance and reporting

- The case should be also discussed with the designated NFPs for surveillance. Once a consensus is reached then the case should be notified
- Case-based reporting of all suspect cases of SARS/MERS should be done immediately
- Concurrently the Epidemiologist/regional Focal Point for communicable diseases should elicit

complete history of movements and contacts of that case in the preceding 2 weeks and immediately launch an epidemiological investigation of the case

- The special notification form for SARS/MERS should be utilized for notification

Note: NFPs for surveillance and case management should consult the NFPs to assess the clinical and epidemiological *compatibility*.

Note: The clinical presentation of SARS/MERS may mimic simple upper respiratory tract infection; clinical compatibility therefore cannot be entirely relied upon. The epidemiological compatibility of the case is thus can be assessed with detailed history of the movements of the suspect case in the past two weeks elicited by thorough interrogation.

9. Prevention and control

- There is NO licensed vaccine currently available
- Case report (SARS/MERS) universally required under IHR

Contacts management

- The close family contacts should be considered to be exposed and should be put under surveillance for a period of 14 days
- Strict isolation and quarantine however is not recommended
- The family should be visited by the designated health worker and they should be explained about the importance of daily monitoring of clinical symptoms
- Daily checking of the body temperature for fever and/or appearance of respiratory symptoms should be considered as a cause for suspicion
- This could be either done at home by the health inspector or the family members should report at the nearest health facility on a daily basis

10. Laboratory investigation protocol

The CPHL in Muscat is designated as the only laboratory in the country for conducting all laboratory investigations for SARS/MERS infection.

The director/Focal Point of the laboratory should be contacted in advance and the procedures and protocols for taking clinical samples, handling, storage and transport should be discussed in detail before sending the samples. The IP and C precautions should be strictly adhered to.

SARS-CoV

Type of test	rRT-PCR			Serology*
Type of sample	Respiratory samples: 1. BAL or tracheal aspirate or sputum (collect 2-3 ml into a sterile, leak-proof, screw cap dry container) AND 2. Nasal and throat swab (viral swab)	Stool (collect in leak-proof, clean, dry container)	Plasma (EDTA blood): 5-10 ml	Serum (in SST): 5-10 ml, acute and convalescent
When to collect	At any stage during illness (levels of SARS-CoV may be higher later in the course of the illness)	After the first week of illness	Within first week of illness	Acute serum: Within first week of illness Convalescent serum: > 28 days after onset of illness
Storage	At 4°C up to 48 hours. Freeze at -70°C if exceeding 48 hours			
Transport	Category B			
BSL	BSL2 in a Class II BSC and collected with appropriate PPEs			
Availability	CPHL			

* Check with CPHL for availability of the assay before sending samples.

MERS-CoV

Type of test	rRT-PCR	
Type of sample	Respiratory samples: 1. BAL or Tracheal aspirate or sputum (collect 2-3 ml into a sterile, leak-proof, screw cap dry container) AND 2. Nasal and throat swab (viral swab)	Plasma (EDTA blood): 5-10 ml
When to collect	Ideally within 7 days after symptoms onset, but still can be tested afterward if still symptomatic	Within 1 st week of illness
Storage	At 2-8°C up to 72 hours Freeze at -70°C if exceeding 72 hours and ship on dry ice	At 2-8°C and ship on icepack (do not freeze)
Transport	Category B	
BSL	BSL2 in a class II BSC and collected with appropriate PPEs	
Laboratory	CPHL	

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Food Poisoning Syndrome

Food poisoning due to infectious agents including salmonellosis

1. Background

Food poisoning is a syndrome of acute gastroenteritis (AGE) caused by ingestion of food or drink contaminated with either bacteria or their toxins or poisons derived from plants or animals. More than 250 different foodborne diseases have been described. The most common epidemiological pattern of this disease is a sharp and explosive outbreak mostly in close communities, catering organizations, e.g. student's hostels, Armed Forces mess halls, worker camps, hotels and restaurants.

Such outbreaks can also occur in household situations if storage is improper. Festive occasions when large gatherings of people are offered a communal meal, e.g. weddings, birthday parties, etc. might also present an opportunity for an outbreak of food poisoning.

Outbreaks are particularly common during the hot months (May to September) when the environmental ambient temperature is in the vicinity of 37° C. In such situations inappropriately stored food material (raw or cooked) may provide an excellent substrate for bacteria to multiply and flourish.

Frequent causes of foodborne illnesses are:

1. Toxins elaborated by bacterial growth, harmful algae species and chemicals
2. Bacterial, viral or parasitic infections

2. Epidemiological features

Infectious agent	Bacterial (table 15), viral and parasitic
Reservoir	Humans, occasionally cows with mastitis, dogs, fowl
Transmission	Ingestion of contaminated food
Incubation	Generally 2-4 hours, See table below
Communicability	As long as the food item is contaminated
Susceptibility	Universal, disease may be severe in children and elderly

Table 19: Common bacterial agents causing food poisoning

Organism	Reservoir	Food items	Pathogenesis	Incubation	Clinical features
<i>Staphylococcus aureus</i>	Cows with mastitis, Human	Milk and milk products, vegetable salads, custards	Heat-stable preformed enterotoxin	1-6 hours	Vomiting and diarrhoea
<i>Bacillus cereus</i>	Soil	Raw, dried and processed foods	Enterotoxin	0.5-6 hours	Vomiting, diarrhoea, abdominal cramps
<i>Clostridium perfringens</i>	Soil, animals, humans	Meat, meat dishes and poultry. Food prepared 24 hrs before allowed to cool slowly at room temperature and heated immediately before serving	Enterotoxin	12-24 hours	Diarrhoea, abdominal cramps, vomiting
<i>Clostridium botulinum</i>	Soil, dust, animals	Canned vegetables, smoked or pickled fish, homemade cheese and low acid foods	Heat labile Neurotoxin	12-72 hours	Vomiting, diarrhoea, diplopia, descending flaccid paralysis
<i>Escherichia coli</i> (enterotoxigenic)	Humans, animals (cattle)	Raw fruits and vegetables, milk, cheese, contaminated meat during slaughter contaminated water, person-to person	Heat labile toxin	6-48 hours	Diarrhoea, abdominal cramps, nausea, vomiting
<i>Escherichia coli</i> (O157: 87)			Shiga toxin	4-5 days	Diarrhoea (often bloody), severe abdominal cramps, Haemolytic uraemic syndrome (HUS)
<i>Shigella</i> species			Entero-invasive	2-4 days	Diarrhoea (often bloody), fever, abdominal cramps
<i>Salmonella enterica</i>	Animals, poultry	Milk and milk products, sausages, custards, ice-cream, salads (cucumber), egg and egg products (hummus, tahini)	Entero-invasive	16-48 hours	Fever, anorexia, malaise, headache, myalgia, sometimes diarrhoea or constipation
<i>Vibrio parahaemolyticus</i>	Warm salt water	Raw or undercooked shellfish (oysters), open wound exposed to warm sea water	Cholera-like enterotoxin	6-36 hours	Diarrhoea
<i>Campylobacter jejuni</i>	Domestic animals	Chicken carcasses (88 %)	Enterotoxin	2-5 days	Diarrhoea (often bloody), fever, abdominal pain

Note: Norovirus outbreaks occur in the food service settings like restaurants, day care centres etc. Infected food handlers serving with bare hands are frequently the source. Ready-to-eat foods, raw fruits and vegetables and oysters are the common food items.

3. Situation in Oman

Food poisoning of infectious origin is one of the most common infectious diseases in Oman. The following graph shows the cases notified since 1991. The rapid changes in lifestyle and food habits could probably be responsible for initial rise as also the increase in general awareness and health care seeking behaviour. The trend in recent years appears to be on the decline.

Fig. 55: Reported cases of food poisoning in Oman: 1991-2015

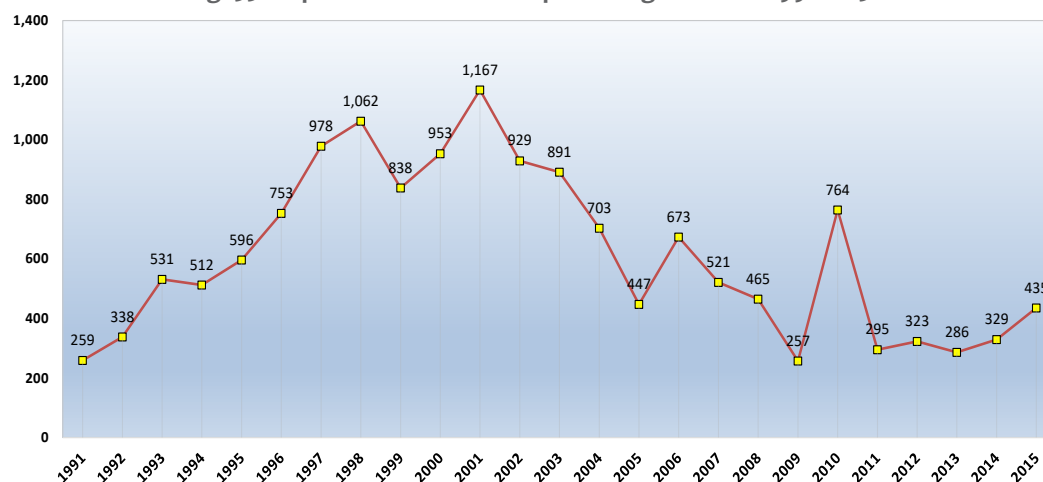


Table 20: Bacterial isolates from food poisoning episodes in Oman: 1991-2015

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Salmonella spp.	71	63	43	62	65	32	13	51	28	8	7	152	14	21	2	8	101*
S. enteritidis																	
Salmonella gr C				2									1				
Salmonella gr D			1	2	3			9								11	
Staph aureus				7	24	18		2	2			7					

*Salmonella weltevedren outbreak in Saham

4. Case definition

Suspect

An incident in which 2 or more persons experience a similar illness after ingestion of a common food and epidemiological analysis implicates the food as the source of illness.

The condition is characterized by:

- sudden onset of illness (short period-few hours-days)
- history of ingestion of common food
- attack of many persons at the same time and
- similarity of signs and symptoms in the majority of cases

The reported event could be classified into 2 types:

- **Minor event** is a single household event in which few members of the family are affected usually with mild signs and symptoms (not requiring admission)
- **Major event** is that in which a large number of people from different households are affected. Usually in these situations the food is served by a catering company in a cafeteria, mess, hotel and restaurant or in parties

Note: single case of foodborne illness is difficult to identify unless as in botulism, which is a distinctive clinical syndrome.

Confirmed

Suspect case which is laboratory confirmed

5. Case management

Treatment typically depends on the source of the illness and the severity of symptoms. For most people, the illness resolves without treatment within a few days, though some types of food poisoning may last longer.

Fluid replacement is key to prevent or treat dehydration. Choice of antibiotics is based on the laboratory identification of organism and the antibiotic sensitivity report.

6. Surveillance and reporting

All events of food poisoning whether minor or major must be reported immediately within 24 hours to the regional health authorities (Epidemiologist or the Focal Point for communicable diseases).

In addition, for major events of food poisoning an epidemiological investigation must be conducted. A preliminary report should be prepared and submitted within 24 hours to national surveillance unit. The final report should then be submitted after the reports of laboratory investigations are received and community actions for control are undertaken.

However for the minor events of food poisoning detailed investigations are NOT mandatory. The actions are limited to visiting the household and offering health education to the family in food hygiene to prevent such occurrences in future.

7. Outbreak investigation

A notified outbreak should be immediately investigated using the specific investigation form. The aim is to identify the implicated food item and to ascertain the circumstances leading to the contamination. Delay in investigation should be avoided since it may result in the destruction of evidence either due to deterioration of specimen or carelessness or deliberate attempt by kitchen staff to dispose of the implicated food item.

Outbreak investigation team

The epidemiological investigation should be led by the Epidemiologist in the region. Other members of the team include the regional Focal Point for nutrition and environmental health. The team may need to liaise with the concerned staff in the municipality (*Baladiyah*).

Epidemiological investigation

Use the 10 general steps of investigating an outbreak including the following minimum details.

- Obtain a list of the various items of food served during the implicated meal
- A complete line list of persons, whether affected or unaffected, who consumed the suspected meal should be prepared. Collect following data elements such as name, age, sex, items consumed, symptoms and signs along with time of appearance (include vomiting, diarrhoea, bloody stools, fever, abdominal cramps), management details and the outcome
- Ascertain the source of supply of the food item
- Inspect the place of preparation for general cleanliness
- Note the amount of handling the food received before, during and after cooking
- Ascertain the method of storage and transport of the food item
- Check for general hygiene of the place, cockroach and rodent menace
- Clinically examine the food handlers and take laboratory specimens for examination if required

Report preparation

Descriptive analysis of the data should be done in terms of time, place and person distribution. Food specific attack rates should be calculated. A case-control or retrospective cohort study should be undertaken to establish the epidemiological association between illness and intake of an implicated food item.

A preliminary brief report of all major outbreaks should be submitted to the national surveillance unit within 24 hours of the occurrence. A final report providing detailed epidemiological findings and laboratory investigations along with recommendations is required to be submitted within 3 weeks of occurrence of the event to the national level.

8. Prevention and control

The WHO is promoting improvement of food safety as part of the 2015 World Health Day campaign **“from farm to plate, make food safe.”** It is working with countries and partners to strengthen efforts to prevent, detect and respond to foodborne disease outbreaks in line with the *Codex Alimentarius* (Latin for “Food Code” established by FAO and the WHO in 1963). The organization advocates food safety is a shared responsibility – from farmers and manufacturers to vendors and consumers – and is raising awareness about the importance of the part everyone can play in ensuring that the food on our plate is safe to eat.

Food sanitation

- Ensure examination by veterinary staff before and after slaughter
- Maintain good personal hygiene for people involved in food handling
- Advise periodic check and examination of food handlers
- Advocate proper food handling techniques
- Recommend sanitary improvement in the establishments
- Ensure health education for food handlers, families and community

Refrigeration

Advice **“cook and eat same day”** practice and proper storage of raw and cooked items.

Surveillance

It is recommended that food samples are examined from establishments periodically and subjected to laboratory analysis.

Salmonella and eggs

Salmonella can be on both the outside and inside of eggs that appear to be normal, and if the eggs are eaten raw or lightly cooked, the bacterium can cause illness.

- Buy and keep eggs and egg preparations refrigerated at $\leq 4^{\circ}\text{C}$ at all times. Do not keep eggs warm or at room temperature for more than 2 hours
- Discard cracked or dirty eggs
- Wash hands and all food contact surface areas with raw eggs usage
- Eggs should be thoroughly cooked until both the yolk and white are firm. Recipes containing eggs mixed with other foods should be cooked to a temperature of 71°C or more. Avoid dishes made with raw or lightly cooked unpasteurized eggs
- Restaurants should use pasteurized eggs in any recipe (such as **Hollandaise sauce or Caesar salad** dressing) that would result in consumption of raw or lightly cooked eggs

9. Laboratory investigation protocol

Samples for laboratory investigation

In major outbreaks, samples should be obtained from at least 10 to 20 individuals who manifest illness typical of the outbreak to confirm the outbreak and also from some exposed, but not ill, persons. In minor outbreaks, samples should be collected from as many cases as practicable.

Stool	<ul style="list-style-type: none">• From cases 10-20 samples should be collected• From controls – exposed but without illness• All the suspected food handlers
Vomit	<ul style="list-style-type: none">• From cases directly in to the laboratory container
Nasal swab	<ul style="list-style-type: none">• From all the suspected food handlers
Food	<ul style="list-style-type: none">• Remnants of the specific articles of cooked food• Items of raw solid and liquid food items used for the meal
Water	<ul style="list-style-type: none">• Collect water from suspected areas, including from bottles in refrigerators, ice cubes, basins
Serum/urine	<ul style="list-style-type: none">• Serum or urine samples in case of chemical toxin is suspected

Type of test	Bacterial culture	Viral PCR	Serotype	Toxin detection	Genotype (PFGE)
Type of sample	Stool, vomitus, food, nasal swab	Stool	Bacterial isolate		
When to collect	During acute illness				
Storage	See notes below				
Transport	Category B				
BSL	BSL II (e.g. <i>Shigella dysenteriae</i> type 1, <i>Escherichia coli</i> O157)				
Laboratory	Regional hospital and public health	CPHL			

Note:

- **Stool:** keep refrigerated. Place bagged and sealed specimens on ice or with frozen refrigerant packs in an insulated box. For viral PCR keep at 4°C for up to 48 hrs and freeze at -20°C if exceeding 48 hrs.
- **Vomitus:** collect at least 100 ml of vomitus. Keep sample refrigerated. Do not freeze.
- **Food:** Collect at least 200 gram. Keep the sample refrigerated. Do not freeze samples unless they are already frozen.
- **Frozen samples:** place bagged and sealed samples on frozen ice packs.

Fig. 56: Five keys to safer food (WHO)

Five keys to safer food



Keep clean

- ✓ Wash your hands before handling food and often during food preparation
- ✓ Wash your hands after going to the toilet
- ✓ Wash and sanitize all surfaces and equipment used for food preparation
- ✓ Protect kitchen areas and food from insects, pests and other animals

Why?

While most microorganisms do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These microorganisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause foodborne diseases.



Separate raw and cooked

- ✓ Separate raw meat, poultry and seafood from other foods
- ✓ Use separate equipment and utensils such as knives and cutting boards for handling raw foods
- ✓ Store food in containers to avoid contact between raw and prepared foods

Why?

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.



Cook thoroughly

- ✓ Cook food thoroughly, especially meat, poultry, eggs and seafood
- ✓ Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer
- ✓ Reheat cooked food thoroughly

Why?

Proper cooking kills almost all dangerous microorganisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.



Keep food at safe temperatures

- ✓ Do not leave cooked food at room temperature for more than 2 hours
- ✓ Refrigerate promptly all cooked and perishable food (preferably below 5°C)
- ✓ Keep cooked food piping hot (more than 60°C) prior to serving
- ✓ Do not store food too long even in the refrigerator
- ✓ Do not thaw frozen food at room temperature

Why?

Microorganisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of microorganisms is slowed down or stopped. Some dangerous microorganisms still grow below 5°C.



Use safe water and raw materials

- ✓ Use safe water or treat it to make it safe
- ✓ Select fresh and wholesome foods
- ✓ Choose foods processed for safety, such as pasteurized milk
- ✓ Wash fruits and vegetables, especially if eaten raw
- ✓ Do not use food beyond its expiry date

Why?

Raw materials, including water and ice, may be contaminated with dangerous microorganisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Care in selection of raw materials and simple measures such as washing and peeling may reduce the risk.

Knowledge = Prevention



Food Safety
World Health Organization

WHO/FAO/WHO/UNEP
Distribution: General
Original: English

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Group B

Diseases and Syndromes

Group B Diseases

Introduction

The diseases included in this group are a priority and are required to be notified and investigated. However the reporting is comparatively less urgent. Individual case notification should be completed after receiving additional clinical details or laboratory results. Seven days period is permissible for reporting the cases. However, clustering of cases/outbreak of a disease or syndrome from group B diseases should be notified immediately.

From the earlier (March 1991) classification of group B, some diseases either have been removed from the category or moved into another category as described below:

- **Anthrax** was never reported in Oman hence removed from the priority list
- Oman was certified by the WHO as free from **Dracunculiasis** (Guinea worm) in 1994, hence the disease was deleted from the list
- The **active trachoma** (Trachomatous inflammation, follicular [TF] and Trachomatous inflammation, intense [TI]) has been deleted from the diseases under surveillance since Oman has been declared free from blinding trachoma hence considered no more a public health problem (January 2016)
- The Hib vaccine was introduced in 2001. Therefore to monitor the incidence of ***Haemophilus meningitis*** (impact evaluation) the disease was upgraded to group A
- **Food poisoning** was upgraded to a group A syndrome because of the urgency of investigation and public health actions
- **Mumps** and **Varicella** have been moved from group C to B since specific vaccines for these diseases have been introduced in the childhood immunization programme and as a result case-based surveillance was desirable (January 2016)

Syndromic surveillance

- **Acute Encephalitis Syndrome (AES)**
- **Other Meningitis Syndrome**

All types of meningitis except those due to *meningococcal*, *H. influenzae type b* and *pneumococcal* are included in this group. Despite efforts to identify the responsible pathogen either by culture or by antigen test and if all the results are negative, the case should be classified as unspecified.

B15, B16, B17.0-17.2

Acute Viral Hepatitis

Including Serotypes A, B, D, C, and E

1. Background

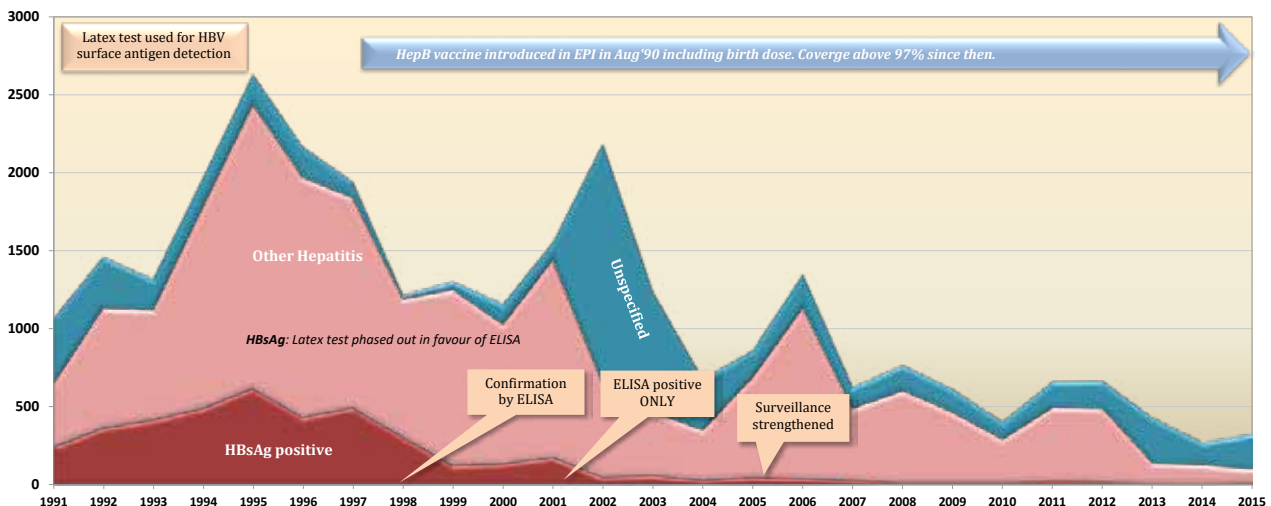
Several distinct viral infections of liver are grouped as viral hepatitis. They are similar in many ways, but differ in aetiology and some epidemiological, immunological, clinical and pathological characteristics. Their prevention and control thus vary greatly.

The common serotypes are A, B, C, D and E. Other than hepatitis B Virus, all other are RNA viruses. The various serological types of hepatitis can be roughly divided into 2 groups. One group is comprised of hepatitis A and E that are transmitted usually by faeco-oral route. While the other group consists of hepatitis B and C infections that are transmitted by parenteral route. Hepatitis D can propagate only in the presence of the hepatitis B virus.

2. Situation in Oman

Viral hepatitis cases commonly occurring infections in Oman and have been under surveillance since 1991. All cases of acute viral hepatitis were tested for hepatitis B surface antigen to group them into positive and negative. Those not tested were classified as unspecified. The initial rapid screening test (latex agglutination test) utilized for this purpose was found to be low in specificity leading to a large number of false positive results. Because of this, it was decided in 1997 to confirm all latex positive samples by the gold standard ELISA. However, this policy was not followed uniformly throughout the country leading to variation in the information available. Latex positive cases even if not confirmed by ELISA were counted as hepatitis B. In 1999, most of the laboratories started performing the ELISA and from 2000 onwards it was decided to include only ELISA test results for the hepatitis B surface antigen. Finally, the latex test was withdrawn from the field in favour of ELISA from mid-2001. Thus there was a wide variation in the diagnostic criteria used for viral hepatitis surveillance. The available surveillance data on hepatitis should hence be interpreted on this background.

Fig. 57: Notified cases of acute viral hepatitis in Oman: 1991-2015



As envisaged in the sixth 5-year plan (2001-2005), the surveillance of individual types of viral hepatitis would help to estimate their individual burden and would also help to assess the impact of interventions.

3. Case definition

An acute illness with a discrete onset of any sign or symptom consistent with acute viral hepatitis (e.g., fever, headache, malaise, anorexia, nausea, vomiting, diarrhoea, and abdominal pain) and either:

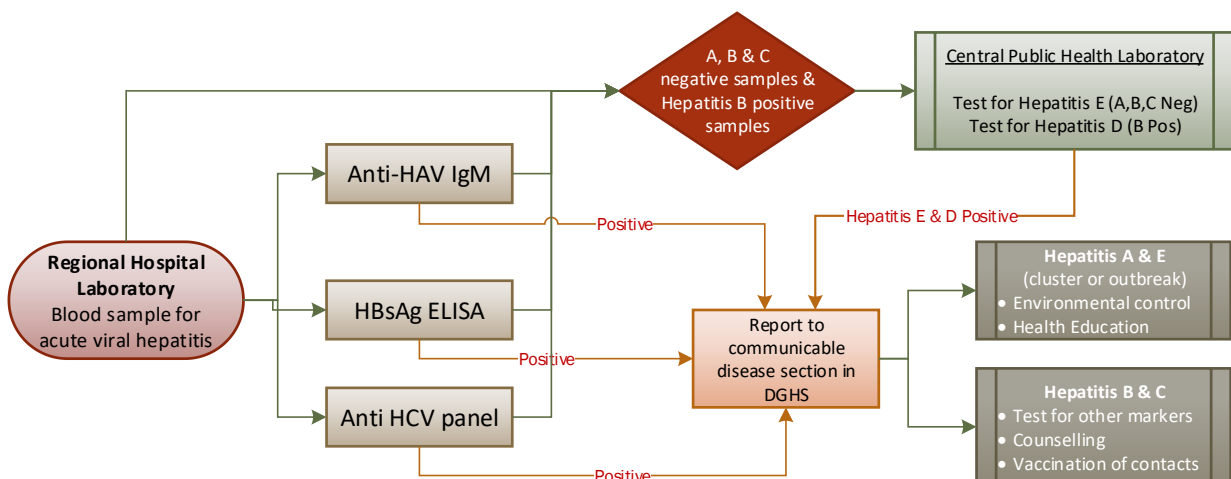
- Jaundice **OR**
- Elevated serum alanine/aspartate aminotransferase

4. Surveillance and reporting

All cases of acute viral hepatitis should be individually notified pending further classification. Blood sample should be collected and sent to the regional hospital laboratory for serological markers. The laboratory would process the sample based on the following algorithm. The case should be classified as either A, B, or C positive or negative. The A, B, and C negative samples should be forwarded to CPHL for diagnosis of viral hepatitis E. All HBsAg positive would be further tested for type D at CPHL.

For the purpose of surveillance and public health actions, an algorithm has been developed to conduct the laboratory investigation for all acute viral hepatitis cases reported at the health institutions.

Fig. 58: Investigation and public health action algorithm for acute viral hepatitis



5. Laboratory investigation protocol

Type of test	Anti-HAV	HBsAg	Anti-HCV	Anti-HEV	Anti-HDV
Sample	Serum 5-7 ml (PCR for hepatitis C virus [HCV] on request. Collect plasma [EDTA] 5-7 ml)				
When to collect	5-10 days after exposure or in acute stage (jaundice)			A, B, C negative	HBsAg positive cases only
Storage	At 4° C up to 48 hours. Freeze at -70° C if longer				
Transport	Category B				
BSL	BSL II				
Availability	Regional Hospitals			CPHL (for HEV and HDV)	

Note:

- Regional laboratory should mention results (A,B,C status) on request form when sending sample to CPHL
- Liver function tests must be part of the initial work-up of acute hepatitis
- All reactive HCV antibody should be followed by HCV PCR. Positive test indicates active HCV infection. If negative repeat after 3-6 months
- Note that it is not easy to differentiate acute and chronic HCV infection on laboratory tests alone. Consult the specialist
- HBsAg reactive must be confirmed by neutralization or equivalent assay. Other markers should be tested if confirmed e.g. Anti-HBc, HBeAg and Anti-HBe. For fulminant hepatitis also test for HBc IgM

Acute Viral Hepatitis – Enteric Transmission

Acute viral hepatitis ‘A’ and ‘E’

(Infectious hepatitis, epidemic hepatitis, epidemic jaundice, catarrhal jaundice)

1. Background

Enterically transmitted hepatitis is a worldwide health problem, with both sporadic cases and epidemic outbreaks. In developing countries, adults are usually immune and epidemics are uncommon, but improved sanitation leads to the presence of many susceptible adults in developing countries, where outbreaks – particularly institutional outbreaks – are increasing. Common source epidemics may evolve explosively. In some areas of Africa and Asia more than 90% population have serological evidence compared to developed countries (33%).

As stated by WHO the countries in the world can be roughly divided into 3 categories for hepatitis A infection:

High endemic: all population asymptomatically affected in childhood with HAV, which effectively prevents clinical hepatitis A in adults. In these countries, large scale vaccination programmes are not recommended.

Intermediate endemic: relatively a large proportion of adult population is susceptible to HAV, a large scale childhood vaccination may be considered as a supplement to health education and improved sanitation.

Low endemic: vaccination is indicated for individuals with increased risk of contracting the infection, such as travellers to areas of intermediate or high endemicity.

Fig. 59: Estimated global prevalence of hepatitis A



Source: CDC 2005

The disease varies in clinical severity from asymptomatic illness to severely disabling disease. Fever, chills, headache, fatigue, generalized weakness, followed by anorexia, nausea, vomiting, dark urine and jaundice are some of the nonspecific symptoms. The onset is abrupt in adults in non-endemic areas.

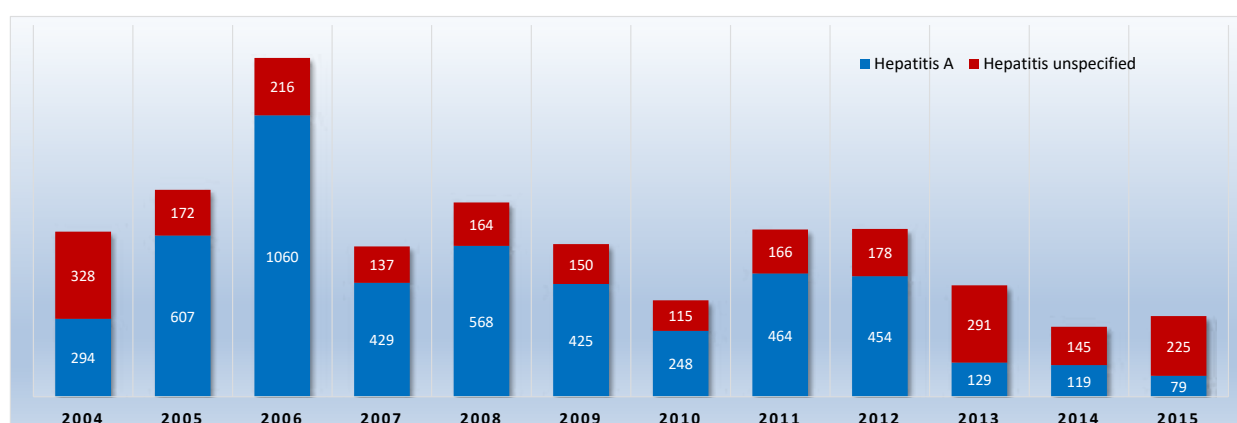
2. Epidemiological characteristics

Infectious agent	Hepatitis A Virus
Reservoir	Humans
Transmission	Faeco-oral (food and water), parenteral, sexual
Incubation	10-50 days (usually 14-28 days)
Communicability	greatest from 2 weeks before to 1 week after the onset of jaundice
Susceptibility	Universal. Children suffer more than adults. Homologous immunity after infection

3. Situation in Oman

Surveillance data on viral Hepatitis A are indicative of intermediate endemicity in Oman. Hence infections occur mainly in childhood with periodic outbreaks in young adult population. However the country is in transitional phase and cases are on the decline.

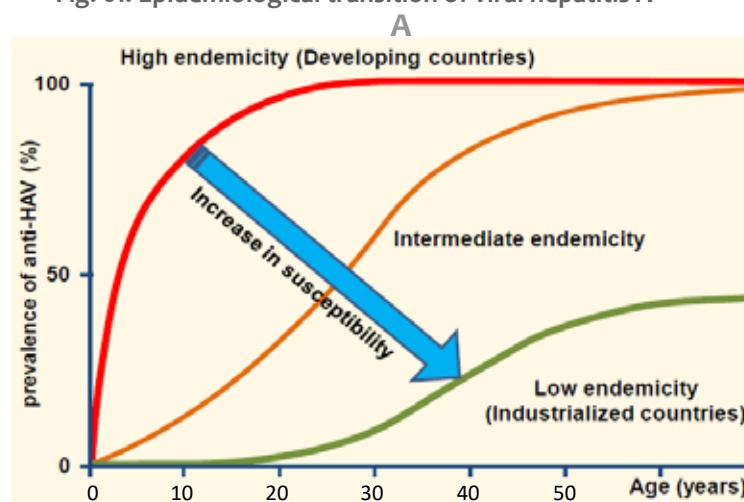
Fig. 60 Notified cases of acute viral hepatitis A in Oman: 2004-2015



A seroepidemiological study (school survey) was done in Oman in 2005 with the primary objective of assessing impact of Hepatitis B virus (HBV) vaccination. Sera were also tested for HAV-IgG. In a multi-stage cluster sample of 2,067 first primary school children (age 6-7 years) the antibody prevalence was 51.9% (CI 46.1, 54.7%).

