Reviewed By
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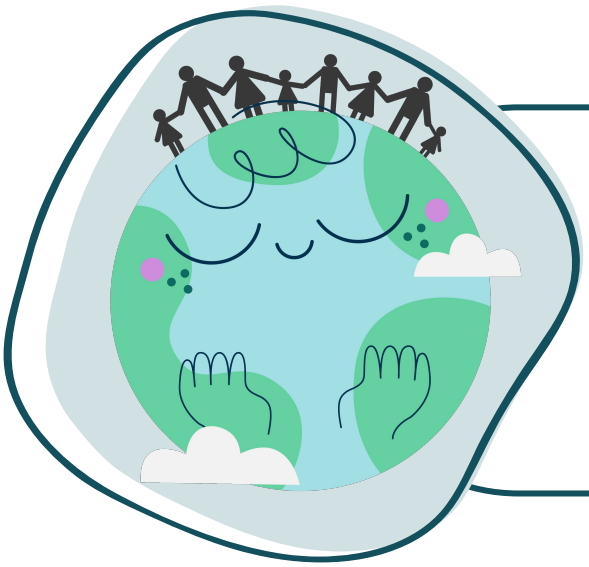


Final Summary

- Deema AlMaziad
- Lama AlAssiri
- Leen AlMazroa
- Muneera AlKhorayef
- Nouf Alhussaini
- Reema AlMutawa
- Renad Alhaqbani
- Wejdan AlNufaie

Color Index

- Main text
- Males slides
- Females slides
- Doctor notes
- Important
- Textbook
- Golden notes
- Extra

Editing File

L16- Malaria

- a life threatening febrile illness caused by infection with the protozoan parasite **Plasmodium**.
- It is transmitted to humans by **the bite of the female Anopheles mosquito**

Epidemiology

predominantly affecting **:**

- **young children** (Especially those who are less than 5 years)
- **pregnant women.**

In **2019**, there were 229 million cases and, 409,000 deaths caused by malaria worldwide (WHO 2020)

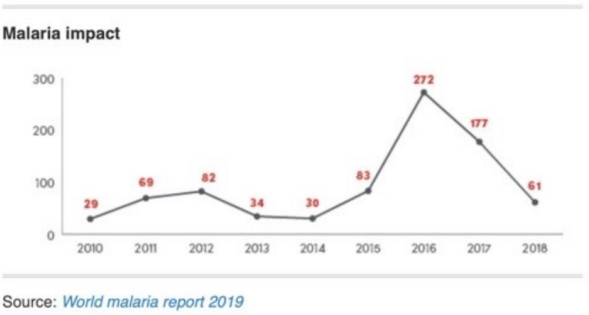
- **67% of deaths were in children aged less than five years.**
- **94% of cases and deaths occurred in Africa.**

Multidrug resistance is prevalent in many areas around the world, particularly in **South East Asia** (**Cambodia, Thailand,** Brunei, Burma (Myanmar), Timor-Leste, Indonesia, Laos, Malaysia, Philippines, Singapore and Vietnam.)

Cases are increasing
Usually due to political reasons (like wars) more than health reasons. Poverty, war, etc can increase the chance of disease incidence and this will also cause the death percentages to increase

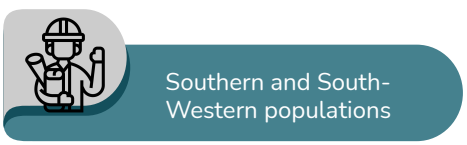
Epidemiology in Saudi Arabia

- Dominant species in indigenous cases: **P. Falciparum** (93%), mainly transmitted by **Anopheles Arabiensis** (MOH 2019; WHO 2019)
- In 2018, number of confirmed cases was 2711, of which:
  - 2650 (97.7%) were either **imported** or **introduced**.
  - only 61 cases were **indigenous.**
- **Zero indigenous deaths** from 2010 to 2018.



Source: *World malaria report 2019*

High-risk populations in KSA



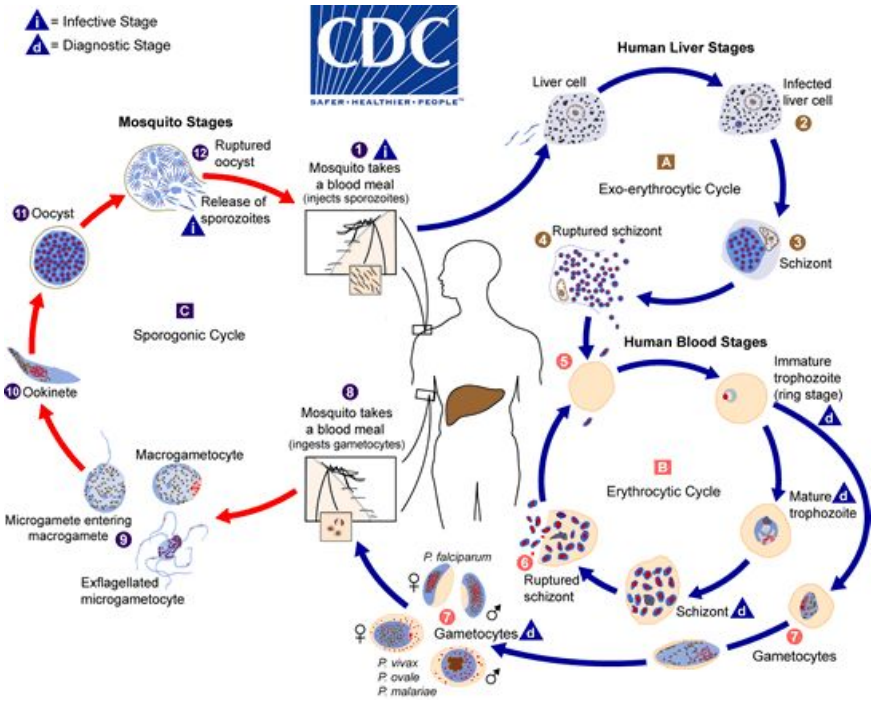
- **Jazan and Aseer**
- ue to seasonal anomalies (i.e., unusual high annual rainfall)

- from Yemen and its neighbouring countries

- from endemic countries.

L16- Malaria

Mode of transmission and lifecycle:



- **MAINLY Vector** (female Anopheles mosquitoes)
- Blood (injection/transfusion of contaminated blood)
- **Congenital (rare)**

Recall from Microbiology
Explanation for the picture:
1. Malaria is mainly carried by **female anopheles mosquito.**
2. The infected mosquito will **bite and inject sporozoites** from it salivary gland into the bloodstream of human
3. Which then will travel through blood until it reaches the liver and enter the hepatocytes where it will multiply asexually to form **merozoites inside the schizont (Exoerythrocytic schizont).**
4. When the **hepatic schizont rupture (clinical symptoms appear)** the merozoites will be released into blood, then it will enter the erythrocytes forming **immature trophozoites (ring stage)** which will have 2 pathways:
a. **First pathway:** It goes through the **erythrocytic cycle** starting from ring stage then into Mature trophozoites, then the merozoites will multiply inside the RBCs forming **schizont (Erythrocytic schizont**), which will rupture (hemolysis) and release the merozoites into the bloodstream (Clinical attack of malaria is due to this stage) and the cycle will repeat over and over again.
b. **Second pathway:** Some immature trophozoites will become **gametocytes (male and female)** those gametocytes will be ingested by another mosquito; in the mosquito:
i. There are Micro(Male) and Macro(Female) gametocytes, the microgametocytes will enter into the macrogametocytes in which they will form Ookinete then it will develop into Oocyst which will rupture releasing **sporozoites** in mosquito, then the cycle will go over and over again.

Symptoms "not specific"

Common	Less common
- **Paroxysms of:** Chills/rigors followed by fever, sweats	Anorexia
- A pattern might develop (i.e., fever occur every 2-3 days)	Nausea, vomiting
	Diarrhoea
- Headache, weakness, muscle and joint pain.	Abdominal pain

L16- Malaria

History and Risk Factors

- **Travel history**
  - key in patients presenting in non-endemic countries.
  - If positive, history of prophylaxis must be obtained. because some patients may be asymptomatic
- **Settled migrants.**
- **Low host immunity.**
- **Pregnancy.**
- Children aged less than five years.
- Elderly.

Physical examination

- Hepatosplenomegaly
  - due to 1- liver stage + Human blood stage 2-Hemolysis-> anemia -> pale
- Signs of Anaemia (e.g., pallor)

★ **he complications of severe malaria (treatment differs in severe cases)**

- Confusion/altered level of consciousness
- Seizures
- Hypotension
- Oliguria/anuria
- Jaundice
- Respiratory distress

Laboratory

1. **Rapid diagnostic test (RDT)**
2. **Light Microscopy:**
   Giemsa-stained blood smear; Thin film, thick film.
3. **Polymerase Chain Reaction (PCR)**
   Only in large hospitals
3. **Loop-mediated Isothermal Amplification (LAMP)**
   An emerging test

Other baseline tests

- **Full blood count (FBC)** for anemia or hemolysis
- **Clotting profile**
- **Serum electrolytes**
- **Urea and creatinine (U&E)**
- **Liver function tests (LFTs)**
- **Blood glucose**
  - Hypoglycemia due to chloroquine- resistance
- **Urinalysis**
- **Arterial blood gas (ABG)** (possible Lactic acidosis)

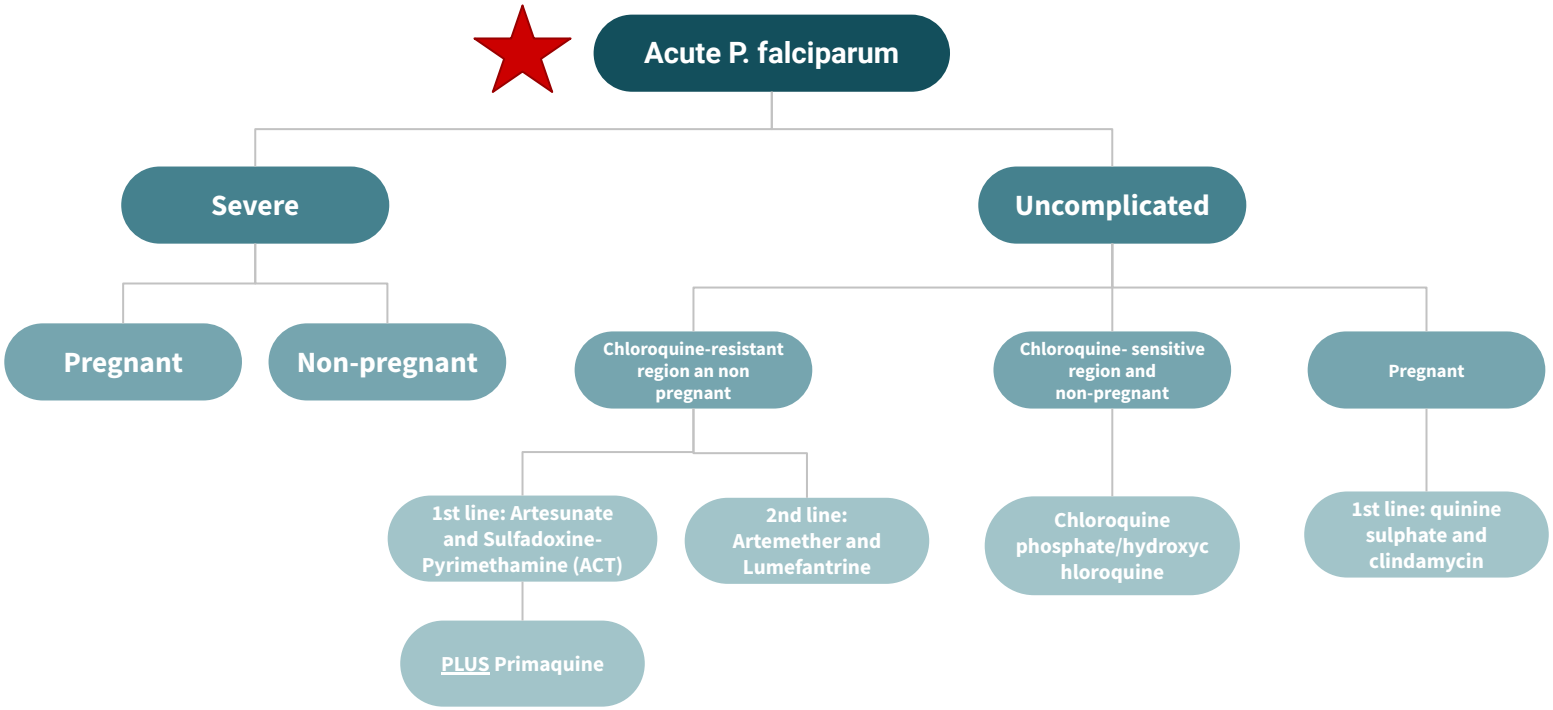
Community diagnosis

Pre-elimination	Eliminated
Areas with advanced malaria control	**Areas where malaria has been eliminated**
- Universal access to diagnostic tests/ capabilities. - **Surveillance**/mapping. - Focused **screening** (e.g., those who present with danger signs) and treatment (e.g., active case strategy in Oman).	- Prevent re-introduction. - Considerable resources are still needed. - Different strategies (e.g., border control, active case management). - Maintain high-quality diagnosis

Which of the following preventive measures is included in the malaria control program ? Case Management

L16- Malaria

Treatment algorithm:



★ **Primaquine is contraindicated in:**

G6PG deficiency | Infants <6m | Pregnancy | Hypersensitivity | lactating mothers for babies <6m

Resistance

- **Three species known for resistance: P. falciparum, vivax and malariae.**
- Resistance to one drug confers resistance to others **(cross-resistance)** which leads to multidrug resistance

gene mutations:

- **Complete:**
  - Survival / multiplication of malaria despite adequate treatment.
- **Partial:**
  - Delayed clearance or incomplete recovery.

