

Hajj and Health



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Objectives:



- Enlist the diseases and health risks related with gathering of Hajj
- Understand the signs and symptoms and prevention of these diseases
- Understand the importance of surveillance and reporting of these diseases at the national and International level
- Appreciate KSA's efforts to address and recognize the health risks and diseases during Hajj

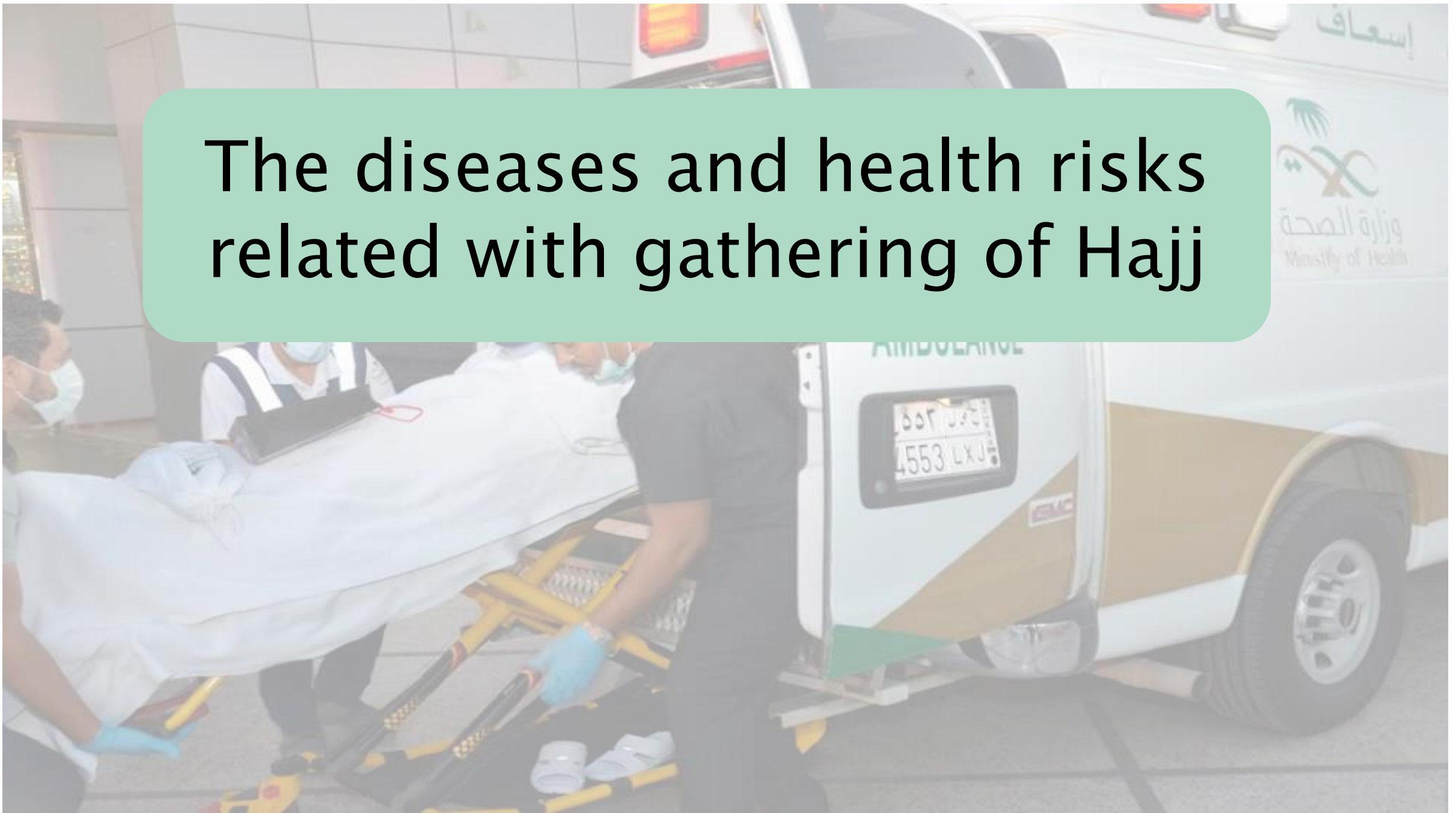
Introduction

- The Hajj pilgrimage is one of the greatest mass gatherings in the world.
- Mass gatherings can present important public health challenges related to the **health of attendees** and of the **host country population** and **health services**
- Pilgrims performing the Hajj are predisposed to diverse and **significant health risks**, due to
 - the limited time and confined geographical area of the event, and
 - the large numbers of people, with population densities among the millions of participants, reaching 7 persons/m²