These data suggests Oman is intermediate endemic country and is presently in transitional phase (Fig. 52).

Fig. 61: Epidemiological transition of viral hepatitis A



4. Mode of transmission

The virus is transmitted through faecal-oral contact. The agent of hepatitis A occurs in faeces, at peak levels in 1-2 week preceding the onset of symptoms and diminishing rapidly after symptoms appear; this information is not available for hepatitis E. Except in premature infants, and most cases are probably non-infectious after the first week of jaundice.

Common source epidemics have been related to contaminated water and to the ingestion of molluscs or uncooked seafood from such waters, as well as to contamination via infected food handlers.

There is no evidence of a chronic form of the infection, although manifestations of the disease may persist for several months. Homologous immunity after infection probably lasts for life, at least for hepatitis A.

The case fatality rate for enterically transmitted hepatitis is usually low (< 1:1000) but can be higher (up to 25:1000) for children under 5 and for those aged 50 and over. Among pregnant women infected with hepatitis E during late pregnancy, the disease may be fulminating and the case fatality rate may reach 20%.

5. Laboratory criteria

Serology: antibodies beginning to appear after 5-10 days of exposure.

- **Hepatitis A:** IgM anti-HAV positive
- **Hepatitis E:** IgM anti-HEV positive

6. Case management

- There is no specific treatment for hepatitis A. Recovery from symptoms following infection may be slow and may take several weeks or months.
- Most important is the avoidance of unnecessary medications. Acetaminophen / Paracetamol and medication against vomiting should not be given.
- Hospitalization is unnecessary in the absence of acute liver failure.
- Therapy is aimed at maintaining comfort and adequate nutritional balance, including replacement of fluids that are lost by vomiting and/or diarrhoea.

7. Prevention and control

- Health education on personal hygiene, environmental sanitation and sanitary disposal of faeces
- Investigation of contacts and source of infection only if hepatitis A/E occurs or is suspected in a food-handler or in outbreak situation
- Improve hygienic and sanitary practices to eliminate faecal contamination of food and water
- Hepatitis A vaccine should be integrated into the national immunization schedule for children aged 12 months in endemic countries and later in non-endemic countries
- Outbreaks are common when there is a common source of infection (water or food). All outbreaks or clusters are to be reported and investigated immediately using the steps of investigation of an outbreak. Use of vaccination is limited and depends on the epidemiological situation and the regional Epidemiologist should be involved in consultation with the DCD for implementation
- Pre-exposure immunization:
 - Within 2 weeks of exposure
 - For children ≥ 12 months
 - For risk groups
 - To susceptible travellers to endemic countries
- Post-exposure immunization and IG:
 - Within 2 weeks of exposure
 - To close personal contacts
- HEV vaccine is under development

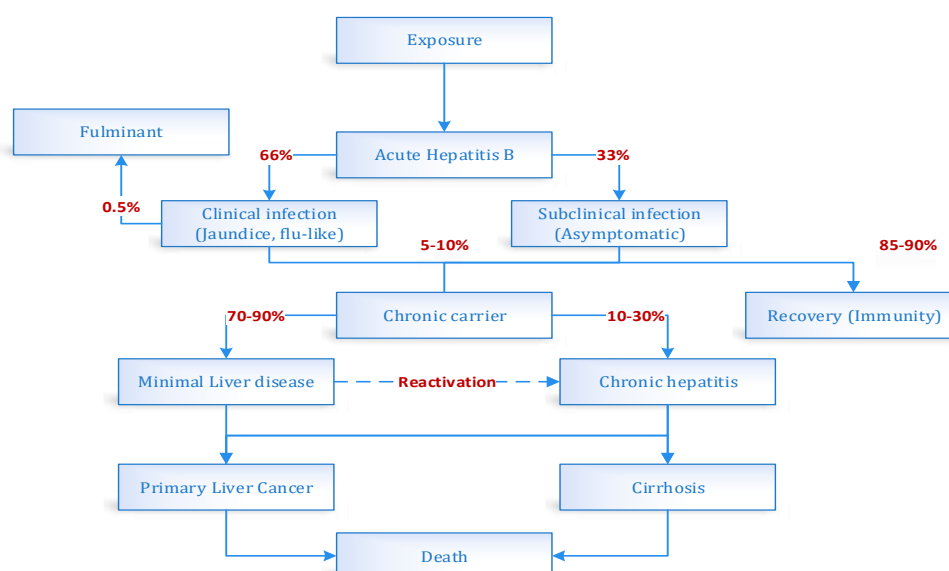
Acute Viral Hepatitis – Parenteral Transmission

Acute viral hepatitis ‘B’ and ‘D’

1. Background

It is estimated that more than 2 billion persons are infected with HBV globally including 200 million chronically infected. Each year 600,000 die as a result of HBV infection. Fewer than 10% of children and 30-50% of adults with acute HBV show icteric disease. Anorexia, nausea, vomiting, arthralgia and vague abdominal discomfort are some of the symptoms.

Fig. 62: Natural history of hepatitis B infection



Source: WHO 1994, EOHS Series No.8

Among children under 5 years of age who become infected with HBV, fewer than 10% have signs or symptoms of acute disease, but chronic infection develops in 80-90% of infants infected during the first year of life, and 30-50% of children infected between 1 and 4 years of age. By comparison, 30-50% of adults who become infected with HBV are symptomatic; only 2-6% develop chronic infection.

Chronic infection and severe sequelae occur – an estimated 15 to 25% will die prematurely of either cirrhosis, fulminating hepatitis or hepatocellular carcinoma. The virus of hepatitis B may be the cause of up to 50% of all cases of hepatocellular carcinoma worldwide, and is the second only to tobacco among known human carcinogens.

2. Epidemiological characteristics

Infectious agent	Hepatitis B Virus
Reservoir	Humans
Transmission	Parenteral, perinatal, sexual
Incubation	6 weeks-6 months (average 60-90 days)
Communicability	Varies, several months to years or until disappearance of HBsAg
Susceptibility	Universal. Immunity after infection. High-risk groups

Transmission of HDV can occur either via simultaneous infection with HBV (co-infection) or superimposed on chronic hepatitis B or hepatitis B carrier state (superinfection).

HBV and HIV: It is estimated that 10% of the 40 million infected with HIV worldwide are co-infected with HBV.

Control measures include ensuring transfusion safety and injection safety, and immunization. Hepatitis D shares many clinical and epidemiological characteristics with hepatitis B; control measures are similar for both of these agents.

Fig. 63: Estimated global prevalence of hepatitis B infection among adults

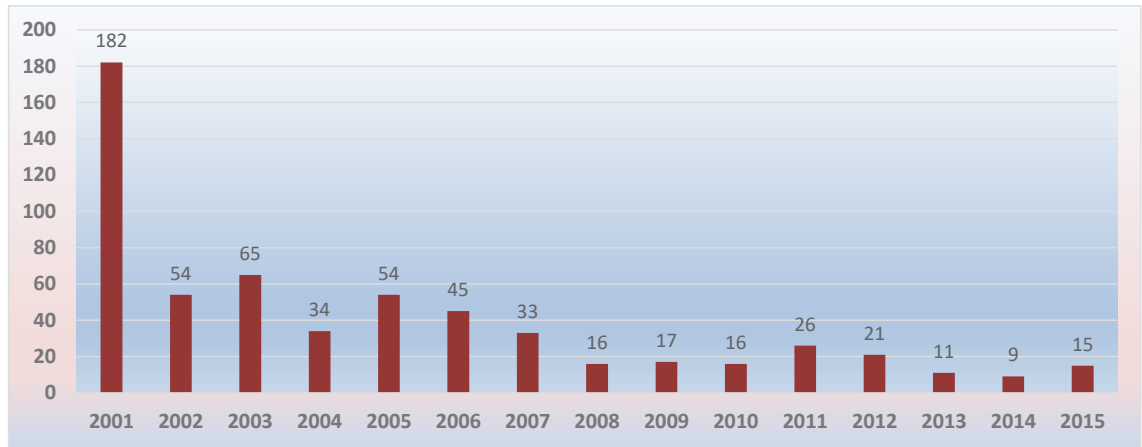


Source: Vaccine. 2012; 30(12):2212-19

3. Hepatitis B in Oman

Oman has been classified as intermediate endemic for hepatitis B although no population estimates are available on its true seroprevalence. In countries with an intermediate level of HBV endemicity (HBsAg prevalence 2-7%), infections occur commonly in all age groups, although transmission during infancy and early childhood maintains a high rate of chronic infection.

Fig. 64: Notified cases of acute viral hepatitis B (HBsAg+) in Oman: 2001-2014



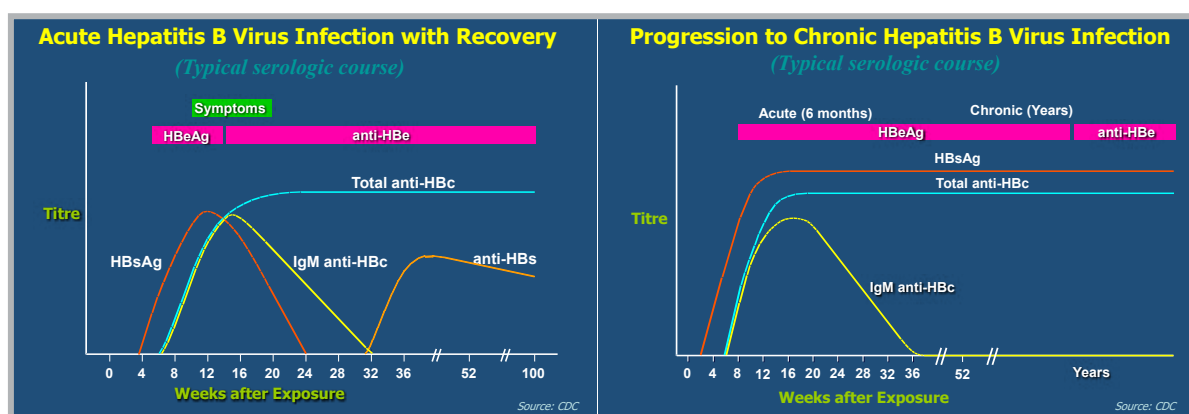
4. Mode of transmission

Major modes of HBV transmission include sexual contact with an infected person, perinatal transmission from mother to infant (vertical), shared needles or syringes among intravenous drug users, transfusions, and use of non-sterile parenteral equipment.

Transmission of HBV in households occurs from child-to-child (horizontal). The most important nosocomial exposures resulting in percutaneous hepatitis transmission include transfusion of blood or blood products that are not screened for hepatitis, unsafe injection practices (needlestick injuries), and other inadequate infection control practices.

5. Laboratory criteria

Fig. 65: Hepatitis B evolution and diagnostic markers



Serology: HBV surface antigen beginning to appear after 4 weeks of exposure.

- **Hepatitis B:** positive hepatitis B surface antigen (HBsAg + Anti-HBc-IgM)
- **Hepatitis D:** anti-HDV positive (as co-infection of hepatitis B)

Note: HBsAg positivity lasting for more than 6 months indicates a chronic infection. HBc IgM is important in the diagnosis of acute HBV infection. Other markers of clinical significance are HBeAg, anti-HBc, anti-HBe.

6. Case management

There is no specific medication for acute HBV infection. In adults, acute hepatitis is self-limiting in 95% of cases. The treatment should be conservative and supportive. Antiviral therapy is not therefore likely to improve the rate of recovery and is not required unless the disease is accompanied by complications. A proposal for the treatment of eligible cases is under consideration of the MoH.

7. Prevention and control

- Hepatitis B vaccination was introduced in EPI schedule from August 1, 1990 and over 97% coverage was achieved from the outset. Three doses include the birth dose, second dose at 40 days and the third at 7 months. Current schedule is at birth and at 2, 4, 6, months.
- Post-exposure immunization beginning at birth is highly effective in preventing neonatal infections in infants of HBV infected mothers. Optimum efficacy is achieved when vaccine is administered preferably within 12 hours after birth to protect against mother-to-child (vertical) transmission
- Catch-up school campaign was started among the high-risk group (adolescents up to 17-18 years of age) from 2001 and was continued until the year 2004 to reach the EPI vaccinated cohorts. As a result, by the year 2014 in Oman, all persons below the age of 28 years would have received vaccinations against hepatitis B
- Immunizations of spouse and the family contacts of all hepatitis B cases and carriers were started from year 2002
- The same policy of contact immunization was also followed for the contacts of HBsAg positive blood donors
- Hospital wards and laboratories strictly implement precautionary measures while handling blood or body fluids

- All aspects of injection safety are being followed including use of disposable syringe and needles, and safe disposal of infectious waste etc.
- Mandatory screening of all blood units for surface antigen was started from 1990 in all blood banks
- All health care workers immunization with hepatitis B vaccine was started
- Post-exposure prophylaxis using hepatitis B vaccine and/or hepatitis B immune globulin is used after percutaneous or mucous membrane exposure to blood that contains HBsAg such as a needlestick injury (follow IP and C guidelines on management)
- Estimation of antibodies (Anti-HBs) against hepatitis B is neither recommended nor the booster dose of the vaccine

Acute viral hepatitis C

1. Background

Hepatitis C is the major cause of parenterally transmitted hepatitis. Intravenous drug users and patients receiving multiple therapeutic injections (e.g. haemophilic patients) for long time under doubtful sterility conditions. The disease ranges from a mild illness to serious lifelong illness. The symptoms include fever, fatigue, and decreased appetite, nausea, vomiting abdominal pain, dark urine, grey-coloured faeces, joint pain and jaundice. About 75-85% of newly infected develop chronic disease and 60-70% of them develop chronic liver disease: 5-20% develop cirrhosis and 1-5% die from cirrhosis or liver cancer. In 25% of liver cancer patients, the underlying cause is HCV. Chronic infection is common in hepatitis C, and 5% to 20% of those infected may develop cirrhosis. There is an association between HCV infection and hepatocellular carcinoma. Every year, 3-4 million are infected of which 150 million chronically with HCV accounting 350,000 deaths each year.

2. Epidemiological characteristics

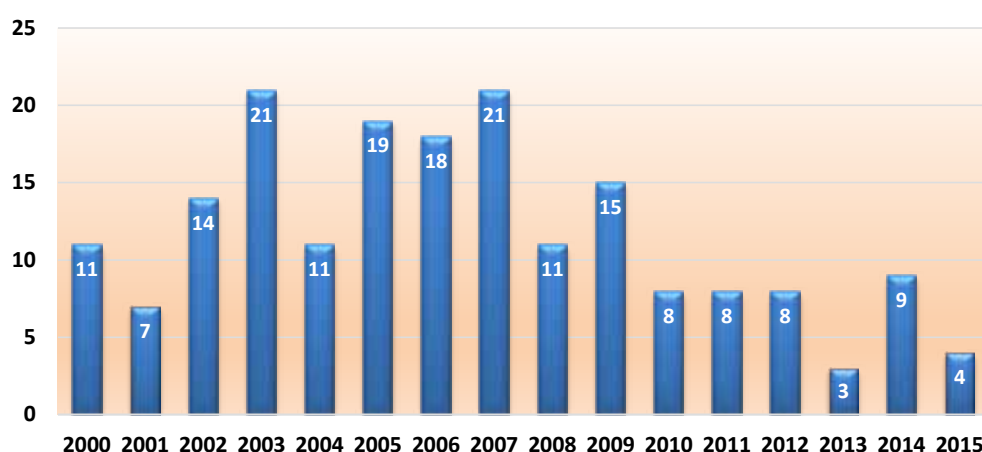
Infectious agent	Hepatitis C Virus
Reservoir	Humans
Transmission	Parenteral
Incubation	2 weeks to 6 months
Communicability	One or more weeks before onset of the first symptoms; may persist in most persons indefinitely
Susceptibility	Universal. Immunity after infection unknown. High-risk groups

3. Situation in Oman

Acute hepatitis C is under surveillance from 2005. However valid data on the true incidence and prevalence are scarce. Chronic cases are usually discovered in high risk groups such as patients in renal dialysis units and IDU. Prevalence in blood donors is on the decline. Indirect evidences suggest that HCV infections may not be a major public health problem in Oman.

Recently the availability of an effective drug treatment and its standardization has led to a renewed interest in the treatment of chronic hepatitis C patients. Therefore hepatitis C has been included along with hepatitis B in the proposed national registry for long term follow up and treatment.

Fig. 66: Notified cases of acute viral hepatitis C cases in Oman: 2000-2015



Cases are usually detected in renal dialysis units. Screening of hepatitis B and C is mandatory for all patients on dialysis. To avoid nosocomial transmission special dialysis equipment is earmarked for the use of known hepatitis C chronic carriers.

As a routine, all blood units for transfusion are also screened for hepatitis C (enzyme immunoassay) along with B. After 1996, an average annual prevalence of HCV in blood units was observed to be around 1% while in the year 2003 it was 0.8%.

4. Mode of transmission

The virus is transmitted by parenteral exposure to blood and plasma derivatives. It is found in highest concentrations in blood. Contaminated needles and syringes are the main vehicles of spread, either among parenteral drug users or through nosocomial transmission. The most important nosocomial exposures include transfusion of blood or blood products that are not screened for hepatitis C, injection overuse combined with unsafe injection practices, and other inadequate infection control practices. It may also be transmitted by sexual contact.

The risk of transmission by household contact or sexual relations appears to be low, as is the case for mother-to-child transmission.

5. Laboratory criteria

All new anti-HCV positive cases should be confirmed by HCV PCR. The anti-HCV test should be repeated after 3 to 6 months to evaluate chronicity of the infection.

6. Case management

The initial treatment is conservative and supportive.

Specific medications for treatment of chronic HCV infection are available. There are 6 genotypes of HCV and each responds differently to treatment. A proposal for the universal treatment of eligible cases of hepatitis C is under consideration by the MoH.

7. Prevention and control

- There is no universal vaccine available for HCV
- Hepatitis B virus vaccine is recommended for HCV positive patients
- Prevention of injection-associated transmission by using safe injection practices, including appropriate use and safe disposal of needles and syringes
- Appropriate disinfection and sterilization practices for equipment and environmental surfaces
- Health education and counselling on prevention, care, regular follow-up and treatment

Chapter 20

A01.0, A01.4

Typhoid and Paratyphoid

Enteric fevers

1. Background

Typhoid fevers are systemic bacterial diseases of worldwide occurrence, especially in developing countries, with an estimated 27 million cases and 210,000 deaths each year. The disease is common in South East Asia and the children are the most commonly affected. Rates of disease decreased in the developed world as a result of improved sanitation and use of antibiotics to treat the disease. It is caused by gram-negative bacilli, namely *Salmonella typhi* and *paratyphi*. Of the 3 serovars, *Salmonella paratyphi* A is most common, B is less frequent and C is extremely rare. Gradual onset of a high fever over several days followed by weakness, abdominal pain, constipation and headache are common. Diarrhoea and vomiting are uncommon. Some people develop a skin rash with rose coloured spots. Relapses occur in 3-4% of cases. Complications include intestinal perforation and haemorrhage, but mild or inapparent forms are common, especially in endemic areas, mainly where sanitation is poor. The case fatality is less than 1% with prompt appropriate antibiotics use.

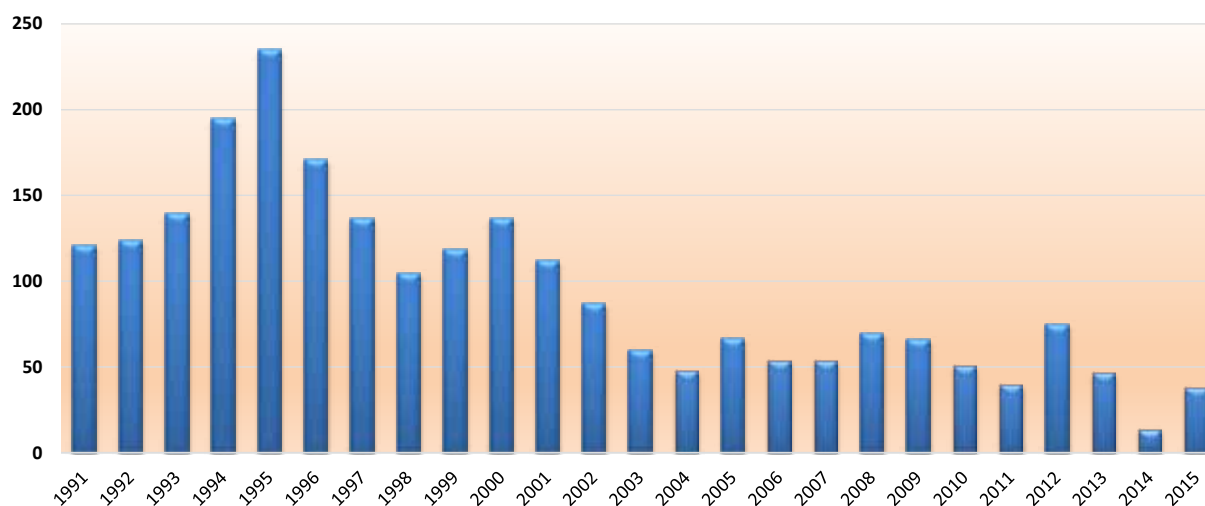
2. Epidemiological characteristics

Infectious agent	<i>Salmonella Typhi</i> , <i>S. Paratyphi</i> A and B
Reservoir	Humans
Transmission	Faeco-oral
Incubation	Usually 1-3 weeks, Paratyphoid 1-10 days
Communicability	Cases remain infective as long as typhoid bacilli persist in excreta
Susceptibility	Universal. Children (5-19 years), exposure to contaminated water and food

3. Situation in Oman

Enteric fevers are endemic in Oman. Following graph shows the overall declining trend in the country. Food handlers are considered a high risk group and are subjected to periodic health examination to rule out chronic carrier status.

Fig. 67: Notified cases* of enteric fevers in Oman: 1991-2015



*Widal test and/or culture positive cases

4. Case definition

Suspect

- Insidious onset of sustained fever, headache, malaise, anorexia, relative bradycardia, rose spots on the trunk, splenomegaly and constipation more common than diarrhoea in adults
- Epidemiological link to another confirmed case
- History of travel to endemic countries or areas

Confirmed

Suspect case which is laboratory confirmed

5. Mode of transmission

The incubation period depends on the infecting dose. Chronic carriers shed the organisms from their gall bladder and biliary tract. Major vehicles of transmission are food and water contaminated by faeces and urine. Flies may contaminate food in which organisms multiply to reach an infective level. Contaminated raw fruits and vegetables, milk and milk products by the food handlers (carrier) are the important vehicles of transmission in some countries.

About 10% of typhoid patients discharge bacilli for 3 months and by the end of a year, the figure is around 3% (chronic carriers). In paratyphoid, the fall in excretion may begin a week or 2 earlier.

6. Laboratory criteria

- Positive culture of salmonella from stool/urine/blood.

7. Case management

- Enteric precautions during illness and concurrent disinfection of faeces, urine and soiled articles
- Supportive treatment with oral or intravenous hydration, the use of antipyretics, and appropriate

nutrition

- More than 90% of patients can be managed at home with oral antibiotics, reliable care and close medical follow-up for complications or failure to respond to therapy
- First-line drugs, namely chloramphenicol, ampicillin, amoxicillin and trimethoprim-sulfamethoxazole
- Fluoroquinolones (ofloxacin, ciprofloxacin, fleroxacin, perfloxacin) are highly active and equivalent in efficacy

8. Surveillance and reporting

- Mandatory case-based reporting is required and initiate epidemiological investigation
- Locate family and house and enlist all members of family, age, sex and relationship to index case
- **Point-source epidemic** – active search for unreported cases and possible source

9. Prevention and control

- Take stool samples for culture from contacts to determine any unreported cases or carriers
- Educate the community about the importance of personal hygiene especially hand washing and also of sanitary disposal of waste, safe water supply, and housefly control
- If a household or close contact of the case is positive then he/she should not be allowed to food handling duties until at least 2 negative culture of stools collected 24 hours apart
- In Oman, Vi polysaccharide typhoid vaccine (Typhim Vi®) is offered to food handlers every 2 years

10. Laboratory investigation protocol

Type of test	Culture	AST	Serotype/ genotype
Type of sample	Urine, stool, blood culture	Bacterial isolate	Bacterial isolate
When to collect	From suspect case on presentation		
Storage	Samples should be processed immediately. If delay anticipated store at 4°C		
Transport	Transport to laboratory immediately or maximum within 24 hrs		
BSL	BSL2		
Laboratory	Regional hospitals		CPHL

Chapter 21

A37.0, A37.9, A37.1

Pertussis

100 day cough, whooping cough. Includes parapertussis

1. Background

Pertussis is a major cause of childhood morbidity and mortality in developing countries and is caused by *Bordetella pertussis*, a gram-negative bacillus. Humans are the only hosts. Case fatality rates in developing countries can reach to 4%. In the developed world fatality is low. Although pertussis may occur at any age, most cases of serious disease and most fatalities are observed in early infancy. Infants less than 6 months old, adolescents and adults do not have the typical 'whoop' or paroxysm. Complications include pulmonary hypertension, pneumonia, atelectasis, seizures and encephalopathy. High routine coverage with DTP vaccine is the mainstay of prevention. Recently pertussis is being observed in previously immunized adolescents and young adults indicating waning immunity. Outbreaks typically occur every 3-4 years. WHO estimates (2008), - despite an estimated worldwide vaccination coverage of around 82% with 3 doses there were still estimated 16 million pertussis cases and 195,000 deaths.

2. Epidemiological characteristics

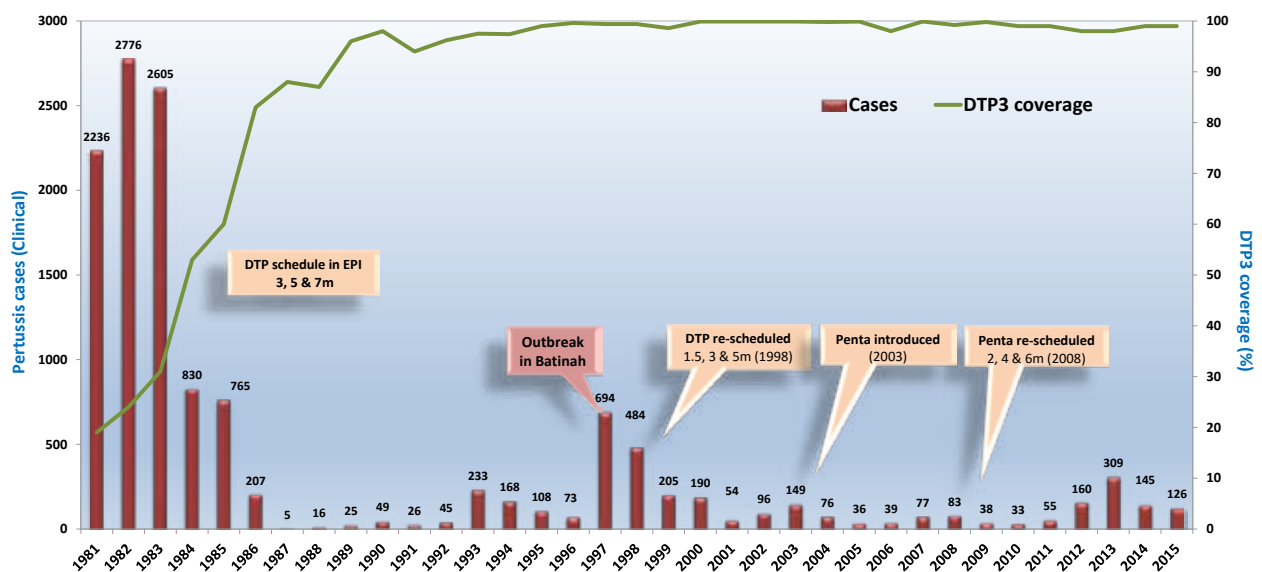
Infectious agent	<i>Bordetella pertussis</i>
Reservoir	Humans
Transmission	Droplet infection and direct contact
Incubation	Average 9-10 days (range 6-20 days)
Communicability	From the onset of the catarrhal stage up to paroxysmal cough
Susceptibility	Universal among unimmunized. Children < 5 yrs. Household and school contacts

3. Pertussis in Oman

Pertussis was a common childhood infection of the past. As the DTP3 coverage in the EPI increased to above 80% the incidence dropped dramatically by late 1980s. Due to the difficulties associated with the laboratory confirmation of pertussis, only outbreaks or clusters were investigated. Majority of the sporadic cases reported therefore are clinical. Hence, the total cases reported may include cases of pertussis-like illnesses of other aetiology.

In the following years, 2 outbreaks of pertussis were noted in some parts of the country the second being laboratory confirmed. The age distribution of the cases reported in the Sohar outbreak in 1997 revealed that a large proportion of cases occurred in infants less than 3 months of age, i.e. before the due date for DTP1. Therefore, DTP was rescheduled in the EPI to 6 weeks, 3 and 5 months.

Fig. 68: Incidence of pertussis in Oman: 1981-2014



4. Case definition

Suspect

A person with cough **with at least one** of the following symptoms:

- Paroxysms (i.e. fits) of coughing
- Inspiratory “whoop”
- Posttussive vomiting (i.e. vomiting immediately after coughing)

Confirmed

A suspect case with laboratory confirmation.

5. Mode of transmission

Pertussis is transmitted by direct contact with discharges from respiratory mucous membranes of infected persons via the airborne route, probably by droplets. The secondary attack rate is 90% among non-immune household contacts. Untreated patients may be contagious for 3 weeks after the onset of paroxysmal cough in the absence of treatment or 5 days after the onset of treatment although communicability diminishes rapidly after the catarrhal stage.

6. Laboratory criteria

- WBC count with absolute lymphocytes over 15,000/³mm or more (lymphocytosis)

- **Serology:** IgG Paired sample is recommended. Single sample serology can also provide good specificity and sensitivity to determine cases in older children, adolescents and adults. IgA antibodies may serve as an additional test for equivocal results. Measuring IgM only antibodies is not recommended
- **Isolation** (Culture) of *Bordetella* spp. from properly collected nasopharyngeal swab or aspirate taken within 2 weeks of illness
- **PCR** from NP swab or aspirate using Dacron swab taken within 4 weeks is confirmatory

Note: Obtaining a specimen from the posterior nasopharynx is an uncomfortable procedure for the patient and suboptimal specimen collection is common. Proper specimen collection procedure for NP swab will typically induce cough or sneeze. The person obtaining the specimen should wear a protective face mask and gloves to prevent droplet transmission (AGP).

7. Case management

Respiratory isolation

A reasonable guideline is to treat people age > 1 year within 3 weeks of cough onset and infants < 1 year and pregnant women within 6 weeks of cough onset. If the person is diagnosed late, antibiotics will not alter the course of the illness

Erythromycin, clarithromycin, and azithromycin are preferred in patients over 1 month of age. For infants < 1 month of age, azithromycin is preferred for PEP and treatment.

8. Surveillance and reporting

All suspect cases should be reported within 7 days along with immunization status. Attempts should be made to confirm the diagnosis although it is known that the organisms are difficult to culture. Confirmation may be required only in few cases in an outbreak situation.

Outbreak threshold: occurrence of a cluster of 5 or more suspect cases or a confirmed case of whooping cough. The decision on the outbreak situation and further interventions such as isolation, chemoprophylaxis, and immunization should be made by the Epidemiologist in the region or in liaison with the national surveillance unit.

9. Prevention and control

Routine pertussis vaccination is the best prevention measure.

The contacts of a confirmed case of pertussis should be managed as follows:

- Keep infants and young children away from the case
- Those known to have been in close contact with the case should be given chemoprophylaxis with erythromycin at a dose of 40 to 50 mg/kg of body weight per day in 4 divided doses for 14 days. Azithromycin is preferred if available
- Check immunization status of close contacts and give DTP dose if due
- A proposal is under consideration to vaccinate expecting mothers with Tdap vaccine during pregnancy that would be effective against early infection in newborns in their first 2 months of life
- Tdap vaccination has been included in the Health Care Workers vaccination programme

10. Laboratory investigation protocol

Type of test	Culture	PCR	Serology
Type of sample	NP swab using charcoal transport medium or NP aspirate	NP swab or aspirate using Dacron swab	Serum
When to collect	On presentation		
Storage	Culture swabs should be processed immediately	NP samples for PCR can be stored at 4°C	4°C
Transport	Transport to laboratory immediately or maximum within 24 hrs		
BSL	BSL2 in a class II BSC		
Laboratory	CPHL		

A23

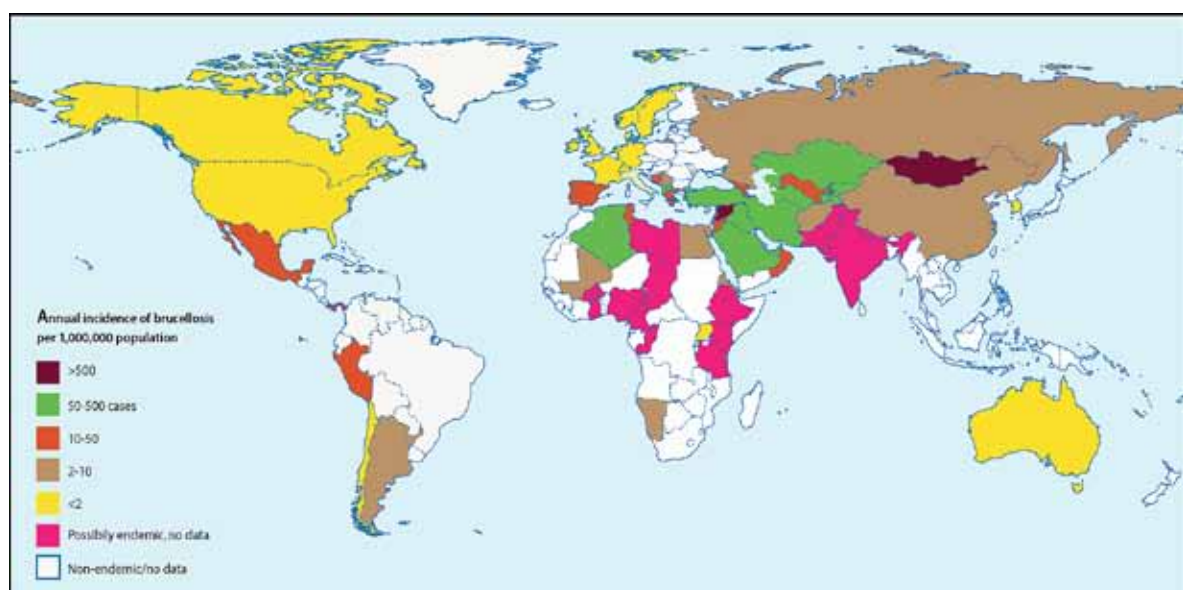
Brucellosis

Undulant fever, Malta fever, Mediterranean fever

1. Background

Brucellosis is the most widespread zoonosis transmitted from animals (cattle, sheep, goats, pigs, camels and buffaloes) through direct contact with blood, placenta, foetuses or uterine secretions, or through consumption of infected raw animal products (especially milk and milk products). The agent is a gram-negative, non-motile, non-sporing intracellular coccobacilli. Four species infect man: *Brucella abortus*, biovars 1-6, 9; *Brucella melitensis*, biovars 1-6; *Brucella suis*, biovars 1-5; and *Brucella canis*.