WHO efforts in malaria control (vision 2030)

VISION – A WORLD FREE OF MALARIA

GOALS	MILESTONES		TARGETS
	2020	2025	2030
1. Reduce malaria mortality rates globally compared with 2015	At least 40%	At least 75%	At least 90%
2. Reduce malaria case incidence globally compared with 2015	At least 40%	At least 75%	At least 90%
3. Eliminate malaria from countries in which malaria was transmitted in 2015	At least 10 countries	At least 20 countries	At least 35 countries
4. Prevent re-establishment of malaria in all countries that are malaria-free	Re-establishment prevented	Re-establishment prevented	Re-establishment prevented

L16- Malaria

Global technical strategy "GTS" (2016-2030)

Pilar 1: Ensure **universal access** to malaria prevention, diagnosis and treatment

1- Vector control

- Maintain adequate **entomological** surveillance and monitoring

2- Chemo-prevention

subtherapeutic doses of malaria treatment for prophylaxis

Example: Someone plans on traveling to an endemic chloroquine- resistant country? Doxycycline (before/during/after travel)

3- Diagnostic testing and treatment

- All suspected cases must be confirmed first before given treatment. If treatment failure is > 10% , first line therapy is reviewed (every 2 years, countries review their malaria health policies)
- Use multiple drugs (combination) to avoid resistance

Pillar 2: accelerate **efforts towards elimination** and attainment of malaria-free status

- **Enact legislation**
- Implement transmission-blocking chemotherapy in high transmission/resistance cases
- Detect all infections to attain elimination and prevent reestablishment
- Use of medicines to reduce the parasite pool
- **Devise P. vivax-specific strategies** the problem is that it can live in multi environments so it's very resistant
- Use **surveillance** as an intervention in elimination programs

Pillar 3: transform malaria surveillance into a core intervention

- **Surveillance in areas of high** (focus on no. of deaths and cases) **and low** (focus on high risk groups) **transmission.**
- **Invest** in routine information systems
- **Ensure the surveillance system is monitored**

Supporting element 1: harnessing innovation and expanding **research**	**Supporting element 2:** strengthening the enabling environment
• Vector control • Diagnostic testing and treatment • Malaria vaccines • Surveillance • Elimination	• Increase international and domestic financing • Ensure robust health sector response • Strengthen health workforce and malaria expert base • Ensure the sustainability of malaria responses • Improve government stewardship • Strengthen multisectoral collaboration • Encourage private sector participation • Empower communities and engage with non-governmental organisation

L17- Emerging Respiratory infectious diseases

Influenza Virus

Antigen type	Who does it infect?	What does it cause?
A	Human	Seasonal epidemic,pandemic
B	Human	Seasonal Epidemic
C	Human	Mild respiratory illness
D	Cattle	---

Antigenic drift

- Happens continually over time.
- Results from point mutation of the gene -> changes in surface proteins[1].
- Why do some people get the flu more than 1 time, although they are vaccinated? This is due to antigenic drift.

Antigenic Shift

- Complete sudden change
- Results from genetic recombination of human virus with animal or avian virus Responsible for pandemic strains.

Three different methods for antigenic shift:
1- virus from human and avian reassort in the swine.
2- virus jumps from avian to human.
3- virus jumps from avian to swine to human without Reassortment

Influenza A subtypes infective to humans:
Currently circulating viruses type A are:

- H1N1 responsible for pandemics (this is the doctor's note and a golden note)
- H3N2

Date of Pandemic	Influenza subtype	Death Toll
1918-1919	Spanish influenza H1N1	50 million
1957-1958	Asian influenza H2N2	2 million
1968-1969	Hong kong influenza H3N2	1 million
2009-2010	H1N1 (swine flu) - novel subtype	18.2 thousand +

Signs of an outbreak :

01 Starts with few cases

02 Sudden outburst of disease

03 Increased febrile illness in children followed by adults

04 Increased hospitalization due to illness

05 Attack rates are high: 5-10% in adults; 20-30% children

06 Epidemic peaks within 3-4 weeks then declines

L17- Emerging Respiratory infectious diseases

Influenza Virus

- **Vaccine**
  - takes **two weeks** to produce immunity
  - Immunity against type A (H1N1; H3N2) , and B (trivalent)

Flu vaccines available in KSA:

Injection vaccine:

- Inactivated virus
- Ages 6 months and above
- Safe for pregnant women
- Targets H antigen

Nasal spray vaccine:

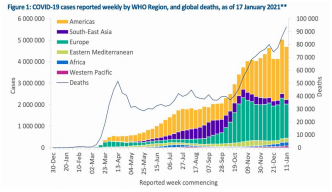
- Live weakened virus
- Ages 2y to 49 y
- NOT safe for pregnant women
- Targets both H and A antigens

Contraindications (the Doctor might ask a question)

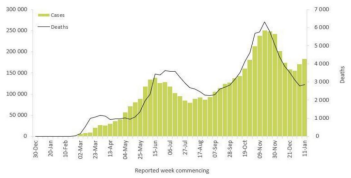
- Those who have severe egg allergy Previous history of severe allergy to influenza vaccine Yes there are vaccine modifications where egg allergies aren't contradicted but we don't know of KSA has them so we make sure they don't have egg allergies
- History of Guillain Barre Syndrome after taking the vaccine
- Children under 6 months
- People suffering from very high or moderate temperature

	Influenza	MERS-CoV	SARS-CoV
Reservoir	• Animals (swine, horses, dogs, cats) • Birds (poultry, wild birds) • human	• Animals in the Arabian peninsula • Dromedary camels • May have been in bats and transmitted to camels sometime in the past	**Horseshoe bats**
Mode of transmission	• Secretions of respiratory tract	• Person-to-person(patient- to-HCW) • Camels-to-humans	• Direct: • Indirect: Contacting surface contaminated with droplets • May be airborne ? Aerosol-generating procedures • Virus shed in stool – not clear feco-oral transmission
Incubation period	• 18 – 72 hrs • Period of infectivity: 1-2 days prior to symptoms, and 5-7 days after.	• **2-14 days** • high case fatality rate in relation to COVID-19	2 – 7 days
Risk factors	• **Season:** Winter or rainy • **Age:** severe in elderly and < 18 m • **Overcrowding** • **Contact** with infected individual • **Immunity** • **Chronic diseases;** DM; CHD; CLD. • **Pregnancy**	• close contact with a confirmed case • Healthcare personnel who do not use recommended infection-control precautions • contact with camels • Consumption of raw animal products • Elderly, immunocompromised, chronic disease	
Prevention & control	• **Cough etiquette** • **Wash hands** • **Vaccine**	**secondary prevention** : Same as influenza + • Avoid touching eyes, nose and mouth • Avoid personal contact, or sharing items • Clean and disinfect frequently touched surfaces • Healthcare workers practice infection control precautions	Same as previous + • **early identification and efficient reporting of cases** • Isolation of patients • **Exit screening for international travelers**

L18- COVID-19 Pandemic



- It entered a global level on March, 2020. The graph shows **two major peaks (Mar & Nov)** with smaller peaks in between.
- Americas region is where most of the cases are.

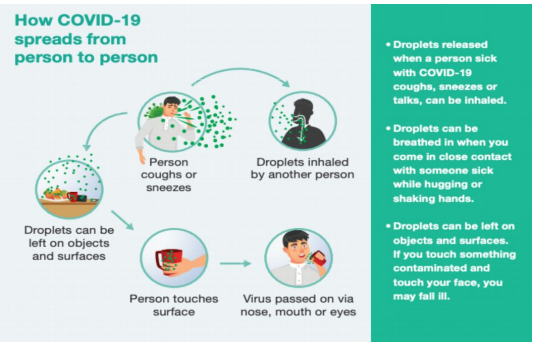


Eastern Mediterenean regions

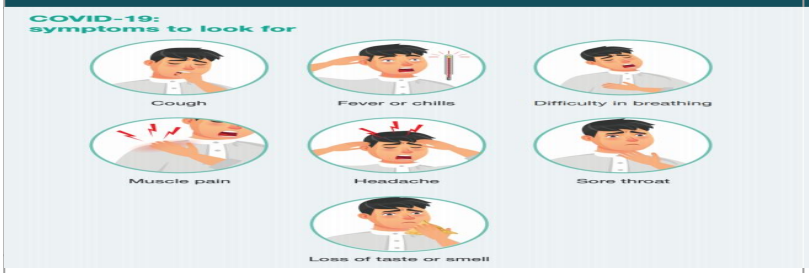
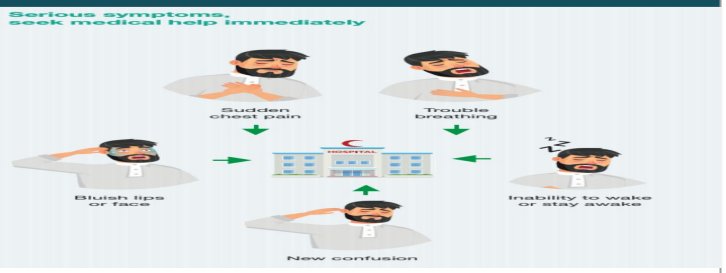
- There are two peaks. First was in May-June and the other peak was in November.
- The graph also predicts that there might be a rise in the cases if necessary precautions weren't implemented.

Mode of Transmission:

- COVID-19 is mainly transmitted through droplet infection.
- Whenever an infected person speaks or coughs, droplets are released and can be inhaled by a different person within 2 m
- Moreover, droplets can be left on surfaces [1] for sometime before getting inactivated

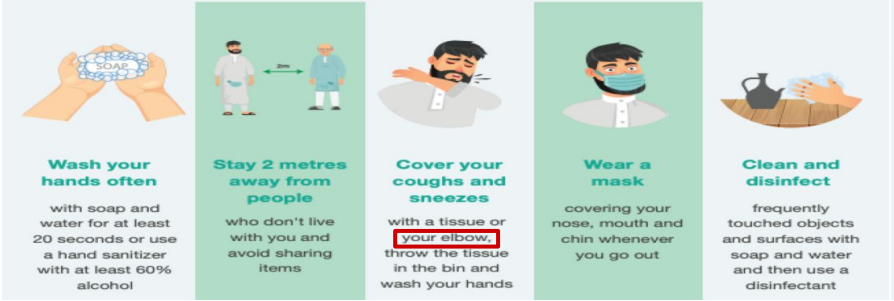


Signs and Symptoms:

Common symptoms	Serious/Severe Symptoms
	
• The symptoms differ from the flu in their intensity. • Loss of taste or smell is particularly pathognomic and should rise high index of suspicion.	• Any patient with any of the symptoms above should immediately seek healthcare and **MUST** be admitted to the hospital.

How to protect yourself and others? [2,3]

Video is very important!!



- 2 meters = 2 arm's length
- Handwashing should be for **2 minutes**

1. Recent research evaluated the survival of the COVID-19 virus on different surfaces and reported that the virus can remain viable for up to 72 hours on plastic and stainless steel, up to four hours on copper, and up to 24 hours on cardboard.
2. Does a person, who had the infection, required to wear a mask? YES, all people should wear masks even if they got the infection since they're still susceptible for reinfection.
3. Medical masks (surgical) should be worn by healthcare workers, COVID-19 infected people, people who takes care of infected people, people above the age of 60 and people with underlying conditions. Other than that, a fabric mask is enough.

What Should I do if I Feel Sick?

REPORT IMMEDIATELY!

Flu-like symptoms:

- Report to the **flu clinic**
- Opens 24 hrs

Who & Where

Come in Close Contact:

- Report to the **occupational health clinics**
- Fill in the link for contact tracing

Public Health and Social Measurements

Community Transmission

- No (active) cases
- Imported / Sporadic cases
- Clusters of cases
- CT1: Low incidence of locally acquired widely dispersed cases detected in the past 14 days
- CT2: Moderate incidence of locally acquired widely dispersed cases detected in the past 14 days
- CT3: High incidence of locally acquired widely dispersed cases in the past 14 days
- CT4: Very high incidence of locally acquired widely dispersed cases in the past 14 days

Table 1: Situational Level assessment matrix using transmission level and response capacity indicators to guide adjustment of PHSM

	Response capacity		
Transmission level	Adequate	Moderate	Limited
No cases	0	0	1
Imported/Sporadic cases	0	1	1
Clusters of cases	1	1	2
Community - CT1	1	2	2
Community - CT2	2	2	3
Community - CT3	2	3	3
Community - CT4	3	3	4

1. Public health and social measures (PHSM) have proven critical to limiting transmission of COVID19 and reducing deaths.

2. The decision to introduce, adapt or lift PHSM should be based primarily **on a situational assessment of the intensity of transmission and the capacity of the health system to respond**, but must also be considered in light of the effects these measures may have on the general welfare of society and individuals

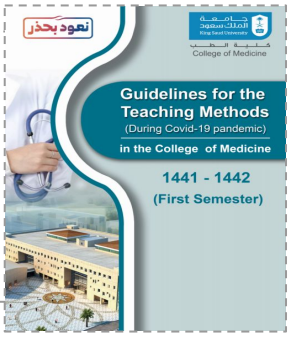
3. **Indicators and suggested thresholds are provided** to gauge both the intensity of transmission and the capacity of the health system to respond; taken together, these provide a basis for guiding the adjustment of PHSM. Measures are indicative and need to be tailored to local contexts.