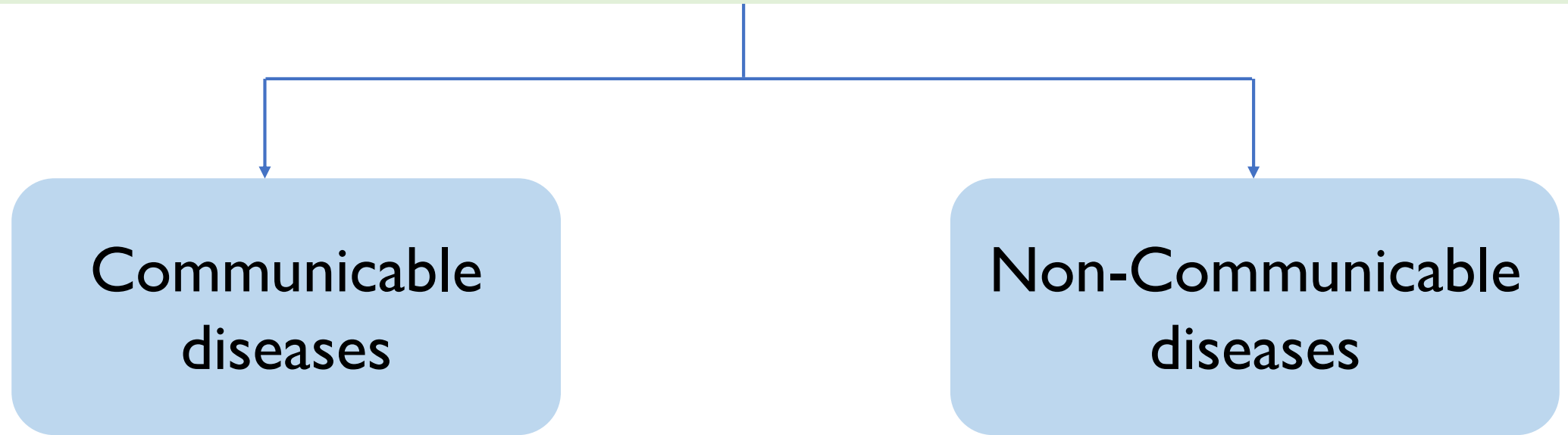
Health risks and hazards associated with mass gatherings

1. Transmission of communicable diseases, including antibiotic-resistant bacterial infections
2. Water and sanitation related disorders
3. Non-communicable diseases and exacerbation of comorbidities (eg, diabetes, hypertension, COPD, and cardiovascular events)
4. Mental health and psychosocial disorders
5. Thermal disorders, including heat hyperpyrexia, heat stroke, heat exhaustion, and dehydration
6. Stampedes
7. Accidents, trauma, and crush injuries
8. Terrorist incidents (biological and chemical warfare threats, explosives, and bombs)

The diseases and health risks related with gathering of Hajj



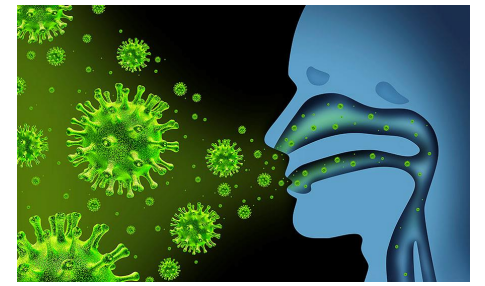
Diseases and Health Risks During Hajj



Communicable diseases



Communicable Disease



Factors associated with increasing the risks of outbreaks and the spread of infectious diseases among pilgrims

- Unhygienic practices
 - Close contacts between pilgrims in overcrowded situations
 - International travel
- The risk of infectious diseases transmission may extend to the **local Saudi population** and to the **home population of returning pilgrims** after Hajj.
 - This could strain the public health services in Saudi Arabia and may threaten global health security.