Fig. 69: Global incidence of human brucellosis per million population



Source: Lancet Infect Dis. 2006 Feb;6(2):91-9

in areas where sheep and goats are raised. Human brucellosis usually presents as an acute febrile illness. The disease may persist as relapse, chronic localized infection or delayed convalescence. The acute phase may progress to a chronic one with relapse, development of persistent localized infection or a nonspecific syndrome resembling the “chronic fatigue syndrome”. Complications may affect any organ system. All age groups are affected. The case fatality ratio in untreated patients is about 2%. Brucellosis has an important worldwide impact on human health and the animal industry. Brucellosis causes more than 500,000 infections per year worldwide particularly in Mediterranean basin and Arabian Peninsula. In most countries brucellosis is a notifiable disease.

2. Epidemiological characteristics

Infectious agent	Brucella
Reservoir	Domestic animals
Transmission	Contact, foodborne and airborne infection
Incubation	Variable and long (5 days to 5 months)
Communicability	No H2H transmission. Contact with animal infected blood and body tissues and fluids
Susceptibility	Animal handlers and workers (occupational)

3. Brucellosis in Oman

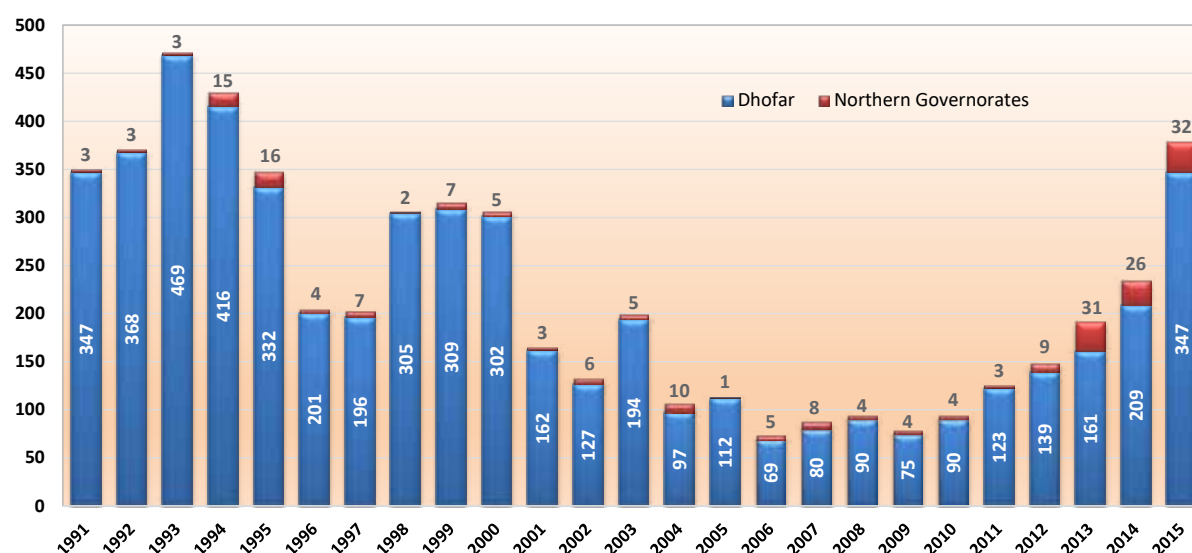
Brucellosis in Oman is one of the major zoonotic infectious diseases mainly restricted to the southern part of the country, viz. the Governorate of Dhofar (95%). The climate in Dhofar is significantly different compared to the rest of the country. The majority of population lives in the coastal area. The region receives monsoon rainfall during June to August (*Khareef* season). Animal herding and breeding is the main profession of the people living in the green areas of the mountains (*Jabals*). The cattle, camels, sheep and goats are the main animals.

An earlier serosurvey conducted in the animal population in Dhofar (1985-1986) revealed prevalence of 8.0% in camels, 6.4% in goats and sheep and 3.3% in cattle. A multisectoral Regional Brucellosis Control Committee was established including members from MoH, Ministry of Agriculture and Fisheries and Municipality in 1997. The more specific diagnostic 2-mercaptoethanol test was introduced in addition to the routine slide agglutination method and culture. The diagnostic criteria and treatment regimen were reviewed and resolved. Health education material emphasizing the prevention of brucellosis was produced and distributed. The topic was also introduced in the school health education programme.

Due to the common subjective errors encountered; from the year 2003, the slide agglutination method was phased out in favour of the standard tube agglutination method in the diagnosis of brucellosis.

The following graph shows the reported cases of human Brucellosis in Oman from 1991 to 2014.

Fig. 70: Incidence of human brucellosis in Oman: 1991-2015



4. Case definition

Suspect

An illness characterized by acute or insidious onset with continued, intermittent or irregular fever of variable duration, profuse night sweating, fatigue, anorexia, weight loss, headache, arthralgia and generalized aching.

History of animal exposure or occupational exposure or drinking unpasteurized milk or travel to an endemic area.

Confirmed

Suspect case which is laboratory confirmed

5. Mode of transmission

Transmission is usually from infected domestic animals (reservoirs – cattle, sheep, goat, camels) to man. There is no evidence of transmission from person-to-person. In Oman (Dhofar), ingestion of raw milk and milk products is responsible for transmitting the disease in 63% of the cases while 83% had history of direct contact with animals, mainly the cattle. The routes of spread are:

- **Contact infection:** most commonly, infection occurs by direct contact with infected tissues, blood, urine, vaginal discharge, aborted fetuses and especially placenta. Infection takes place through abraded skin, mucosa or conjunctiva (mucocutaneous route). This type of spread is largely occupational and occurs in persons involved in handling livestock and slaughter house workers
- **Foodborne infection:** infection may take place indirectly by the ingestion of raw milk or dairy products (cheese) from infected animals. Fresh raw vegetables can also carry infection if grown on soil containing manure from infected farms
- **Airborne infection:** the environment in a cowshed may be heavily infected and inhalation of infected dust or aerosols is possible. The organism may also be inhaled in aerosol form in slaughter houses and laboratories

6. Laboratory criteria

Rose Bengal test is used for screening at primary health care level and should be confirmed by following tests:

Presumptive

- **Brucella agglutination titre** in one or more serum specimens after onset of symptoms:
 - Standard tube agglutination test (SATT) diagnostic titre > 1:160
 - In a low incidence areas such as Northern Oman, a titre of 1:80 can be considered diagnostic in presence of appropriate clinical criteria
- Enzyme Immunoassay (EIA)

Definitive

- **Culture** and identification of *Brucella spp.* from blood or other clinical specimens. Culture for 10-14 days in BacTec and BacT/Alert systems
- Detection of Brucella DNA in a clinical specimen (blood/urine) by PCR assay is available at CPHL

7. Case management

- Draining and secretion precautions
 - Concurrent disinfection of purulent discharges
 - Standard recommended treatment protocol:
 - Doxycycline 100 mg twice a day for 6 weeks + Streptomycin 1 g daily for 2-3 weeks
- OR

- Doxycycline 100 mg twice a day + rifampicin 15 mg/kg body weight (maximum daily dose of 900 mg) daily for 6 weeks
- Relapses occur in 5-15% of treated cases and must be treated like new cases
- In pregnancy recommended treatment is with rifampicin 15 mg/kg body weight (maximum daily dose of 900 mg) and (TMP 80 mg+SMZ 400 mg) for 45 days depending on clinical outcome
- In less than 8 years children tetracyclines are contraindicated. Recommended treatment is with cotrimoxazole and streptomycin or gentamycin

8. Surveillance and reporting

- Mandatory case-based reporting is required. Cases occurring outside Dhofar region should be investigated to trace the source of infection
- A high level of suspicion should be maintained, particularly among occupational high-risk groups, that is to say, farmers, shepherds, workers in slaughterhouses, butchers, veterinarians, laboratory personnel
- Control activities must be coordinated and shared between both public health and animal health sectors along with the local municipality. Administrative arrangements between these sectors is must to facilitate immediate cross-notification of cases, as well as joint investigations and control
- **Point-source epidemic** Search for and recall incriminated produce (usually raw milk or cheese from an infected herd)

9. Prevention and control

Food hygiene, occupational hygiene, personal hygiene and farm sanitation

- Health education of the community and in schools to avoid consuming raw (unpasteurized) milk and milk derivatives
- Vaccination not recommended – although 19BA vaccine is available
- Health education of the community for encouraging immunization of herds so as to achieve the elimination of infected herds (source of infection)
- Barrier precautions for professionals at risk (butchers, cattle farmers, slaughterers) regarding careful handling and disposal of ‘afterbirths’ especially in cases of abortion. Disinfectants recommended – hypochlorite, iodophor or phenolic disinfectant
- Control and prevention schemes require effective intersectoral collaboration between all sections of the community (Ministry of Agriculture and Fisheries, Baladiyah and MoH)
- Test and slaughter infected animals

10. Laboratory investigation protocol

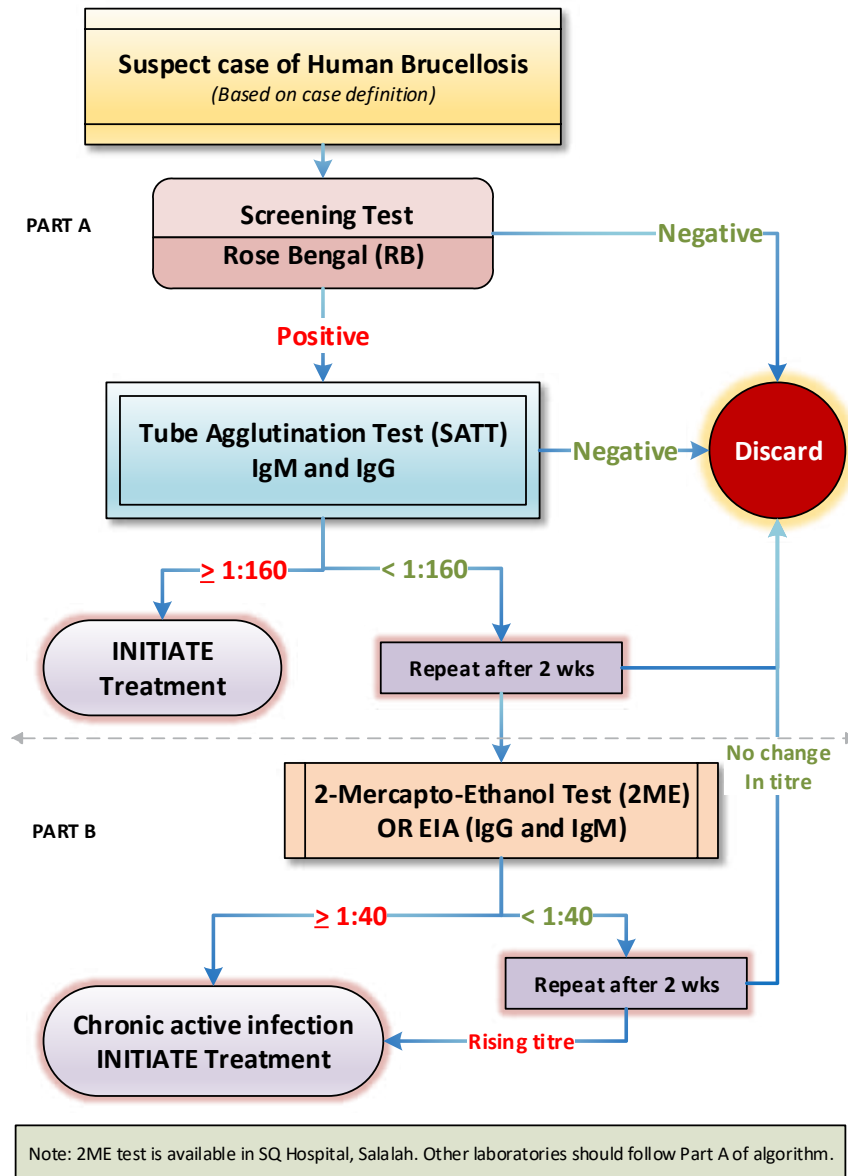
Type of test	Rose Bengal and Serology (SAT)	Culture	16S rRNA* reaction (PCR)
Sample	3-5 ml serum sample	Blood, bone marrow, or other body fluids or tissues	Blood samples to be taken in 5 ml EDTA bottle or urine
Storage	Send fresh specimen on cold packs. Do not freeze	Should not be stored	
Transport	Category A	Category B	
BSL	BSL-2 practices	Containment level 3 setting using a class 1 biological safety cabinet	BSL-2 practices
Availability	Regional Hospital	CPHL	

*rRNA: Ribosomal ribonucleic acid

11. Case investigation algorithm

History of animal exposure or occupational exposure or drinking unpasteurized milk or travel to an endemic area.

Fig. 71: Laboratory investigation algorithm for human brucellosis



Note: The diagnostic titre of 1:160 is applicable for the endemic Dhofar governorate. For other governorates in the north of Oman a titre of 1:80 may be considered diagnostic if clinical presentation is in line with case definition of brucellosis.

Chapter 23

B55.0, B55.1, B55.2

Leishmaniasis

Visceral form (Kala Azar), cutaneous and mucosal form (Oriental sore, Delhi boil, Baghdad boil)

1. Background

Leishmaniasis is a disease caused by protozoan parasites of the genus *Leishmania* and spread by the bite of certain types of sand flies. At least 20 different *Leishmania* parasites have been associated with human infection. *Leishmania donovani* causes kala azar, *L. tropica* causes Oriental sore and *L. braziliensis* causes mucocutaneous leishmaniasis. Furthermore the majority of these do not offer cross immunity. About 12 million people are currently infected in some 98 countries. About 2 million new cases and between 20 and 50 thousand deaths occur each year.

Cutaneous leishmaniasis (CL) has several clinical forms: localized cutaneous leishmaniasis, diffuse cutaneous leishmaniasis and the most difficult to treat, (in the western hemisphere mainly) mucosal leishmaniasis. Bangladesh, Brazil, India and Sudan report more than 90% of all visceral leishmaniasis (VL) cases (annual incidence of 300,000 cases worldwide), with high case fatality ratios.

2. Epidemiological characteristics

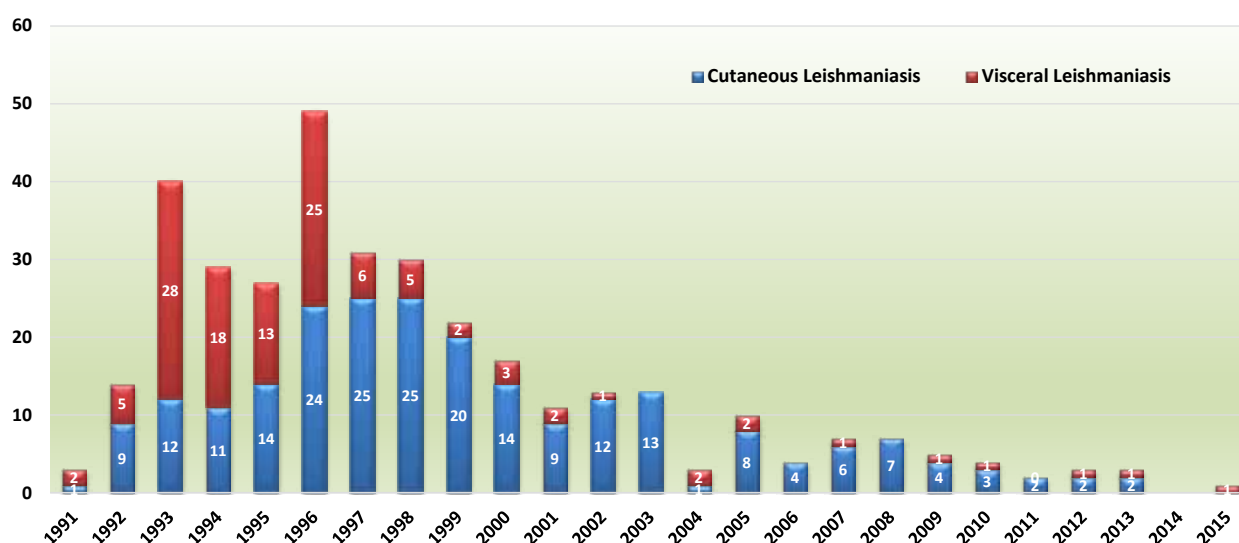
Infectious agent	Leishmania
Reservoir	Dogs, jackals, foxes, rodents and other mammals
Transmission	Bite of infected female sandflies
Incubation	Varies (weeks to months)
Communicability	Bite of infected female sand flies. No H2H transmission.
Susceptibility	Universal. Occupational exposure risk. No cross immunity

3. Leishmaniasis in Oman

Two forms of leishmaniasis occur in Oman—cutaneous and visceral. The former is not a major public health problem while few foci of VL exist. Mucocutaneous form of leishmaniasis is not been reported in Oman. The notified cases over the period 1991 to 2015 are shown in figure 70.

Cases have been reported mostly from the mountains and foot hills of northern Oman and a focus in Dhofar governorate in the south. In 1992 there was a sudden rise in VL cases compared to cases reported in the past. On investigation cases were found to be from the Madinat Shahan, Shaleem and Raysut area cases. Four species of *Phlebotomus* sand flies were identified from the Shahan and Rakhyut area, i.e. *P. bergeroti*, *P. papatasi*, *P. alexandri* and *P. sergenti*. Epidemiological and entomological studies around the patients' houses indicated that children at the periphery of villages, close to rocky terrain are most at risk. Spraying operations were conducted in January and February 1994 in the affected areas of Shahan to interrupt the transmission. The number of cases has reduced since then.

Fig. 72: Notified cases of leishmaniasis in Oman 1991-2015



4. Case definition

A case of **CL** can be defined as a person showing clinical signs (skin or mucosal lesions) with parasitological confirmation of the diagnosis (positive smear or culture) and/or, **for mucosal leishmaniasis only**, serological diagnosis.

A case of **VL** is a person showing clinical signs (prolonged irregular fever, splenomegaly and weight loss) with serological and/or parasitological confirmation of the diagnosis in malaria non-endemic areas.

Cutaneous leishmaniasis: the appearance of one or more skin lesions, typically on uncovered parts such as face, neck, arms and legs. A nodule may appear at the site of inoculation and may enlarge to become an indolent ulcer that heals slowly to leave a depressed scar.

Visceral leishmaniasis: an illness with prolonged irregular fever, splenomegaly and weight loss.

5. Mode of transmission

Leishmaniasis is transmitted by the bite of female sand flies (*Phlebotomine*). Some 30 species of sand flies are proven vectors and the usual reservoir hosts are domestic and/or wild animals. Female sand flies become infected by feeding from reservoir hosts. Most forms are zoonotic, humans being infected only secondarily but in anthroponotic forms humans are believed to be the sole reservoir hosts (indirect person-to-person transmission). Direct person-to-person transmission occurs rarely through blood transfusion.

6. Laboratory criteria

- Visceral Leishmaniasis (VL): Progressive leucopaenia, anaemia, reversal of albumin-globulin ratio, increased ESR and hypergammaglobulinaemia
- Parasitology: Detection of amastigotes in stained smear or culture from the lesion in CL, and in VL bone marrow, spleen, liver, lymph node, blood or culture of the organism from a biopsy or aspirated material
- Serology: Only to be used for epidemiological purposes and has limited diagnostic value for mucocutaneous and visceral leishmaniasis

7. Case management

The cutaneous form of the disease is often self-limiting. Treatment is based on pentavalent antimonials (sodium stibogluconate) as first-line drug. Recovery from kala azar and Oriental sore gives a lasting immunity.

Amphotericin B, topical paromomycin, oral miltefosine, pentamidine, antibiotics and ketoconazole, itraconazole, fluconazole are some of the treatment options depending on the patient condition.

During the active phase of kala azar, there is impairment of cell mediated immunity; this is reflected in the negative skin reaction to leishmanin test. **Leishmania/HIV co-infections** have already been reported from over 30 countries and the coinfection is on the increase worldwide. In southern Europe, 25%-70% of adult cases of visceral leishmaniasis are related to HIV infection and 1.5%-9% of AIDS cases suffer from newly acquired or reactivated VL.

In Oman as of 2004 one case of *Leishmania infantum* in an AIDS patient was confirmed and in 2 serology was positive.

8. Surveillance and reporting

Individual case should be reported. Early detection through clinical, parasitological or serological diagnosis, followed by prompt treatment. Carefully monitor of patients with leishmaniasis for relapse or recrudescence for up to 6 months after successful treatment.

9. Prevention and control

- No commercial vaccine is available
- Environmental control: systematic study of the vector bionomics is required. The local transmission cycle thus can be interrupted in the most practical way. Eliminate sand fly breeding places (cracks in walls, rodent burrows, firewood, rubbish) and keep animal houses clean
- Vector control: Phlebotomine sand flies have a short flight range and are highly susceptible to control by spraying with residual insecticide. viz. fenitrothion
- Advise personal protective measures

10. Laboratory investigation protocol

Type of test	Histology (Giemsa and H&E stains)	Serology
Sample	Tissue biopsy or aspirate (skin, spleen, bone marrow)	Serum
BSL	BSL II precautions	
Availability	Regional and tertiary hospitals and CPHL	Tertiary hospitals and CPHL

B65

Schistosomiasis

Intestinal schistosomiasis, Bilharziasis, snail fever

1. Background

Schistosomiasis, a blood fluke (trematode) parasitic infection is the most common with malaria as second causing about 207 million cases in 2013. *Schistosoma mansoni* and *S. japonicum* give rise primarily to hepatic and intestinal signs and symptoms; *S. haematobium* to urinary manifestations.

Fig. 73: Schistosomiasis countries or areas at risk, 2014



Source: WHO, 2014

It is a leading cause of severe morbidity in large parts of Africa, Asia and the Americas. Around 700 million people, in more than 70 countries, live in areas where the disease is common. Children under 14 years of age are most commonly affected. The WHO estimates globally, 12,000 direct deaths, more than 200,000 related deaths and 20 million people have had severe consequences from the disease annually. It is the most deadly of the neglected tropical diseases.

Urinary schistosomiasis is endemic in 53 countries in the Middle East and most of Africa. Intestinal schistosomiasis currently occurs in at least 55 countries in Africa and Asia. Because schistosomiasis is a chronic insidious disease, it is poorly recognized in the early stages. It is linked to water and agricultural development schemes and becomes a threat to development as disease occurs in adulthood.

2. Epidemiological characteristics

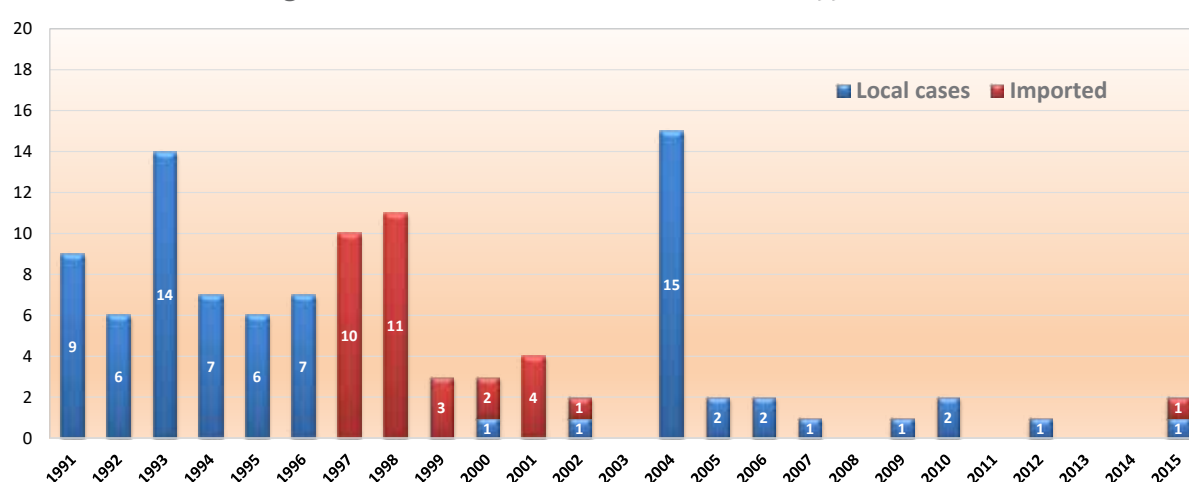
Infectious agent	<i>Schistosoma mansoni</i>
Reservoir	Humans
Transmission	Water containing free-swimming larvae (cercariae) that have developed in vector snails
Incubation	2-6 weeks after exposure
Communicability	No human-to-human transmission
Susceptibility	Universal. Geographical – endemic and contaminated water with infected snails

3. Intestinal schistosomiasis in Oman

In Oman only *S. mansoni* transmission takes place and so far has only been identified in the Dhofar Governorate. The first case was reported in 1979. The following graph shows the cases of schistosomiasis notified through the surveillance system from 1991 to 2014. The classification of local and imported is done on the basis of information available in the notification form.

Parasitological surveys were conducted in some schools but no new cases were detected. The intermediate snail host *Biomphalaria arabica* for *S. mansoni* was reported from Dhofar region as early as in 1896 in a study by Wright and Brown. In the 1982 survey, 5 fresh water reservoirs were found harbouring *B. arabica* snails in the region.

Fig. 74: Notified schistosomiasis cases in Oman: 1991-2015



Various observations and studies in the past have revealed a focus of indigenous transmission of schistosomiasis in the Dhofar region. It was postulated that the infection was probably introduced by expatriate farm workers from endemic countries or by the immigrated East African-born Omani population. In 1982, a parasitological survey was carried out among people working in the Ayn Razat farm which showed 30% prevalence of *S. mansoni*. Indigenous cases of *S. haematobium* were never observed in Oman.

4. Case definition

Suspect

- Acute systemic schistosomiasis (Katayama fever) include fever, headache, myalgia, rash, diarrhoea and respiratory symptoms
- Hepatic and intestinal pathology include abdominal pain, diarrhoea, blood in stool, with possible hepatosplenomegaly
- Urinary manifestations include dysuria, urinary frequency and haematuria
- History of travel and exposure to contaminated water
- Positive serology

Confirmed

Suspect case with positive stool sample (demonstration of eggs)

5. Mode of transmission

There is no person-to-person transmission. The eggs of *S. mansoni* leave the human body and hatch in water and liberate larvae (miracidia) that penetrate into freshwater intermediate hosts – snails. After several weeks, cercariae emerge from the snails and penetrate the human skin (during wading, swimming, washing). Within the body, cercariae develop to maturity and subsequently migrate to the lungs, the liver, and the veins of the abdominal cavity. Eggs escape through the bowel. Human discharge of eggs may last in excess of 10 years; infected snails release cercariae throughout their lifetime (3 weeks to 3 months).

6. Laboratory criteria

Demonstration of eggs in stool (*S. mansoni* or *S. japonicum*) or urine (*S. haematobium*) by direct smear. For intestinal schistosomiasis Kato-Katz technique is utilized and to label a case as 'negative' at least 3 negative stool samples should be examined. Schistosome serology cannot distinguish between past or current infection nor can it differentiate the species of parasite.

It is planned to introduce a new laboratory test for circulating cathodic antigen (CCA) in endemic area of Dhofar governorate. The test is highly sensitive, requires urine sample and is confirmatory for current infection with *S. mansoni*.

7. Case management

Praziquantel is the drug of choice against all schistosomes. A single oral dose of 40-60 mg/kg is generally sufficient to give cure rates of between 80% and 90% and the dramatic reductions in the average number of eggs excreted. Praziquantel can be used in pregnant and lactating women.

8. Surveillance and reporting

Data from general health statistics often underestimate the prevalence but may nevertheless indicate a relatively high prevalence in a particular area. Surveillance of schistosomiasis has to take into account the distribution of the disease in geographical foci – adjacent areas may have very different patterns and rates. Surveillance must be incorporated in the primary health care system.

Dhofar is a low-prevalence zone where elimination strategies are targeted. Routine monthly reporting of aggregated suspected or confirmed cases from peripheral to intermediate and central levels; however, only parasitologically positive cases should be counted. Other tests to be introduced soon for verification of elimination of transmission are the detection the circulating cathodic antigen (CCA) test and the demonstration of infection in snails by PCR.

9. Prevention and control

- Isolation, quarantine and immunoprophylaxis – not applicable
- Investigation of contacts and source of infection – examine for schistosomiasis and treat all who are infected, pay particular attention to children
- Based on the prevalence, mass drug treatment with praziquantel for population at risk, such as school-age children, women of childbearing age or special occupational groups
- Educate the public in endemic areas to seek treatment early and regularly and to protect themselves. Apply 70% alcohol immediately to the skin to kill surface cercariae
- Travellers visiting endemic areas should be advised
- Sanitary disposal of faeces and urine
- Improve irrigation and agriculture practices; reduce snail habitats by removing vegetation, by draining and filling, or by lining canals with concrete
- Treat snail-breeding sites with molluscicides. Cost may limit the use of these agents

10.1 Laboratory investigation protocol

Type of test	Stool microscopy	Serology
Sample	Stool microscopic examination for schistosome eggs using concentration technique (formalin-ethyl acetate) and quantification (Kato-Katz)	Serum
Transport		
BSL	BSL 2	BSL 2
Laboratory	Regional and tertiary hospital	CPHL

Note: CCA test will be introduced in endemic Dhofar governorate

Chapter 25

ICD 10: B20-B24, B33.3, Z21

HIV/AIDS

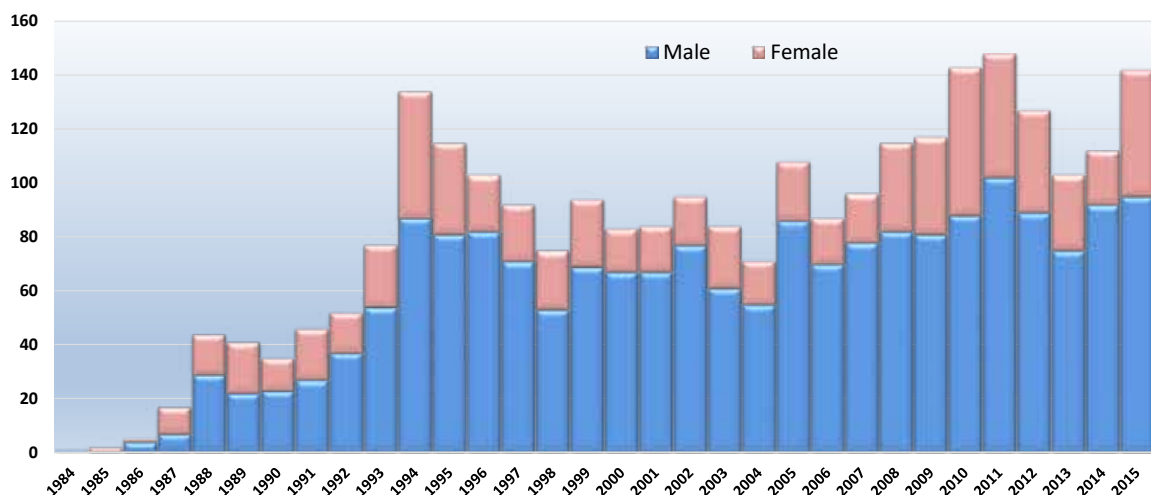
1. Background

Globally by the end of 2015 there were approximately 36.7 million 'People Living with HIV' (PLHIV) with 2.1 million newly infected in 2015. In the same year, approximately 1.1 million people died due to HIV. The new HIV infections and deaths are decreasing globally mainly because of increase in awareness, detection and the treatment of cases.

However Middle East and North Africa (MENA) is one of the 2 regions of the world, where new HIV infections and deaths are on the rise in the past decade. The main reasons attributed to this rise are lack of awareness mainly among the youth, delayed or lack of access to health care and inadequate interventions among persons at higher risk of acquiring HIV.