4. PHSM must be **continuously adjusted to the intensity of transmission** and capacity of the health system in a country and at sub-national levels . When PHSM are adjusted, **communities should be fully consulted and engaged** before changes are made

COVID-19 in University Settings

Risk transmission can be categorized as the following:

- **Lowest risk:** virtual learning, activities, and events.
- **More risk:** small in-person classes, activities, and events. (eg. hybrid virtual and in-person class structures or staggered / rotated scheduling to accommodate smaller class sizes)
  - Individuals are spaced at least 1.5-2 m apart and DO NOT share objects
- **Highest risk:** Full-sized in-person classes, activities, and events.
  - Individuals are not spaced apart and they share objects, materials and supplies



How do you protect yourself in the hospital?

- **REMEMBER**: PPE, surgical masks, face shield & gloves
- **Always follow the guidelines** in the OR, ICU, ER
- **Always report any signs of illness**, any one is deviating from the policies laid down
- **Reduce congestion** in the health clinic
  - Distance inside clinics has to be 1.5 meters
  - Compensate the clinical training by enforcing CBD, or online courses

L19- Hajj and Health

- The Hajj pilgrimage is one of the greatest **mass gatherings** in the world, and presents unique public health challenges.
- Mass gatherings can present important public health **challenges** related to the **health of attendees** and of the **host country population** and **health services.**

Diseases and Health risks associated with mass gathering (Hajj)

- **Transmission of communicable diseases, including antibiotic-resistant bacterial infections.**
- Non communicable diseases.

Communicable diseases

- **Unhygienic practices** and close contacts between pilgrims in **overcrowded situations** during the Hajj rituals, as well as **international travel**, increase the risks of outbreaks and the spread of infectious diseases among pilgrims.

Meningococcal disease ★

- Meningitis most commonly caused by **Neisseria meningitidis** because of its **potential to cause epidemics.**

Epidemiology

- **Crowded conditions** are a risk factor for the carriage and transmission
- **Hajj has been associated with outbreaks of invasive meningococcal disease.** Most cause of epidemics
  - **Outbreaks have high fatality rates.**
  - **Associated with medical costs.**
- During the **2000** and **2001** Hajj pilgrimages, Saudi Arabia experienced 2 large outbreaks of invasive meningococcal disease that led to global spread of N. meningitidis serogroup **W-135** This happened during hajj before that this strain wasn't known.

Neisseria meningitidis

- Pathogenic meningococci are enveloped by a **polysaccharide capsule** the capsule identifies the valurince
- **Humans are the only reservoir.**
- **Nasopharynx** is the natural habitat and reservoir, in most cases colonization of Nasopharynx is asymptomatic.
- Even with adequate chemotherapy, meningococcal meningitis has a **fatality rate of about 10%** and about 15% of the survivors have residual (CNS) damage hearing loss, vision loss, and preeminent damage

Meningococcal disease

Host

- **Maternal antibodies offer protection against invasive disease till the age of six months.**
- Susceptibility **peaks at age 6 - 12 months** and decreases again after colonization of closely related non-pathogenic bacteria.
- **Invasive disease occurs if no protective bactericidal antibodies are mounted against the infecting strain.**

Environment

- **Crowded living conditions** also facilitate disease spread, since individuals from different areas have different strains of meningococci.
- The **risk of invasive disease** is higher in the first **few days** **after exposure to a new strain.**
- **Smokers**

Mode of Transmission

- **Direct contact.**
- **Respiratory droplets**
- The average **incubation period is 3 - 4 days** with a range of 2 to 10 days, this is also the period of communicability.

Diagnosis

- by the **clinical presentation** and a **lumbar puncture** showing a **purulent spinal fluid.**
- **Typical CSF abnormalities in meningitis include:**
  - **Increased pressure (>180 mm water)**
  - **WBC counts between 10 and 10,000 cells/µL, (predominantly neutrophils)**
  - **Decreased glucose concentration (<45 mg/dL)**
  - **Increased protein concentration (>45 mg/dL)**

Clinical Features

Most Common symptoms	In infants and young children
- Acute onset of intense headache **- High fever** can reach to 40 **- Sensitivity to light (photophobia)** **- Stiff neck.** - **Meningococcal septicaemia:** which is characterized by a **haemorrhagic rash** which usually indicates disease progression and rapid circulatory collapse	- **Subacute infection that progresses over several days.** - Irritability and **projectile vomiting** may be the presenting features in this age group. - **Seizures** occur in 40% of children with meningitis. - Neck stiffness can be absent in children so a high fever in children meningitis unless proven otherwise

Meningococcal disease

Management

- fatal and should always be viewed as **medical emergency.**
- requires **early recognition**, prompt **initial parenteral antibiotic** therapy and close monitoring.

Preventive measures for Meningococcal diseases

Chemoprophylaxis	Use of vaccination	Health awareness and educational campaigns	Efficient disease surveillance and response systems

1- Chemoprophylaxis:

- Is the preferred means of prevention of disease among close contacts of sporadic

2- Meningococcal Vaccines:

- More than 90% of meningococcal disease, **vaccines are available for group A, C, Y and W - 135**
- At present **two types** of meningococcal vaccines are licensed;
- Meningococcal **polysaccharide vaccines**:
  - Bivalent → protection against serogroups A and C.
  - Quadrivalent → protection against serogroups A, C, Y and W - 135 commonly used
- Meningococcal conjugated polysaccharide vaccine.
- **Recommendations for use of meningococcal vaccine:**

Vaccination with a single dose of polysaccharide vaccine is recommended for travelers above 18 months of age going to an area experiencing an epidemic of meningococcal disease or to areas with a high rate of endemic meningococcal disease.

Diarrhoeal diseases

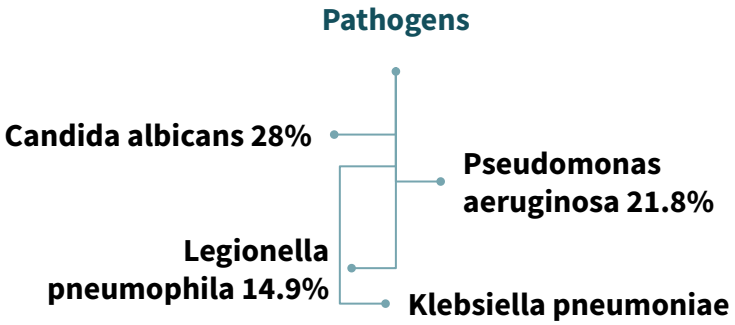
- **Cholera (especially from Yemen)** and **traveller's diarrhoea** are common during the Hajj.

Respiratory tract infections

- Upper respiratory tract infections (URTIs), including **pharyngitis**, **viral URTI,** and **tonsillitis** are the most common cause of outpatient department visits during the Hajj

Pneumonia

-One of the leading causes of **hospitalization** of pilgrims in Mecca, especially among elderly people
- The leading cause of severe **sepsis** and **septic shock** among pilgrims admitted to the ICU.



Tuberculosis

- The annual risk is **3 times higher** in Mecca than the national average in Saudi Arabia.

KSA's Efforts for a Healthy Hajj

KSA's Healthcare System during Hajj

- The Saudi government provides **free healthcare services** for all pilgrims.
- The **healthcare system**, which is operated by 26 421 domestic employees in addition to international visiting healthcare practitioners, provides **curative** and **preventive services.**

Travel immunisation recommendations

- They are classified as:
  - **Mandatory** (required)
  - **Voluntary** (recommended) before performing Hajj
- The three **mandatory** vaccines are:
  - quadrivalent meningococcal vaccine for all pilgrims
  - Yellow fever
  - Polio vaccines for pilgrims coming from countries with active polio transmission.
- **Recommended** vaccines include:
  - influenza vaccine
  - pneumococcal vaccine

L20- Reporting & Surveillance

- The Centres for Disease Control and Prevention (CDC) defined **Public Health Surveillance** as: "**Ongoing systematic collection**, **analysis**, **interpretation** and **dissemination** of data regarding a health related event for use in public health **action** to reduce morbidity and mortality and to improve health".
- In other words, it means "**information for action**".
- It is the eyes and ears of public health.
- It a very **important tool** for public health
- It is a network of people and activities to keep this process.
- Functions at local to international levels and is available in regular reports routinely.

Objectives of Public Health Surveillance

Main aim:
Disease control and prevention

1. To study the trends of disease
2. Early warning of epidemics
3. To provide quantitative estimates of magnitude of health problem
4. To study the natural history of disease
5. Demonstrating the spread of a disease in time and Place
6. To develop epidemiologic research questions
7. To test epidemiologic hypothesis
8. Evaluation of control and preventive measures Breast cancer screening
9. Monitoring of change in infectious agent like changes in malaria species
10. Detecting changes in health practices

Types of Surveillance

Types	Item	Description
Passive	Definition	• Regular reporting of disease data by all institutions that see patients (or test specimens) and are part of a reporting network. • There is **no active search for cases**. • Relies on the cooperation of health-care providers — laboratories, hospitals, health facilities and private practitioners. • This is the **most common type** of surveillance. Example: Reported cases of COVID-19 by hospitals.
	Uses	• In this type of surveillance criteria are established for **reporting diseases, risk factors or health-related events** then health practitioners are notified of the requirements and they report events as they come to their attention. • The data recipient has to wait for the data providers to report. • In most countries with a passive surveillance system, **every health facility is required to send a monthly (sometimes weekly/daily)** report of all cases on a standard form.
	Advantage	• Simple to conduct • Inexpensive • Covers wide areas (whole countries or provinces)
	Disadvantage	• It can be difficult to ensure completeness and timeliness of data. - Because it relies on an extensive network of health workers. • Usually underestimate the true illness burden.

Types	Item	Description
Active	Definition	• In active surveillance the organization conducting the surveillance **actively seeks the relevant information** (healthcare providers are contacted and asked to provide details of any cases they have seen). • Data must be obtained by searching for cases, and also by periodically contacting those who may know of cases. Example: - Health workers go into the community, search for cases of fever and take their blood slide for malarial parasite - Screening for people arriving from a certain country. - Actively visiting and screening individuals in high risk areas.
	Uses [1]	Active surveillance is used when there is an indication that **something unusual is occurring**: • Rare disease • Disease on way to eradication e.g. polio • During outbreaks (very good indication) Regular outreach to potential reporters, to stimulate the reporting of specific diseases or injuries.
	Advantage	• Produce complete data of a **good quality**
	Disadvantage	• Expensive • high use of resources - For this reason, when it is used, it is for a limited time period.
Sentinel [2]	Definition	• Reporting of cases of **specific diseases** [3] or risk factors that may indicate that a particular preventive or therapeutic activity is not working as planned. Example: a measles outbreak in kids who were supposedly vaccinated.
	Uses	It is **used when high-quality data are needed** about a particular disease that cannot be obtained through a passive system. - It involves only a limited network of carefully selected reporting sites - Data is obtained from selected hospitals who agree to report all cases of the disease. Data collected in a well-designed sentinel system can be used to: • Signal trends. • Identify outbreaks. • Monitor the burden of disease in a community.
	Advantage	• Rapid • Economical alternative to other surveillance methods. - Because it is conducted **only in selected locations**.
	Disadvantage	• May not be as effective for detecting rare diseases or diseases that occur outside the catchment areas.

1. This type of surveillance is not effective in all types of diseases.
2. Similar to passive but more detailed and is not considered a main type of surveillance.
3. E.g. Myocardial Infarction

Steps in Establishing a Surveillance System

Step 1
Is it Justifiable to Establish a Surveillance System?

Step 2
Spell out the objectives of surveillance system

Step 3
Specify the organization and structure of the surveillance?

Step 4
Clearly define the disease(s) being considered for surveillance?

Case Definition: ★

A set of uniform criteria used to define a disease for public health surveillance (possible, probable, confirmed).

Low specificity — **Suspected** — **Probable** — **Confirmed** — High specificity

Example	Item	Description
Beginning of COVID-19 (2019-nCoV)	Suspected case	A person with acute respiratory illness (fever with cough and/or shortness of breath) AND and of the following: 1. A history of travel to China in the 14 days prior to the symptom onset. 2. A close physical contact in the past 14 days with a confirmed case of COVID
	Confirmed case	Suspected case with laboratory confirmation of 2019-nCoV infection
Smallpox	Probable case	A case that meets the clinical case definition that is not laboratory confirmed but has an **epidemiological link** to another confirmed or probable case.
	Confirmed case	case of smallpox that is laboratory confirmed.

Step 5
Specify the Details of Collection of Information

Step 6
The Organization and procedures of data analysis

Step 7
Making Scientific interpretations out of the results

Step 8
Ensure proper feedback to all concerned

Step 9
Periodically evaluate / review the surveillance system

Examples of National Surveillance Systems

1 HESN

- **Health Electronic Surveillance Network** (HESN) is used to control and manage infectious diseases and epidemics online.