Common Infectious Diseases

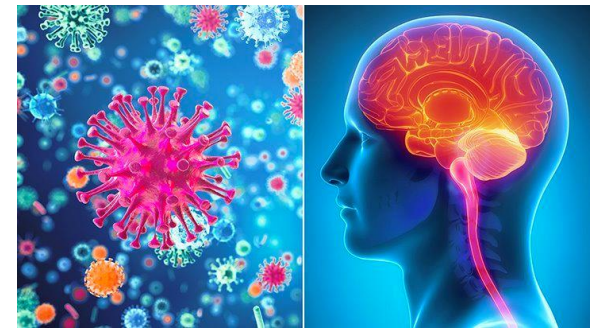


Meningococcal disease



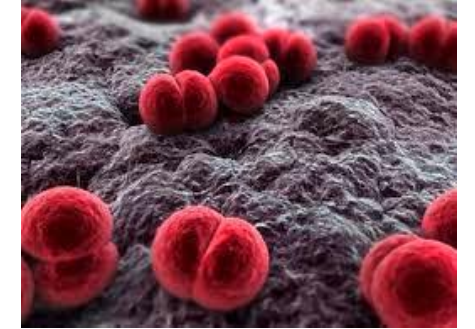
- Meningococcal disease is a serious public health threat given the seriousness of the illness, its disabling sequelae and its potential for epidemic spread.
- The disease is a concern during mass gatherings which provide **conditions that facilitate transmission of infectious agents**
- Crowded conditions are a risk factor for the carriage and transmission of **infectious agents**
- Hajj has been associated with **outbreaks of invasive** meningococcal disease
- 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**
- Meningococcal disease outbreaks have **high fatality rates** and associated **medical costs**
 - Preventive measures are needed to control its transmission
- Even with adequate chemotherapy, meningococcal meningitis has a fatality rate of about 10% and about 15% of the survivors have residual Central Nervous System (CNS) damage

Meningococcal disease



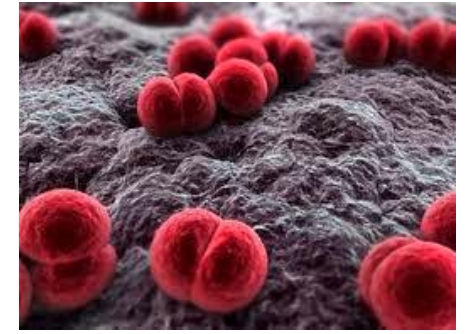
Causative agent

Neisseria meningitidis



- Gram-negative diplococci.
- 12 serotypes have been identified,
- Groups A, B, C, H, I, K, L, W135, X, Y, Z based on the structure of the polysaccharide capsule.
- The majority of invasive meningococcal infections are caused by organisms of serogroups A, B, C, X, W135 and Y.
- Meningococci of these serogroups have the potential to cause both endemic disease and outbreaks.
- It is a very sensitive organism; it dies rapidly on exposure to heat and cold

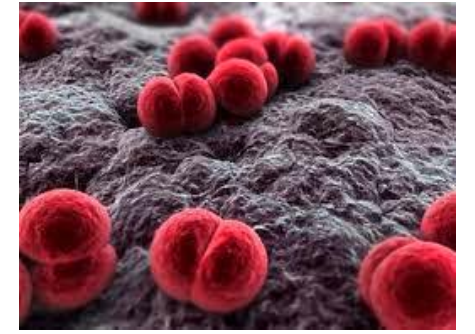
Meningococcal disease



Source of Infection

- The organism is found in the **nasopharynx** of cases and carriers.
- In most cases colonization of the human nasopharynx is **asymptomatic**.
- **Blood stream invasion** by *N. meningitidis* can lead to meningitis and septicaemia with serious consequences.
- Carriers are the most important source of infection.

Meningococcal disease



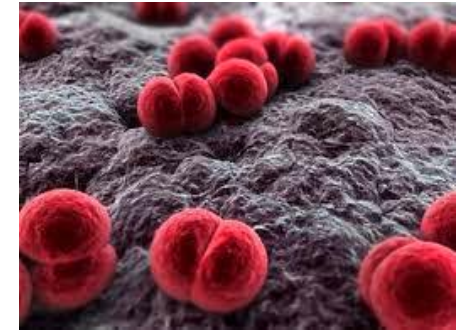
Period of Communicability :

- Until meningococci are **no longer present** in discharges from nose and throat.
- Cases rapidly lose their infectiousness within 24 hours of specific treatment.

Immunity:

- All ages are susceptible.
- **Younger age groups** are more susceptible than older groups as their antibodies are lower.
- Immunity is acquired by subclinical infection (mostly), clinical disease or vaccination.
- Infants derive **passive immunity** from the mother, till the age of **six months**.

Meningococcal disease



Environmental Factors

- The seasonal variation of the disease is well established; outbreaks occur more frequently in the dry and cold months of the year from December to June.
- Overcrowding is an important predisposing factor.
- The incidence is also greater in
 - The low socio-economic groups living under poor housing conditions
 - HIV infection
 - Travel to endemic areas.

Meningococcal disease



Transmission

- The main modes of transmission are **direct contact** and **respiratory droplets**.
- Respiratory droplets produced by coughing and sneezing can be transmitted to non immune hosts within a distance of one meter
- The average **incubation period** is **3 - 4 days** with a range of 2 to 10 days, this is also the period of communicability.
- The bacteria are rapidly eliminated from the nasopharynx after starting antibiotics, usually within 24 hours.
- Humans are the only reservoir.
- Both **cases and carriers** serve as the source of infection.