2. Situation in Oman

Fig. 75: Reported cases of HIV/AIDS in Oman by year and gender: 1984-2015



The WHO has classified HIV in Oman as a low-prevalence epidemic. The first case of HIV in Oman was detected in 1984. The graph (Fig. 69) shows the trend of HIV case detection from 1984 through 2015. A cumulative total of 2,646 HIV/AIDS cases were reported among Omanis, of which 1697 (64%) were alive and 949 (36%) had died by the end of 2015.

3. HIV classification

Clinical staging is used to suspect clinical HIV infection, to categorize severity, to permit clinical assessment of PLHIV (baseline and follow-up) and to guide decisions on prophylaxis and initiation of antiretroviral-therapy (ART).

Each stage of HIV infection is associated with various conditions.

Table 21: WHO clinical staging of HIV infection

HIV-associated symptoms	Clinical stage
Asymptomatic	Stage 1 (HIV infection)
Mild symptoms	Stage 2 (HIV infection)
Advanced symptoms	Stage 3 (advanced HIV infection)
Severe symptoms	Stage 4 (AIDS)

4. Immunological classification (WHO)

HIV is also classified by WHO according to immune status of the patient, which is measured by CD4 count. The normal absolute CD4 cell count in adults and adolescents ranges from 500-1500 cells/ml. In infants and children, the normal range is much higher, and it is preferable to use percentage CD4 in children under 5 years of age. The WHO has classified the immunological stages of CD4 cell count and percentage (for children) over the course of HIV disease (Table 22).

Table 22: WHO immunological classification for established HIV infection

HIV-associated immunodeficiency	Age-related CD4 values			
	< 11 m	12-35 m	36-59 m	> 5 yr. (absolute #/mm ³) or %CD4+
None/not significant (stage 1)	> 35	> 30	> 25	> 500
Mild (stage 2)	30-35	25-30	20-25	350-499
Advanced (stage 3)	25-29	20-24	15-19	200-349
Severe (stage 4)	< 25	< 20	< 15	< 200 or < 15%

5. Mode of transmission

Sexual transmission: HIV can be transmitted sexually from an infected individual to a non-infected one (susceptible) through any form of sexual activity; vaginal, rectal, and/or oral. Sexual transmission is the predominant mode of HIV transmission where it accounts for 75% to 85% of cases worldwide.

Parenteral transmission: HIV can be transmitted through blood-to-blood contact from an infected individual to a susceptible one. This may occur through sharing syringes and needles among people who inject drugs, needle stick injuries, Transfusion of blood/ blood products and Organ transplantation

Among these parenteral routes, sharing injecting equipment remains the most common mode of transmission while blood transfusion has become almost 100% safe with the adoption of blood safety programs in all countries including Oman.

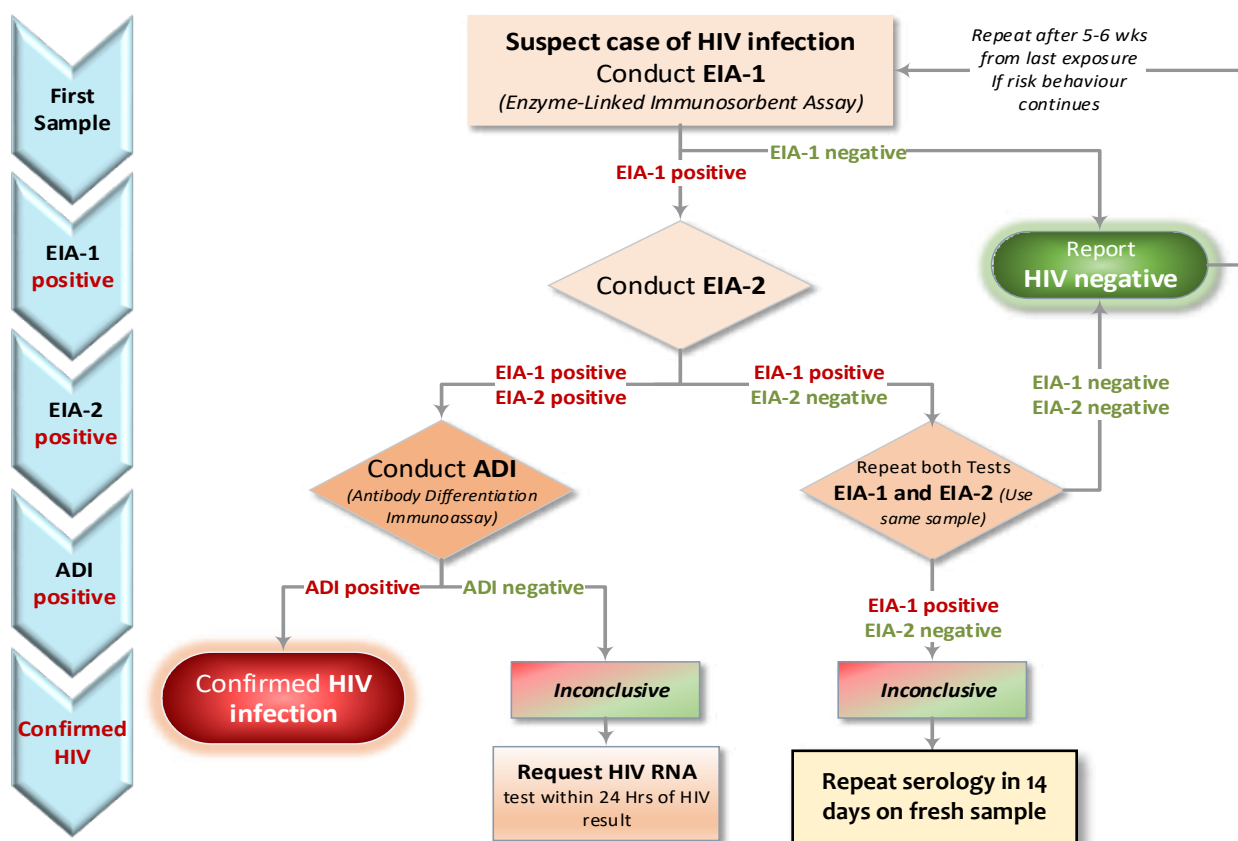
Perinatal transmission: Without any preventive interventions 15-40% of pregnant mothers living with HIV may pass the virus to their children either during pregnancy, labour, delivery, or during the process of breastfeeding.

In Oman Sexual transmission accounted for the majority of infections (71%) followed by parenteral transmission (6.4%) and perinatal transmission (5.6%) among people living with HIV at the end of 2015, however rest of about 17% cases history of mode of transmission is not disclosed though sexual mode of transmission is most likely.

6. Laboratory criteria

For HIV diagnosis in all persons more than 18 months of age following algorithm should be used (Fig. 74). Rapid test kits are used for screening in Voluntary Counselling and Testing (VCT) centres or outreach teams. Initially HIV is tested by ELISA and confirmed by antibody differentiation immunoassay (ADI). Re-bleeding is done to confirm identity.

Fig. 76: HIV diagnostic algorithm (for all above 18 months of age)



7. Case management

Currently, there is no cure for HIV infection. Yet, there are treatments to enable people living with HIV to live a long and healthy life. Life expectancy of PLHIV is nearly as long as persons not infected with HIV provided proper treatment and care is offered and medical advices followed by the PLHIV.

At the end of 2015, out of the 1,697 PLHIV in Oman, 1098 (65% of PLHIV) are receiving Anti-retroviral treatment (ART) through 15 treatment centres spread all over the country.

Antiretroviral Therapy (ART) helps by

- Reducing HIV-associated morbidity and mortality. Prolong duration and quality of life
- restoring and preserving immunologic function
- suppressing plasma HIV viral load on sustained basis and
- Preventing spread of HIV infection among the contacts of PLHIV

The ART should be started in ALL HIV patients irrespective of CD4 cell count, provided PLHIV are committed to strict compliance

Oman has adopted policy of treating all persons with HIV irrespective of CD4 counts however following groups are given special emphasis

- 1) PLHIV with active TB disease
- 2) PLHIV with HBV co-infection and severe liver disease

- 3) Pregnant women with HIV
- 4) Children younger than five years living with HIV and
- 5) Individuals with HIV in sero-discordant relationships.

Antiretroviral Therapy (ART) is the standard treatment for HIV infection and is composed of a combination of at least three antiretroviral (ARV) drugs. This ART combination often called highly active antiretroviral therapy (HAART). First preference in Oman is to have a single tablet (contains three ARV) per day for majority of patient. HIV treatment Focal Points make selection of ART and prophylactic medicines depends on various clinical factors in 15 treatment centres spread across the country.

Adequate response to ART is considered when PLHIV has undetectable viral load at the end of 24 weeks of starting ART and adherence is more than 95%. Sustained lifelong suppression of viral load with more than 95% of adherence is the goal of ART.

8. Surveillance and reporting

All HIV cases at the time of diagnosis or first visit to the institute should be reported on HIV notification form (PR-83) with identity proof (identity card/resident card/ vehicle driving license). Non-nationals have additional requirements like passport copy, photograph and details of the sponsor.

Diagnosed cases should be linked to HIV treatment centres for lifelong treatment and care. Each Governorate is responsible for providing relevant details of PLHIV to National AIDS Program and will later additionally monitored by electronic reporting.

HIV surveillance, reporting and treatment & care are responsibility of HIV team under the guidance of Director of Communicable diseases of the Governorate and Executive Director of the hospital.

9. Prevention and control

a. Contact management

Sexual contacts of any HIV positive cases, all children delivered by HIV positive woman and needle sharing partners require screening and counselling for HIV. Counsellors working for HIV program are equipped with requisite skills to perform contact management to preserve confidentiality and ensure long-term compliance for HIV treatment and care.

Children less than 18 months of age with unknown HIV status of mother or delivered by HIV positive mother follow a separate diagnostic algorithm. HIV PCR test (viral load) is used for diagnosis in children less than 18 months of age.

b. Post-exposure prophylaxis

Post-exposure prophylaxis (PEP) is defined as “the medical response to prevent the transmission of blood-borne pathogens following a potential exposure to HIV. PEP is considered to be an integral part of the overall strategy for preventing the transmission of HIV, and should only be **offered for exposure that has the potential for HIV transmission**, and **should be initiated as early as possible**, preferably **before 72 hours**, following the exposure. 28 days of Anti-retroviral medicines are offered by HIV treatment Focal Point in addition to regular HIV testing, risk reduction and adherence related counselling.

c. Prevention of mother-to-child transmission

Oman has initiated at national level, screening for HIV in pregnant women since July 2009, is consistently maintaining coverage of screening above 90%, and has reached 97% in 2015. On an average 30 women per year are detected HIV positive during ANC, which includes newly diagnosed and known cases of HIV who became pregnant during the year. Oman is committed to end the perinatal transmission of HIV and is one of the first countries among Middle East and North Africa (MENA) region to consider application to WHO for elimination of mother-to-child transmission of HIV.

For every HIV positive pregnant woman following interventions are needed

- 1) ART initiated from 14 weeks of pregnancy or as early thereafter as possible or continuation of ART for known case of HIV on ART. ART will be continued for lifelong (also referred as WHO option B+) for the mother
- 2) Planned mode of delivery in secondary or tertiary care
- 3) ART infusion from beginning of active labour until delivery
- 4) Avoidance of breast-feeding
- 5) Prophylaxis of ART to children from birth up to six weeks. Co-trimoxazole prophylaxis should start after completion of six weeks of ART prophylaxis and continued until HIV positivity is largely ruled out by Paediatrician
- 6) Avoid live vaccines like BCG and OPV. All other vaccinations should be as per the guidance of the Paediatrician
- 7) HIV PCR (viral load) testing at birth, 2 months and 4 months is described in the algorithm for children less than 18 months of age in the national guidelines on HIV

d. Health Education and awareness

Health education and awareness related to HIV among health care workers, general population as well as PLHIV is the best strategy to avoid HIV infection. Flip charts are available for one to one communication for counselling different areas such as

- Basic information about the HIV Virus
- Modes of transmission
- Significance of CD4 count and viral load
- Treatment of HIV (ART)
- Importance of adherence to ART
- Side effects of ART

Health education and awareness campaigns are conducted in various forms like

- Annual Muscat Festival, *Khareef* festival and similar mass gatherings in Governorates
- Health care workers' training programs
- Voluntary Counselling and Testing (VCT) Centres where HIV rapid diagnostic tests are provided
- Various training activities conducted in school, clubs etc. by the HIV counsellors

e. Stigma and discrimination

Stigma is the process by which reaction of others spoil the normal identity of individuals. Stigma is because of disapproval of lifestyle, disease, sexual orientation etc. that are perceived to be against cultural norms. When stigma is enacted, it results in different behaviour to some persons, which is called as discrimination. Substantial portion of stigma and discrimination is fuelled by lack of awareness related to disease and availability of treatment and care options. Sense of shame, guilt and reduced self-esteem resulting from stigma and discrimination affects the access to health care services.

f. Infection control measures and procedures following death of PLHIV

The universal application of standard precautions is the minimum level of infection control required in the care of all patients with HIV infection. The major risks for transmission in health care settings for HIV and other blood borne pathogens such as HBV and HCV are blood contact due to percutaneous injuries and, to a lesser extent, mucous membrane and skin contact. Additional precautions (airborne isolation) is required to protect against transmission of other associated infections like TB.

Note: For detailed guidance and further information kindly refer to 'HIV Management in Oman – A guide for Health Care Workers, 3rd edition, 2015'.

Chapter 26

B26

Mumps

Infectious parotitis

1. Background

An acute viral disease characterized by fever, swelling and tenderness of one or more salivary glands, usually the parotid and sometimes the sublingual or submaxillary glands. Parotitis may be unilateral or bilateral, and typically lasts 7-10 days in unvaccinated individuals. Prodromal symptoms are nonspecific, consisting of myalgia, anorexia, malaise, headache and low grade fever. In 30-40% Mumps infection is clinically inapparent (subclinical).

Not all cases of parotitis are caused by mumps infection, but other parotitis-causing agents do not produce parotitis on an epidemic scale. Orchitis, most commonly unilateral, occurs in 20%-30% of affected post-pubertal males. Testicular atrophy occurs in about one-third of patients, but sterility is extremely rare. Mumps orchitis has been reported to be a risk factor for testicular cancer. As many as 40%-50% of mumps infections have been associated with respiratory symptoms, particularly in children under 5. Mumps can cause sensorineural hearing loss in both children and adults. Pancreatitis, usually mild, occurs in 4% of cases.

Symptomatic aseptic meningitis occurs in up to 10% of mumps cases; patients usually recover without complications, though many require hospitalization. Mumps encephalitis is rare (1-2/10,000 cases), but can result in permanent sequelae, such as paralysis, seizures and hydrocephalus; the case fatality rate for mumps encephalitis is about 1%. Mumps infection during the first trimester of pregnancy is associated with a high (25%) incidence of spontaneous abortion, but there is no firm evidence that mumps during pregnancy causes congenital malformations.

Globally, in an unvaccinated populations, about 1/3rd of patients have inapparent or subclinical infections, especially young children. In temperate climates, winter and spring are peak seasons. In the absence of immunization, mumps is endemic, with an annual incidence usually greater than 100 per 100,000 population and epidemic peaks every 2-5 years. In many industrialized countries, mumps was a major cause of viral encephalitis. Serosurveys conducted prior to mumps vaccine introduction found that in some countries 90% of persons were immune by age 15 years, while in other countries a large

proportion of the adult population remained susceptible. In countries where mumps vaccine has not been introduced, the incidence of mumps remains high, mostly affecting children 5-9.

2. Epidemiological characteristics

Infectious agent	Mumps Virus
Reservoir	Humans
Transmission	Airborne, droplet, direct contact
Incubation	16-18 days (range 12-25 days)
Communicability	2 days before to 4 days after onset of illness
Susceptibility	Children (< 15 yrs). Lifelong immunity after inapparent or clinical infection

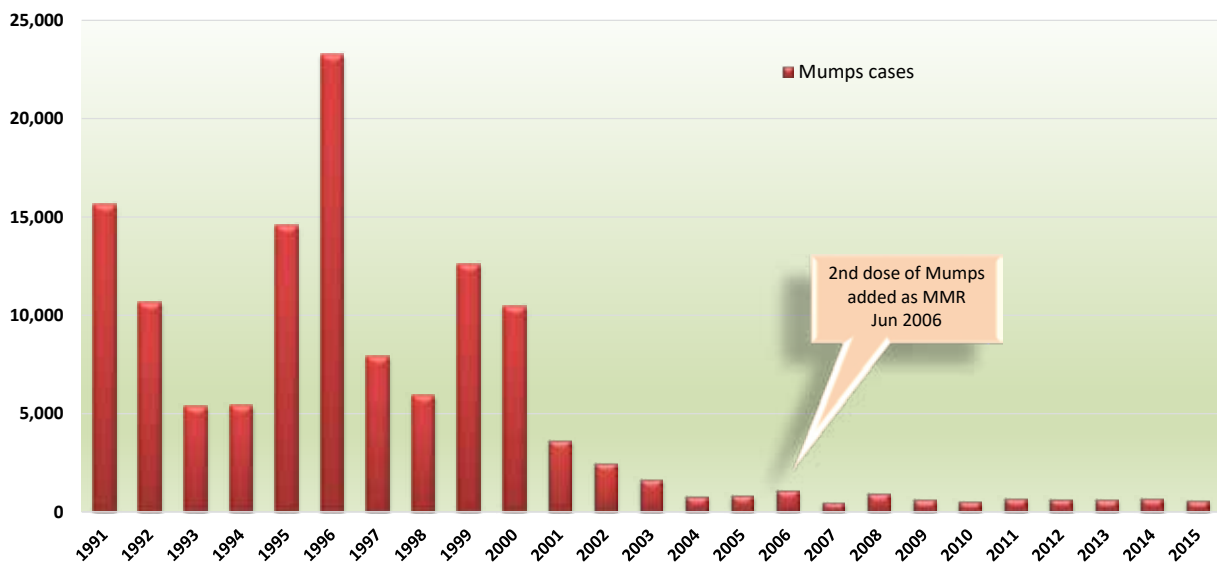
3. Situation in Oman

Mumps was included in group C of priority disease since the surveillance was launched in 1991. The cases were reported on monthly basis as aggregate data.

The mumps vaccine was introduced in October 1997 at 9 months in the childhood immunization program in Oman. The second dose was introduced in 2006. Currently MMR is given at 12 and 18 months.

From year 2001 onwards the cases have declined dramatically.

Fig. 77: Notified mumps cases in Oman: 1991-2015



4. Case definition

Suspect

- Acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland, lasting > 2 days, and without other apparent cause.
- Epidemiologic linkage to another probable or confirmed case.

Confirmed

Suspect case which is laboratory confirmed.

5. Mode of transmission

Both clinical and subclinical cases are the source of infection. Person-to-person transmission is by droplet spread; also direct contact with the saliva of an infected person. Virus has been isolated from saliva (7 days before to 9 days after the onset of parotitis). Maximum infectiousness occurs between 2 days before to 5 days after onset of parotitis. Inapparent infections can be communicable. Immunity is generally lifelong and develops after either inapparent or clinical infections. Humans are the only reservoirs of infection. The secondary attack rate is about 86%.

6. Laboratory criteria

Diagnosis is usually clinical. Routinely laboratory confirmation is not required but is useful in epidemiological studies and in the post-vaccine era to identify the viral strain. Negative laboratory results among vaccinated persons do not necessarily rule out the diagnosis of mumps, particularly if there is an outbreak of parotitis.

Laboratory confirmation is by the following:

- A positive serological test for mumps-specific IgM antibodies is presumptive
- Laboratory confirmation by RT-PCR

7. Case management

There is no specific or prophylactic treatment for mumps. Mumps without associated major complications can be managed on an outpatient basis with supportive care and good follow-up. No antiviral agent is indicated, as mumps is a self-limited disease. Respiratory isolation and exclusion of patients from school or the workplace for 5 days after the onset of parotitis effectively prevents transmission. Concurrent disinfection of articles soiled by discharges from the nose and throat helps to control its spread. Supportive care includes, bed rest, adequate hydration, restriction of acidic foods, analgesics (acetaminophen, ibuprofen) for severe headaches or discomfort, topical application of warm or cold packs to the swollen parotid area. Consultation and transfer to a higher medical facility may be considered in complicated cases (encephalitis, meningitis, nephritis, myocarditis or severe pancreatitis) with multiple organ system involvement for higher level of inpatient supportive care.

8. Surveillance and reporting

From the year 2016, Mumps is included in group B notifiable diseases for case-based reporting, collecting standard demographic, clinical and epidemiologic data on each case. Tracking the number and size of mumps outbreaks and complete investigation and control of outbreaks is a priority by public health authorities applying the basic steps of investigation of outbreaks.

Outbreaks involving:

- Patients and staff in health care settings
- Persons in residential/school/organizational settings
- Persons at high-risk for severe disease and complications
- Cases among persons vaccinated with 2 doses of mumps vaccine

9. Prevention and control

- Mumps vaccine was introduced in EPI programme from October 1997 as measles, mumps, and rubella (MMR) vaccine, single dose at 15 months. A live attenuated mumps virus vaccine, 2 doses (since June 2006). More than 90% of recipients develop immunity that is long lasting and may be lifelong
- Since November 2010, all health care workers without evidence of immunity i.e. documentation of 2 doses of vaccine, history of disease in the past or serologic evidence are to be vaccinated

- Contraindications: immunocompromised persons, history of anaphylactic reactions, pregnancy (avoid pregnancy for 4 weeks after vaccination) and ongoing severe illness
- Protect high-risk individuals who cannot be immunized from exposure
- The source of infection may be a case of mumps
- Serological screening to identify susceptible is not recommended
- Isolation of mumps-susceptible contacts is not required. On the basis of the epidemiology of the outbreak, susceptible groups should be targeted for immunization with MMR vaccine, especially those at greatest risk of exposure. However, immunization after exposure may not prevent infection
- Antiviral drugs or immunoglobulins are not effective as a preventive measure or as PEP, and not recommended
- Three or more cases occurring within an incubation period in a common setting is considered as outbreak. Outbreaks of mumps are common in schools and other institutional settings. Mumps is the only known cause of epidemic parotitis. Infectious cases should be isolated and susceptible contacts immunized rapidly before exposure

10. Laboratory investigation protocol

Type of test	Serology (IgM)	RT-PCR
Type of sample	Serum	Oral or buccal swab (see note below), urine and CSF
When to collect		As soon as possible after symptom onset
Storage	At 4°C and ship on cold packs (4°C) within 24 hrs. for at 4°C Freeze at -70°C if exceeding 24 hrs and ship on dry ice and ship on wet ice packs. At -20°C if > 1 week up to 7 days	
Transport	Category B	
BSL	BSL II	
Laboratory	CPHL and SQUH	

Note:

- Oral or buccal swab specimens are obtained by massaging the parotid gland area for 30 seconds prior to swabbing the area around Stensen's duct
- Synthetic swabs (e.g. Dacron) are preferred over cotton swabs. Swabs should be placed in 2 ml of standard VTM
- PCR will be done only in selected cases

Chapter 27

B01-02

Varicella

Chickenpox, herpes zoster, shingles

1. Background

Human (alpha) herpesvirus 3 (varicella zoster virus [VZV]), a member of herpesvirus group causes 2 distinct diseases: varicella or chickenpox, is a primary infection, and later if VZV reactivates, herpes zoster or shingles. Varicella is an acute, generalized, pruritic, maculopapulovesicular rash in various stages of development. The lesions are maculopapular for a few hours, vesicular and pustular for 3-4 days and leaves a granular scab. The vesicles are unilocular and collapse on puncture, in contrast to the multilocular, non-collapsing vesicles of smallpox. Lesions commonly occur in successive crops, with several stages of maturity present at the same time; they tend to be more abundant on covered than on exposed parts of the body. Breakthrough varicella develops more than 42 days after vaccination. It is mostly mild.

Serious complications include pneumonia or encephalitis. Secondary bacterial infections of the vesicles may leave disfiguring scars or result in necrotizing fasciitis or septicaemia. Rarely complications result in death. The case fatality rate is lower for children (1:100,000 in the 5-9 years group) than for the adults (1:5,000).

Herpes zoster (shingles) is a local manifestation of reactivation of latent varicella infection in the dorsal root ganglia. Vesicles with an erythematous base are restricted to skin areas supplied by sensory nerves of a single or associated group of dorsal root ganglia. The clinical course is divided into pre-eruptive and eruptive stage. Lesions may appear in irregular crops along nerve pathways; they are histologically identical to those of chickenpox but usually unilateral, deeper seated and more closely aggregated. The rash lasts about 7-10 days and heals within 2-4 weeks. Severe pain and paraesthesia are common that may persist as chronic pain in some patients lasting several weeks and sometimes permanently (post-herpetic neuralgia).

Worldwide, infection is nearly universal. In temperate climates, at least 90% of the population has had chickenpox by age 15 and at least 95% by young adulthood. In temperate zones, chickenpox occurs most frequently in winter and early spring. The epidemiology of varicella in tropical countries differs

from temperate climates, with a higher proportion of cases occurring among adults. Zoster occurs more commonly in older people.

2. Epidemiological characteristics

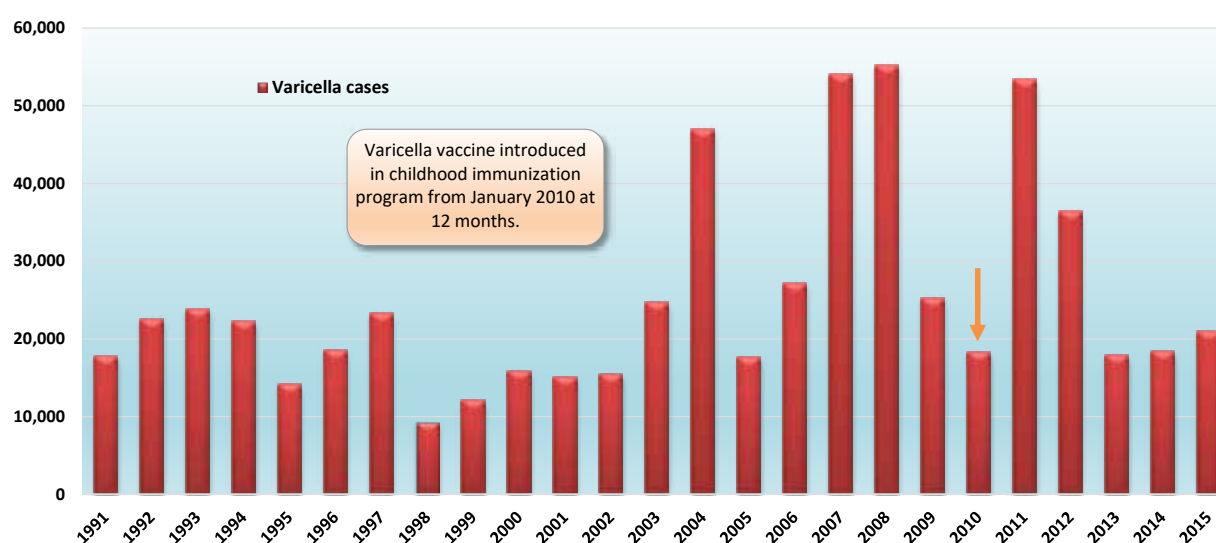
Infectious agent	Varicella zoster virus
Reservoir	Humans
Transmission	Direct contact, droplet or airborne spread
Incubation	2 to 3 weeks, commonly 14-16 days
Communicability	1-2 days before onset of rash until all lesions are crusted (usually about 5 days) after rash onset
Susceptibility	Universal among those not previously infected. More common in children. Infection usually confers long immunity

3. Situation in Oman

Varicella was included in group C of priority disease since the surveillance was launched in 1991. The cases were reported on monthly basis as aggregate data. There is likely to be underreporting and duplication. Therefore caution should be observed in the interpretation of the trend.

The varicella vaccine has been introduced at 12 months in the childhood immunization program in Oman for the birth cohorts born after 1 January 2010. The impact on the incidence of the disease is yet to be seen.

Fig. 78: Reported cases of varicella in Oman: 1991-2015



4. Case definition

Suspect

- An illness with acute onset of diffuse (generalized) maculopapulovesicular rash without other apparent cause
- Epidemiologic linkage to another probable or confirmed case

Confirmed

- Suspect case which is laboratory confirmed

5. Mode of transmission

Person-to-person transmission is by direct contact, droplet or airborne spread of vesicle fluid or secretions of the respiratory tract of cases or of vesicle fluid of patients with herpes zoster; indirectly through articles freshly soiled by discharges from vesicles and mucous membranes of infected people. In contrast to vaccinia and variola, scabs from varicella lesions are not infective.

The secondary attack rate among susceptible siblings is 70-90%. Patients with zoster may be infectious for a week after the appearance of vesiculopustular lesions. Susceptible individuals should be considered infectious for 8-21 days following exposure. Infection during the first trimester of pregnancy may lead to congenital varicella syndrome in 1% of cases.

6. Laboratory criteria

Routinely, laboratory confirmation is not required but is useful in complicated cases to know the immunity status, in epidemiological studies and in the post-vaccine era to identify the viral strain.

Laboratory confirmation is by RT-PCR from the swab taken from the skin lesion or CSF.

7. Case management

Report to health authority. Infectious patients should be isolated and excluded from school, work or public places until all lesions are crusted (usually after 5 days after rash). Concurrent disinfection of articles soiled by discharges from the nose and throat.

Chickenpox is a self-limiting mild illness that requires only symptomatic treatment. Calamine lotion and colloidal oatmeal baths may help relieve itching. Keeping fingernails trimmed may help prevent skin infections caused by scratching blisters. Use non-aspirin medications, such as acetaminophen, to relieve fever among high-risk groups like older than 12 years of age, people with chronic skin or lung disease, receiving steroid therapy, immune-compromised and pregnant women.

Uncomplicated cases of chickenpox, especially in children do not require antiviral treatment. However, antiviral medications are recommended for people who are more likely to develop serious disease or complications (high-risk group). Acyclovir can be used for the treatment of chickenpox. Other antiviral medications that may also work include valacyclovir and famciclovir.

8. Surveillance and reporting

From the year 2016, chickenpox has been included in group B notifiable diseases for case-based reporting, i.e. collecting standard demographic, clinical, and epidemiologic data on each case. Tracking the number and size of varicella outbreaks and complete investigation and control of outbreaks is a priority by public health authorities applying the basic steps of investigation of outbreaks. Priorities include:

- Patients and staff in health care settings
- Persons at high risk for severe disease and complications
- Cases among persons vaccinated with 2 doses of varicella vaccine
- Persons in residential, school or other organizational settings

Note:

Although varicella is included in group B, individual case notification forms are neither required nor individual entry in e-notification system for reporting presently. Eventually case based surveillance will be introduced when the impact of vaccination program is observed on the incidence of varicella.

9. Prevention and control

Varicella vaccine was introduced in EPI programme from January 2011 for those who were born on or after 1st January 2010. A live attenuated varicella virus vaccine, single 0.5 ml SC dose is recommended for routine immunization of children aged 12 months.

- Since November 2010, all health care workers without evidence of immunity (documentation of 2 doses of vaccine/ h/o disease diagnosis/laboratory evidence) are to be vaccinated. Two doses 0.5 ml SC with at least a 4 week interval between the doses is recommended
- Contraindications: immunocompromised persons, history of anaphylactic reactions, during pregnancy (avoid pregnancy for 4 weeks after vaccination) and ongoing severe illness
- Protect high-risk individuals who cannot be immunized from exposure
- The source of infection may be a case of varicella or herpes zoster
- All contacts should be evaluated to determine the need for PEP
- Immunoprophylaxis: Exposed susceptibles eligible for vaccination should receive vaccine. Varicella vaccine is effective in preventing illness or modifying severity if used within 3 days, and possibly up to 5 days, of exposure
- Immunoglobulin (varicella zoster immunoglobulin) given within 72 hours of exposure may prevent or modify disease in susceptible close contacts of cases who are ineligible for vaccination. Immune globulin is **only recommended** for people who cannot receive the vaccine, lack evidence of immunity to varicella, whose exposure is likely to result in infection, high risk for severe varicella
- Chemoprophylaxis: Antiviral drugs such as acyclovir appear useful in preventing or modifying varicella in exposed individuals if given within a week of exposure
- Outbreaks of varicella are common in schools and other institutional settings. They may be protracted, disruptive and associated with complications. Infectious cases should be isolated and susceptible contacts immunized. Persons ineligible for immunization, should be evaluated immediately for administration of immunoglobulins

10. Laboratory investigation protocol

Type of test	RT-PCR
Type of sample	Vesicle fluid or CSF
When to collect	During acute stage of illness (rash onset)
Storage	
Transport	
BSL	
Laboratory	SQUH and CPHL

Note: The RT-PCR test is currently not available in CPHL but will be introduced soon. Contact CPHL before sending sample.