2 ISSA

- **Influenza Surveillance In Saudi Arabia** (ISSA)

L21-Introduction to Non-Communicable Diseases

Definition of NCDs

● Non-communicable diseases are all impairments or deviations from the normal, which have one or more of the following characteristics;

- Are permanent
- Caused by non-reversible pathological alterations
- Leave residual disability
- Require special training of the patient for rehabilitation
- May be expected to require a long term supervision

Non-Communicable Diseases

1. Hypertensive Heart Diseases
2. Chronic Obstructive diseases
3. Coronary Heart Diseases
4. Mental Retardation
5. Mental disorders: Schizophrenia, anxiety and depression
6. Peptic Ulcer
7. Blindness
8. Diabetes
9. Arthritis
10. Cancer
11. Stroke

Causes of non-communicable diseases

1. Underlying socioeconomic, cultural, political and environmental determinants:
   ● Globalization ● Urbanization ● Population ageing
2. Common modifiable risk factors:
   ● Unhealthy diet ● Physical inactivity ● Tobacco use
3. Non-modifiable risk factors:
   ● Age ● Heredity ● Gender
4. Intermediate risk factors:
   ● Raised blood pressure ● Raised blood glucose ● Abnormal blood lipids ● Overweight/obesity
5. Main Chronic Diseases:
   ● Heart Disease ● Stroke ● Cancer ● Chronic Respiratory Disease ● Diabetes

Modifiable risk factors

- Cigarette smoking
- High Blood pressure
- Elevated serum Cholesterol
- Diabetes
- Lifestyle changes (dietary patterns,physical activity)
- Stress factors
- Alcohol abuse

VS

Non Modifiable risk factors

- Age
- Sex
- Family Hx
- Genetic factors
- Personality
- Race

Framework for NCD prevention

Primary prevention
- Population Strategy
- High Risk strategy

Secondary prevention

Tertiary prevention

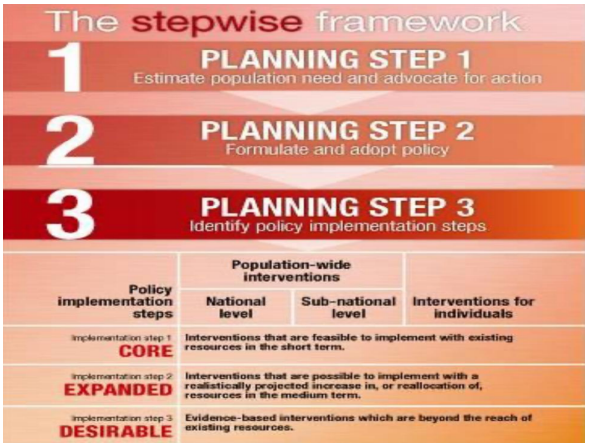
Population Strategy
- Dietary Changes
- Blood pressure control
- Physical activity
- (weight reduction)- specially children
- Behavioral change reduction of stress & Smoking cessation
- Self care
- Health education

High risk approach
- Identify Risk: Identify high risk people and families eg those who smoke, and have high serum cholesterol.
- Specific Advice: helping them to stop smoking and exercise and diet control ect

Secondary approach
Continuation of primary care.
Early case detection and treatment.
- Eg: CHD
  - Cessation of smoking
  - Reduction of serum cholesterol level
  - Compliance

The stepwise framework

Step 1→Data, data will give us how many male and female diabetics we have, how many people died of stroke and how many people need secondary or tertiary prevention due to stroke.
Step 2→Policy, for ex. adaptation of tobacco free areas and taxation of tobacco products.
Step 3→Implementation:
A.National level: not selling tobacco products to anyone under 18.
B.Sub-national level: labeling zones and neighborhoods that are smoke free.
C.Individuals level: fines/penalties for anyone who smokes in a smoke free area.



L22-Introduction to Non-Communicable Diseases

Cardiovascular Disease

Definition:

CVDs are the **#1 cause of death globally.**
Cardiovascular disease (CVD) is a group of disorders of the heart and blood vessels,and may include:

Coronary heart disease	Cerebro-vascular disease	Peripheral arterial disease	Congenital heart disease
Disease of the blood vessels supplying the heart muscle.	Disease of the blood vessels supplying the brain. (Stroke)	Disease of blood vessels supplying the arms and legs.	Malformations of heart structure existing at birth not of main focus.

Diabetes

Definition:

- Diabetes is a **disorder of metabolism** — the way the body uses digested food for growth and energy.
- There are 4 types:
  1- Type 1 an autoimmune attack against insulin secreting cells in the pancreas
  2- Type 2 insulin resistance combined with decreased insulin secretion
  3- Gestational diabetes first diagnosed during pregnancy that usually resolves after labor.
  4- Prediabetes elevated blood sugar but doesn't meet the clinical definition of diabetes.
- Type 2 is mainly caused by modifiable risk factors and is the **most common** world wide.
- >90% of all adult diabetes cases are type 2.
- Healthy diet, regular physical activity, normal body weight and avoiding tobacco use can prevent or delay the onset of type 2 diabetes.

Risk Factors: 

Major Modifiable	Other Modifiable
• Unhealthy diets • Physical Inactivity • Obesity or Overweight • High Blood Pressure • High Cholesterol	• Low socioeconomic status • Heavy alcohol use • Psychological stress • **High consumption of sugar sweetened beverages** • Low consumption of fiber
Non-Modifiable	**Other**
• Increased age • Family history/genetics • Race • Distribution of fat	• Low birth weight • Presence of autoantibodies

Cancer

Definition:

- Generic term for a large group of diseases that can affect any part of the body.
- "Rapid creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs." (WHO, 2012)
- About 30% of cancers are **attributable to behavior risk factors.**

1 Cervical Cancer

Risk Factors:

1. Human Papillomavirus (HPV) [4]
2. Smoking
3. Immunodeficiency Disorders (e.g. HIV)
4. Poverty
5. No access to PAP screening
6. Family history of cervical cancer

2 Breast Cancer

Risk Factors:

1. Hormonal therapy
2. Weight and physical activity[1]
3. Race
4. Age is the most reliable risk factor
   - Screening should start after 45.[2]
5. Genetics (e.g. BRCA1, BRCA2)

3 Lung Cancer [3]

Risk Factors:

1. **Smoking** cigarettes, pipes, or cigars now or in the past.
2. Being exposed to secondhand smoke
3. Being exposed to asbestos, radon, chromium, nickel, arsenic, soot, or tar.
4. Being treated with radiation therapy
   - To the breast or chest
5. Living where there is air pollution.

4 Prostate Cancer (2nd most common cancer among men)

Risk Factors:

1. Age
2. Weight gain
3. Obesity
4. Race

1. Estrogen is formed in the ovaries and in adipose tissue. Obesity can increase the aromatization of androgens and increase the levels of estrogen leading to an increased risk for breast cancer
2. Women with positive family history should start screening prior to this age
3. Two main types: 1- small cell cancer 'more aggressive' 2- non-small cell cancer. It is important to differentiate between the 2 types because the two have different management options; SCC can not be treated by surgery.
4. There's a vaccine for this virus that decreased the incidence of cervical cancer

5 Colorectal Cancer

- 3rd most common type of cancer (most common in men in KSA)
- Forms in the lower part of the digestive system (large intestine)
- Most preventable cancer among men in KSA
- Most common death cause of cancer among men in KSA

Risk Factors:

1. Age
2. Unhealthy diet and low exercise
3. Black Race
4. Diabetes
5. Family history of colorectal cancer

Chronic Respiratory Disease

Risk Factors

1. **Cigarette smoke**
2. Occupational dust and chemicals
3. Environmental Tobacco Smoke (ETS)
4. Indoor and outdoor air pollution
5. Genes
6. Infections (frequent respiratory infections)
7. Socio-economic status
8. Aging populations

Why Risk Factors?

- Surveillance for non-communicable disease can be difficult because of:
  - Lag time between exposure and health condition (e.g. smoking and COPD)
  - More than one exposure for a health condition
  - Exposure linked to more than one health condition
- Interventions that target risk factors are needed to prevent disease.

Metabolic **Risk Factors** ★

1 Raised Blood Pressure:

Health Effects:

- Leading risk factor for **stroke** and **coronary heart disease (CHD)**.
- In some age groups, the risk of CVD doubles for each increment of 20/10 mmHg of blood pressure.
- In the U.S. 75% of sodium consumed comes from **processed and restaurant foods.**
- In China and Japan, 75% of sodium consumed comes from cooking with **high sodium products**.

Recommendations and Actual Intakes WHO/PAHO:

- A population salt intake of less than **5 grams or approximately 2,000 milligrams of sodium**, per person per day is recommended to reach national targets or in their absence. This level was recommended for the prevention of cardiovascular diseases.
- Actual intake: Latest global estimates show that average sodium intake varies from 2,000 to 7,200 milligrams of sodium per person per day

2 Raised Blood Cholesterol:

Health Effects

- **Increases risks of heart disease and stroke**
  - Globally, ⅓ of ischaemic heart disease is attributable to high cholesterol.
  - A 10% reduction in serum cholesterol in men aged 40 has been reported to result in a 50% reduction in heart disease within 5 years.
  - A 10% reduction in serum cholesterol in men aged 70 years can result in an average 20% reduction in heart disease occurrence in the next 5 years

3 Raised Blood Glucose:

Health Effects

- Elevated glucose levels can lead to type 2 diabetes.
- Diabetes is the leading cause of renal failure.
- Lower limb amputations are at least 10 times more common in people with diabetes
- Raised glucose is a major cause of heart disease and renal disease.
- Retinal damage

4 Overweight and Obesity:

- Overweight and obesity are defined as
  "abnormal or excessive fat accumulation that presents a risk to health."

Body Mass Index	
BMI (Body Mass Index) = Weight (kg) / Height^2 (m)	
Underweight	<18.5
Normal	18.5-24.9
Overweight	25-29.9
Obese	>30
Skinfold Thickness Test	
Waist-to-Hip Circumference Ratio	
Men	> 102 cm are considered high risk
Women	> 88 cm are considered high risk

L23- Diabetes

Classification of diabetes

Type 1 diabetes: due to autoimmune β-cell destruction, usually leading to absolute insulin deficiency

Type 2 diabetes[1]: due to a progressive loss of β-cell insulin secretion frequently on the background of insulin resistance[2]

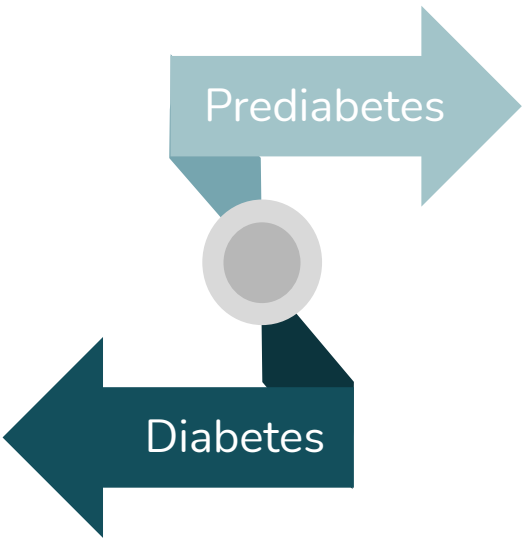
Gestational diabetes mellitus (GDM): diabetes diagnosed in the second or third trimester of pregnancy that was not present prior to gestation

Specific types of diabetes due to other causes, e.g. maturity-onset diabetes of the young [MODY], and drug induced diabetes (such as with glucocorticoid use,)

Criteria for the diagnosis

No reference values will be given during the OSCE

- **FPG:** 126 mg/dL (7.0 mmol/L)[3]. Fasting for at least 8 h.
- **OR 2-h PP:** 200 mg/dL (11.1 mmol/L).
- **OR A1C:** 6.5%.
- **OR** In a patient with **classic symptoms of hyperglycemia** and a random plasma glucose 200 mg/dL (11.1 mmol/L)[4].
- In the a**bsence of unequivocal hyperglycemia**, diagnosis requires **two** abnormal test results from the same sample or in **two separate test samples**. (2 FPG / 2 A1C / FPG and A1C/ FPG and 2hpp)



- **Normal Fasting Plasma Glucose:** 5.5 mmol/L (99 mg/dL)
- **Normal 2-h PP:** < 140 mg/dl (7.8 mmol/L)
- **Prediabetes;** Fasting Plasma Glucose: 5.6 – 6.9 mmol/L (100 - 125 mg/dL)
- **Prediabetes 2-h PP:** 140- 199 mg/dl (7.8-11 mmol/L)
- **Prediabetes;** A1C: 5.7 – 6.4%
- The person is at risk to develop diabetes mellitus

1. More common in the clinic
2. Especially among obese patient
3. To get in mmol/L divide by 18 and vice versa.
4. In symptomatic patients one random plasma glucose reading is sufficient to diagnose diabetes.

Criteria for testing for diabetes in asymptomatic adults

1. Testing should be considered in **overweight** or **obese** adults who have **one or more of the following risk factors:**
   - **a.** First-degree relative with diabetes
   - **b.** History of CVD or Hypertension
   - **c.** Women with polycystic ovary syndrome
   - **d.** Physical inactivity
   - **e.** Conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
2. Patients with prediabetes should be tested yearly.
3. Women who were diagnosed with GDM even after delivery.
4. For all other patients, testing should begin at age 45 years.
5. If results are normal, testing should be repeated at a **minimum of 3-year intervals**

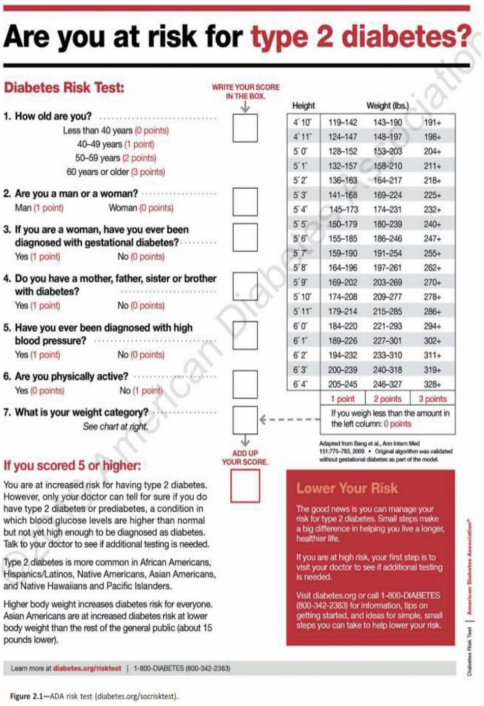


Figure 2.1—ADA risk test (diabetes.org/socrisktest).