Acute Encephalitis Syndrome

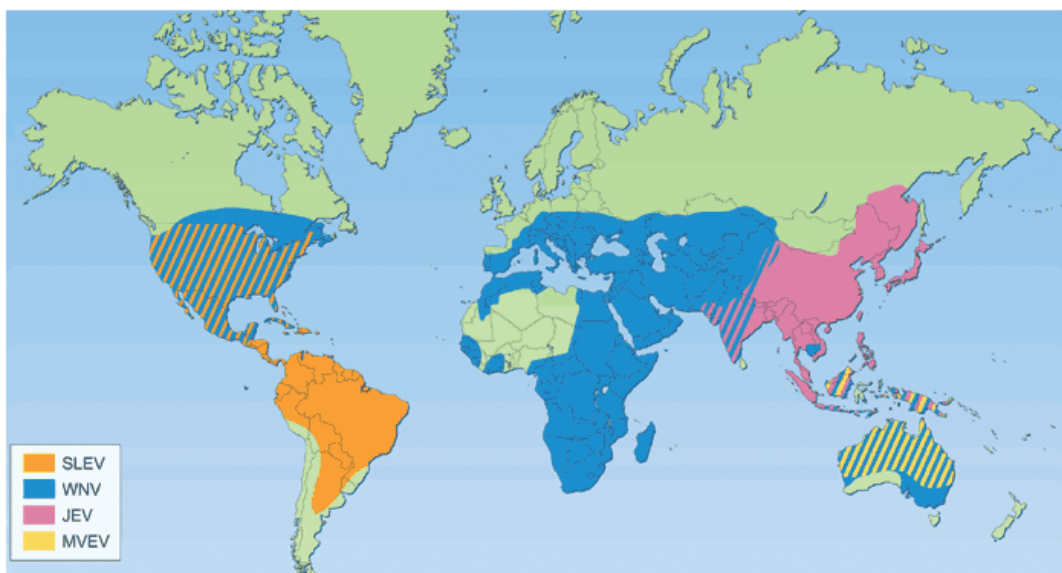
(Encephalitis/meningoencephalitis – viral, bacterial, others, unknown)

1. Background

Acute encephalitis syndrome is a group of clinical neurologic manifestation caused by wide range of viruses, bacteria, fungus, parasites, spirochetes, chemical and toxins. The disease is of short duration involving parts of the brain, spinal cord and meninges. Signs and symptoms of these diseases are similar but vary in severity and rate of progress.

Fig. 79: Global distribution of arboviral diseases

(SLE-St. Louis Encephalitis; WNV-West Nile virus; JEV-Japanese Encephalitis virus; MVE-Murray Valley encephalitis)



Source: Nat Med. 2004 Dec;10(12 Suppl):S98-109

Initially, most infections are asymptomatic or result in undifferentiated febrile illness. Severe infections are usually marked by acute onset, headache, high fever, meningeal signs, stupor, disorientation, coma, tremors, occasional convulsions (especially in infants) and spastic (rarely flaccid) paralysis. Neurological manifestations include meningitis, meningoencephalitis, encephalitis or myelitis.

Case fatality rates are high and vary widely. Neurological sequelae can occur in up to 50% of survivors. **Primary amoebic meningoencephalitis (PAM)** has a CFR of >95%.

Encephalitis is a complex disease involving multiple causes and factors. There is seasonal and geographical variation. Determining the true incidence of encephalitis is difficult, because reporting policies are neither standardized nor rigorously enforced. The reported incidence of acute encephalitis in western countries is 7.4 cases per 100,000 population per year while in tropical countries, it is 6.34 per 100,000 per year. Herpes simplex encephalitis (HSE), the most common, has an incidence of 2-4 per million population per year.

Japanese encephalitis virus, occurring principally in Japan, Southeast Asia, China, and India, is by far the **most commonly occurring viral encephalitis**.

Tick-borne encephalitis is common in eastern, central and northern European countries, and in northern China, Mongolia, and the Russian Federation. Approximately 10,000-12,000 clinical cases of tick-borne encephalitis are reported each year, but this may be an underestimate.

Primary amoebic meningoencephalitis (PAM), is an infection of the brain by the free-living protozoon *Naegleria fowleri*, also known as the “brain-eating amoeba”, is typically found in warm bodies of fresh water, such as ponds, lakes, rivers, and hot springs. The disease is rare and highly lethal. There had been fewer than 300 cases as of 2008.

2. Epidemiological characteristics

Infectious agent	<ul style="list-style-type: none"> ○ Arbovirus: mosquito-borne (JE, Eastern equine encephalitis, SLE and WNV) and Tick-borne Encephalitis (TBE) ○ Other viruses: measles, dengue, Epstein-Barr, VZV, enterovirus, herpes simplex virus type 1 and 2, and mumps ○ Bacterial: listeria monocytogenes, <i>N. meningitides</i>, <i>Rickettsia prowazekii</i>, mycoplasma pneumonia, TB, Lyme disease, leptospirosis ○ Others: PAM, <i>Trypanosoma brucei</i>, <i>Toxoplasma gondii</i>, malaria, cryptococcal, syphilis
Reservoir	Variety of species of birds and mammals (rodents, squirrels, pigs) act as vertebrate hosts in transmission cycle of arboviruses
Transmission	Bite of infective mosquitoes and ticks. Most important vector is <i>Culex</i> mosquitoes JE: <i>Culex tritaeniorhynchus</i> , <i>C. vishnui</i> complex and in the tropics, <i>C. gelidus</i> WNV: <i>Culex pipiens</i> , <i>C. tarsalis</i> and <i>C. quinquefasciatus</i> Eastern equine encephalitis and SLE: <i>Culex</i> spp. WEE: <i>Culex tarsalis</i> TBE: <i>Ixodes ricinus</i> and <i>I. persulcatus</i>
Incubation	Usually 3-14 days
Communicability	No direct person-to-person transmission
Susceptibility	Highest in infancy and old age. Inapparent or undiagnosed infection is more common at other ages

3. Primary amoebic meningoencephalitis (PAM) in Oman

In Oman, 2 confirmed cases (fatal) of PAM were reported in June and July 2000 from Wadi Himli (South Batinah governorate) that were epidemiologically linked to the history of swimming in a certain shallow fresh water pond during the hot summer climate.

4. Case definition

Suspect

Any person with altered mental state (consciousness, agitation, lethargy) for > 24 hours and:

- Fever $\geq 38^{\circ}\text{C}$ or history of fever
- Meningitis, encephalitis or other acute signs of central or peripheral neurologic dysfunction
- No alternative diagnosis (microbiological or non-infectious)
- Presence of epidemiological linkage (history of travel) to an endemic country or contact with a known case

Confirmed

A suspect case that is epidemiologically linked to a confirmed case or laboratory confirmed

The following section mainly deals with the arboviral meningoencephalitis/ encephalitis. For other diseases refer to the specific disease described in this manual elsewhere.

5. Laboratory criteria

The diagnosis of viral encephalitis can be confirmed by CSF examination for cell counts and biochemical parameters. Differential diagnosis such as TB, syphilis, fungal aetiology should be ruled out.

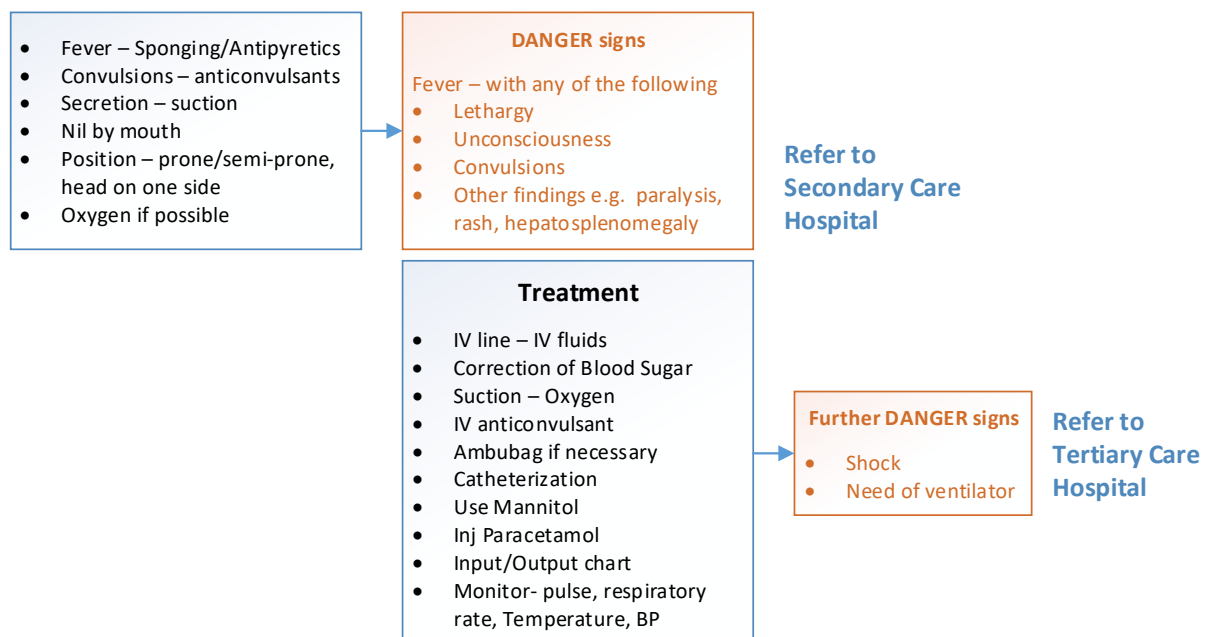
Viral PCR assays are available in CPHL. Requests should be made according to the clinical presentation, history of travel, and immune status and should be discussed with microbiologist or virologist to receive appropriate guidance on investigation tailored for each case.

6. Case management

There is no specific or prophylactic treatment for viral encephalitis. Primary treatments for all arboviral diseases are supportive. Standard blood and substance precautions are sufficient. Isolation is not applicable; the virus not usually found in blood, secretions or discharges during clinical disease. Enteric precautions appropriate until enterovirus meningoencephalitis is ruled out.

The figure below depicts the management of AES including JE at the community level (PHC) and the following table shows the recommended treatment for AES by a specific causative organism.

Fig. 80: Management of AES at the primary level



Source: Guidelines-clinical management of AES Including Japanese encephalitis. GOI, NVBDCP, DGHS, MOHFW, Aug 2009.

Table 23: Recommended treatment of AES by specific cause (if identified)

Organism	Drugs	Dosage
Herpes	Acyclovir	10 mg/kg/dose, slowly over a period of 1 hour – 8 hourly X 21 days
Varicella zoster	Acyclovir	10mg/kg/dose, 1/2hrs slowly over a period of 1 hour – 8 hourly X 2-3 weeks
Malaria	I/V quinine	20 mg/kg in 5% dextrose slowly over 1 hr then 10 mg/kg 8 hourly. Monitor BP and sugar
Bacterial meningitis (pyogenic)	Start with inj. ampicillin + Inj. ceftriaxone + steroid	400 mg/kg 6 hourly up to 12 gm/day 100-150 mg/kg as stat dose than in 2 divided doses 12 hourly
	Change antibiotics according to C/S report and response	
TB meningitis	Anti-tubercular drugs	1NH, PZA, Rcin + ethambutol + steroids
Toxoplasmosis	Pyrimethamine	2 mg/kg/24 hours in 2 divided doses X 2 days than 1 mg/kg/ on alternate day
Amoebic (PAM)	Metronidazole	10 mg/kg I/V slowly 8 hourly X 10-14 days
Fungal infection	Inj. amphotericin B Fluconazole	5 mg/kg/24 hours or 200-400 mg/kg for 3-6 months
Neurocysticercosis	Albendazole	10 mg/kg (up to 400 mg)/day X 2 weeks

Source: Guidelines-clinical management of AES Including Japanese encephalitis. GOI, NVBDCP, DGHS, MOHFW, Aug 2009.

7. Surveillance and reporting

From the year 2016, meningoencephalitis/encephalitis is included in group B syndromes notifiable diseases for case-based reporting collecting standard demographic, clinical, and epidemiologic data on each case. Tracking the number and size of outbreaks and complete investigation and control of outbreaks is a priority by public health authorities applying the basic steps of investigation of outbreaks.

8. Prevention and control

- Isolation, quarantine, concurrent disinfection and immune-prophylaxis is not applicable
- Search for unreported or undiagnosed cases or travel-related cases
- Identification of source of infection among invertebrate and vertebrate reservoirs
- Search for the presence of vector mosquitoes and apply integrated vector control measures
- Educate the public regarding modes of spread and control, eliminating mosquito breeding sites and personal protection against mosquito bite
- Vaccines – JE vaccine, cell culture based live attenuated vaccine (SA-14-14-2) is being used against JE encephalitis is used for children in India, Japan, the Republic of Korea, Taiwan (China), and Thailand: it is commercially available and is recommended for those travelling to endemic areas for extended visits to rural areas. Live attenuated and formalin inactivated primary hamster kidney cell vaccines are licensed and widely used in China
- Pasteurization of milk products
- Advise travellers when travelling to endemic areas with ongoing outbreak

9. Laboratory investigation protocol

Type of test	Serology (IgM and IgG)	Viral culture	rRT-PCR
Type of sample	Paired sera	Stool, throat swab	CSF, OP/NP swab
When to collect	Acute and convalescent	During acute phase	
Storage			CSF in sterile container (No VTM)
Transport			
BSL			
Laboratory	CPHL		

A87, G00, G03.0, G00.1, P35-37, P37.8

Other Meningitis Syndrome

Other than meningococcal, haemophilus and pneumococcal meningitis

1. Background

Meningitis is characterized by sudden onset of febrile illness with signs and symptoms of meningeal involvement. The inflammation may be caused by infection with viruses, bacteria, parasites, fungi and other non-infectious agents such as nonsteroidal anti-inflammatory drugs.

Neisseria meningitides, *S. pneumoniae* and Hib constitute more than 75% of all cases of bacterial meningitis in most studies, and 90% of bacterial meningitis in children.

Other bacterial meningitis: besides meningitis due to *H. influenzae* serotype b, Meningococcal and invasive pneumococcal disease other common bacterial agents responsible for meningitis include *S. pneumoniae* in age group above 5 years of age. The bacterial causes of neonatal meningitis include Group B streptococci, *E. coli*, *Listeria monocytogenes* and other organisms acquired from the birth canal. Klebsiella-Enterobacter-Serratia group from nursery environment may also be responsible for neonatal meningitis.

Viral meningitis (aseptic meningitis): it is relatively common but rarely a serious clinical syndrome with multiple viral aetiologies. Viral meningitis occurs worldwide and sporadically or as an epidemic disease. Case fatality rates are generally low. Infection may have potential of long-term sequelae in those affected (mostly children) but the disease is rarely severe and recovery is usually complete. A rash, transient paresis and encephalitic manifestations may be present. Active illness seldom exceeds 10 days. Neuromuscular residual signs may occur for about 1 year and usually clear up completely.

Aseptic meningitis has a reported incidence of 10.9 cases per 100,000 person-years. It occurs in individuals of all ages but is more common in children, especially during summer and 3 times more common in males.

2. Epidemiological characteristics

Infectious agent	<ul style="list-style-type: none"> ○ Other Bacteria: <i>Listeria spp.</i> (monocytogenes), Staphylococci, enteric bacteria, group B streptococci, <i>Mycobacterium tuberculosis</i>, syphilis, <i>Leptospirosis</i>, <i>Borrelia burgdorferi</i>, <i>T. pallidum</i>, <i>Brucella spp.</i>, <i>Francisella tularensis</i>, <i>Nocardia spp.</i> and <i>Actinomyces spp.</i> ○ Viruses: Mumps, Enterovirus, coxsackievirus, arboviruses, measles, herpes simplex and varicella viruses and lymphocytic choriomeningitis ○ Fungi: <i>Cryptococcus neoformans</i>, <i>Coccidioides immitis</i>, <i>Blastomyces dermatitidis</i>, <i>Histoplasma capsulatum</i>, <i>Candida albicans</i>, <i>Aspergillus spp.</i> and <i>Sporothrix schencki</i> ○ Parasites: <i>Acanthamoeba spp.</i>, <i>Naegleria fowleri</i>, <i>Angiostrongylus cantonensis</i>, <i>Gnathostoma spinigerum</i>, <i>Baylisascaris procyonis</i>, <i>Schistosoma, spp.</i>, <i>Strongyloides stercoralis</i> and <i>Echinococcus granulosus</i> ○ Drugs: nonsteroidal anti-inflammatory drugs (NSAIDs), metronidazole and IV immunoglobulin
Reservoir, transmission, incubation, communicability, susceptibility Varies with the specific infectious agent (refer to specific disease chapters)	

Note: Various diseases caused by non-viral infectious agents may mimic aseptic meningitis. Pre-referral antibiotics may produce a negative result for CSF and blood culture resulting in misclassification of bacterial as viral meningitis.

3. Situation in Oman

The differentiation of meningitis other than *Haemophilus* and meningococcal into categories viz. bacterial and viral meningitis was recently started. Categorization of bacterial aetiology into pneumococcal and streptococcal was started in 1998. The classification of meningitis into categories of viral origin was based on laboratory criteria.

4. Case definition

Suspect

Acute onset of fever $\geq 38.5^{\circ}\text{C}$ and one or more of the following:

- Neck stiffness and pain
- Severe headache
- Nausea and vomiting
- Photophobia
- Altered mental status

In children < 2 years of age a case with sudden onset of fever $\geq 38.5^{\circ}\text{C}$ and irritability or bulging fontanelles should be clinically defined as a case of meningitis.

Suspect viral meningitis: A suspected case with one or more of the following features seen in the CSF examination:

- Normal glucose and normal or mild increase ($> 50 \text{ mg/dl}$) in protein
- Moderate increase cells ($< 500/\text{mm}^3$) and lymphocyte predominance ($> 50\%$)
- Epidemiological link to a confirmed case

Suspect bacterial meningitis: a suspected case with one or more of the following features seen in the CSF examination:

- Turbid
- Decreased glucose ($< 50 \text{ mg/dl}$) and increase of protein ($100\text{--}500 \text{ mg/dl}$)
- Increased cells ($> 500/\text{mm}^3$) and polymorph predominance ($> 50\%$)
- Positive microscopy
- Epidemiological link to a confirmed case

Confirmed

A suspect case that is epidemiologically linked to a confirmed case, or a case that is laboratory confirmed by serology/microscopy/culture/isolation.

Note:

- Positive Kernig's sign–hip flexion with extended knee causes pain in the back and legs
- Many organisms that cause meningitis lead to meningoencephalitis or AES if not treated. At the time of reporting, if the disease is limited to the meninges report as other meningitis syndrome and if it has spread beyond meninges report as AES.
- If the causative organism is identified, the case should be reported as specific disease not as syndrome of other meningitis or AES.

5. Laboratory criteria

Viral meningitis is under laboratory surveillance in Oman since 2001. Blood and urine samples should be collected from all suspect viral meningitis cases and sent to the CPHL, Darsait for viral culture and isolation. Detailed virological data on specific causal agents on a national basis would be useful for the epidemiological analysis. The CSF findings in a typical suspect case of meningitis are summarized in the following table:

Table 24: Typical CSF findings in patients with and without meningitis

Parameter	Normal	Bacterial meningitis	Viral meningitis	Fungal meningitis	Tuberculous meningitis
Opening pressure (mm H ₂ O)	< 180	200-500	N/A	> 250 (<i>Cryptococcus spp.</i>)	N/A
WBC count	0-5	100-20,000 (mean 800)	5-500 (mean 80)	20-2000 (mean 100)	5-2000 (mean 200)
WBC differential	No predominance	>80% PMN	> 50% L, < 20% PMN	> 50% L	> 80% L
Protein (mg/dl)	15-50	100-500	30-150	40-150	> 50
Glucose (mg/dl)	45-100 (2/3 of serum)	≤ 40 (< 40% of serum)	30-70	30-70	< 40
Gram stain (% positive)	N/A	60-90	–	–	37-87 (AFB smear)

AFB: acid-fast bacilli; L: lymphocytes; N/A: not applicable; PMN: polymorphonuclear cells

Source: Renee R. Koski, Dean Van Loo. Aetiology and Management of Chronic Meningitis. US Pharm. 2010; 35(1): HS-2-HS-8.

Confirmatory tests

- **Wellcogen Test** – a bacterial antigen rapid latex agglutination test for qualitative detection of antigen present in CSF as a consequence of infection from *Streptococcus* group B, *H. influenzae* Type B, *S. pneumoniae*, *N. meningitidis* and *E. coli*.
- Serological evidence with a specific bacterial antigen detection tests in CSF or blood depending on the suspected causative agent
- Serological evidence of acute infection (within 7 days) with a virus-specific antibody (IgM) in CSF or blood depending on the suspected causative agent
- Blood/CSF culture after 48-72 hours of incubation
- Detection by PCR from CSF in acute phase of illness

Note: If laboratory findings due to bacterial, viral or other agents. Only after careful clinical review the case should be categorised as **unspecified meningitis**.

6. Case management

Report cases to health authority. Infectious patients should be isolated and excluded from school, work or public places until the patient is non-infectious. Concurrent disinfection should be practiced of articles soiled by discharges from the patient.

The initial management of a suspect case of meningitis is support therapy and stabilize patient. Administer antibiotics immediately if bacterial cause is suspected. Most cases of viral meningitis are benign and self-limited. Often, patients need only supportive care and require no specific therapy. In certain instances, specific antiviral therapy may be indicated. Following table shows the suggested treatment for meningitis if specific causative organisms are identified.

Table 25: Recommended treatment for meningitis for some specific causative organism

Organism	First Choice	Alternative
<i>Listeria monocytogenes</i>	Ampicillin or penicillin G	TMP-SMX
<i>Enterobacteriaceae</i>	Cefotaxime or ceftriaxone	Aztreonam, TMP-SMX, meropenem, ampicillin
<i>Streptococcus agalactiae</i> (GBS)	Ampicillin or penicillin G	Cefotaxime, ceftriaxone, vancomycin
<i>Pseudomonas aeruginosa</i>	Ceftazidime or cefepime	Aztreonam, meropenem, ciprofloxacin
<i>Staphylococcus epidermidis</i>	Vancomycin	Linezolid
	<i>Change antibiotics according to C/S report and response</i>	
Viral meningitis	No specific treatment. Supportive care/therapy	Acyclovir
Fungal meningitis	Amphotericin B with or without flucytosine	Fluconazole
Parasitic meningitis	Amphotericin B	Miconazole and Rifampin

Source: Modified from: Rodrigo H and Michael SB. Meningitis Treatment and Management. Medscape, 2015.

7. Surveillance and reporting

All cases of meningitis should be reported and followed-up to further classify them based on the aetiological agent. Misclassification due to lack of growth should be avoided. In the event of refusal for lumbar puncture the clinical presentation should be further assessed and recorded in details. Only then should the case be classified into the broad category of bacterial or viral meningitis.

8. Prevention and control

Prevention and control measures depend on the specific causative agent.

- Isolation: Specific diagnosis depends on laboratory data not usually available until after recovery. Therefore enteric precautions are indicated for 7 days after onset of illness unless a non-enteroviral diagnosis is established
- No special precautions needed beyond routine sanitary practices and IP and C measures
- Quarantine not applicable
- Immunization of contacts as per the specific infectious agent
- Investigation of contacts and source of infection is not usually indicated

9. Laboratory investigation protocol

Type of test	Bacterial		Viral	
	Antigen detection* (Wellcogen)	Culture and microscopy	Serology*	Molecular tests
Type of sample	Serum CSF	Blood, stool and CSF		CSF OP/NP swab
When to collect	Acute phase of illness			
Storage	<ul style="list-style-type: none"> CSF specimens for culture should not be refrigerated or exposed to extreme cold and heat. Transport at 20°C to 35°C CSF for viral molecular testing to be kept at 4°C for up to 1 week and at -80°C if exceeding 1 week Viral PCR store at 4°C for 48 hrs, freeze if exceeding 48hrs For 16s, blood and CSF can be kept at 4°C for up to 1 week, do not freeze. Freeze CSF if exceeding 1 week Blood samples should be immediately inoculated into a culture bottle and transported as soon as possible 			
Transport	Depends on suspect organism			
BSL	Depends on suspect organism			
Laboratory	Regional Hospital		Tertiary Hospital and CPHL	

*specific bacterial antigen detection and viral serology will depend on the suspect agent

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Group C

Health Conditions Under Surveillance

Group C

Health Conditions Under Surveillance

Introduction

Health conditions under surveillance' is a group of diseases/syndromes that has been added to the list of communicable diseases under surveillance to acknowledge their importance and role in addressing the community's health. Thus it replaces the 'group C diseases and syndromes' in the previous editions of the manual. The monthly aggregated data received did not serve any meaningful purpose in the past. Moreover, due to the availability of Al Shifa, a computerized patient record system, compiling aggregated data at governorate and national levels is a relatively simple task.

The health conditions included in this group have direct implications on the communicable disease burden and must be addressed for the benefit of the community's health.

However, these surveillance activities are performed by various departments or sections under the umbrella of the newly established Directorate General of Disease Surveillance and Control in the MoH. The departments have developed their own system and mechanism to monitor these health conditions at the national level.

This chapter represents the health conditions under public health surveillance highlighting briefly the concept, the policies, the method and the guidelines. Kindly note that some of these conditions have been newly introduced and hence are at a conceptual stage and in the process of development over a period of time.

For further details, the readers should refer to the detailed guidelines either already issued or that are being introduced by the respective departments.

National ARI Surveillance

Acute Respiratory Infections

1. Background

There have been several incidents of emerging respiratory infectious diseases in the past decades, including influenza A (H1N1) pandemic of pdm2009, the Middle East respiratory syndrome coronavirus (MERS-CoV) in the Arabian Gulf countries. All of these events demonstrate the importance of establishing a respiratory disease surveillance system that can detect new pathogens rapidly and provide information to assess the impact on the population and the presence of an operational preparedness plans.

Oman launched the influenza-like-illnesses (ILI) surveillance system in 2001 in collaboration with NAMRU-3 in Cairo where initially all samples were processed subsequently the CPHL fully established all necessary procedures in the virology section for the detection and viral isolation.

The epidemiological surveillance of ARIs with laboratory surveillance was integrated into one system to strengthen basic surveillance and response capacities. The SARI surveillance system launched in 2008 has been integrated into the national Surveillance System and recently upgraded to a comprehensive electronic surveillance system of acute respiratory infections (ILI/SARI).

2. Situation in Oman

In order to serve as an early warning system, the ILI/ARI data are captured from patient record system (Al Shifa) based on ICD-10 (J code) on weekly basis. National baseline levels of activity for ILI/ARI and severe respiratory related diseases with alert threshold were established to evaluate the impact and severity of each season and detect any future epidemic events.

Throughout 2015 and 2016, a total of 14988 respiratory samples were tested in the CPHL with almost 30% positivity rate. Among those positive samples 64% were for influenza (30% H1N1, 13% H3 and 21% Flue B) and the rest were other respiratory viruses.

Fig. 81: Acute respiratory infections (ARI) rate, Oman (Week 26, 2016)

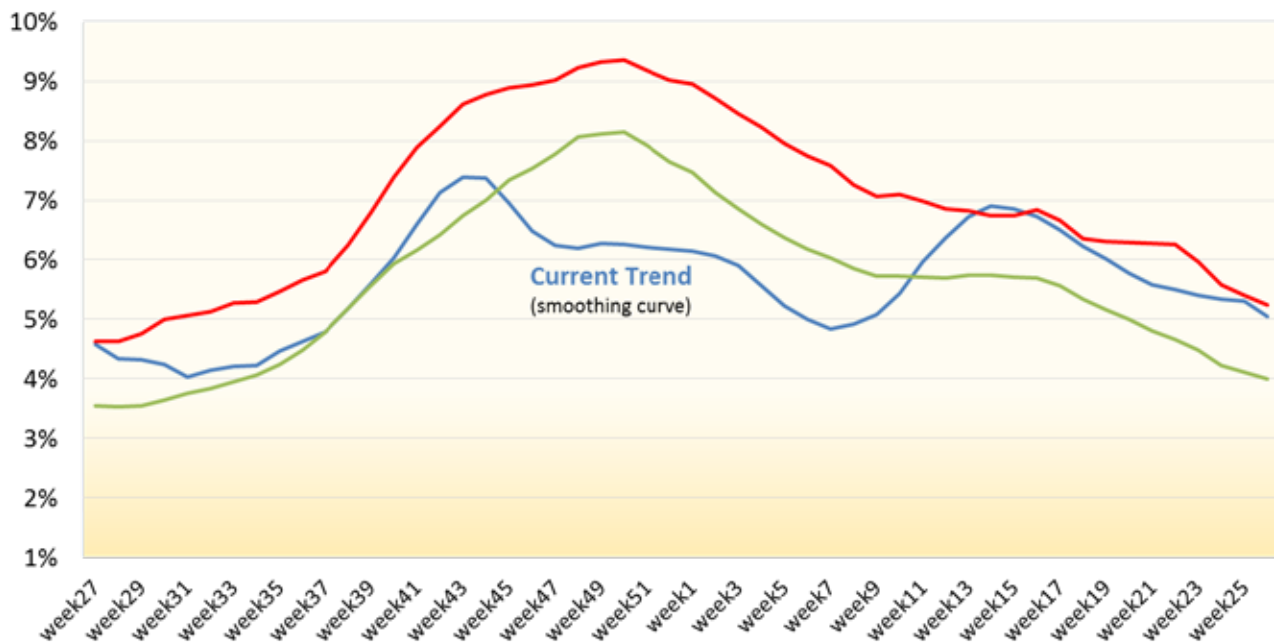
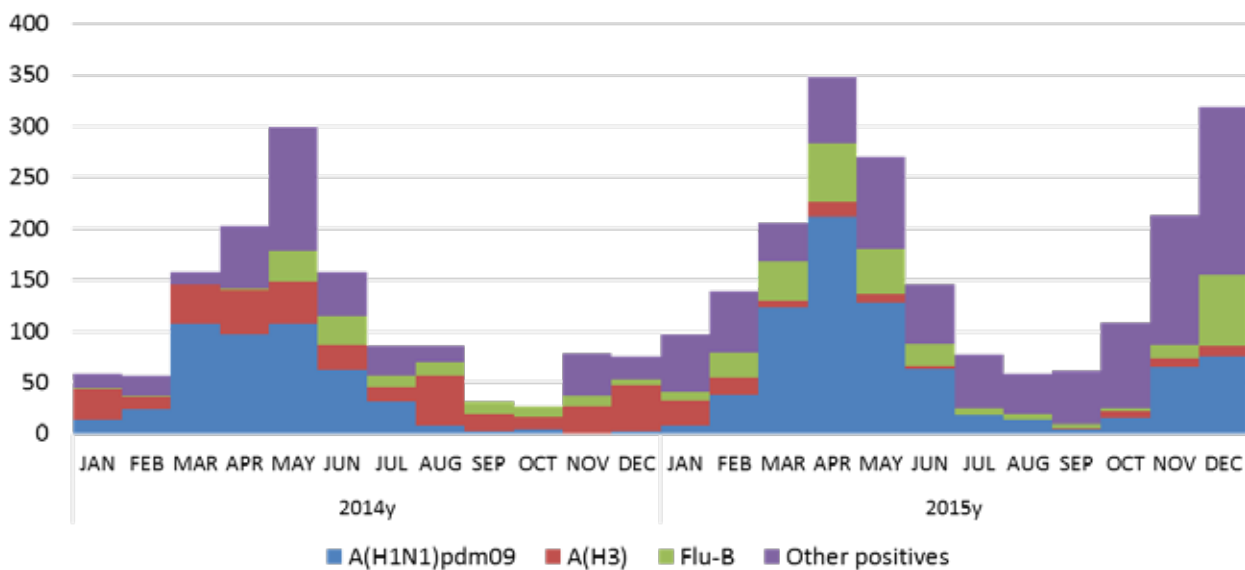


Fig. 82: Distribution of Respiratory viruses in Oman, 2015-16



The distribution of respiratory viruses varied between both years and throughout months. For instance, the dominant viruses in 2015 was H1N1 pdm09 compared to Non influenza respiratory viruses in 2016 (Fig. 2).

3. NARI Surveillance strategy

The national acute respiratory infection (ARI) Surveillance System consists of:

- SARI Sentinel Surveillance: for SARI cases in sentinel hospitals
- SARI Intensified Surveillance (SARI-IS): for unusual or unexpected occurrences of SARIs in all hospitals including sentinel sites
- Influenza-like-illnesses sentinel site surveillance: in selected outpatient health centres.

4. Case definition

SARI sentinel surveillance

An ARI with:

- ✓ History of fever or measured fever of $\geq 38^{\circ}\text{C}$ and
- ✓ Cough with
- ✓ Onset within last 10 days and
- ✓ Requires hospitalization

SARI intensified surveillance

Admitted patient with the respiratory symptoms, i.e. fever $> 38^{\circ}\text{C}$ and cough (or exacerbation) or breathing difficulty.

AND one of the following:

- Evidence of severe illness progression, i.e. either radiographic evidence of infiltrates consistent with pneumonia or a diagnosis of ARDS or severe ILI which may also include complications, such as encephalitis, myocarditis or other severe and life-threatening complications
- The patient needs admission to the ICU or another area of the hospital where critically ill patients are cared for with or without mechanical ventilation
- No alternate diagnosis within 72 hours of hospitalization, i.e. results of preliminary clinical and or laboratory investigations, within 72 hours of hospitalization, cannot ascertain a diagnosis that reasonably explains the illness
- High-risk groups (pregnancy, immunocompromised, chronic conditions viz. DM/ HTN)
- One or more of the following exposures/conditions:
 - ✓ Residence in or recent travel within < 10 days of illness onset to a country
 - ✓ Where human cases of novel influenza virus or other emerging/re-emerging pathogens have recently been detected or are known to be circulating in animals
 - ✓ Close contact with a confirmed case with emerging/re-emerging pathogens within 10 days prior to onset of symptoms
 - ✓ History of exposure involving direct health care, laboratory, animal exposure
 - ✓ Part of cluster with similar respiratory symptoms

ILI case definition

The ILI case definition is generally intended for use in outpatient treatment centres.

An Acute Respiratory Infection with all of the following:

- ✓ Measured fever of $\geq 38^{\circ}\text{C}$ And
- ✓ Cough
- ✓ Onset within the last 10 days

5. Laboratory criteria

Laboratory parameters tested for SARI sentinel sites samples:

- Influenza A and subtyping (H1N1 pdm09, seasonal H1, H3, H5 and H7)
- Influenza B and subtyping (B-Yamagata and B-Victoria)
- 10% of SARI-SS will be tested for MERS-CoV randomly.

Specimens from ICU SARI-IS admitted cases using real time RT-PCR will be tested for:

MERS-CoV and the respiratory viral panel which includes the following viruses: influenza A, influenza A (H1N1) pdm09, influenza B, rhinovirus, coronavirus NL63, 229E, OC43, HKU1, parainfluenza 1, 2, 3,

4, human metapneumovirus A/B (HMP), bocavirus, respiratory syncytial virus A/B (RSV), adenovirus, enterovirus, human parechovirus infection and *Mycoplasma pneumonia*).

Specimens from other wards SARI-IS admitted cases using real time RT-PCR will be tested for:

- Influenza A and subtyping (H1N1 pdm09, seasonal H1, H3, H5 and H7)
- Influenza B and subtyping (B-Yamagata and B-Victoria)
- MERS-CoV
- Atypical bacterial origin panel PCR (for all samples negative for the above)

Laboratory parameters tested for ILI

- Influenza A/B and typing.
- Cell culture (for positive samples by PCR)

6. Reporting

From the year 2015, ARI is included in group B notifiable diseases for case-based reporting, collecting standard demographic, clinical, and epidemiologic and virological data on each SARI case or ILI through ARI e-Notification reporting system (Al Shifa).

7. Global reporting network

The collected data are shared on weekly basis with WHO through regional and global networks

8. Prevention and control

- Seasonal influenza vaccine was introduced from October 2005 as a single dose annually for health care workers, Hajj/Umrah pilgrims and other high-risk groups such as elderly (over 65 years) and anyone with a serious long-term health condition
- A new high-risk group of pregnant women was added from 2015
- Recommendations for infection prevention and control measures for patients presenting with suspected or confirmed infection or co-infection with ARI in all health care settings should be followed and include:
 - ✓ Standard precautions
 - ✓ Contact and droplet precautions

Acute Gastroenteritis Surveillance

1. Background

Acute gastroenteritis as defined as diarrhoea and/or vomiting, is a major cause of morbidity in all health care institutions in the country.

The illness is caused by a variety of viral, bacterial and parasitic pathogens and by toxins, chemicals, and other non-infectious causes. Noroviruses are the leading cause of epidemic gastroenteritis, detected in $\geq 50\%$ of AGE outbreaks across Europe and the United States. The national communicable disease surveillance system currently focuses on foodborne disease outbreaks and unusual clusters of AGE. The routine surveillance data and trends on this common condition are not captured by the surveillance system. Hence, to understand and guide appropriate interventions to prevent epidemic AGE, an enhancement of the AGE surveillance is required to be adopted at the governorate levels.

A brief description of a sentinel AGE surveillance being launched as a pilot project in the Muscat Governorate is provided below.

Apart from foodborne and waterborne AGE outbreaks, there are a number of others caused by contact with infected persons, animals or environmental sources and those caused by other or unknown modes of transmission.

An AGE outbreak for the purpose of surveillance is defined as ≥ 2 cases of a similar illness epidemiologically linked to a common source or exposure. Data collected pertain to the date of onset, primary mode of exposure and/or transmission, suspect, or confirmed aetiology. Number of outbreak-associated illnesses, hospitalizations and deaths are also recorded. The primary mode of transmission is determined by each reporting site on the basis of the local public health investigation and guidance document.

2. Objectives

- To assess the burden and epidemiology of AGE in health care and community setting (identified priority areas and populations) for applying public health interventions
- To characterize AGE outbreaks, for example, aetiology, mode of transmission, trend, etc.

3. Surveillance type

Sentinel site.

4. Sentinel sites

The surveillance is proposed to be organized initially in the primary care facilities of the governorate. Eventually the surveillance may be expanded to secondary or tertiary care facilities. The selected sites should preferably geographically and demographically represent the governorate. The number of sites will depend on the available resources.

5. Case definition (WHO)

A case of **gastroenteritis** refers to an individual with ≥ 3 loose stools and/or any vomiting in past 24 hours, but excluding those...

- With bowel cancer, irritable bowel syndrome, Crohn's disease, ulcerative colitis, cystic fibrosis, coeliac disease or another chronic illness with symptoms of diarrhoea or vomiting or
- Who report their symptoms were due to drugs, alcohol or pregnancy

6. Recruitment

An individual is recruited when the above case definition is met. All doctors working in the primary care institutions selected should request 2 stool samples namely 'stool routine' and 'stool culture' (bacterial and viral). Laboratory request should be placed for the above in the computer with required clinical details. The laboratory in the health centre receives 2 samples and processes one as routine and for culture to a reference laboratory. The second sample is for the viral studies sent directly to CPHL.

7. Data management

Details include unique identifier, age, gender, clinical details. The printout should be sent to an Epidemiologist every week. The list of patients should include all in whom the stool culture request was made.

- Apart from patient details as above collect information on total outpatient cases with AGE, numbers recruited and number of samples collected
- The results should be sent to the regional Epidemiologist by the primary care institutions for updating the database
- The data are analysed on weekly basis by the regional Epidemiologist. A short summary weekly report should be sent as feedback
- The referral laboratories should send any positive isolates to the CPHL for typing

8. Surveillance site team

- **All the doctors** and laboratory are primarily responsible for the AGE surveillance
- The MOIC or a designated Focal Point in the health centre will function as the AGE **Surveillance Coordinator** in the field and a team leader

- The **Laboratory Technician** in the health facility is designated as the **Focal Point** for gastroenteritis surveillance and reporting

Kindly note the AGE surveillance has not yet been introduced formally. The experience of Muscat Governorate will be observed for preparation of future national guidelines. However other governorate offices are encouraged to initiate and develop their own alternate surveillance system for AGE on a voluntary basis within available resources and to share their field experiences.

STI Syndromic Surveillance

Sexually transmitted infections

1. Introduction

The term 'STI' refers to a variety of clinical syndromes and infections caused by pathogens that can be acquired and transmitted through sexual activity. More than 30 different bacteria, viruses and parasites cause STIs. A person can have STI without having obvious symptoms of disease. Therefore the term "sexually transmitted infection" is a broader term than "sexually transmitted disease" (STD).

In STIs, as the name suggests, transmission occurs predominantly by sexual contact. Some spread by skin-to-skin genital contact. The organisms can also spread through non-sexual route such as through blood products, tissue transfer and from mother to child during pregnancy and childbirth.

2. Magnitude of the problem

Globally, more than 1 million people acquire STIs every day. Each year an estimated 500 million people become ill with one of 4 curable STIs, namely, chlamydia, gonorrhoea, syphilis and trichomoniasis. More than 530 million people are infected with the virus that causes genital herpes (herpes simplex virus 2). More than 290 million women have a human papillomavirus infection. Some STIs can increase the risk of HIV acquisition 3-fold or more. An STI can have serious consequences beyond the immediate impact of the infection itself including mother-to-child transmission and chronic diseases. Drug resistance, especially for gonorrhoea, is a major threat in controlling the STI worldwide.

Globally, 26 million of an estimated 500 million people (5.2%) with 4 curable STIs, viz. chlamydia, gonorrhoea, syphilis and trichomoniasis are contributed by the Eastern Mediterranean region.

The STIs presenting with symptoms are considered as the tip of the iceberg whereas the majority of STIs are asymptomatic and remain hidden in communities. Females have more asymptomatic cases compared to males.

3. Management approaches

Management of STIs are done primarily through 3 approaches viz. **Syndromic, Aetiological and Clinical.**

Out of all 3 approaches syndromic approach is preferred for primary health care as it offers following benefits:

1. First-line service providers are meant to diagnose an STI and treat patients “on the spot”, without waiting for the results of time consuming and costly laboratory tests. This allows for easy accessibility of treatment
2. By offering treatment on the patient’s first visit, it helps to prevent the further spread of STIs
3. It also Includes patient education (about the infection, how STIs are transmitted, risky sexual behaviour and how to reduce risk), partner management and the provision of condoms

Syndromic surveillance uses flow charts hence it standardizes the decision-making, treatment offered as well as it serves as a reminder for providing health education and protection in terms of condom provision.

4. STI Syndromic surveillance in Oman

The following STI syndromes have been under surveillance in Oman since 2010 (an abridged version of these were under surveillance since 1996):

- 1) Urethral discharge
- 2) Scrotal swelling
- 3) Vaginal discharge
- 4) Pelvic inflammatory disease (PID)
- 5) Genital ulcers
- 6) Inguinal bubo
- 7) Anal symptoms

Neonatal conjunctivitis is under surveillance but usually cases are not reported. Detail flow chart related to their diagnosis, treatment and advices offered can be accessed through STI case management quick reference chart, the syndromic approach for primary health care settings, MoH publication, 2009. Syndromic surveillance is implemented in the private sector as well.

Consequences of STIs, such as cervical cancer, infertility and neonatal deaths, can have a profound impact on sexual and reproductive health and some STIs can increase the risk of acquiring HIV by 3-fold or more.

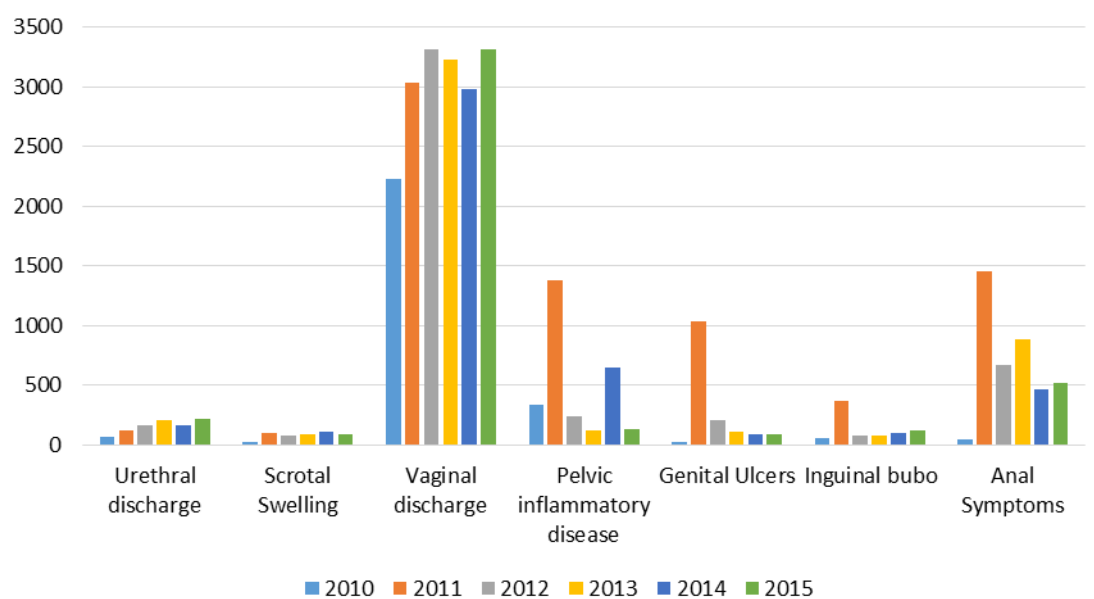
Each patient with an STI is offered test for syphilis and HIV in Oman. STIs are often referred as a gateway for the entry of HIV infection and therefore surveillance and response to STIs are very important. It is especially relevant in Oman where new HIV infections are yet to witness a sustained declining trend.

5. Limitations of syndromic surveillance

Syndromic surveillance is quite reliable for urethral discharge but not so reliable for vaginal discharge. Validation of the flow charts should be done from time to time using NAAT or nucleic acid amplification testing, which are not presently available in Oman.

The following graph shows reported STI cases by syndromic surveillance from 2010 to 2015 in Oman.

Fig. 83: Reported STI cases by syndromic surveillance in Oman: 2010-2015



AMR Surveillance

Antimicrobial resistance surveillance including multidrug-resistant organism (MDRO) and *Clostridium difficile*

1. Background

Data from around the world confirm that AMR including MDR is increasing among many pathogens responsible for infections in health care facilities and in the community. AMR makes it difficult and more expensive to treat a variety of common infections causing delays in effective treatment or, in the worst case, the inability to provide appropriate therapy.

The predictable consequence of resistance is increased morbidity, prolonged illness, a greater risk of complications and higher mortality rates. The economic burden includes loss of productivity (loss in income, diminished worker productivity, time spent by family) and increased cost of diagnostics and treatment (consultation, infrastructure, screening, cost of equipment, drugs). Both the health and economic consequences of AMR are considerable and costly but difficult to quantify precisely as the available data are incomplete in many countries. The additional human burden associated with it (pain, change in daily activities, psychosocial costs) is also significant, but even more difficult to quantify.

Although *C. difficile* is not technically categorized as an MDRO, it is usually included with MDRO reporting guidelines because its epidemiological significance is related to that of MDRO.

The emergence of MDROs and *Clostridium difficile* are increasingly recognized as major threats to public health.

Multidrug-resistant organisms are bacteria that have become resistant to one or more classes of antimicrobial agents. *C. difficile* infections (CDIs) rarely have drug resistance but most are related to antibiotic use and have significant mortality and morbidity.

Although antimicrobial resistance is a natural phenomenon, it is being propagated by the misuse of antimicrobial medicines, inadequate or inexistent programs for infection prevention and control (IPC), poor-quality medicines, weak laboratory capacity, inadequate surveillance and insufficient regulation of the use of antimicrobial medicines.

Clostridium difficile is a spore-forming, gram-positive, strictly anaerobic bacillus. Its spores can survive

outside the human body for weeks to months on environmental surfaces, medical equipment and devices. Further, the spore is not killed via typical hospital-grade disinfectants or, in the case of hand hygiene, by alcohol-based hand rubs. These characteristics make it especially challenging to control.

Clostridium difficile produces a variety of clinical outcomes, ranging from asymptomatic colonization and self-limiting diarrhoea to life-threatening sepsis and pseudomembranous colitis. Recognized as a major cause of infectious diarrhoea in hospitals and other health care settings, it is associated with considerable morbidity and mortality. The first reports establishing *Clostridium difficile* as the cause of antibiotic-induced pseudomembranous colitis were published in 1978. Since then CDI has emerged as the most common cause of antibiotic-associated diarrhoea and a highly problematic health care-associated infection.

Comprehensive national plans based on a multisectoral approach and with sustainable financing are regarded as one of the main ways to fight antimicrobial resistance and *C. difficile* globally.

A national surveillance mechanism and the necessary laboratory capacity are essential to detect, analyse and track resistant microorganisms and *C. difficile*. Data on AMR among local pathogens help define the best possible treatment for individual patients. However, the proportion of resistant bacteria can vary from one area to another, and in many health facilities there are no local data on resistance patterns. Experiences from national and international surveillance networks on antimicrobial use can be put to multiple uses, including orienting treatment choices, understanding AMR trends, informing public health policy, identifying priority areas for interventions and monitoring the impact of interventions to contain resistance. The lack of adequate surveillance in many parts of the world leaves large gaps in existing knowledge of the distribution and extent of AMR and *C. difficile*.

National MDROs surveillance in Oman is under development and will be launched using an e-notification system.

2. Surveillance objectives

- Foster national and local surveillance systems and to harmonize them with the global standards
- Estimate the extent and burden of AMR and *C. difficile* by selected indicators
- Analyse and report national and local data on AMR and *C. difficile* on a regular basis
- Detect emerging resistance and its spread
- Assess the impact of interventions targeted prevention and control programs

3. Method

The definitions and methods of the CDC's National Healthcare Safety Network multidrug-resistant organism and *Clostridium difficile* infection (MDRO/CDI) module will be used and/or customized to conform to national needs and capacity.

4. Management of MDROs

- Initiate contact precautions in addition to standard precautions
- Patient must be in a single room or can be cohorted with another patient with the same organism
- Place a contact isolation sign on the outside of the isolation room door
- Practice strict hand hygiene
- Cohort non-critical items such as stethoscopes and pressure cuffs with the patient
- Store the minimum amount of supplies in the patient's room
- Use an isolation cart for extra supplies (kept outside the room)
- Ensure that all staff understand and comply with the isolation precautions and hand hygiene protocol
- Limit the patient's activity outside the room to treatments or tests
- Notify receiving departments/wards (e.g., radiology, endoscopy, clinics, OR) of the patient's isolation status when the patient must be transported for treatment/tests

- Ensure concurrent and terminal cleaning of the isolation room and equipment as per housekeeping procedure
- Handle/discard contaminated items as per standard precautions

5. Management of outbreak

Management of outbreaks will be coordinated by the infection prevention and control specialists and will require the cooperation of medical, nursing, laboratory and other departments.

Refer to the national AMR/MDRO policy for the method and definitions of the targeted MDROs under the surveillance programme.

Infectious Disease Mortality Surveillance

Background

Worldwide, infectious diseases are the leading cause of death in children and adolescents, and one of the leading causes in adults. About 15 million (> 25%) of 57 million annual deaths worldwide are the direct result of infectious diseases. Three of the top 10 causes of death, or 16% of all deaths each year, are from infectious diseases and are attributable to preventable or treatable causes.

Aim

The main aim of this infectious disease mortality surveillance is to determine the leading causes of death due to infectious diseases at the governorate as well as the national level.

Data source

The source of data for mortality surveillance system will be from the routine monthly mortality reports of the MoH hospitals.

The surveillance data will be compiled and analysed in collaboration with the directorate of health information and statistics, MoH.

Responsibility

The regional epidemiologists in the governorates will analyse these reports and identify potential issues and communicate periodically (quarterly) the information to the national level public health counterparts to take necessary actions in terms of policies, actions and developing specific guidelines.

Outcome

The primary outcome for the surveillance is the mortality rates by major groups of infectious diseases by governorate, age and gender.

Health Care-Associated Infections (HAI) Surveillance

Hospital-associated infections

1. Background

Health care-associated infections or infections acquired in health care settings are a leading cause of morbidity and mortality worldwide with tens of thousands of lives lost each year. The WHO identifies HAI as a **“priority patients’ safety goal”**.

These infections pose a serious risk to patients, health care workers and visitors. Patients with HAI require prolonged hospitalization, significant nursing and highly specialized medical care, long complex antibiotic treatment, an increased number of outpatient and emergency visits, and possibly readmission to the hospital.

Such infections were long accepted by clinicians as an inevitable hazard of hospitalization or health care delivery. However, it is now understood that relatively straightforward approaches can prevent many common HAI.

HAI cover any infection contracted:

- As a result of treatment in, or contact with, a health or social care setting
- As a result of health care delivered in the community
- Outside a health care setting and brought in by patients, staff or visitors and transmitted to others (i.e. influenza)

Although the epidemiology of HAI is evolving, surgical site infections (SSIs) and infections associated with indwelling devices, such as ventilator-associated pneumonia (VAP), central line-associated blood stream infections (CLABSIs) and catheter-associated urinary tract infections (CAUTIs) account for a large

proportion of HAIs. More recent data, especially reports published by the CDC indicate that infections associated with indwelling devices (CLABSI, CAUTI, and VAP) and SSIs stand for approximately half of all HAIs in the US.

Some of the most well-known HAIs include those caused by MRSA, methicillin-sensitive *Staphylococcus aureus*, *Clostridium difficile* and *E. coli*. They impose a significant economic burden on the nation's health system. Some published reports estimate the overall annual direct cost of treating HAIs in US hospitals to exceed one hundred billion dollars. However, 70% to 80% of this huge cost could be saved through the prevention of these infections.

Accurate local data that estimate expenditure on treating HAIs is lacking. However, based on the WHO's published rate of HAIs for GCC countries of 7.5% and an average treatment cost of at least \$10,000 for one patient. The MoH is probably spending an approximate amount of 42 million dollars per year for treating these infections in a single tertiary care hospital.

2. Prevention

The key elements for the prevention and/or elimination of HAIs are:

- Collect data using active surveillance and disseminate results
- Identify and respond to emerging threats
- Improve science for prevention through research
- Recognize excellence

Appropriate hand hygiene programs stay at the forefront of all prevention plans. Health care institutions need not only to develop standard hand hygiene policies and procedures but should provide the necessary resources. In addition, they need to implement ongoing monitoring tools and audit reports to improve compliance and adherence to hand hygiene guidelines.

However, the overall prevention requires a multifactorial approach that encompasses standard precautions, efficient patients' triaging, prompt and accurate isolation of infected patients, judicious antibiotic use and an effective MDRO elimination plan.

Equally important is the proper surface cleaning that take into consideration the importance of preventive as well as reactive environmental decontaminations. It has been proven beyond any doubt that conventional cleaning methods currently used in different hospitals are unable to eliminate MDROs.

Relevant education of HCWs about HAIs and suitable approaches to combat them is quite instrumental.

3. Summary

Health care-associated infections are preventable complications and all health institutions are required to develop and implement relevant plans to reduce or eliminate these infections. Although infection prevention and control departments and sections continue to lead the fight, it remains the responsibility of all and each HCW to take an active role in the journey towards achieving "zero tolerance".

Chronic Hepatitis Surveillance

Chronic viral Hepatitis B and C

1. Background

Hepatitis is a major public health problem worldwide. Hepatitis A, B, C, D and E cause acute and chronic liver disease. There are nearly 500 million chronically infected and 1.4 million deaths/year. Hepatitis B virus accounts for 350 million with 600,000 deaths. HCV accounts for 150-170 million infections and 350,000 deaths. The most common complications are cirrhosis and hepatocellular carcinoma. More than 4 million new acute clinical cases occur annually. Serosurveys have estimated that 1.25 million Americans are chronically infected with HBV, and 2.7 million persons are infected with HCV.

Viral hepatitis B constitutes one of the major causes of morbidity in Oman. Based on prevalence studies as well as other limited epidemiological data, Oman is classified as an intermediate endemic country for viral hepatitis B (2-7%).

As indicated in a serosurvey, of 175 children born pre-vaccine introduction, 16 (9.1%) had evidence of HBV exposure, and 4 (2.3%) had evidence of chronic infection. Of 1890 children born after vaccine introduction, 43 (2.3%) had evidence of HBV exposure, and 10 (0.5%) had evidence of chronic infection. A study in 2000 among pregnant women 25-46 years of age in 9 health centres found an HBsAg seroprevalence of 7.1%.

Public health surveillance for viral hepatitis has traditionally focused on acute cases. Long-term liver damage may occur during the chronic phases of both these infections, including cirrhosis, liver failure, and hepatic carcinoma. A minority of health departments conduct surveillance for chronic hepatitis. Thus, many health departments lack the data needed to plan prevention programs and improve provisions of services such as counselling, immunization and treatment for chronically infected individuals.

Although chronic hepatitis B and chronic hepatitis C are diseases of public health importance, only a few health departments nationally have chronic viral hepatitis under surveillance; these programs rely primarily on direct reporting by medical laboratories.

As per the 2012 WHO framework for global action to prevent and control viral hepatitis infection and the recommendation of the WHO consultant visit to Oman, a comprehensive approach to the viral hepatitis infection is being sought with the aim to develop and implement coordinated multisectoral national strategy for preventing, diagnosing and treating viral hepatitis based on the local epidemiological context.

2. National registry for chronic hepatitis (B and C)

At the national level, efforts to improve chronic viral hepatitis surveillance are underway. Chronic hepatitis surveillance is being planned in the next 5 year plan 2016-2020. It is recommended confirmed cases of chronic hepatitis under national surveillance through the National Notifiable Disease Surveillance System establishing a national hepatitis registry.

For further details refer to the national guidelines on viral hepatitis surveillance and case management that are in preparation and will be released in 2017.

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Annexes

Annexe #1

Communicable diseases and syndromes reported in Oman: 2005-2015 (Selected priority diseases)

Diseases/syndromes	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005
Group A (diseases and syndromes)											
Cholera	1 (i)				1 (i)				3+(2)	1	1
Plague	Never reported										
YF	Never reported										
Meningococcal infection	4	7	3		1	1		3	3	3	1
Hib meningitis		1				1	1	2		1	1
Rabies	No cases reported since 2003										
Malaria	822	1001	1451	2051	1532	1193	898	965	705	443	545
TB sputum positive	55	70	78	105	106	84	97	92	114	118	96
AFP	39	34	20	31	39	33	19	19	32	16	23
Fever and rash illness	1,621	1229	862	696	793	459	596	852	746	700	667
Measles		14		3	3	3	3	6	8	11(2)	19
Rubella				2	1	2	3	4		9(2)	16(1)
CRS								1		1	1
SARS	Never reported										
Crimean-Congo HF	20	18	10	2	2						
Food poisoning	435	329	286	323	295	764	257	465	521	673	447
Group B (diseases and syndromes)											
Bacterial meningitis (other)		10	19	15	21	19	12	33	26	16	19
Viral meningitis		2	3	14	4	2	2		8	6	4
Meningitis unspecified	95	61	51	39	38	40	23	44	36	36	51
Acute viral hepatitis – Total	331	281	437	659	667	411	618	772	631	1353	866
Acute viral hepatitis A	79	119	129	448	464	248	425	568	429	1060	607
Acute viral hepatitis B	15	9	11	17	26	16	17	16	33	45	54
Acute viral hepatitis C	4	6	3	8	8	8	15	11	21	18	19
Acute viral hepatitis D	Never reported										
Acute viral hepatitis E	8	2	3	10	3	24	11	13	11	14	14
Hepatitis unspecified	225	145	291	176	166	115	150	164	137	216	172
Typhoid/paratyphoid fevers	38	14	47	75	40	51	66	70	54	54	67
Pertussis [IgM+]	126	145 [20]	309	130	56	33 [1]	38	51[7]	75 [2]	39	36
Trachoma active (TF and TI)			6			10	32	72	64	34	16
Brucellosis	379	235	192	148	126	95	79	94	88	74	113
Cutaneous Leishmaniasis (CL)			2	2	2	3	4	7	6	4	8
Visceral Leishmaniasis (VL)	1		1	1		1	1		1		2
Schistosomiasis (intestinal)	1			1		2	1		1	2	2
TB sputum negative	31	24	22	25	22	19	23	32	28	29	33
Extra-pulmonary TB	86	87	82	104	108	110	110	109	96	104	83
HIV/AIDS	142	112	103	127	148	143	117	116	97	87	105
Group C diseases											
Varicella	21,028	18,376	17,903	36,455	53,382	18,264	25,319	55,278	54,417	27,173	17,620
Mumps [IgM+]	588	630[13]	640	679	706	565[10]	635[12]	934[61]	493[73]	1127	856

Note:

- Figures in parenthesis are imported case/s
- Figures in square brackets show seropositive case/s
- TB/HIV/AIDS data are only for Omani population
- Malaria cases are total cases (imported and autochthonous)
- Yellow boxes represent 'Nil' cases

Article 1: Every disease listed in the table attached to this law is considered an infectious disease.

Article 2: If a person falls ill or is suspected of being ill with one of the infectious diseases or is a carrier of Agents of these diseases, the person should be reported to the nearest health institution according to the form issued by the decree by the Minister of Health and during the following period:

24 hours for diseases of the first section of the table

(One week) for diseases of the second section of the table

(30 days) for diseases of the third section of the table

Article 3: The ones responsible for the reporting mentioned in the previous article are by order:

- a. The physician who examined the patient
- b. The responsible person in the health institution where the disease occurred
- c. The person in charge of the laboratory where the sample indicating the presence of the disease was examined
- d. The head of the patient's family or the one who is taking care of him
- e. The owner or responsible director if the illness occurred in an industrial or commercial institution or public shops
- f. The one in-charge of the transport vehicle if the disease occurred or was suspected in a patient during his presence in it
- g. The representative of the administrative authority (the Wali, the Sheik or the police)

Article 4: The reporting of the patient or the suspected patient should include his/her triple name, his/her address and occupation in a way that will make it possible for health authorities to reach him/her.

Article 5: Zoonotic disease mentioned in the attached table should be reported and the ones responsible for that are by order:

- a. The vets or their assistants who examined the sick animal
- b. The technical director responsible for the farm, the stable or the place where the case occurred
- c. The owner of the diseased animal

Reporting in such a condition should be to the relevant authority of veterinary affairs and this authority will report to the relevant health centre within the period defined by the Minister of Health. The centre will take the necessary preventive measures in this condition.

Article 6: Every person ill or suspected of being ill with one of the infectious diseases mentioned in the first section of the table attached to this law is to be isolated in the hospital or the place determined by the MoH. Isolation is advised by a decision of the relevant physician.

Article 7: The MoH is permitted to isolate contacts of patients affected by infectious diseases mentioned in the first section of the table attached to this law. Isolation is practiced in the places determined by the Ministry for that purpose according to the decision of the relevant health physician and for the period he sees necessary.

Article 8: The MoH will put contacts of patients with infectious diseases under surveillance. These contacts shall present themselves to the related health centres for medical examination according to the time schedule determined by the Ministry for that reason. It is allowed to isolate contacts of infectious disease patients if by the nature of their disease or occupation they may expose others to infection.

Article 9: In cases where the health physician deems it possible to treat a patient suffering from one of the infectious diseases mentioned in the second and third sections of the table attached to the law, at his dwelling, the related health officials shall take necessary measures to protect his contacts from contracting the disease and put them under surveillance for the proper time.

Article 10: The relevant health authorities can exclude patients of an infectious diseases or carriers of its microbe from any job related to the spread of infection such as preparation, selling or transportation of food materials or drinks of any kind or any other job.

Anybody excluded accordingly is not allowed to return to any of these jobs except by a permission of these authorities. The owner or director of the job is also held responsible if he permits a person excluded, as mentioned above, to continue to work in any of the mentioned jobs.

Article 11: Transport of patients ill with one of the infectious diseases mentioned in the first section of the table attached to this law, and who have been isolated is not allowed without a permission of the MoH and the transport should occur by the means prepared by the Ministry. Transport or hiding of clothes, bedding, instruments or furniture or others by which infection may spread is not permitted. The MoH may order the destruction of such clothes, bedding, instrument or furniture or it may order its sterilization or disinfection.

Article 12: The MoH has the right to take the necessary sample from patients suffering from one of the infectious diseases listed in the table attached to this law or from their contacts so it can be tested in the laboratory until it is verified that they are free from pathogenic microbes.

Article 13: Physicians of the MoH or its agents are allowed to vaccinate with the protective vaccine the persons dwelling with a patient affected by one of the infectious diseases mentioned in the table attached to this law and the persons who might have had a contact with him/her or has been exposed to infection by any means.

Article 14: The Minister of Health may decide compulsory vaccination against any infectious disease to protect newborns or any specific groups of population or the whole population, according to public health interest and this decree will determine the times and measures to be followed in such conditions.

Article 15: Taking into consideration the provisions of current laws and regulations, agents of the MoH authorized by it are allowed to enter houses, if deemed necessary, to search for patients with infectious diseases, or to implement necessary measures of disinfection or vaccination, or examine contacts, or for the purpose of controlling insects and rodents, and they have to present a verification of their identity before entering houses. In order to do this duty they can ask the help of the relevant authorities.

Article 16: The Minister of Health can restrict the treatment of some cases of the infectious diseases mentioned in the table attached to this law to governmental treating institutions and prevent its treatment in private clinics and hospitals.

Article 17: During burial, transfer or transport of cadavers of persons dead from one of the diseases mentioned in the table attached to this law and defined by a decree of the Minister of Health, the preventive measures decided by the MoH shall be considered.

- Article 18:** In the case of occurrence of any epidemic disease that endangers the public health, the Minister of Health or the one whom he delegates, has exceptional authorities to protect the country from the spread of the epidemic with due collaboration (agreement) with the relevant authorities.
- Article 19:** Every person who does not report an infectious disease according to the provisions of the articles (2, 3 and 5) of this law is punished by imprisonment for a period not exceeding 6 months and a duty of 100 Omani rials or by one of these punishments. This is not to substitute any severer punishment stated in another law.
- Article 20:** With due consideration to article (19) of this law, a punishment of not less than 20 Omani rials and not more than 50 Omani rials is due on every person who does not comply with any of the articles of this law or the Ministerial decrees implementing it.

Annexe #4

Surveillance definitions

(Source: WHO Recommended Surveillance Standards WHO/CDS/CSR/ISR/99.2)

Active case finding

The process of seeking out cases or health events under surveillance (e.g. house visits by community workers to identify cases of TB, active searching of medical records to identify cases of acute haemorrhagic fever).

Attack rate

The cumulative incidence of infection in a group observed over a period during an epidemic. This “rate” can be determined empirically by identifying clinical cases and/or by means of seroepidemiology. Because its time dimension is uncertain or arbitrarily decided, it should probably not be described as a rate.

Case

A person who has the particular disease, health disorder, or condition which meets the case definition for surveillance and outbreak investigation purposes. The definition of a case for surveillance and outbreak investigation purpose is not necessarily the same as the ordinary clinical definition.

Case classification

Gradations in the likelihood of being a case (e.g. suspect/probable/confirmed). This is particularly useful where early reporting of cases is important (e.g., Ebola haemorrhagic fever) and where there are difficulties in making definite diagnoses (e.g. specialized laboratory tests required).

Case definition

A set of diagnostic criteria that must be fulfilled for an individual to be regarded as a case of a particular disease for surveillance and outbreak investigation purposes. Case definitions can be based on clinical criteria, laboratory criteria or a combination of the 2 with the elements of time, place and person.

Case fatality ratio

The proportion of cases of a specified condition which are fatal within a specified time.

$$\text{Case fatality rate} = \frac{\text{Deaths from a given disease in a given period} * 100}{\text{Diagnosed cases of that disease (in the same period)}}$$

Cluster

Aggregation of relatively uncommon events or diseases in space and/or time in amounts that are believed or perceived to be greater than could be expected by chance.