Can be distributed on the world's diabetes day for awareness and educational purposes.

Prevention or delay development of diabetes

- The strongest evidence for diabetes prevention comes from the Diabetes Prevention Program **(DPP)** .
- DPP demonstrated that an intensive lifestyle intervention could reduce the incidence of type 2 diabetes by 58% over 3 year

❖ LIFESTYLE INTERVENTIONS

- Refer patients with prediabetes to an intensive behavioral lifestyle intervention program.
- Based on the Diabetes Prevention Program (DPP) to achieve PREVENTION OR DELAY OF TYPE 2 DIABETES and maintain 7 - 10% loss of initial body weight and increase **moderate-intensity physical activity (such as brisk walking) to at least 150 min/week** (i.e. at least 30 min, 5 day a week).

Healthy nutrition

Encourage:
- Whole grains, legumes, nuts, fruits, vegetables, and meat with no fat
- **Minimize;** refined and processed foods, like rice, white bread, sugary drinks,
- use of nonnutritive sweeteners.
- **A referral to dietitian (even when you give them diet advice)**

Physical activity and tobacco cessation

- Just as **150 min/week** of **moderate intensity physical activity,** such as **brisk walking,** showed beneficial effects in those with prediabetes.
- Moderate intensity physical activity has been shown to improve insulin sensitivity and reduce abdominal fat.
- Tobacco Smoking may **increase the risk of type 2 diabetes;** therefore, evaluation for tobacco use and referral for tobacco cessation.

Pharmacologic Interventions

- **Metformin** therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those who are obese and hypertensive.
- **Metformin** and **intensive lifestyle modification** led to an equivalent 50% reduction in diabetes risk.

Complications of DM

Cardiovascular Disease (CVD)

- After 10 years of observational follow-up of the UKPDS, those originally randomized to intensive glycemic control had significant long-term reductions in MI (15% with sulfonylurea or insulin as initial pharmacotherapy, 33% with metformin as initial pharmacotherapy) and in all-cause mortality (13% and 27%,respectively).
- DM increase risk of CVD

Chronic kidney disease (CKD)

- **Optimize glucose control** to reduce the risk or slow the progression of chronic kidney disease. A
- **Optimize blood pressure control** to reduce the risk or slow the progression of chronic kidney disease. A

Screening by:

➢ Albumin/Creatinine Ratio to detect Microalbuminuria beside Renal function tests.
  - Normal levels → once a year
  - Abnormal levels → more than once a year, depending on the patient status.

Diabetic Retinopathy

- **Optimize glycemic control** to reduce the risk or slow the progression of diabetic retinopathy. A
- **Optimize blood pressure** and **serum lipid control** to reduce the risk or slow the progression of diabetic retinopathy. A

Screening by referring them to the ophthalmology clinic:

➢ Adults with type 1 diabetes should be referred to an ophthalmologist within 5 years[1] after the onset of diabetes. B

➢ Patients with type 2 diabetes should be referred to an ophthalmologist at the time[2] of the diabetes diagnosis. B

Neuropathy

Screening by the GP no need for referral to neurology:

➢ All patients should be assessed for diabetic peripheral neuropathy starting **at diagnosis of type 2 diabetes** and **5 years** after the diagnosis of **type 1 diabetes** and at least annually thereafter. B

Foot care & Diabetic foot

- Perform a comprehensive foot evaluation at least **annually**[3] to identify risk factors for ulcers and amputations. B
- The examination should include inspection of the skin,assessment of foot deformities, neurological assessment (monofilament testing with pinprick, temperature, vibration), and vascular assessment including pulses in the legs and feet. B

1. Because the symptoms presents shortly after the onset of insulin deficiency
2. Because the pathological process (hyperglycemia) started years ago
3. However, in each visit ask about the feet and maybe do a general inspection.

L24- Cancer

TRUE OR FALSE?

- **True or False:** Large percentage of cancers are preventable.
- **True or False:** Preventing cancer is easier than treating cancer.
- **True or False:** Screening tests are recommended for most cancers.

2nd leading cause of death globally
In Saudi Arabia there is no countrywide policy for colorectal screening despite the increasing incidence of the disease.

Screening for Cancer

Wilson-Jungner Criteria for Screening program:

1. The condition being screened for should be an **important health problem**.
2. The **natural history** of the condition should be **well understood.**
3. There should be a **detectable early stage**.
4. **Treatment at an early stage** should be of **more benefit** than at a later stage.
5. A **suitable test** [2] should be devised for **the early stage**.
6. The test should be **acceptable**.
7. **Intervals** for **repeating** the test should be determined.
8. **Adequate health service** provision should be made for the extra clinical workload resulting from screening.
9. The **risks**, both physical and psychological, **should be less than the benefits**. [3]
10. The **costs** should **be balanced** against the **benefits**

Screening for Liver Malignancy 

- Patients with **cirrhosis** of any etiology, but especially cirrhosis caused by **hepatitis B or C,** are at high risk for the development of HCC and these patients should be the targets for a screening program.
- The best screening modality is **ultrasound** of the liver. Every 6 months

Screening for Uterine Malignancy

- **No evidence that screening reduces mortality** from uterine (endometrial) cancer.
- Most cases of endometrial cancer (85%) are diagnosed at an early stage because of symptoms [1], and survival rates are high.

Screening for Ovarian Cancer 

- Example of a high-risk hereditary cancer syndrome, women with **BRCA1 or BRCA2** genetic mutations associated with **hereditary breast and ovarian cancer.**
- **Symptoms:**
  - **Menopause**
  - **Vaginal bleeding after menopause**

1-Symptoms include: unusual vaginal bleeding, spotting, or discharge. For premenopausal women, this includes menorrhagia, which is an abnormally heavy or prolonged bleeding, and/or abnormal uterine bleeding.

2- An example of suitable test is measurement of PSA levels. An example of an unsuitable test is bone marrow biopsy.

3- For example, mammogram can be painful the women; however, when comparing it to the danger of breast cancer and the benefit of early screening we'll notice that the benefits outweigh the risks

Define "Adequate" cervical cancer screening?

Very Important!!

- **3 consecutive negative cytology (Pap smear) results.**
- **2 consecutive negative HPV results within 10 years before cessation of screening, with the most recent test occurring within 5 years.**
- **Screening may be clinically indicated in > 65 years for whom the adequacy of prior screening cannot be accurately assessed or documented.**
- **Secondary prevention of cervical cancer → pap smear every 3 years** (the main type of prevention nowadays and usually starts at 21 years old)
- **Primary prevention of cervical cancer → improve personal hygiene and birth control.** Gardasil 9 is an HPV vaccine approved by the U.S. Food and Drug Administration and can be used for both girls and boys. This vaccine can prevent most cases of cervical cancer if given before a girl or woman is exposed to the virus.**STD prevention, HPV vaccine hasn't been added in our guidelines yet**

Screening for Hematological Malignancy

- There are **no routine screening tests** for hematologic malignancies (Lymphoma, Leukemia, .. etc)
- It is typical for a patient to seek medical treatment when symptoms appear.
- Can be discovered incidentally when a blood test (leukocytosis) is ordered for another reason

Screening for Lung Malignancy

Most common malignancy in men worldwide

- **Screening patients for smoking:**

1. Ask all your patients systematically if they smoke or not. Make it part of their **vital signs**.
2. If a smoker is identified, implement smoking cessation guidelines. (which is the 5A's)

- **Screening for Lung Cancer:**
  - Age 55–77 years.
  - Smoking history ≥ 30 Pack Years.
  - **And** Active smoker or quit smoking less than 15 years ago.
  - Did not have chest CT scan the last year.
- **Screening modality: Low dose chest CT scan**.
  → Conventional chest CT radiation dose (7-8 mSv), low dose chest CT (1.4 mSv).

Screening for Prostate Cancer

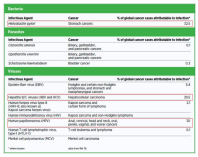
- Men should have an opportunity to **discuss** the potential **benefits and harms** of screening with their clinician. **(Individualized choice)**
- Screening offers a **small potential benefit of reducing the chance of death** from prostate cancer in some men.
- Many men will experience **potential harms of screening**, including **false-positive** results that require additional testing and possible prostate biopsy; **overdiagnosis** and overtreatment; and treatment complications, such as **incontinence and erectile dysfunction**.

Screening for Thyroid Cancer

patient tend to be asymptomatic What we mean by screening is screening for asymptomatic people as a mean of secondary prevention. If the patient is symptomatic (has a goiter or hyperthyroidism) then we need to perform diagnostic tests for him.

Region	World				Middle East and North Africa				Saudi Arabia			
Cause	Men		Women		Men		Women		Men		Women	
	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality
1st	Lung		Breast		Lung		Breast		Colorectal		Breast	
2nd	Prostate	Liver	Colorectal	Lung	Prostate	Liver	Colorectal		Lymphomas, multiple myeloma		Colorectal	
3rd	Colorectal	Stomach	Lung	Colorectal	Bladder	Prostate	Thyroid	Lung	Prostate	Lung	Thyroid	Lymphomas, multiple myeloma
4th	Stomach	Colorectal	Cervical		Colorectal		Non-Hodgkins	Stomach	Lung	Liver	Lymphomas, multiple myeloma	Leukemia
5th	Liver	Prostate	Stomach		Liver	Bladder	Ovarian	Liver	Leukemia		Uterine	Liver

Causes of Cancer

Causes of Cancer	
Cancer is the result of the interaction between a **person's** factors and **3** categories of **external agents**	
Personal Factors	
Genetic [1]	Example: Family Hx and oncogenic genes
Age	Through two main mechanisms: **A-** Cellular repair mechanisms become less effective as a person grows older. **B-** Accumulation of external risk factors. [2]
External Factors	
Physical Carcinogens	Example: Ultraviolet and ionizing radiation.
Chemical Carcinogens [3]	Example: • Asbestos, components of tobacco smoke, • aflatoxin (a food contaminant), and arsenic (a drinking water contaminant). (also in rice so wash carefully) • Diethylstilbestrol (DES) hormone is associated with vaginal adenocarcinoma
Biological Carcinogens 	Example: • Bacteria → **H. pylori** causing stomach cancer • Parasites → **S. haematobium** causing bladder cancer → C. sinensis causing biliary, gallbladder and pancreatic cancer → O. viverrini causing biliary, gallbladder and pancreatic cancer • Viruses → EBV causing hodgkin and non-Hodgkin lymphoma, stomach and nasopharyngeal cancer → **Hep B/C** causing hepatocellular carcinoma → HHV-8 causing kaposi sarcoma and certain form of lymphoma → HIV causing Kaposi sarcoma and non-Hodgkin lymphoma → **HPV** causing anal, cervical, head, neck, oral, vaginal and vulvar Cancers → HTLV-1 causing T-cell leukemia and lymphoma → MCV causing Merkel cell carcinoma

جدول التطعيمات الوطني

الزيارة Visit	التطعيم Vaccine	
عند الولادة At Birth	• BCG	• درن
	• Hepatitis B	• التهاب كبدي (ب)
عمر شهرين 2 months	• IPV	• شلل أطفال معطل
	• DTaP	• الثلاثي البكتيري
	• Hepatitis B	• الالتهاب الكبدي (ب)
	• Hib	• المستدمية النزلية
	• Pneumococcal Conjugate (PCV)*	• البكتيريا العقدية الرئوية*
	• Rota**	• فيروس الروتا**
عمر ٤ شهور 4 months	• IPV	• شلل أطفال معطل
	• DTaP	• الثلاثي البكتيري
	• Hepatitis B	• الالتهاب الكبدي (ب)
	• Hib	• المستدمية النزلية
	• Pneumococcal Conjugate (PCV)*	• البكتيريا العقدية الرئوية*
	• Rota**	• فيروس الروتا**
عمر ٦ شهور 6 months	• OPV	• شلل الأطفال الفموي
	• IPV	• شلل أطفال معطل
	• DTaP	• الثلاثي البكتيري
	• Hepatitis B	• الالتهاب الكبدي (ب)
	• Hib	• المستدمية النزلية
	• Pneumococcal Conjugate (PCV)*	• البكتيريا العقدية الرئوية*

1. Genetic testing has become crucial in some family related cancers such us BRCA1 and BRCA2 gene testing for breast and ovarian cancers
2. As the person grows he accumulates more risk factors such as exposure to chemical carcinogens , UV radiation ...etc
3. Asbestos can lead to mesothelioma and aflatoxin can increase the risk for liver cancer

Factors Affecting Cancer Control and Future Research

Factors Affecting Cancer Control

The following are important factors and trends affecting cancer control and the directions of future research

1- Tobacco Use

- **Raise tobacco taxes** to at least prevent tobacco products from becoming affordable.
- Tax all tobacco products to prevent consumers switching from highly taxed products to less taxed ones.
- Require by law and Enforce **100% smoke-free environments** in all indoor workplaces and public places.
- Put **health warnings** on all tobacco packaging.
- Establish a **national pilot cessation** program in health-care facilities
  - https://www.moh.gov.sa/Ministry/Projects/TCP/Pages/default.aspx / **CALL 937**
- **Build media awareness** of both the addictive nature of tobacco use and treatment options.

2- Unhealthy Diet, Physical Inactivity, Overweight and Obesity

- **Develop and implement national dietary guidelines** and nutrition policies.
  - Example: Restaurants should put calories.
- **Promote educational and information campaigns** about reducing salt, sugar and fat consumption.
- Develop and implement **national guidelines on physical activity**.
- Implement community-wide **campaigns** to promote the benefits of physical activity.
- **Promote physical activity** in workplaces. (give discount for gym subscriptions)

3- Alcohol

- Raise public awareness, especially among young people, about alcohol-related health risks, including cancer.

4- Hepatitis B Virus

- Implement **universal infant immunization** using one of the recommended immunization schedules.

5- Environmental Exposures to Carcinogens

- **Stop using** all forms of **asbestos**.
- Provide safe drinking water.
- **Reduce** the **use of biomass and coal for heating** and cooking at home, and promote use of clean burning and efficient stoves.
- Implement food safety systems (legislation and monitoring) focusing on key contaminants eg. SFDA.

6- Occupational Exposures to Carcinogens

- Develop regulatory standards and enforce control of the use of known carcinogens in the workplace.
- **Include occupational cancer** in the national list of occupational diseases.
- Identify workers, workplaces and worksites with exposure to carcinogens.

Factors Affecting Cancer Control and Future Research

Factors Affecting Cancer Control

The following are important factors and trends affecting cancer control and the directions of future research

7- Radiation

- **Provide information** about sources and effects of all types of radiation.
- Establish **national radiation protection standards** (using internationally available guidelines).
- Ensure **regular safety training** of radiation workers.
- Promote UV risk awareness and UV protection action.
- For example Dose limits for Ionizing radiation are:
  - for the public, 1 mSv/year.
  - for occupationally exposed persons, 20 mSv/year.

How are people exposed to UV radiation?

- **Sunlight**: the main source of UV radiation.
- **Sunlamps and sunbeds** (tanning beds and booths).
- **Phototherapy** (UV therapy):
  - UVA (320 to 400 nm) OR UVB, UVB is divided into:
    → Broadband (280 to 320 nm) more carcinogenic
    → Narrowband (311-313 nm)
  - The carcinogenic potential of narrow band UVB is less established.
- **Other:** (Black-light lamps, Mercury-vapor lamps, High-pressure xenon and xenon-mercury arc lamps, plasma torches, and welding arcs).

Display of background radiation in a hotel at Naraha, Japan, showing dose rate in microsieverts per hour, five years after the Fukushima disaster.

Personal radiation badge

Radiation protection clothes

L25- Travel Medicine

What is travel medicine?[1]

An interdisciplinary specialty concerned with prevention, early detection, and research of health problems associated with travel.

What does travel medicine do?

1. Seeks to prevent illnesses and injuries occurring to travelers going abroad.
2. Manages problems arising in travelers coming back or coming from abroad.
3. Impact of tourism on health and to improve health and safety services to tourists
4. Refugee and migrant health

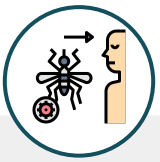
Common diseases associated with international travel:

- Traveler's diarrhea
- Typhoid fever
- Hepatitis A
- Cholera
- Poliomyelitis

Gastrointestinal

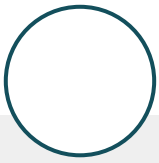
- Influenza
- Meningitis
- MERS-Cov
- COVID19
- Tuberculosis

Pulmonary Disease



- Yellow fever
- Malaria
- Dengue fever
- Leishmaniasis
- Japanese encephalitis

Vector borne diseases



- Sexually transmitted diseases

Behavior related

- Rabies

Zoonotic diseases

- Hepatitis B

Blood borne

- Tetanus

Soil borne

1: Because the numbers of travellers are usually increasing every year, keep in mind that it got affected by the pandemic so the numbers are gonna decrease with the latest updates

Preventive Measures for International Travelers

Immunization:

Routine:

- Childhood immunizations.

Recommended:

- According to risk of infection.

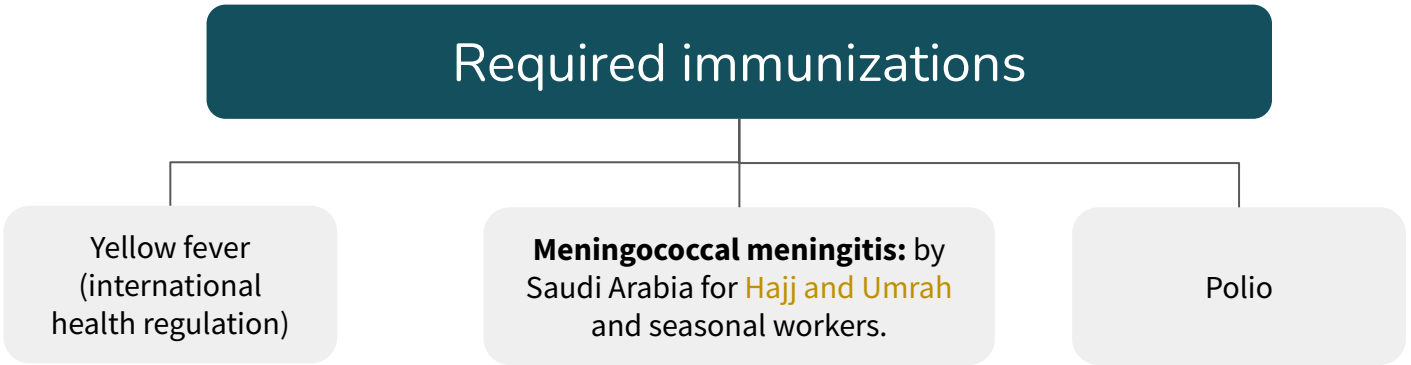
Required:

- yellow fever vaccine
- meningococcal vaccine
- COVID-19 vaccine?

Routine immunizations:

1. Hepatitis A
2. Hepatitis B
3. BCG
4. DPT
5. MMR
6. Polio
7. Pneumococcal
8. **Meningococcal**
9. Rota virus
10. Varicella
11. Hemophilus influenzae

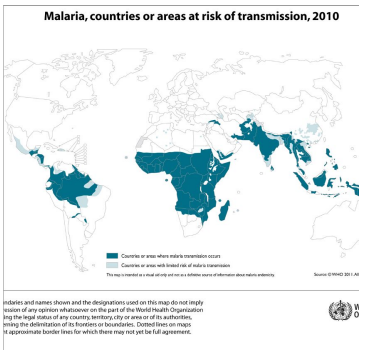
1. Human papilloma virus
2. Tick borne encephalitis
3. Influenza



Preventive Measures for International Travelers

Chemoprophylaxis

• Malaria



Transmission: Mosquito bite Malaria

Prevention:

- Awareness
- Bite avoidance
- Chemoprophylaxis before and after traveling
- Diagnosis of febrile illness

Fever in returned traveler is a medical emergency considered malaria until proven otherwise

Drug	Area	Instructions of use
Proguanil	all areas	1 – 2 days before departure, daily during the journey and 7 days after return
Doxycycline 100 mg	all areas	1 – 2 days before departure, daily during the journey and 4 weeks after return
Chloroquine 300 mg	chloroquine sensitive areas	1 – 2 weeks before departure, weekly during the journey and 4 weeks after return
Primaquine 30mg	predominant vivax areas & ovale	1 – 2 days before departure, daily during the journey and 7 days after return
Mefloquine 228mg	mefloquine sensitive areas	2 weeks before departure, weekly during the journey and 4 weeks after return

Responsibilities of Travelers to Prevent Ill-health

Check status of destination:

Warning level 1

Practice usual precautions
Presence of usual risk for infectious diseases as diarrheal diseases and malaria

Warning level 2

Practice enhanced precautions
Presence of MERS-CoV in Arabian Peninsula

Warning level 3

Avoid non-essential travel
- Presence of outbreak (Ebola, COVID-19) and adverse security situation if returned from and infectious diseased country then the person should quarantine

Disease	Info	Recommended	Vaccination	Not recommended
Hepatitis A	Endemic in many developing countries & High mortality in elderly & pregnant women Prevention: Food, water, personal hygiene & immunization	-Travelers to the developing countries -2 years and older	Inactivated vaccines **Dose** (2 doses) (HAVRIX® or VAQTA®) (can combine immunoglobulins with the vaccine if needed) **-Protection:** 14 – 20 years in children 25 years among adults	-
Hepatitis B	Transmission: Blood- borne, sexual contact Prevention: Avoid risk factors & immunization	travelers to endemic areas and travelers with special risk	**-Type**: Recombinant vaccine, IM **injection** -Monovalent or combined with hepatitis A (for those ≥ 18 years)	-
Cholera	Transmission: Contaminated food or water Prevention: Food, water & personal hygiene Vaccination (oral)	-	**Type**: Oral vaccine (Live attenuated)	-
Yellow fever	**vector borne disease associated with international travel and addressed by the international health regulation (IHR)** Required for travelers to a country under the International health regulations.	travelers to endemic area. Ex: Brazil	**Type**: Live attenuated virus vaccine **Dose**: Single subcutaneous injection **Immunity**: starts after 10 days **Protection**: Valid for 10 years	Infants < 9 months Immunocompromised patients Pregnant women Egg allergies HIV-positive individuals

Disease	Info	Recommended	Vaccination	Not recommended
Meningococcal meningitis	Required: by Saudi government for Hajj or Umrah.	or travelers to **endemic** area. Risk: Sub-Saharan Africa (seasonal) Saudi Arabia (Hajj Crowded student dormitory situations	**Dose**: Single dose (injection) **Protection**: for 3–5 years in adults and older children **Not effective**: for children below 2 years	-

Disease	Transmission	Prevention	cause/risk
Typhoid	contaminated food and water	Food, water, personal hygiene & vaccination	-
Polio	contaminated food and water.	1. Food, water, personal hygiene 2. Vaccination: (injectable, oral)	-
Japanese encephalitis	By mosquito bite same as malaria	vector control & vaccination	increases in travelers to rural Asia or long stay travelers
Rabies	Animal bite or scratch	immunization (Preexposure • Post exposure • Immunoglobulin)	occupational , travel to rabies risk countries
Tick-borne encephalitis	1. Ixodes sp. Ticks. 2. Ingestion of unpasteurized dairy products.	1. Tick prevention. 2. Avoidance of unpasteurized dairy products. 3. Vaccination. 4. Self check and removal ASAP (tweezers).	Rural forested areas of east and Central Europe, Russia and part of Asia.
Zika virus	mosquito bite	preventing mosquito bite	pregnant women —> microcephaly and other brain abnormalities.
Traveler's diarrhea One of the most common traveler's incidence.	-	• Wash It, Peel It, Cook It, or Forget It • Only Drink Bottled Water • Wash hands frequently	Bacterial (60-80%) Viral (10-20%) Parasitic (5-10%)

L26- Introduction to Occupational Health

Occupational Health

- It is the promotion and maintenance of the highest degree of physical, mental, and social Well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work, and people to their jobs.

Industrial Hygiene

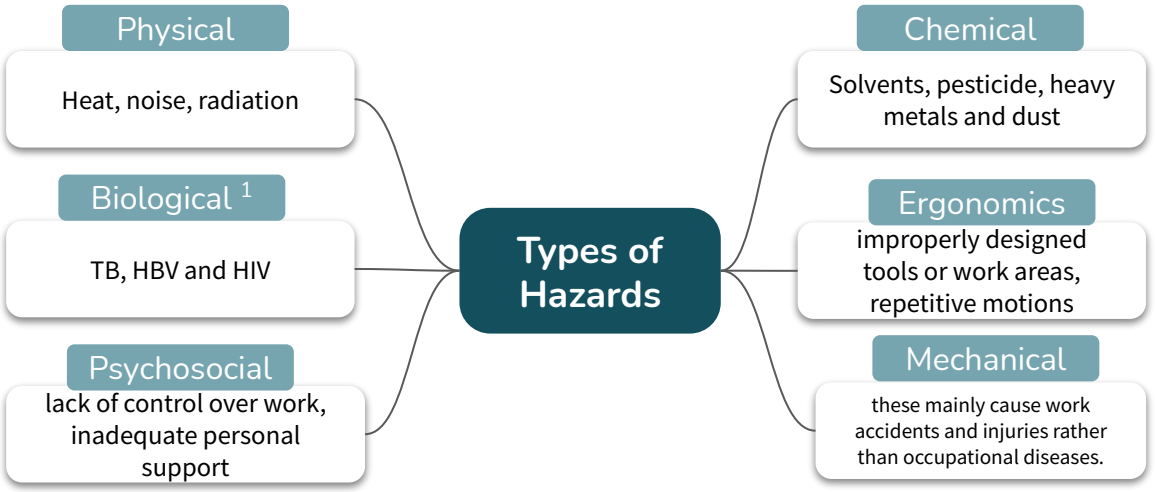
- Activities directed to **identifying**, **assessing**, **preventing**, and **managing hazards** to the worker. In the working environment, falls in the domain of Occupational Safety and Health (OSH).[1]
- These activities should be systematic and scientific.

Ergonomics

- Stress evaluation occurring in a work environment and the ability of people to cope with these stresses. [2]
- Designing suitability, the facilities, furniture, equipment, tools, and job demands to make them compatible with the work-force capabilities and limitations.
- Example: having a rest support under the wrist can prevent carpal tunnel syndrome

Occupational Diseases

- Occupational diseases are adverse health conditions in the human being, the occurrence or severity of which is related to exposure to factors on the job or in the work environment.