Communicable disease (synonym: infectious disease)

An illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or the inanimate environment.

Contact (of an infection)

A person or animal that has been in such association with an infected person or animal or a contaminated environment as to have had opportunity to acquire the infection.

Endemic

The constant presence of a disease or infectious agent within a given geographic area or population group; may also refer to the usual prevalence of a given disease within such area or group. The expression “endemic disease” has a similar meaning.

Epidemic

The occurrence in a community or region of cases of an illness, specific health-related behaviour, or other health-related events clearly in excess of normal expectancy. The community or region and the period in which the cases occur are specified precisely. The number of cases indicating the presence of an epidemic* varies according to the agent, size, and type of population exposed; previous experience or lack of exposure to the disease; and time and place of occurrence.

Exposure

Proximity and/or contact with a source of an agent in such a manner that effective transmission of the agent, harmful or protective effects of the agent may occur.

Feedback

The regular process of sending analyses and reports about the surveillance data back through all levels of the surveillance system so that all participants can be informed of trends and performance.

Health event

Any event relating to the health of an individual e.g., the occurrence of a case of a specific disease or syndrome, the administration of a vaccine or an admission to hospital.

Incidence

The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population. Incidence is usually expressed as a rate, the denominator being the average number of persons in the specified population during the defined period or the estimated number of persons at the mid-point of that period.

Notifiable disease

A disease that, by legal requirements, must be reported to the public health or other authority in the pertinent jurisdiction when the diagnosis is made.

Notification

The processes by which cases or outbreaks are brought to the knowledge of the health authorities. In the context of the *IHR*, notification is the official communication of a disease/health event to the WHO by the health administration of the Member State affected by the disease/health event.

Outbreak

An epidemic limited to localized increase in the incidence* of a disease, e.g. in a village, town, or closed institution.

Performance indicators

Specific agreed measurements of how participants are functioning within the surveillance or reporting system. These indicators may measure both the process of reporting (e.g. completeness, timeliness) and the action taken in response to surveillance information (e.g. the percentage of cases investigated or surveyed) and the impact of surveillance and control measures on the disease or syndrome in question (e.g. the percentage of outbreaks detected by the system, the drop in the number of cases over a specified time period).

Periodicity

The presence of a repeating pattern of excess cases. The repeating pattern can be in years, months or weeks.

Prevalence

The number of instances of illness or of persons ill, or of any other event such as accidents, in a specified population, without any distinction between new and old cases. Prevalence may be recorded at a stated moment (point prevalence) or during a given period of time (period prevalence).

Reporting completeness

Proportion of all expected reports that were actually received. It is usually stated as “% completeness as of a certain date” (e.g. if of 30 administrative units in a reporting system 15 submit reports, the reporting completeness is 50%).

Reporting system

The specific process by which diseases or health events are reported. This will depend on the importance of the disease and the type of surveillance.

Reporting timeliness

Proportion of all expected reports in a reporting system received by a given due date.

Seasonal variation

Change in occurrence of a disease or health event that conforms to a regular seasonal pattern.

Secular Trend (*synonym: temporal trend*)

Changes over a long period of time, generally years or decades.

Serosurveillance

The surveillance of an infectious disease through immunological markers of the disease in a population or sub-population.

Sensitivity

The ability of a surveillance or reporting system to detect true health events, i.e. the ratio of the total number of health events detected by the system over the total number of true health events as determined by an independent and more complete means of ascertainment.

Specificity

A measure of how infrequently a system detects false positive health events, i.e. the number of individuals identified by the system as not being diseased or not having a risk factor, divided by the total number of all persons who do not have the disease or risk factor of interest.

Surveillance

The process of systematic collection, orderly consolidation and evaluation of pertinent data with prompt dissemination of the results to those who need to know, particularly those who are in a position to take action.

Surveillance, active

Surveillance where public health officers seek reports from participants in the surveillance system on a regular basis, rather than waiting for the reports.

Surveillance, case-based

Surveillance of a disease by collecting specific data on each and every case (e.g. collecting details on each case of AFP in poliomyelitis surveillance).

Surveillance, community

Surveillance where the starting point for the notification is from community level, normally reported by a community worker. It can be active (looking for cases) or passive (reporting cases). This may be particularly useful during an outbreak and where syndromic case definitions can be used.

Surveillance, enhanced

The collection of additional data about cases reported under routine surveillance. Routine surveillance is a starting point for more specific data collection on a given health event. This information may be sought from the reporter, the case, the laboratory or from another surveillance data set.

Surveillance, hospital-based (synonym: hospital surveillance)

Surveillance where the starting point for notification is the identification by a hospital of a patient with a particular disease or syndrome.

Surveillance, intensified

The upgrading from a passive to an active surveillance system for a specified reason and for a limited period (usually because of an outbreak). It must be noted that the system then becomes more sensitive; secular trends may therefore need to be interpreted carefully.

Surveillance, laboratory-based

Surveillance where the starting point is the identification or isolation of a particular organism in a laboratory (e.g. surveillance of salmonellosis, antimicrobial resistance)

Surveillance, passive

Surveillance where reports are awaited and no attempt are made to seek reports actively from the participants in the system.

Surveillance, routine

The regular systematic collection of specified data in order to monitor a disease or health event.

Surveillance, sentinel

Sentinel surveillance is surveillance based on the collection of data from a sample (random or non-random) of collecting sites as indicator data for the rest of the population, in order to identify cases of a disease early or to obtain indicative data about trends of a disease or health event. One instance of sentinel surveillance is the use of a particular population group (e.g., monitoring the serology of syphilis among pregnant women as an indicator of syphilis trends in the general population).

Survey

An investigation in which information is systematically collected. Usually carried out in a sample of a defined population group, within a defined time period. Unlike surveillance it is not ongoing; however, if repeated regularly, surveys can form the basis of a surveillance system.

Syndrome

A symptom complex in which the symptoms and/or signs coexist more frequently than would be expected by chance on the assumption of independence.

‘Zero’ reporting

The reporting of “zero case” when no cases have been detected by the reporting unit. This allows the next level of the reporting system to be sure that the participant has not sent data that have been lost, or that the participant has not forgotten to report.

Public Health Risk Assessment

1. Risk Assessment

The risk assessment should be undertaken after the data have been reviewed and the initial surveillance processes such as signal verification, validity check and conformity check have been performed. Additional information may be necessary for the assessment process.

Following critical factors should be considered during the process of risk assessment. The factors relevant in the context and nature of the event should be utilized for the process. The list is not necessarily exhaustive. Any other new parameters may be utilised by the risk assessment team if relevant to the event.

Criteria to consider to assess severity of event (disease/ outbreak/ cluster)

1. Total number of cases in an event
2. Incidence rate
3. Number of deaths
4. Case fatality rate
5. Severity of clinical signs
6. Hospitalization rates
7. Sequelae
8. Dynamics of the outbreak
9. Rapidity of spread
10. Geographical distribution
11. Duration of sickness
12. Specific population affected
13. Health care workers affected
14. Transmission within health care setting
15. Involvement of specific risk groups

Characteristics of the causative agent

1. Level of knowledge of the agent
2. Mode of transmission
3. Transmissibility of infection
4. Virulence of the agent
5. Pathogenicity
6. Potential for spread
7. Availability of preventive measures (e.g. vaccination)
8. Availability and feasibility of implementation of control measures
9. Modification of agent its epidemiologic and biologic characteristics (e.g. resistance)

Grading of risk by geographic and population parameters

1. Event is declared a Global health crisis
 2. Event carries potential risk to affect national territory
 3. Risk of importation in the country
 4. Occurs in a neighbouring country with shared land boundaries
 5. Event that has affected in countries of origin of major expatriate groups in the country
 6. Affects a country hosting large national expatriate community
 7. Affects main tourist destinations
 8. Concurrent with other event (large gathering, pilgrimage)
 9. Emerging phenomenon that could change recommendations (e.g. travellers)
 10. Population density of infected area
 11. Location (rural-urban, Wilayat, village, etc.)
-

2. Risk characterization

Once the risk assessment team has carried out the hazard, exposure and context assessments, a level of risk should be assigned. This process is called risk characterization. If there is no mathematical output from a quantitative model or comparison with a guidance value (e.g. in food safety risk assessments), the process is based on the expert opinion of the team. A useful tool to assist the team is a risk matrix

As the majority of acute public health event risk assessments are qualitative, the categories used in the matrix are not based on numerical values but on broad descriptive definitions of likelihood and consequences (Fig. 1a and 1b). Table 1 following text explains how to read the risk matrix. When applying the matrix, the definitions of likelihood and consequence can be refined to fit with the national or sub-national context in each country.

During discussions the team members should consider all types of consequences in addition to the expected morbidity, mortality, and direct long-term health consequences of the event (e.g. disability).

The risk matrix also helps to assess and document changes in risk before and after the control measures are implemented. For some events, where information is limited and when the overall level of risk is obvious the matrix may not be needed.

Fig 1a: A risk matrix showing clearly delimited boundaries between categories

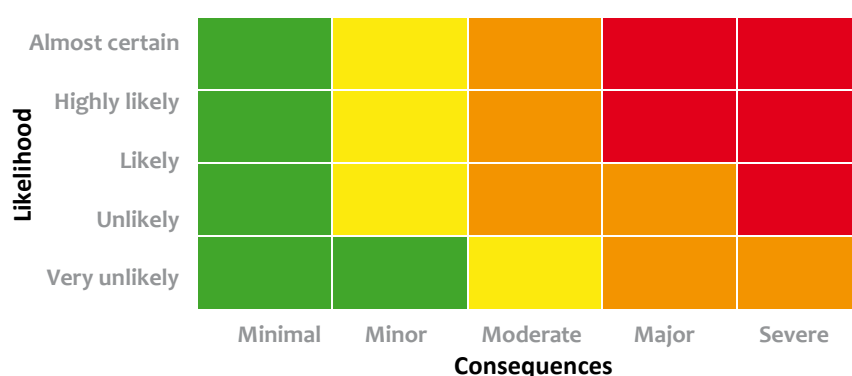


Fig 1b: A risk matrix without clearly delimited boundaries between categories



Table 1: Levels of overall risk and the corresponding response actions

Level of overall risk		Actions
	Low risk	Managed according to standard response protocols, routine control programmes and regulation (e.g. monitoring through routine surveillance systems)
	Moderate risk	Roles and responsibility for the response must be specified. Specific monitoring or control measures required (e.g. enhanced surveillance, additional vaccination campaigns)
	High risk	Senior management attention needed: there may be a need to establish command and control structures; a range of additional control measures will be required some of which may have significant consequences
	Very high risk	Immediate response required even if the event is reported out of normal working hours. Immediate senior management attention needed (e.g. the command and control structure should be established within hours); the implementation of control measures with serious consequences is highly likely

A. Estimates of likelihood definitions

- **Almost certain:** Is expected to occur in most circumstances (e.g. probability of 95% or more)
- **Highly likely:** Will probably occur in most circumstances (e.g. a probability of between 70% and 94%)
- **Likely:** Will occur some of the time (e.g. a probability of between 30% and 69%)
- **Unlikely:** Could occur some of the time (e.g. a probability of between 5% and 29%)
- **Very likely:** Could occur under exceptional circumstances (e.g. a probability of less than 5%)

B. Estimates of consequences definitions

a. Minimal level

- Limited impact on the affected population
- Little disruption to normal activities and services
- Routine responses are adequate and there is no need to implement additional control measures
- Few extra costs for authorities and stakeholders

b. Minor level

- Minor impact for a small population or at-risk group
- Limited disruption to normal activities and services
- A small number of additional control measures will be needed that require minimal resources
- Some increase in costs for authorities and stakeholders

c. Moderate level

- Moderate impact as a large population or at-risk group is affected
- Moderate disruption to normal activities and services
- Some additional control measures will be needed and some of these require moderate resources to implement
- Moderate increase in costs for authorities and stakeholders

d. Major level

- Major impact for a small population or at-risk group
- Major disruption to normal activities and services
- A large number of additional control measures will be needed and some of these require significant resources to implement
- Significant increase in costs for authorities and stakeholders

e. Severe level

- Severe impact for a large population or at-risk group
- Severe disruption to normal activities and services
- A large number of additional control measures will be needed and most of these require significant resources to implement
- Serious increase in costs for authorities and stakeholders

3. Alert Levels

Based on the risk assessment the alert levels should be assigned that in turn initiates a clear response pathway. The steps that need to be taken in different levels of risk should be customised for the event. Following table defines the alert levels

Table 2: Levels of alert code (colour) and response activities

Level	Alert code	Description	Activities
Low	Green	Events that carries potential risk but has been contained	Follow up, Information dissemination
Medium	Yellow	Events that show triggers that increase potential risk of spread	Advisory, monitoring and updating, interventions
High	Orange	Event that has spread and has further potential to spread	Advisory, health alert with immediate actions
Extreme	Red	Event that spreads extremely fast or has high case fatality	Advisory, health alert, activate national response plan

Source: Adapted from WHO publication 'Rapid Risk Assessment of Acute Public Health Events' (WHO/HSE/GAR/ARO/2012.1)

Outbreak response plan

Principles of outbreak management

The principles of outbreak management are to:

- Detect and investigate outbreaks of public health importance within a time frame appropriate to the situation and as a result, limit secondary cases and/or risk to the community
- Manage public health outbreaks in accordance with legislation, regulations, standards, and protocols
- Ensure timely coordination, participation, and communication of relevant stakeholders

The decisions whether and how extensively to investigate a potential outbreak depends on risk assessment that involves a number of factors such as:

- the severity of the illness
- the number of cases
- the source
- the mode or the ease of transmission
- the availability of prevention and control measures

Rapid Response Team (RRT)

The RRT in the governorate is responsible for the investigation of outbreak in conjunction with appropriate partners (external and internal). Members on the outbreak team will vary depending on the type of infectious agent, the site and the geographical extent of spread. Additional team members will be required for the operational requirements to implement public health measures for the control of transmission.

The RRT at the governorate level is led by the Director of communicable diseases (DGHS) and generally is responsible to investigate outbreaks within the governorate. However an investigation team may be formed at the national level under specific circumstances outlined below:

- An outbreak of exceptional magnitude or complexity (novel strain or disease)
- An outbreak that involves a multi-departmental provincial government response
- An outbreak that overwhelms the capacity of the provincial government
- An outbreak which involves provincial, national, or international boundaries

Decision to activate the Emergency Operations Centre (EOC) at the MoH will be taken at the national level under appropriate circumstances.

Roles and responsibilities of the RRT

For the RRT to function, requires effective communication and collaboration between professionals, common goal setting, problem-solving skills and a clear understanding of each member's role on the team. The roles can overlap and may potentially cause conflict. Clarifying each member's role and responsibilities helps reduce conflict, mitigate role ambiguity, dissolve professional boundaries and build trusting relationships.

The "Outbreak Management" functions include:

- Investigation management
- Case investigation
- Surveillance and epidemiology information

- Coordination
- Outbreak communication
- Resource management
- Laboratory investigations
- Logistics management

Components of outbreak investigation and management

The following are key components of outbreak investigation and management

1. Establish the existence of an outbreak and notify the national level
2. Establish an outbreak investigation team (RRT) and assign functions
3. Develop a specific case definition for the outbreak
4. Develop an interview tool and collect relevant epidemiological information and data and prepare a line-list and continue surveillance for new cases
5. Conduct epidemiological analysis on available data and develop hypothesis or consider conducting a case control study
6. Implement control measures based on findings
7. Communicate regularly and periodically to stakeholders and the national level
8. Document the entire outbreak investigation and complete the final report
9. Determine when the outbreak is over
10. Evaluate the outbreak control and management with appropriate recommendations

(Adapted from Nova Scotia, Outbreak Response Plan (June 2015))

Note: The Director of Disease Surveillance and Control in the governorate is required to provide information on the outbreak periodically and progressively to the national communicable disease department.

The first preliminary report (SitRep-1) should be sent to national level within 24 hours. The further reports such as SitRep-2, 3, 4... should follow after completion of field/laboratory investigations. The final report should be built around these reports and sent within 4 weeks of the end of event.

Kindly note the 'Final Report' should be based on the template provided on the next page. Ensure it is a standalone report and not a compilation of SitReps.

Comprehensive final epidemiological investigation report of event

Outbreak/cluster/event (unusual) investigation report

| Case investigation report

Outbreak investigation		Case investigation	
Outbreak start and end (dd/mm/yy): Start: / / End: / /		Name:	
Outbreak location of (Name of facility/address):		Age:	Gender: National:
Type of outbreak: <input type="checkbox"/> Enteric <input type="checkbox"/> Respiratory <input type="checkbox"/> Other (specify):		Occupation:	Village: Wilayat:
Date of 'Final Report submission': / /		Reporting Institution:	
		Date of report: / /	
Executive Summary			
Include the key features of the outbreak investigation, addressing the "who, what, where, and when" of the outbreak. A scientific description of the outbreak or the causal hypothesis based on the evidence. Identify lessons learned, recommendations, interventions (could be ongoing), or areas that need further attention. Include important points in the report.		Summarize findings, actions taken and recommendations.	
Introduction and background			
Describe the specific events that led to the investigation, including how the outbreak or case was first reported. For outbreak - steps taken to confirm the outbreak (including surveillance trends), and who assisted in the investigation. Background information identifies the population demographics, previous, similar outbreaks, describing the area, site or facility involved.		History of similar illness, exposure to animal, vector or a case and travel history Date of onset: / / Chief complaints: Date of admission: / / Chronology of events: / /	
Methods			
Outline the steps taken to investigate the outbreak or case investigation Epidemiological methods: Explain how cases are defined and ascertained. Outline the analytical study methodology and include interview tools and techniques used for investigation Public Health measures: Outline number and types of public health measures that were implemented including case management (inspection report, site visits, etc.), contact tracing, community measures (immunization, facility closure and/or sanitizing), etc. Laboratory analysis: Describe the number and types of specimens submitted for analysis		Public Health measures: contact management - Follow-up - Screening - Prophylaxis Laboratory test/s - Type of samples	
Results			
Scientific description of what was discovered Epidemiological results: Highlight the number of cases, personal details, and clinical features, including geographical distribution, epidemic curve, risk factor analysis, and attack rates Environmental public health results: Describe the results of inspections, risk assessments, and trace back Laboratory results: Summarize the results of human and food or source testing		Clinical progress including specific treatment Correlate and summarize laboratory findings Risk assessment Final outcome Date of discharge: / /	
Discussion			
This section brings together all aspects of the outbreak and case investigation. Discussion will include the main hypotheses and justification of conclusions and actions being based on evidence or balance of probabilities. Actions taken to protect public health are described well as, highlight the problems encountered during the investigation including the lessons learned during the investigation.			
Conclusions			
Highlight briefly the outcome of the investigation			
Evaluation and recommendations			
Describe what should have been done to control the outbreak or the illness in the case, prevent future occurrences, and improve management in the future. The purpose of this section is to educate, so specificity is important. Recommendations for any changes to "Outbreak Response Plan" should be included			
Acknowledgements			
This is an opportunity to thank those who assisted with the outbreak/case investigation			
Appendices (optional)			
These may include a chronology of events, RRT members, terms-of-reference (ToR) for the team, maps and references, questionnaire letters to health-care professionals, media releases, and fact sheets etc.			
Signature			
This report requires sign-off by the Outbreak Management Designate (The Director, Department of Disease Surveillance and control, _____ governorate, DGHS, MoH)			
Seal of the DGHS	Signature	Date: (dd/mm/yy): / /	

SMS template

(Applicable only to group A diseases and syndromes OR any unusual incident/cluster/outbreak)

- **Whom to send?**
To 'DCD,DGDSC,Oman' group by SMS
Simultaneously send to Director, DCD at Governorate and National level
- **When to send SMS?**
Immediate as soon as information is received e.g. within an hour
- **Flow of Information should be as in the incident common and chain (Algorithm on page #9)**
- **Elements of an SMS**
Person (demographic details): age, gender, nationality, occupation
Suspect disease/condition name:
Time: date, time information received
Place: village, wilayat
Clinical presentation (major signs/symptoms): 1. 2. 3.
Date of onset: dd-mmm
Date of admission: dd-mmm
Relevant history: similar illness, exposure, travel, vaccination (if relevant)
Hospital/patient details: relevant lab result/s, present condition (e.g. stable, ICU)
Public health actions: actions done/planned

Sample SMS-1 sent on 05-December (case of CCHF)

A 30 yr old male Bangladeshi from Amerat admitted to Royal Hospital on 04-Dec with fever, diarrhoea, vomiting. No bleeding. Onset 29-Nov. Tailor. H/o slaughter. Returned from Bangladesh on 25-Nov. Now bleeding, shifted to ICU, critical. Low platelets. Suspect CCHF. Sample sent today to CPHL. Ribavirin started. HCW contacts listed. Field investigation planned on 06-Dec.

Sample SMS-2 sent on 02-December (food poisoning episode)

6 cases of food poisoning reported on 02-Dec from Seeb with fever, diarrhoea, vomiting since 01-Dec. No similar illness in family. Symptoms onset 6-8 hrs after shared food (*Shoarma*) from *Al Khuwair* restaurant. No travel history. 1 critical case (Indian) referred to Royal Hospital ICU under observation and stable. Food and stool samples collected on 02-Dec. Baladiyah closed the place. Culture results on 07-Dec. Site visit and investigation planned on 03-Dec.

Annexe #6

Contact investigation reporting form

Follow-up of contacts exposed to infectious disease known to spread

Essential elements of investigation report for submission to DCD, DGDSC, MoH

1. Health Institution/Governorate :
2. Infectious disease : Name/date of laboratory confirmation
3. Mandatory observation period : # of days from last exposure
4. Contact details : Name/age/gender/relation/designation
5. Type of contacts followed : Health care worker/family/community
6. Last date of exposure : Describe process/PPE
7. Risk category : High/moderate/low*
8. Last day of follow-up : Maximum incubation period from last exposure
9. Laboratory results : If symptomatic contacts are tested
10. Date of preparation and submission : dd/mm/yy
11. Name/title of Focal Point :

Note:

- **Responsibility:** health care workers contacts – Head of department/Focal Point of Infection Prevention and Control in the hospital and for family/community contacts – regional Epidemiologist (communicable disease Focal Point) in the governorate. Overall responsibility and accountability of all the public health actions including contact follow-up has been assigned to the regional Epidemiologist
- High and moderate risk contacts should be under active surveillance, i.e. daily follow-up by telephone/home visit etc.; while the low risk contacts should report to Focal Point only if symptomatic (passive surveillance)
- In moderate/high risk contacts laboratory testing should ONLY be done if symptomatic (e.g. fever)
- In the remarks mention the exact type of procedure/activity performed by the contact
- Head of IP and C in Hospital should send the compiled list of contacts as described above at the beginning (line list) and at the end of the follow-up period (final report) to the regional Epidemiologist (communicable disease Focal Point) in the governorate (DGHS)

Risk category*

Exposure to a confirmed case of communicable disease (airborne, contact and droplet)

High risk	Moderate risk	Low risk (but not zero)
Person in household or health care facility with direct contact with infected body fluids through <ul style="list-style-type: none">- Living with and caring for a person with symptoms or- needle-stick injury or N- splashes to eyes/nose/mouth/ on skin and- Without wearing PPE or- Not following recommended safety precautions or- Handling/washing dead body without PPE	Person in household or health care facility with <ul style="list-style-type: none">- Direct/close contact with a person with symptoms and- Wearing appropriate PPE or has taken safety precautions	Person in household or health care facility with <ul style="list-style-type: none">- Having been in near vicinity and- Having no known exposure or direct contact with a person with symptoms

Annexe #7

Specific IP&C Measures for Priority Communicable Diseases

Important notes

- As a general rule standard (Universal) precautions are recommended for all communicable diseases (suspect and confirmed) within the health care setting. Appropriate procedures as described in **Annexure #8** as 'Standard Precautions' should be followed by health care workers and attendants at all times.
- Note that the period of communicability is generally longer in immunocompromised patients for most infectious diseases. Hence IPC measures should be continued for longer period.
- For diseases transmitted by droplets when performing 'Aerosol Generating Procedures' (AGPs) such as intubation, suction etc. then **Airborne precautions** are recommended, which include use of N-95 respirator and face shield or eye protection.

Recommended additional specific IP&C measures for notifiable communicable diseases

Chapter	Disease/Syndrome	Recommended specific IPC measures (Standard Precautions are applicable to all diseases)
Group A Diseases		
1	Cholera	<ul style="list-style-type: none"> Strict isolation is not indicated Contact (enteric) precautions for the duration of illness Concurrent disinfection of soiled articles, faeces etc.
2	Yellow Fever	No specific measures other than standard precautions
3	Plague (<i>Yersinia pestis</i>)	No specific measures other than standard precautions
	Bubonic (no cough/chest x-ray neg.)	
	Pneumonic	<ul style="list-style-type: none"> Droplet precautions to continue until 72 hrs after effective antimicrobial therapy Concurrent disinfection of respiratory secretions, soiled articles and surfaces
4	Influenza A (due to novel subtype)	<ul style="list-style-type: none"> Isolation and cohorting of cases Droplet precautions to continue until duration of illness Concurrent disinfection of respiratory secretions
	Highly Pathogenic Avian Influenza (HPAI)	<ul style="list-style-type: none"> In addition airborne precautions are required for the duration of illness
5	Crimean-Congo Haemorrhagic fever	<ul style="list-style-type: none"> Contact and droplet precautions until duration of illness Concurrent disinfection of body fluids
6	Dengue fever	No specific measures other than standard precautions
7	Pneumococcal invasive disease (<i>Streptococcus pneumoniae</i>)	<ul style="list-style-type: none"> Droplet precautions to continue 24 hrs after effective antimicrobial therapy
8	Haemophilus influenzae type b (Hib)	
9	Meningococcal disease (<i>Neisseria meningitidis</i>)	
10	Tuberculosis (<i>Mycobacterium tuberculosis</i>)	<ul style="list-style-type: none"> Airborne precautions until patient is put on effective ATT and clinically improving and three consecutive sputum smears are negative for AFB (Samples collected 8-24 hours apart and at least one is an early morning specimen)
	Pulmonary sputum positive (including suspect)	
	Extra-pulmonary (no draining lesions)	No specific measures other than standard precautions
	Extra-pulmonary (draining lesions)	<ul style="list-style-type: none"> Contact precautions until clinical improvement (drainage ceased) or three consecutive negative cultures of the discharge
	Latent tuberculosis (Mantoux positive)	No specific measures other than standard precautions
11	Malaria	No specific measures other than standard precautions
12	Rabies	No specific measures other than standard precautions

Chapter	Disease/Syndrome	Recommended specific IPC measures (Standard Precautions are applicable to all diseases)
Group A Syndromes		
13	Acute Flaccid Paralysis (suspect Poliomyelitis)	<ul style="list-style-type: none"> Contact precautions during illness for infants and young children
14	Fever & Rash (suspect Measles/ Rubella)	<ul style="list-style-type: none"> Droplet and airborne precautions until confirmed
	Rubella (including post-natal)	<ul style="list-style-type: none"> Droplet precautions until 7 days after rash onset
	Measles	<ul style="list-style-type: none"> Airborne precautions during illness
15	Congenital Rubella Syndrome (CRS & CRI)	<ul style="list-style-type: none"> Contact precautions for infants until 1 year of age OR after 3 months laboratory evidence suggests absence of rubella virus in respiratory secretions and urine
16	Acute Haemorrhagic Fever Syndrome	<ul style="list-style-type: none"> Contact and droplet precautions for duration of illness until diagnosis is laboratory confirmed
	<i>Flaviviridae: DF, YF, KFD, Al Khumra</i>	<ul style="list-style-type: none"> No H2H transmission: For arboviruses - DF, YF, KFD, Al Khumra, RVF and
	<i>Arenaviridae: Lassa</i>	<ul style="list-style-type: none"> Rare H2H transmission in Lassa and Hanta virus
	<i>Bunyaviridae: CCHF, RVF, Hanta</i>	<ul style="list-style-type: none"> Ebola/Marburg –Contact and droplet precautions, full gear PPE. Possible airborne transmission should also be considered.
	<i>Filoviridae: Ebola and Marburg</i>	
	<i>Severe disease OR prominent cough</i>	<ul style="list-style-type: none"> Contact and airborne precautions for the duration of illness
17	Coronavirus infections SARS-CoV and MERS-CoV	<ul style="list-style-type: none"> Contact and droplet precautions for the duration of illness
	<i>Aerosol Generating Procedures</i>	<ul style="list-style-type: none"> Airborne precautions
18	Foodborne Diseases	No specific measures other than standard precautions
Group B Diseases and Syndromes		
19	Acute Viral Hepatitis (unspecified)	No specific measures other than standard precautions
	<i>Hepatitis A and E</i>	<ul style="list-style-type: none"> Strict isolation is not indicated Contact (enteric) precautions for the duration of illness Concurrent disinfection of soiled articles, faeces etc.
19	<i>Hepatitis B and C (acute or chronic)</i>	No specific measures other than standard precautions
20	Typhoid fever (<i>Salmonella typhi</i>)	<ul style="list-style-type: none"> Strict isolation is not indicated Contact (enteric) precautions for the duration of illness Concurrent disinfection of soiled articles, faeces etc.
21	Pertussis (whooping cough)	<ul style="list-style-type: none"> Droplet precautions to continue until 5 days after effective antimicrobial therapy
22	Brucellosis (Human)	<ul style="list-style-type: none"> Contact precautions recommended if procedures involving exposure to body fluids
23	Leishmaniasis (Visceral and Cutaneous)	No specific measures other than standard precautions
24	Schistosomiasis (Intestinal)	No specific measures other than standard precautions
25	HIV and AIDS	No specific measures other than standard precautions
26	Mumps (Infectious parotitis)	<ul style="list-style-type: none"> Droplet precautions until 9 days after onset of parotitis
27	Varicella (Chickenpox)	<ul style="list-style-type: none"> Contact and airborne precautions during illness until skin lesions are crusted (usually 5 days from onset of rash)
28	Acute Encephalitis Syndrome (AES)	<ul style="list-style-type: none"> Contact precautions are generally recommended during illness
29	Other Meningitis Syndrome	<ul style="list-style-type: none"> Specific measures will depend of the causative agent.

H2H = Human-to-human transmission

Adopted from the WHO, CDC and the GCC guidelines

Standard Precautions

(For priority communicable diseases in Health care setting)

Standard precautions are meant to reduce the risk of transmission of blood borne and other pathogens from both recognized and unrecognized sources. They are the basic level of infection control precautions which are to be used, as a minimum, in the care of all patients.

Hand hygiene is a major component of standard precautions and one of the most effective methods to prevent transmission of pathogens associated with health care delivery. In addition to hand hygiene, the use of personal protective equipment (PPE) should be guided by risk assessment and the extent of contact anticipated with blood and body fluids, or pathogens.

In addition to practices carried out by healthcare workers when providing care, all individuals (including patients and visitors) should comply with infection prevention and control practices in healthcare settings.

a. Hand Hygiene

Hand hygiene procedures include the use of alcohol-based hand rubs (containing 60-95% alcohol) and handwashing with soap and water. Alcohol-based hand rub is the preferred method for decontaminating hands, except when hands are visibly soiled (e.g., dirt, blood, body fluids), or after caring for patients with known or suspected infectious diarrhoea (e.g., *Clostridium difficile*, norovirus), in which case soap and water should be used. Hand hygiene stations should be strategically placed to ensure easy access.

Indications for Hand Hygiene

Always perform hand hygiene in the following situations...

- Before touching a patient even if gloves will be worn
- Before exiting the patient's care area after touching the patient or the patient's immediate environment
- After contact with blood, body fluids or excretions or wound dressings
- Prior to performing an aseptic task (e.g. accessing a port, preparing an injection)
- If hands will be moving from a contaminated-body site to a clean-body site during patient care
- After glove removal

b. Personal Protective Equipment

PPE use involves specialized clothing or equipment worn by facility staff for protection against infectious materials. The selection of PPE is based on the nature of the patient interaction and potential for exposure to blood, body fluids or infectious agents. A review of available PPE should be performed periodically (e.g., annually) due to new product developments and improvements.

c. Use of PPE

Gloves

Wear gloves when there is potential contact with blood, body fluids, mucous membranes, non-intact skin or contaminated equipment.

- Wear gloves that fit appropriately (select gloves according to hand size)
- Do not wear the same pair of gloves for the care of more than one patient
- Perform hand hygiene before and immediately after removing gloves

Gowns

Wear a gown to protect skin and clothing during procedures or activities where contact with blood or body fluids is anticipated.

- Do not wear the same gown for the care of more than one patient
- Remove gown and perform hand hygiene before leaving the patient's environment.

Facemasks (Procedure or Surgical Masks)

Wear a surgical mask

- Potential contact with respiratory secretions and sprays of blood or body fluids.
- May be used in combination with goggles or face shield to protect the mouth, nose and eyes

Goggles, Face Shields

- Wear eye protection for potential splash or spray of blood, respiratory secretions, or other body fluids.
- Personal eyeglasses and contact lenses are not considered adequate eye protection
- May use goggles with facemasks, or face shield alone, to protect the mouth, nose and eyes

Respirators

- Wear N95 mask for potential exposure to infectious agents transmitted via the airborne route (e.g., tuberculosis).
- All healthcare personnel that use N95 should be fit tested.

d. Respiratory Hygiene and Cough Etiquette

Persons with respiratory symptoms should apply source control measures:

- Cover their nose and mouth when coughing/sneezing with tissue or mask, dispose of used tissues and masks, and perform hand hygiene after contact with respiratory secretions.

Health-care facilities should...

- Place acute febrile respiratory symptomatic patients at least 1 meter (3 feet) away from others in common waiting areas, if possible.
- Post visual alerts at the entrance to health-care facilities instructing persons with respiratory symptoms to practice respiratory hygiene/cough etiquette.
- Consider making hand hygiene resources, tissues and masks available in common areas and areas used for the evaluation of patients with respiratory illnesses.

e. Injection safety

Injection safety refers to the proper use and handling of supplies for administering injections and infusions (e.g., syringes needles, finger stick devices, intravenous tubing, medication vials, and parenteral solutions). These practices are intended to prevent transmission of infectious diseases between one patient and another, or between a patient and healthcare personnel during preparation and administration of parenteral medications.

The following aspects should be considered to prevent needle stick injury...

- Sharps should not be passed directly hand to hand, and handling should be kept to a minimum and carried out with care.
- Needles must not be re-sheathed, re-capped, bent, broken or disassembled after use.
- Never try to manipulate/remove a needle/other sharp from its holding implement with your hands.
- Used sharps must be discarded into a sharps container.
- Items should never be removed from sharps containers. The temporary closure mechanism of sharps containers should be used in between use for safety.

f. Environmental cleaning

Use adequate procedures for the routine cleaning and disinfection of environmental and other frequently touched surfaces

g. Linens

Handle, transport, and process used linen in a manner which...

- Prevents skin and mucous membrane exposures and contamination of clothing.
- Avoid transfer of pathogens to other patients and/or the environment.

h. Infectious waste disposal

- Ensure safe waste management.
- Treat waste contaminated with blood, body fluids, secretions and excretions as clinical waste, in accordance with local regulations.
- Human tissues and laboratory waste that is directly associated with specimen processing should also be treated as clinical waste.
- Discard single use items properly.

i. Patient care equipment

- Handle equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of pathogens to other patients or the environment.
- Clean, disinfect and reprocess reusable equipment appropriately before use with another patient.

Annexe #9

Safe burial practices

Applicable to viral haemorrhagic fevers such as Ebola and CCHF OR
Novel Coronavirus infections (MERS and SARS) OR
any other highly infectious and fatal disease

Rationale

Risk of transmission may exist to the health care workers and the community when a patient dies due to highly infectious disease because body fluids of the deceased may remain contagious for some period after the death. Hence specific precautions are recommended when following the burial ritual and practices.

Safe burial practices recommended by WHO and CDC

(Source: Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting, Dec 1998)

1. Prepare the Body Safely

Burial should take place as soon as possible after the body is prepared in the health facility. Health facility staff should:

- Be aware of the family's cultural practices and religious beliefs
- Help the family understand why some practices cannot be done because they place the family or others at risk for exposure
- Counsel the family about why special steps need to be taken to protect the family and community from illness
- If the body is prepared without giving information and support to the family and the community, they may not want to bring other family members to the health facility in the future. They may think that if the patient dies, the body will not be returned to them
- Identify a family member who has influence with the rest of the family and who can make sure family members avoid dangerous practices such as washing or touching the body

2. To prepare the body in the health facility

- Wear protective clothing as recommended for staff in the patient isolation area. Use thick rubber gloves as the second pair (or outer layer) of gloves.
- Spray the body and the area around it with 1:10 bleach solution.
- Place the body in a "body bag" and close it securely. Spray the body bag with 1:10 bleach solution.
- If body bags are not available, wrap the body in two thickness of cotton cloth and soak with 1:10 bleach solution. Then wrap the body in plastic sheeting. Seal the wrapping with plastic tape. Spray the body bag as in Step 3. Place the body in a coffin if one is available.
- Transport the body to the burial site as soon as possible. Assign a health officer or health facility staff person to accompany the body to ensure that the safety precautions remain secure during the journey.

3. Transport the Body Safely

Isolation precautions should remain in force when the body is being transported to burial site.

- Plan to take the shortest route possible for security purposes and to limit any possibility of disease transmission through accidental contact.
- Any health facility staff that must touch or carry the body during transport should wear the same protective clothing as is worn in the isolation area. Note: The driver does not need to wear protective clothing if there is no contact with the body.
- Take a closed container or sprayer with 1:10 bleach solution in the event of any accidental contact with the body or infectious body fluids. Also use it to clean up spills in the transport vehicle

4. Prepare Burial Site

- The grave should be at least 2 meters deep.
- Explain to the family that viewing the body is not possible. Help them to understand the reason for limiting the burial ceremony to family only.

5. Disinfect the Vehicle after Transporting the Body

- The staff person who disinfects the vehicle must wear protective clothing.
- Rinse the interior of the vehicle where the body was carried with 1:10 bleach solution.
- Let it soak for 10 minutes.
- Rinse well with clean water and let the vehicle air-dry. Be sure to rinse well because the solution is corrosive to the vehicle.

Office of the Assistant Grand Mufti, Ministry of Endowments and Religious Affairs Sultanate of Oman

Fatwa on how to deal with those who die of Ebola

Dated 2nd April 2015

With reference to your letter containing your request for Fatwa on burial of people infected with Ebola, addressed to His Eminence, the Grand Mufti of the Sultanate; and after studying the information it contained about the disease, ways of its transmission and how to prevent it, the answer is as follows:

A Muslim whether alive or dead has sanctity and rights in the Law of Allah, the Exalted. Of his rights when he is dead are to be washed, enshrouded, prayed for and buried in accordance with the teachings of Islam. Certainly there are cases of exigency that this law takes into consideration, in addition to the fact that one of its high objectives is to save lives and preserve souls.

For all that - and after looking into the explanation provided regarding this disease, ways of its transmission and its consequences - the legally sound opinion is that:

- A specialized team of medical staff qualified in preventive methods, sterilization and how to deal with the infected cases should undertake the washing of those who die of this disease at health institutions designated to handle the disease. Thus, the right of the deceased to be washed is maintained along with prevention of disease transmission. Since the medical team is qualified in treating the infected cases, they would be all the more capable of handling the dead bodies with the very precautions adopted medically.
- If the deceased cannot be washed for a good medical reason, it may be resorted to thoroughly spraying his body with water, observing the ethics of washing a dead person.
- If spraying with water is difficult for any significant reason it may be, according to some Muslim jurists, resorted to performing *tayammum* (dry ablution) for the deceased in the same manner as for the living, maintaining all the medical precautions established with you.
- Then this medical team should also assume enshrouding of the dead and putting them in the medically recommended bags; and some of the deceased's family members may be invited to attend the ceremony, emphasizing that they shall never open the bags.
- If there is no risk in handing over the deceased's body to his family, the body may be handed over to them so that they may offer funeral prayer for him and bury him themselves; because these special bags prevent transmission of the disease as understood from your statements.
- If the medical profession decides that hastening his burial is necessary in order to avoid risks and prevent any potential harm as a result of opening the bags for whatever reason, the funeral prayer for him may be held at the health institution designated to receive and treat these patients, with the presence of some of their close relatives, even by putting a glass barrier between the corpse and the congregation.
- If anything prevents following the previously mentioned procedure, there is no objection to

hastening the burial of the deceased and then praying for him in absentia.

- There is no objection religiously to allocation of a cemetery for such cases, taking into account the previously mentioned procedures in addition to informing the family of the deceased and inviting them to attend the funeral.

This applies to those cases that are proven with you to be actually infected with the disease, on condition that those who assume the washing and shrouding be men if the deceased was a man and be women if the deceased was a woman.

In conclusion, we agree with you on the importance of sensitizing the community about preventive measures, and the necessary ways and means to cope with the disease and handle the dead bodies, God forbid. Such is the answer and Allah knows best.

We ask Allah to ward off every plague and to ordain health, safety and well-being for everyone.

Thanking you profusely with high regards.

Assistant Grand Mufti of the Sultanate of Oman

Annexe #10

Communicable disease surveillance checklist

Assessment tool (including guidelines) for various domains in health care institutions

1	Designated Focal Point for communicable disease surveillance in the health facility		
Structure	1. Availability: designated Focal Point for communicable disease surveillance in the health facility 2. Availability: a backup for the Focal Point so the surveillance routine activities are always carried out without any restraint		
Assessment			
1. Check whether a designated Focal Point is available at the health facility with knowledge of the responsibilities		Not available	
		Available and aware	
2. Check whether a backup for the Focal Point has been designated and is he/she is aware of the responsibilities (one of them should always be available)		Not available	
		Available and aware	
2	National guidelines on communicable disease surveillance		
Structure and process	1. Availability: the latest edition (Third Edition as of 1 st October 2016) should be available in the health centre 2. Accessibility: the manual should be kept in a place for easy access by any staff at all time 3. Awareness: all staff should be aware of the availability and should know where they can locate the manual		
Assessment			
3. Availability and accessibility: check whether the manual is kept in a place which is accessible to all or not		Not available	
		Available but inaccessible	
		Available and accessible	
4. Awareness: randomly select one doctor and one staff nurse and ask them about their awareness regarding the manual and its availability		Both not aware	
		One of them aware	
		Both aware	
3	Availability of health equipment and materials		
Structure and process	1. Ensure containers and equipment are available for collection of sputum, stool, urine, blood and OP/NP swabs in the outpatient setting 2. Ensure adequate knowledge and skills among the concerned staff (doctors, staff nurses) for clinical specimen collection 3. Ensure laboratory technicians have the required knowledge to assist for the above two items 4. Does the facility have appropriate storage place for samples if delay in sending to lab? 5. Ensure that there are provisions and items, e.g. packing material, working refrigerator and transport containers, i.e. 2 cold boxes for transporting samples: one yellow box for transporting infectious specimens and one blue box for transporting other clinical specimens to referral laboratories		
Assessment			
1. Check availability of containers in outpatient area		Not available	
		Available	
2. In the laboratory, check for the presence of cold boxes, packing material, a working refrigerator with temperature monitoring tools		Not available	
		Available but incomplete	
		Available	

4	Orientation and staff training		
Process	<div>1. Ensure all new staff members are oriented on communicable disease surveillance within a month of joining their duties health centre and documented</div> <div>2. Ensure documentation is maintained in health facility regarding training of staff (doctors, staff nurses and laboratory technicians) on surveillance and related issues</div> <div>3. Conducted a minimum of two orientation training sessions of one hour each during the past year to appropriately document all staff of the health centre</div>		
Assessment			
1.	Check availability of records of training of staff at governorate level, wilayat level and health centre level with respect to communicable disease surveillance and control	Not available	
		Available but Incomplete	
2.	Ascertain with a randomly selected staff member about any training received with respect to communicable disease surveillance	Available and complete	
		No training	
		Received training	
5	Availability of medicines		
Process	Availability of drugs for controlling and managing of priority communicable diseases (TB, typhoid fever, helminthiasis)		
Assessment			
1.	Check availability of first line drugs for typhoid and helminthiasis	Not available	
		All are available	
2.	Check whether mechanisms for procuring anti-TB drugs are in place whenever TB drugs are required	Not available	
		All are available	
6	Availability of essential infrastructure		
Structure	<div>1. Ensure availability of unhindered electric power supply (includes presence of working generator), safe water supply for 24 hours and availability of ambulance and transport vehicle as and when required</div> <div>2. Ensure availability of computer for managing data in the form of spreadsheets</div> <div>3. Ensure availability of telephone, fax, TV and video</div> <div>4. Ensure Internet connectivity</div>		
Assessment			
1.	Basic infrastructure: unhindered electric power supply (includes presence of working generator). Safe water supply for 24 hours. Ambulance and transport vehicle as and when required	Not available	
		Available not working	
		Available and working	
2.	Communication tools and health education equipment: telephone, fax, TV and video	Not Available	
		Available not working	
		Available and working	
3.	Data processing: computer for managing data in the form of spreadsheets	Not Available	
		Available not working	
		Available and working	
4.	Check for internet connectivity	Not Available	
		Available not working	
		Available and working	
7	Electronic notification and reporting		
Process	<div>1. Coordinate with IT section and ensure that working e-notification system is made available to all computers in the clinic</div> <div>2. Technical failure of e-notification system should be documented. A record of the same should be maintained by the Focal Point (maintenance record)</div> <div>3. Inform and build awareness among all doctors and staff nurses about the e-notification facility and document the process of training. After initial implementation orientation of new staff should be done as an ongoing process and documented</div> <div>4. Working system for all group A diseases/syndromes e-notification within 24 hours</div> <div>5. Working system for submitting group B diseases as early as possible within one week</div>		

Assessment		
1. Whether e-notification system implemented or not (if not, no need to assess this domain further)	No	
	Yes and incomplete	
	Yes and complete	
2. If implemented is it accessible and possible to submit notifications within reasonable time in all computers	No	
	Yes and incomplete	
	Yes and complete	
3. If e-notification is working check for completeness and timeliness of two randomly selected notified cases	No	
	Yes and incomplete	
	Yes and complete	
4. Check availability of updated e-notification system maintenance record	No	
	Yes and incomplete	
	Yes and complete	
8	Manual notification and reporting	
Please note: Manual notification system should be available in all health facilities and in those with functional e-notification systems, the manual system should always remain as a backup system.		
Process	<ol style="list-style-type: none">1. Ensure availability of blank notification forms2. Working system for transmitting completed notifications to regional level3. Ensure there is documentation for outgoing notification. Date and time of faxing or postal dispatch4. Ensure completeness of entry of essential details in notifications forms before transmission (patient demography, name of doctor, date and time of notification, suspect diagnosis, relevant laboratory investigations and relevant immunization details)5. A copy of a sent notification form should be filed6. Ensure that laboratory testing as per policy is done for the notified cases if laboratory testing is indicated as per guidelines	
Assessment		
1. Check availability and accessibility of notification forms	Not available	
	Available but inaccessible	
	Available and accessible	
2. Check whether completed notification forms are filed	No	
	Yes and incomplete	
	Yes and complete	
3. Check completeness of entry of essential details in notifications forms	Incomplete	
	Complete	
4. Check timeliness of reporting (based on disease grouping)	No information	
	Yes and incomplete	
	Yes and complete	
5. Check whether laboratory testing was done and results documented in computer (check using patient ID from notification form)	No	
	Yes and incomplete	
	Yes and complete	
9	Weekly reporting : active surveillance and negative reporting	
Process	<ol style="list-style-type: none">1. Ensure weekly negative reporting of priority diseases are done through searching computerized records that for notifiable diseases such as AFP, neonatal tetanus, fever and rash illness, etc.2. Ensure at least two persons in health centre are trained to prepare the weekly negative report3. Ensure the reports are checked and signed by the head of health facility and date of sending report to governorate office is documented4. Maintain active surveillance data sheet for the health facility5. Ensure the health facility has received baseline rates for common diseases from	

	regional Epidemiologist for diseases that are monitored to detect outbreaks (influenza and ILI, diarrhoeal disease, ARI, fever)		
6.	Availability of demographic data (by age and gender) of the catchment area updated annually		
7.	Polyclinics and secondary care institutions will also prepare weekly negative reporting for AFP, neonatal tetanus, fever and rash as per the national protocol		
Assessment			
1.	Check the availability of updated (until the week prior to assessment week) active surveillance data sheets	Not available	
		Available but incomplete	
		Available and complete	
2.	Check availability of weekly reports generated through computer search which has been countersigned with date by head of health facility	Not available	
		Available but incomplete	
		Available and complete	
3.	Check availability of demographic data and baseline data of previous year for the health facility	Not available	
		Available but incomplete	
		Available and complete	
10	Surveillance and epidemic preparedness		
Process	1. Ensure all algorithms relating to communicable disease surveillance are available in the health facility 2. Make sure that all GP doctor's clinics and triage areas have AFP and fever rash algorithm displayed 3. Ensure an updated version of Regional Epidemic Preparedness Plan is available and easily accessible 4. Ensure a copy of the updated Influenza Preparedness Plan is available and easily accessible 5. Ensure all circulars issued with regard to surveillance and related issues are filed in one folder for easy reference for all concerned 6. Ensure the communicable disease Focal Points as well as the head of the health facility are well aware of the epidemic management plan 7. Ensure that a rumour notification process/register is in place		
Assessment			
1.	Observe whether algorithms are displayed as required at the right places (AFP and fever and rash in all GP clinics and triage)	Not available	
		Available but incomplete	
		Available and complete	
2.	Observed updated epidemic preparedness plan and influenza preparedness plan	Not available	
		Available but incomplete	
		Available and complete	
3.	Observed the files containing circulars and guidelines	Not available	
		Available but incomplete	
		Available and complete	
4.	Check awareness on rumours notification among Focal Points, head of health centre and availability of 'Rumour Register'	Not available	
		Available but incomplete	
		Available and complete	
11	Communication and feedback		
Process	1. Maintain an updated list of Focal Points (including names and mobile, telephone, fax numbers) accessible to all staff concerned. The list should include Focal Points responsible for all communicable diseases (including TB, HIV and malaria) at health centre, wilayat, regional level and national level 2. Ensure mobile number and active email-ID of the Focal Points are made available to the regional Epidemiologist for timely communication 3. Ensure monthly feedback reports are received from the governorate level and filed with date of receipt 4. Ensure availability of paper copies of Weekly Surveillance Newsletter (EpiWeek) for concerned staff		

Assessment		
1.	Check availability of list of Focal Points concerned with communicable diseases containing contact details	Not Available
		Available but incomplete
		Available and complete
2.	Check availability of feedback reports from higher levels send to health centre, newsletters etc.	Not Available
		Available but incomplete
		Available and complete
12	Quality assurance (QA) and supervisory visits	
Process	1. Conduct self-assessment using this checklist every six months and document the same	
	2. Obtain record of external QA whenever conducted as per governorate plan	
	3. Ensure corrective actions were taken with documentation for the deficiencies observed during previous visits	
Assessment		
1.	Conduct self-assessment using this checklist every six months and keep the records	Not done
		Done but incomplete
		Done and complete
2.	Obtain record of external QA whenever conducted as per regional plan	Not done
		Done but incomplete
		Done and complete
3.	Ensure that corrective actions taken with documentation for the deficiencies observed during previous visits	Not done
		Done but incomplete
		Done and complete

Annexe #11

Terms-of-Reference of the Director (DSC, DGHS) in the governorate with reference to Communicable Diseases

The Director of the Department of Disease Surveillance and Control (DGHS) in the governorate is de facto the focal point for communicable diseases and related programs of public health. He/she is responsible for all the activities related to surveillance, training, and supervision. He/she should coordinate public health response/s and interventions, and to apply preventive and control measures described in this manual to mitigate or contain public health incident/outbreak of communicable disease.

The Director's responsibilities also include the management of health programs associated with the infection prevention and control, malaria, environmental and occupational health, and the regional public health laboratory.

Prime functions

The assigned responsibilities of this position involve the monitoring and surveillance of health status and its correlates, identifying trends, outbreaks of diseases or other adverse health events, and providing data and information about corrective actions or programs to promote and protect public health.

Assist in the planning and implementation of epidemiological programs to prevent and control diseases or conditions.

Major specific job responsibilities

- **Disease surveillance activities:** receive case notifications and conduct epidemiological investigation to take prompt actions for control and prevention. Maintain all records either in printed or in an electronic format
- **Surveillance data management, analysis and interpretation:** maintain a database, perform epidemiologic assessment and analysis, monitor trends and recognize public health problems pertinent to the population. Conduct epidemiological interpretation of observations so as to implement timely interventions in terms of control and prevention
- **Outbreak investigation:** perform outbreak/epidemic and other epidemiologic investigations using established scientific and technical methods to plan and conduct containment activities in liaison with the other public and private partners. Prepare and disseminate investigation reports and feedback to the concerned in a timely manner
- **Intersectoral coordination:** liaise with other health and non-health ministries and departments (agriculture, veterinary services, municipality and environment, etc.) wherever appropriate (e.g. water or foodborne, vector-borne and zoonotic diseases)
- **Surveillance and public health:** supervise, monitor and evaluate surveillance-related activities by conducting regular institutional and community visits. Evaluate health safety standards and programs to improve public health, conferring with health department and others
- **Resource person:** provide appropriate technical support and expert scientific advice in the area of communicable diseases to other public health programs or projects or policy makers within the jurisdiction
- **Interventions:** assist in developing recommended evidence-based interventions and control measures in response to epidemiologic findings within appropriate cultural/social/political framework

- **Planning:** involve as a technical expert in the Ministry of Health's policy and health development plans such as the Five-year Health Development Plan and work towards setting targets and goals and taking steps in achieving these
- **Communication and dissemination of information:** communicate to the staff or the community and feedback to the higher level as well as to the peripheral level with completeness and timeliness. As per the requirement share information, reports and statistical data as per the specific needs of the national health programs
- **Education and training:** conduct training and orientation program for the new and old staff through seminars, symposia, CME and workshops on periodic basis. Health Education activities for the general public in prevention of diseases of public health concern. Also participate in such programs organized by other organization
- **Administrative:** participate in administrative activities as and when assigned. Represent in internal and external committees and organizations if requested by the superiors
- **Research studies:** undertake relevant operational research in order to strengthen the surveillance related activities. Data collection and analysis of data through field research, observational and questionnaire studies. Use various statistical software packages to analyse the information and report their findings during meetings or presentations to the public or policy makers
- **Scientific publication:** participate as independent internal or external expert for applying for grants or other funding proposals or for writing research articles or publications in the scientific national/ international journals
- **Apply principles of good ethical and legal practices in public health**
- **Perform any other technical duties as assigned by the director general as per the requirements of the Ministry of Health**

Annexe #12

National immunization schedules 2016

a. Childhood

Vaccine schedule (months)	Birth	2	4	6	12	13	18
BCG	BCG						
HBV (Hepatitis B)	HBV						
Hexa (HBV, DTaP, Hib, IPV)		Hexa-1	Hexa-2				
PCV-13 (Pneumococcal conjugate)		PCV-1	PCV-2			PCV Booster	
bOPV (Oral polio vaccine-Bivalent)				bOPV			
Penta (HBV, DTP, Hib)				Penta			
MMR (Measles, Mumps, Rubella)					MMR-1		MMR-2
Varicella					Varicella		
Vitamin A supplementation					100,000 IU		200,000 IU
DTP (Diphtheria, Tetanus Pertussis)							DTP Booster
bOPV (Oral polio vaccine-Bivalent)							bOPV Booster

b. School

Vaccine	Schedule
Primary School, Level-1 (Age 6 to 7 years)	
OPV Booster	One dose to ALL
DT Booster OR	One dose to ALL children at school entry OR
DT (2 doses)	Two doses (4 to 6 weeks apart) if NOT immunised before OR NO documentary evidence (e.g. Immunization card)
Primary School, Level-6 (Age 12 to 13 years)	
Td Booster OR	One dose if fully immunised as per schedule OR
Td (2 doses)	Two doses (4 to 6 weeks apart) if NOT immunised as above OR NO documentary evidence
Secondary School, Level-2 (Age 17 to 18 years)	
Td Booster OR	One dose if fully immunised as per schedule OR
Td (2 doses)	Two doses (4 to 6 weeks apart) if NOT immunised as above OR NO documentary evidence
OPV Booster	To ALL

c. Adult immunizations for special groups

Vaccines ▼	Risk groups ►	Pregnancy	Immunocompromised (except HIV)	HCW
Seasonal influenza (inactivated)		1 dose, IM (every year)		
TT (for unvaccinated women)		5 doses, IM (Booster every 10 years)		
Tdap (tetanus/diphtheria adult/acellular Pertussis)				Tdap 1 dose, IM (Td booster/10 years)
Varicella (chickenpox)		Contraindicated		2 doses, SC*
MMR (measles/mumps/rubella)		Contraindicated		2 doses, IM
Pneumococcal PCV13 (conjugate)			1 dose, IM	
Pneumococcal PPSV23 (polysaccharide)			1 dose every 5 years	
Meningococcal ACYW135 (polysaccharide)			1 dose, SC	Lab technicians only 1 dose, SC
Hepatitis B (adult)				3 doses, IM**
Hib (Haemophilus influenzae b)			1 dose, IM	
IPV (Inactivated polio vaccine)				Lab technicians only 3 doses, IM

*Pre-screening recommended for HCW

**Post-screening required for Hep B vaccination

d. Other special groups

People living with HIV and intravenous drug users		
PLHIV (19-65 years)	Hepatitis B (adult)	3 doses
	Pneumococcal PCV13 (conjugated)	1 dose
	Pneumococcal PPSV23 (polysaccharide)	1 dose (every 5 years)
	Seasonal influenza (Inactivated)	1 dose (every year)
	Meningococcal ACYW135 (Polysaccharide)	1 dose (every 3 years)
	Tdap (tetanus + diphtheria adult + acellular pertussis)	1 dose Tdap (Td booster every 10 years)
IDU (19-65 years)	Hepatitis B (adult)	3 doses
Elderly (60+)		
Seasonal influenza		1 dose (every year)
Hajj and Umrah Pilgrims		
Meningococcal polysaccharide (ACYW135)		1 dose (every 3 years)
Seasonal Influenza		1 dose (every year)
Other risk groups		
Travellers to endemic areas	YF	1 dose (Life time)
	Meningococcal polysaccharide (ACYW135)	1 dose (every 3 years)
PEP	Anti-rabies (vero cell) 2-1-1 regimen HRIG if indicated	4 doses 20 IU/kg as single dose

Annexe #13

Web Resources

Organization/Websites	URL
Antimicrobial Resistance Information Bank	http://oms.b3e.jussieu.fr/arinfobank/
CDC Travel Health (Yellow book)	http://www.cdc.gov/travel/page/yellowbook-home-2014/
Department of Health, Australia	http://www.health.gov.au/
Epidemiology and Prevention of Vaccine-Preventable Diseases – The Pink Book	http://www.cdc.gov/vaccines/pubs/pinkbook/index.html
Eradication and elimination programmes	http://www.who.int/ctd/
Geographical Information Systems	http://www.who.int/emc/healthmap/healthmap.html
Influenza Network (FLUNET)	http://oms.b3e.jussieu.fr/flunet/
Ministry of Health, Oman	http://www.moh.gov.om/
ProMED – Health map	http://www.healthmap.org/promed/
Public Health Agency of Canada	http://www.phac-aspc.gc.ca/index-eng.php
Public Health England - infectious-diseases	https://www.gov.uk/topic/health-protection/infectious-diseases
Public Health England (Green book)	https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book#the-green-book
Report on Infectious Diseases	http://www.who.int/infectious-disease-report/
Surveillance and Response	http://www.who.int/emc/
United Nations Children’s Fund	http://www.unicef.org/
Weekly Epidemiological Reports	http://www.who.int/wer/
WHO Disease Outbreak News (DONs)	http://www.who.int/emc/outbreak_news/
WHO ICD-10	http://www.who.int/classifications/icd/en/
WHO International travel and health	http://www.who.int/ith/en/
WHO World Health Statistics	http://www.who.int/gho/publications/world_health_statistics/en/
WHO global digital library - online access	http://apps.who.int/iris/
WHO guidelines on communicable diseases	http://www.who.int/publications/guidelines/communicable_diseases/en/
WHO Office for the Eastern Mediterranean	http://www.emro.who.int/
World health report	http://www.who.int/whr/en/

Other useful websites

https://gphin.canada.ca/cepr/aboutgphin-rmispenbref.jsp?language=en_CA



**Health
Canada**

GPHIN - The Global Public Health Intelligence Network (GPHIN), developed by Health Canada in collaboration with WHO, is a secure Internet-based multilingual early-warning tool that continuously searches global media sources such as news wires and web sites to identify information about disease outbreaks and other events of potential international public health concern.

http://www.who.int/ihr/alert_and_response/outbreak-network/en/



**World Health
Organization**

The Global Outbreak Alert and Response Network contributes towards global health security GOARN is a collaboration of existing institutions and networks,

constantly alert and ready to respond. The network pools human and technical resources for rapid identification, confirmation and response to outbreaks of international importance.

http://ecdc.europa.eu/en/activities/epidemicintelligence/Pages/Activities_EpidemicIntelligence.aspx



The ECDC founding regulations specifies the mandate of ECDC regarding risk identification and risk assessment. Epidemic Intelligence encompasses activities related to early warning functions but also signal assessments and outbreak investigation. It aims to speed up detection of potential health threats and allow timely response.

<http://www.cdc.gov/eis/>



Epidemic Intelligence Service (EIS)
Boots-on-the-ground disease detectives

Training program for Public Health Responders in infectious and non-infectious diseases, global health, injury prevention, environmental health, and occupational health.

<https://epicore.org/#/home>



EpiCore is a virtual community of health professionals using innovative surveillance methods to verify outbreaks of infectious diseases. It links a worldwide network to verify information on disease outbreaks through a secure online reporting platform.

<http://www.promedmail.org/>



commentary.

ProMED-mail of the International Society for Infectious Diseases: Founded in 1994, ProMED-mail rapidly disseminates to its large global audience early warning reports on outbreaks of emerging and re-emerging diseases. Reports are selected and interpreted by a panel of specialists who provide expert



TEPHINET created in 1997, Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) is a professional network of 65 field epidemiology training programs (FETPs) in 90 countries around the world. TEPHINET aims to strengthen international public health capacity by training field epidemiologists through an applied apprenticeship program.

<https://ghsagenda.org/>



The Global Health Security Agenda (GHS) was launched in February 2014 and is a growing partnership of over 50 nations, international organizations, and non-governmental stakeholders to help build countries' capacity to help create a world safe and secure from infectious disease threats and elevate global health security as a national and global priority.

<http://www.onehealthinitiative.com/>



The One Health concept is a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment. The synergism achieved will advance health care for the 21st century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical care.

<http://www.istm.org/>



International Society of Travel Medicine
Promoting healthy travel worldwide 1993-2016

GEOSENTINEL

The Global Surveillance Network of the ISTM in Partnership with the CDC

Annexe #14

National and regional Focal Points for Communicable diseases (2016)

a. Directorate General for Disease Surveillance and Control

Ministry of Health HQ,
PO Box 393, PC 100
Muscat, Sultanate of Oman

Director General: Seif Salim Al Abri

Telephone: 2235 7491

Fax: 2235 7541

Email: dgdsc2014@gmail.com

Prefix + (968) for all international calls

(Direct call office numbers. Last 4 bold digits represent extension)

Department	Director	Email /Telephone
Communicable Diseases (DCD)	Idris Al Abaidani	director@cdscoman.org 2235 7504 , Ext 7504; Fax 2235 7539
Surveillance	Salem Al Mahrooqi	salem.mahrooqi@gmail.com 2235 7533 , Fax 2235 7540
Central Public Health Laboratory (CPHL)	Amina Al Jardani	moh.dl@moh.gov.om 2470 5943; 2470 5740
Infection Prevention and Control (CDIPC)	Amal Al Maani	amalsaifalmaani@gmail.com 2469 9394; Fax 2469 5480
Environment and Occupational Health (DEOH)	Mohammed Al Yazidi	director@deohoman.org 2456 2898; Fax 2456 3121

b. Department of Surveillance and Department of Communicable Diseases

Directorate General for Disease Surveillance and Control
Ministry of Health HQ, PO Box 393, PC 100
Muscat, Sultanate of Oman

Telephone (Surveillance): **2235 7533**; Fax: **2235 7540**

Telephone (Communicable Diseases): **2235 7504**; Fax: **2235 7539**

c. Governorate office (Disease Surveillance and Control, DGHS)

Department of Disease Surveillance and Control	Office	e-mail
Director, DSC, DGHS, Muscat Governorate	2478 2110	surv.mct.oman@gmail.com
Director, DSC, DGHS, Dhofar Governorate	2323 0680	surv.dfr.oman@gmail.com
Director, DSC, DGHS, North Batinah Governorate	2685 0071	surv.nbg.oman@gmail.com
Director, DSC, DGHS, South Batinah Governorate	2687 6707	surv.sbg.oman@gmail.com
Director, DSC, DGHS, Dakhliyah Governorate	2541 1159	surv.dak.oman@gmail.com
Director, DSC, DGHS, North Sharqiyah Governorate	2554 4126	surv.nsg.oman@gmail.com
Director, DSC, DGHS, South Sharqiyah Governorate	2554 4126	surv.ssg.oman@gmail.com
Director, DSC, DGHS, Dhahira Governorate	2569 1870	surv.dhr.oman@gmail.com
Director, DSC, DGHS, Buraimi Governorate	2565 7147	surv.bur.oman@gmail.com
Director, DSC, DGHS, Musandam Governorate	2673 1655	surv.mus.oman@gmail.com
Director, DSC, DGHS, Al Wustah Governorate	2343 6237	surv.wus.oman@gmail.com

d. Regional Epidemiologists (For informal communication)

Region	Epidemiologist	Personal Email
Muscat Governorate	Padmamohan Kurup	geethasmohan@gmail.com
	Mohammed Amin	aminpatra@yahoo.com
Dhofar Governorate	Satish Ghugey	sghugey@gmail.com
N Batinah Governorate	Vidyanand Vaidya	vidyanandvaidya@gmail.com
S Batinah Governorate	Prasanna AR	prasannaar@yahoo.com
	Khairy Anis	khairyanis@yahoo.com
Dakhliyah Governorate	Kishor Duthade	duthadeoffice@gmail.com
	Serag Haleem	seragselimalx@gmail.com
Dhahira Governorate	Mahmood Al Skaiti	mhoskaiti@hotmail.com
	Said Al Jessasi	aljassasi.said@gmail.com
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N Sharqiyah Governorate	Parag Shah	parag_h_shah@yahoo.com
S Sharqiyah Governorate	Iyad Omer	iyadomer@gmail.com
	Amany Elshaeir	amany.elshaeir@yahoo.com
Musandam Governorate	Nilanjan Mitra	nilanjan0311@gmail.com
Al Wustah Governorate	Nabil Guindi	nabielguindi@hotmail.com