Aims of Occupational Health and Safety:

1. Ensure the highest degree of Physical, mental, and social well-being of workers in their occupations
2. Preventing adverse effects on health due to workplace hazards
3. Preventing and controlling hazards of occupations
4. Matching health and safety needs with suitable occupational environment
5. Continued adaptation of workers to work and vise-versa

Characteristics of Occupational Diseases:

1. The **clinical and pathological presentation** are **identical** to that of non-occupational diseases; Example: asthma
2. Occupational disease may **occur after the termination of exposure**. Example: asbestos-related mesothelioma (a cancer affecting the lung and abdomen) which can occur 30 or 40 years after the exposure.
3. The clinical manifestations of occupational disease are related to the **dose** and **timing of exposure** [2] Example: at very high airborne concentrations, elemental mercury is acutely toxic to the lungs and can cause pulmonary failure, while at lower levels of exposure, elemental mercury has no pathologic effect on the lungs but can have chronic adverse effects on the central and peripheral nervous systems.
4. Occupational factors can **act in combination** with non-occupational factors to produce disease Example: exposure to asbestos (five-fold increase in lung cancer); and the long-term smoking of cigarettes (increases the risk by 50 and 70 fold.

Types of Hazards

Physical Agents	
Factor	**Description**
Heat [1]	Heat hyperpyrexia, exhaustion, syncope, cramps, burns
Cold	Trench foot, frostbite
Light	Occupational cataracts, miner's nystagmus
Pressure	Caisson disease [2], air embolism, blast (explosion)
Noise	Occupational deafness
Radiation	Cancers, leukemias, aplastic anemia, pancytopenia
Mechanical Factors	Injuries, accidents
Electricity	Burns
Chemical Agents	
Gases	CO2, CO, HCN, N2,NH3,HCL
Dusts (pneumoconiosis)	Coal dust (anthracosis), silica (silicosis), asbestos (asbestosis, Ca lung), iron (siderosis) Cane fiber (bagassosis), cotton dust (byssinosis), tobacco (tobacossosis), hay or grain dust (farmer's lung)
Metals and their compounds	Toxicity from Lead, mercury, cadmium, mercury, arsenic
Chemicals	Acids, alkalis, pesticides
Other Agents	
Biological agents	Brucellosis, leptospirosis, anthrax, tetanus, encephalitis, fungal infections
Occupational cancers	Skin, lung, bladder
Occupational dermatosis	Dermatitis and eczema
Psychological origin	Industrial neurosis, hypertension, peptic ulcer

Pulmonary Dust Disease

Pneumoconiosis

- Pneumoconiosis is a disabling pulmonary fibrosis that results from the inhalation of various types of inorganic dust, such as silica, asbestos, coal, talc and china clay.

Example: silicosis and asbestosis (the two most important causes of pneumoconiosis)

Types of Pneumoconiosis:

1 Asbestosis

Description	Inhalation of asbestos fibres
Occupations	• Mining and extraction • Exposure to asbestos (insulation) • making of asbestos cloth (soldiers clothes) • manufacture of asbestos cement pipes and other products, Such as vinyl floor tiles, in brake and cloth lining
Presentation	• Interstitial fibrosis of the lungs, pleural thickening, calcification. • Bronchogenic carcinoma, pleural and **peritoneal mesothelioma** • Progressive dyspnoea on exertion frequently out of proportion to the clinical signs in the lungs, cough, expectoration, chest pain, cyanosis and **clubbing of the fingers**
Diagnosis	• Asbestos bodies in **sputum** (asbestos fibres coated with fibrin) • X-ray shows **ground-glass appearance** in the lower 2/3 of the lung →
Progression	Progressive disease
Prevention	Prevention and periodic examinations

Long time ago, insulators were made of asbestos. Asbestos is an important risk factor for mesothelioma which can present with chest pain (pleuritic) and SOB with unexplained weight loss.

2 Silicosis

Description	Absorption of high amount of crystalline silica (SiO_2)
Occupations	• Mining , Coal, mica, gold, silver, lead, zinc • Stone cutting and shaping, sandblasting , Building and construction areas • Glass manufacture • Iron and steel industry • **Ceramic workers and manufacturers**
Time	7–10 years, sometimes less. Prolonged exposure to higher concentrations of dust
Presentation	• Dyspnoea on exertion, irritant cough and chest pain • Pulmonary tuberculosis (silicosis can activate latent TB) • Cardiac or respiratory failure • Impaired TLC (total lung capacity) in advanced disease
Diagnosis	• X-ray shows snow storm appearance (Scattered micro-opacities and might also present with cavitation in upper lobe of the lung because of TB activation)
Progression	Progressive (irreversible) disease and converts to TB "silico-tuberculosis"
Prevention	Prevention and regular physical examinations - Education about the importance of protection

Lead Poisoning (Plumbism)

- Defined as **lead level of 70 µg/ 100 ml** with clinical signs and symptoms
- Occupational usage (Industrial): Storage batteries, glass, ship building, printing and potteries, rubber
- Non-occupational : **Gasoline**, drinking water via **lead pipes**, **paints** (shine in paints), toys

Modes of absorption:

Inhalation of fumes and dust

Ingestion through food or drink

Skin absorption "tetraethyl lead"

Clinical features:

Organic Lead	Insomnia, headache, mental confusion and delirium
Inorganic Lead	Plumbism (lead poisoning), abdominal colic, obstinate constipation (very severe), loss of appetite, blue lines on the gum, anemia and wrist and foot drop

Lab diagnosis:

- Coproporphyrin in urine (screening test)
- Amino levulinic acid in urine
- Lead levels in blood and urine
- Basophilic stipling of RBCs (very sensitive)

Methods of prevention:

1. Substitution (with other materials)
2. Isolation (segregate procedures with risk)
3. Local exhaust ventilation
4. Personal protection (should be disposed of after finishing)
5. Periodic examinations (through coproporphyrin in urine)
6. Health education and personal hygiene (handwashing)

Occupational Cancers

Carcinogenic agent	Organ affected
Arsenic	Skin and lung
Chromium compounds, hexavalents	Lung
Nickel	Lung and nasal sinus
Polycyclic aromatic hydrocarbons	Skin
Coal tars	Skin, scrotum, lung and bladder
Benzol	Blood (leukaemia)
B-naphthylamine	Bladder
Ionizing radiation	Skin, bone, lung and blood (leukaemia)
Asbestos	Lung, pleura, peritoneum

Occupational Dermatitis

Causes:

- Heat, cold and moisture
- Friction and pressure
- X-rays
- Acids, alkalis, solvents, grease, tar and pitch
- Bacteria and fungi
- Leaves, vegetables and fruits

Prevention:

1. Pre-selection (pre-employment check)
2. Protection (protective equipment)
3. Personal hygiene
4. Periodic assessment (usually every 6 months)

Classification

Primary Irritants and Sensitizing Substances

Radiation Hazards

Industrial Exposures:

- Manufacture of radioactive paints
- Painting of luminous dials for watches
- Mining of radioactive ores and sand workers
- X-rays rooms

Effects of Radiation:

Acute	Acute burns, dermatitis and blood dyscrasias
Chronic	Malignancies (carcinogenic effect) and genetic effects

Prevention:

1. Shielding in x-ray areas, monitoring 6 monthly, for their film badge or pocket electronic device, adequate workplace ventilation, replacement and periodic exams. (badges are available)
2. Pregnant ladies should not be allowed to work in the area.

Prevention of Occupational Disease

Prevention of occupational diseases should be addressed by different measures including: medical measures, engineering measures and legislations.

Field	Measurements
Medical	• Pre-placement exams • Periodic examinations • Medical and health care services • Notifications, employees should notify the employer with all diseases he has • Supervision of working environment • Maintenance and analysis of records • Health education and counseling
Engineering	• Designing of the buildings build good exhaust systems • Good housekeeping • General ventilation ACs, windows, ...etc. • Substitution any harmful substance used should be replaced • Dusts • Enclose • Isolate • Local exhausts ventilations • Protective devices based on the occupation • Environmental monitoring • Research
Legislations	• Policies and regulations for factories, work places, health of the workers Example: insurance, sickness policies and disability benefits

Dr. Hafsa recommended reading about the measurements from the book. Link here

L27- Introduction to Environmental Health & Hazards

Environmental Health

Environmental health is the science and practice of preventing human injury and illness and promoting well- being.

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere.

Types of pollutants:

Primary (directly emitted)
- Sulphur oxide, Nitrogen oxides, carbon monoxide (CO), CO 2, volatile organic compounds, particulate matter, persistent free radicals, chlorofluorocarbons, ammonia, odors, radioactive material.

Secondary (form in air when primary pollutants interact with a third agent)
- Ozone, smog, peroxyacetyl nitrate, Acid rain is formed in the presence of water, with sulfur dioxide or nitrogen oxide.

What are the biological consequences of ozone depletion? Increased skin cancer, cortical cataracts, reduction of plankton populations

Water pollution:

- Water appears naturally with impurities **(not hazardous)**
- Pollution of water due to industrialization **(hazardous)**

Water related diseases:

Chemical causes:
- Cyanides, dyes, heavy metals, bleaching agents and ammonia
- Directly cause disease or indirectly (fish life)

Biomedical causes:

Viral, bacterial, protozoal, helminthic, snail and cyclopes

Water purification:
Depends on source:
Wells and springs -> only disinfection Surface water -> needs more treatment

1- Filtration.

2- Storage:
- To preserve water from further contamination and pollution
- Provides a small amount of purification
  - ➢ Number of bacteria die out
  - ➢ Suspended impurities fall by gravity
  - ➢ Chemical composition changes (↓free ammonia, ↑nitrates)
- Must be stored within a certain period
  - ➢ Prolonged periods cause vegetable growth (algae)

3- Disinfection:
Methods for disinfection:
1. Heat[1] (boiling for 10-20 min kills most organisms and sterilizes water)
2. Chlorination[2] (kills bacteria but not spores and viruses)
3. Ozonation[3]
4. Bleaching powder (chlorinated lime)
5. Bromination
Challenges with disinfection:
- Sterilization is impractical at a large scale (only feasible at homes)
- **Chlorination[4] is the most widely method used**
- Organisms resistant to chlorination (E coli, salmonella, polio, HAV)
- Decision for disinfection method depends on:
  - Costs; availability of technology and method Like in developing countries
  - Target organism to get rid of
  - Ability to produce residual to provide post-treatment disinfection

1- the most common method and the cheapest (the most used in developing countries)
2- common method
3- Ozonation: is a chemical water treatment technique based on the infusion of ozone into water.The treatment of water with ozone has a wide range of applications, as it is efficient for disinfection BUT IT'S EXPENSIVE AND RARELY USED
4- used in larger scales

The five stages of environmental hazard risk assessment[1]:

1 Issue Identification

➢ What is the problem in question?
➢ Can the problem be addressed by the proposed risk assessment?
➢ Do we have the technology and capabilities to apply the assessment process?
➢ Are there any factors that contribute to persistence of that risk?
➢ Did the risk come about as a breach in public health measures?

2 Hazard Identification

➢ How severe are the health effects? And are they reversible?
➢ Is there interaction between this hazard and other agents in the environment?
➢ Is the onset of the effect immediate or delayed after exposure to hazard?
➢ Is there a critical window for exposure?

3 Dose-response Relationship[2]

➢ Does the exposure to the hazard exhibit a dose response relationship for the effect to appear?
➢ Is there a critical threshold for exposure? (cut-off point over which the effects will take place)

4 Exposure Assessment

➢ What is the nature of exposure?
➢ Is there a specific frequency of exposure?
➢ Is there a latency period for exposure?
➢ **Can the critical time of exposure be determined?**
(In order to be targeted for prevention and control measures)
➢ Has the route for exposure been identified? Is there more than one route?
➢ Is exposure one time, continuous or intermittent?

5 Risk Characterization

➢ Is there genetic variability in exposure to the hazard?
➢ Do personal characteristics play a role in exposure to hazard?
➢ Or do they play a role in the development of the health outcome following exposure to hazard?
➢ Should we consider any population characteristics or dynamics?

• Prevention and control

Monitoring water

Biological surveillance of water:
- Sanitary surveys
- Inspection of manufacturing of water bottles and ice
- inspection of reservoirs and wells Establishing policies and procedures for extracting water from wells, and maintaining water safety and storing water

Monitoring air pollution

By monitoring the concentration of:
- Sulphur dioxide
- Smoke
- Suspended particles

1: Example: a. Dusty weather and asthmatic/COPD patients b. How severe are the exacerbations c.Dose= duration of exposure (For how long) the more the dust the more the exacerbations d. Exposure can be confined to a location for example riyadh more than jeddah thus more cases in riyadh e. Can staying home or wearing masks minimize the risk?
2: for example: the cut-off point for Na+ in the water that if exceeded would lead to intoxication, the more the dose the more the risk

Risk Assessment

Issue identification

Identification of key issues amenable of risk assessment

Hazard assessment

Collection and analysis of relevant data

1- Hazard identification

- Identify chemicals of potential concern (COPC)

2- Dose - response assessment

- Identify relevant toxicity data

Uncertainty analysis for both hazard identification and dose-response assessment

Exposure assessment

- Conceptual site model
- Analysis of hazard locations
- Identification of exposed populations
- Identification of potential exposure pathways
- Estimation of exposure concentration and intakes of each pathway
- Uncertainty analysis for exposure assessment step

Review and reality check

Risk characterization

- Characterize potential for adverse health effects to occur
- Evaluate uncertainty
- Summarize risk information

Review and reality check

Risk Management

- Define the options and evaluate the environmental health, economic, social, and political aspects of the options
- Make informed decisions
- Take actions to implement the directions
- Monitor and evaluate the effectiveness of the action taken

L28- Mass-Gathering & Related Hazards

Definitions

Mass gatherings (MGs)

1. Are events attended by large numbers of individuals, concentrated in a specific area for a specific purpose andover a limited period of time [1]
2. Are events attended by a sufficient number of people to strain the planning and response resources of the host community, state/province/, nation, or region where it is being held.
3. **The World Health Organization (WHO)** definition also takes a broader view of mass gatherings to include the public health dimensions and **defines** mass gatherings as events attended by a sufficient number of people to potentially strain the public health resources of the community, city, or nation hosting the event.

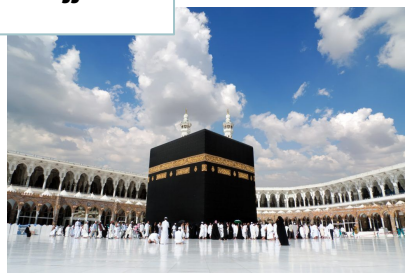
- Number of participants: **>1000 persons**, although most literature suggests >25000 persons

Mass gatherings medicine

- is an **area of medicine that deals with health aspects during mass gatherings** including the health effects and risks of mass gatherings and strategies for effective health services delivery during these events.
- The formal discipline of mass gatherings medicine was launched at the World Health Assembly of Ministers of Health in Geneva in May 2014.

Examples of mass gatherings

Hajj [2]



The London Olympics 2012

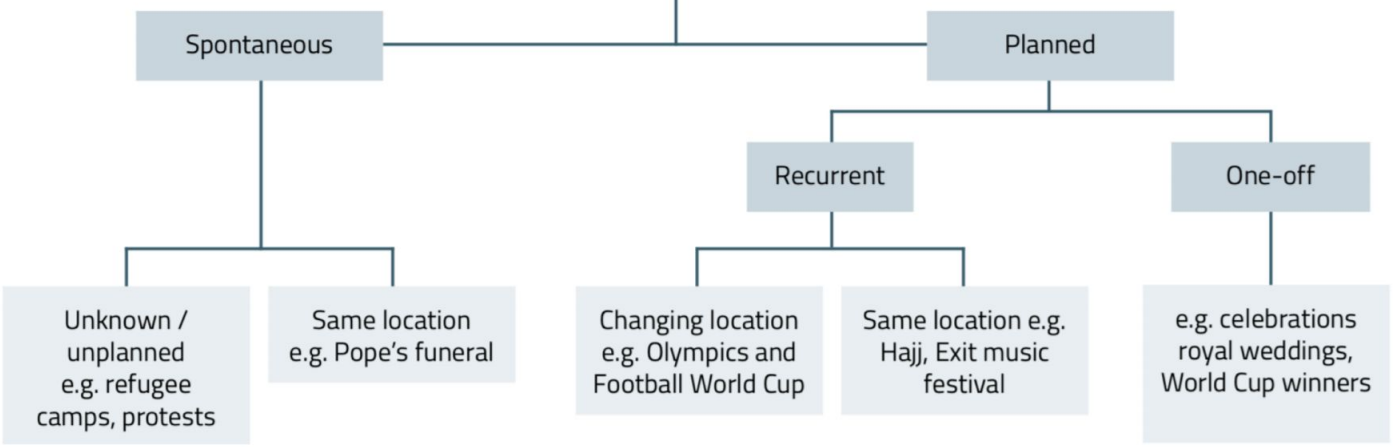
- 10,250 Olympic athletes \4,000 Paralympic athletes\ 20,000 press and media \ 180,000 spectators/day
- 17,000 people living in the Olympic Village
- Estimates of 4.5 million visitors to London
- 26 Olympic sports in 30 venues
- 20 Paralympic sports in 21 venues

Types of Mass-gathering

Fairs, exhibitions (World Expo Shanghai)	Concerts, festivals (Riyadh season, Glastonbury, UK)	Sports (Olympics)	Religious (Hajj)	Political (G20)

1. In other words, mass gathering is a lot of people in a confined space
2. During Hajj, the country hosts millions of people. This confined area creates a risk for hazards that threatens public health to spread and injure those people. Such mass gatherings require huge planning and preparation and identifying potential risks and figuring ways to overcome them.

Categories of Mass-gathering



Where is the risk in MG?

- Mass gatherings can pose several significant public health challenges to the health and security authorities both within the host country and abroad.
- They place additional pressures on health systems, which must operate for the duration of the mass gatherings stretched to surge capacity. [1]
- Require intersectoral approaches to risk mitigation and coordination and cooperation across multiple disciplines, agencies, sectors, and ministries

MG characteristics that represent public health risk		
	Higher population concentration • Diversity of population characteristics [2] • Different communities/ parts of the world/ regions • Imported diseases • Epidemic prone diseases • Different health-related behavior	**Pressure on infrastructure** • Hotels • Food sales • Healthcare system aviors
	Environmental conditions • Heat/ cold • Vectors of diseases	**Political attention** • Terrorism/ bioterrorism

Risk of Outbreak

- The importation of infectious diseases during a mass gathering may result in outbreaks.
- Mass gatherings health deals with the diverse health risks associated with mass gatherings including **transmission of infectious disease**, non-communicable disease, **trauma** and injuries (occupational or otherwise), environmental effects (such as, heat-related illnesses, dehydration, hypothermia), illnesses related to the use of drugs and alcohol and deliberate acts, such as terrorist attacks

Examples of outbreaks

Year	Location	Event	Cause	Deaths	Injuries
1993	Madison, WI, USA	Football game (12 000)	Crowd crush	0	69
1994	Athlone, South Africa	Political rally (20 000)	Crowd surge	3	21
1994	Mecca, Saudi Arabia	Religious festival (2 500 000)	Crowd surge	270	Unknown
1994	Baytown, TX, USA	Sports event	Grandstand collapse	1	17
1994	Saugerties, NY, USA	Rock festival (350 000)		2	7500
1995	Rio de Janeiro, Brazil	Rock concert (3 500 000)		Unknown	Unknown
1996	Cleve, Australia	Circus	Stand collapse	0	48
1997	Mecca, Saudi Arabia	Religious festival	Fire	343	2000
1997	Tel Aviv, Israel	Sports event	Bridge collapse	4	Unknown
1997	Ciudad del Este, Paraguay	Political rally	Structural collapse	38	100+

1. For example Iran facing the coronavirus their healthcare system collapsed
2. Age, gender, disabilities, comorbidities...etc

Risk assessment [1]

1. **Risk identification** (depending on event assessment)
2. **Risk characterization** (impact, likelihood)
3. **Risk management** (surveillance and response)

The aim of risk assessment is to:

- Know the risk **by** risk assessment, identification
- Know when it happens **by** surveillance
- Know what to do when it happens **to prepare** a response

Risk assessment

1 Risk identification

Host country context assessment

- Systems: need for enhancement in surveillance, testing, reporting, response and command, control and communication
- Training: responsibilities
- Population factors: immunity (hosts, visitors)
- Baseline status for CD
- After we finished assessing the event we need to identify the risks based on event assessment

Event assessment	Risk identification
Type: Religious event	Older population with NCD, in-site medical care
Season: summer	Risk of dehydration, heat stroke
International	Imported diseases
Venue: indoor	Poor air circulation
Venue: temporary	Poor infrastructure
Catering: informal	Risk of food-born illnesses
Hygiene: hand washing stations	Decreased risk of infections

2 Risk characterization

- After identifying the risk we need to characterize its impact on the mass gathering and public health (minimal-severe).
- **In other words, what is the risk likelihood?**

	Potential impact on the mg	Potential impact on public health
Minimal	Little or no consequence or disruption to the MG	Little or no consequences
Minor	Small impact on MG can be managed with little impact on the event	Few illness or injuries which public health and medical services can manage
Moderate	Some controlled impact on the Games and reputation for host	Death and or injuries or illness occur. Public and medical services are strained
Major	Event is disruptive to MG and reputation of host	Many deaths, injuries or illness. Disrupts public health and medical services
Severe	Event causes cancellation of some or all of MG. Significant adverse impact on MGs and host reputation.	Substantial loss of life and serious injuries or illness. Widespread disruption of local services and infrastructure

Why risk characterization?

- If the risk estimate that a particular event will occur is highly uncertain, **risk management decisions might be more conservative** than in the case of an event deemed to be highly likely [2]

Then what?

- Once the risks have been mapped on the risk matrix, the objective of public health planning for the MG will be to reduce the likelihood of a threat occurring and to reduce the consequences of each threat: risk management

1. Risk assessment starts with risk identification through assessing the type of event. For example, if the event was religious (ex. Hajj) you need to expect elderly and people with comorbidities to gather. After identifying the risk we need to characterize it whether it's major or minor risk. Depending on the risk characterization, a plan must be developed to manage it.
2. We always need to prioritize the risks we identified after we assessed the mass gathering. Because we can never deal with all risks.

3 Risk management

- What mitigation measures can be put into place to manage the risk and reduce either the probability or impact?

Management can include:

- Initiating **new surveillance programmes**
- Implementing a range of **special prevention** (risk of food-borne, waterborne, airborne and person-to-person spread of diseases)
- Developing **plans for immediate acquisition** of additional human and material **resources** should a crisis occur

Surveillance in MG

When planning surveillance for the MG, the questions that public health authorities are likely to ask are:

1. What diseases or syndromes should surveillance be conducted for and what is the risk of these?
2. What is the best type of public health surveillance system(s) to use? (timeliness and sensitivity)
3. What are the special considerations for outbreak or public health response?

Preparing a surveillance plan

1. Identify monitoring resources at all levels
2. Define conditions to look for
3. Establish priorities
4. Set threshold / alert levels
5. Identify mechanism for prompt investigation and feedback
6. Link notification and response plan

Diseases with the following characteristics should be considered for surveillance:

1. Have an outbreak potential (modes of transmission enhanced in the MG e.g. **respiratory spread**)
2. Are known to be of particular potential use as bioterrorism agents
3. May cause severe illness and require investigation and / or the application of control measures even for a single case
4. Imported diseases not usually seen in the host country (especially drug-resistant organisms and unusual serotypes)
5. Endemic diseases for which event attendees may have no immunity.
6. Highly infectious diseases (e.g., **norovirus or measles**).
7. Diseases or events that need to be reported under the IHR (2005).

Surveillance Problems posed by MGs

1. Short time – problem for collecting information – systems sensitive and responsive
2. Large, diffuse and highly varied population Include diseases not normally surveyed?
3. People arrive from/return to many locations
4. Multiple opportunities for exposure: air travel – food – water – physical contact
5. Varying health surveillance capabilities of – host nation– originating nation(s)
6. Tracking (time/location) and notification – not just in location, but after returning

MG Planning

A safe and healthy MG requires

- Early multi-sectoral preparation involving:
  - event organizers
  - health emergency managers
  - public health authority representatives
  - local hospital emergency departments
  - first-aid personnel
  - other sectoral partners (e.g. police, emergency services, security services)
- Depends on risk assessment and risk identification
- **Medical care needs to be offered at the mass gathering but local care needs to be maintained as usual**

Legacy and Evaluation

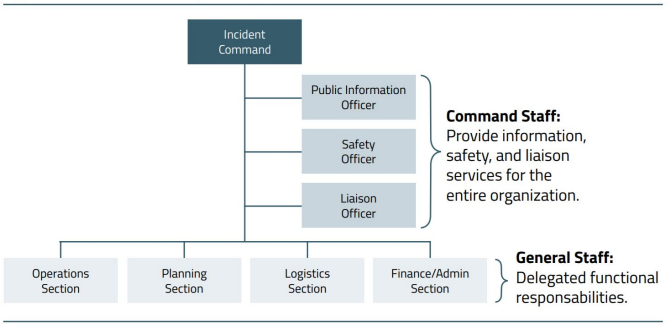
- The wealth of knowledge and expertise generated from mass gatherings can drive best health promotion, education, and risk mitigation strategies and optimize the planning and delivery of effective health services during future mass gathering events.

Response

Establish a major incident response system

- Well rehearsed multi-agency and cross government response systems.
- Effective liaison across health sector.
- Public health engagement with: – Police & other emergency services (threat assessment, incident response) – Central government (threat assessment, preparedness, response) – Intelligence services (threat assessment).

Figure 2: Incident Command System (ICS) structure



WHO's role in mass gatherings

WHO provides advice and technical support to host governments preparing for mass gathering events.

How does WHO provide support to Member States for mass gatherings?

- To provide advice and technical support to Member States that are hosting mass gatherings, **WHO draws on 5 WHO Collaborating Centres for Mass Gatherings and a Virtual Interdisciplinary Advisory Group (VIAG)**. VIAG is an informal network of mass gathering experts. Their role is to **share expertise on public health requirements** and best practices with any organization considering hosting a mass gathering event.

Activities to support host governments of mass gatherings often include:

- Prior to the event: all-hazard risk assessment, travel medicine and activities to encourage increased physical activity, cessation of tobacco use and avoidance of excess alcohol.
- During the event: international monitoring of potential disease spread and risk assessment, emergency medical services and hospitals and plans to manage fan zones.
- After the event: capture lessons learnt and share expertise with future mass gathering hosts

What governs WHO's work on mass gatherings?

- The decision states that the WHO "Director-General should, where appropriate, work closely with Member States that are planning and conducting mass gatherings to support cooperation and communication between the concerned health authorities in each country, and help Member States strengthen capacities to better utilize the International Health Regulations (2005)".

Does WHO have the power to cancel or move mass gatherings?

- WHO may provide advice and technical guidance to host countries on public health risks, **but has no decision power to uphold, cancel or postpone mass gatherings hosted by Member States**.

Q- A planned combination of educational, political, regulatory, and organizational supports for actions and conditions of living conducive to the health of individuals, groups, or communities is the definition of ?
Health promotion .