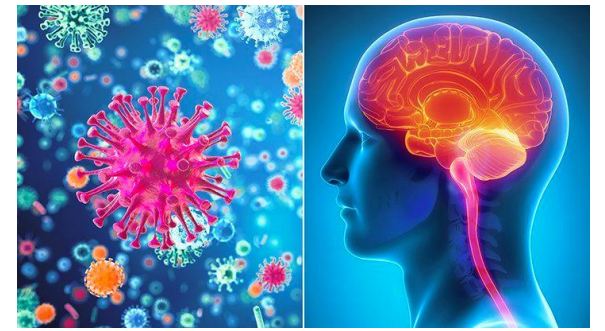
Meningococcal disease



Clinical Features

- Most infections do not cause clinical disease.
- Many infected people become **asymptomatic carriers** of the bacteria and serve as a reservoir and source of infection for others.
- **The most common symptoms are**
 - acute onset of intense headache
 - high fever
 - Nausea
 - Vomiting
 - sensitivity to light (photophobia)
 - stiff neck.
- These symptoms can develop over **several hours**, or they may take **1 - 2 days**.
- A more severe form of meningococcal disease is meningococcal septicaemia which is characterized by a **haemorrhagic rash** which usually indicates disease progression and rapid circulatory collapse

Meningococcal disease

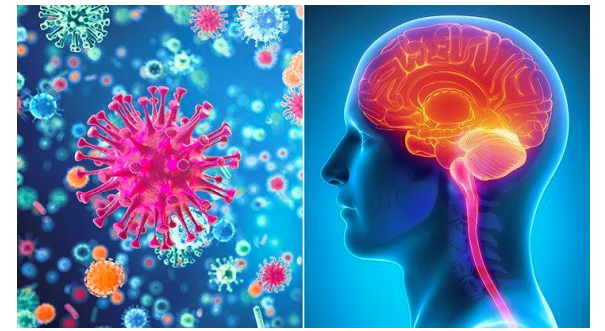


Clinical Features In Infants and young children

- bacterial meningitis usually presents as a **subacute infection** that progresses over several days.
- There is a slower onset of signs and symptoms
- Nonspecific symptoms and neck stiffness may be absent.
- Irritability and **projectile vomiting** may be the presenting features in this age group.
- **Seizures** occur in **40%** of children with meningitis.



Meningococcal disease



Diagnosis

- The diagnosis of meningococcal meningitis is suspected 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/ μ L, (predominantly neutrophils),
 - Decreased glucose concentration (<45 mg/dL) and
 - Increased protein concentration (>45 mg/dL)

Meningococcal disease



Management

- Meningococcal disease is potentially **fatal** and should always be viewed as **medical emergency**.
- Management of meningococcal disease requires **early recognition** of the disease, prompt **initial parenteral antibiotic** therapy and close monitoring
- Admission to a hospital centre is essential
- Treatment with antibiotics can save the lives of **95% of patients** provided that it is started during the **first 2 days of illness**.

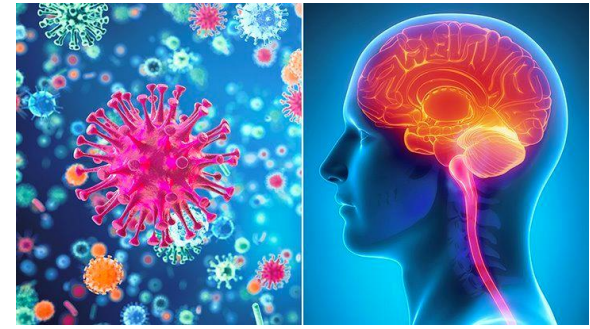
Meningococcal disease



Management

- Several antibiotics can be used for treatment including penicillin, ampicillin, chloramphenicol and ceftriaxone
- Penicillin is the drug of choice.
- In penicillin-allergic patients, ceftriaxone and other third generation cephalosporins should be substituted.
- Isolation of cases is of limited usefulness in controlling epidemics because the carriers outnumber cases.

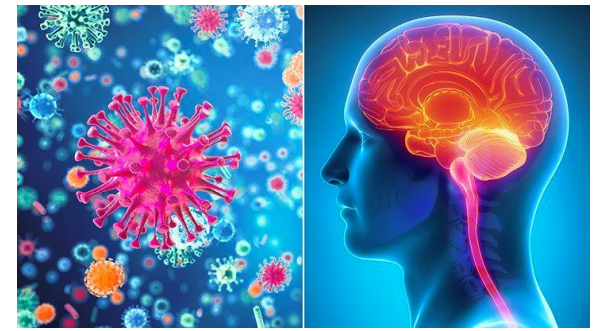
Meningococcal disease



Preventive measures for Meningococcal disease

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

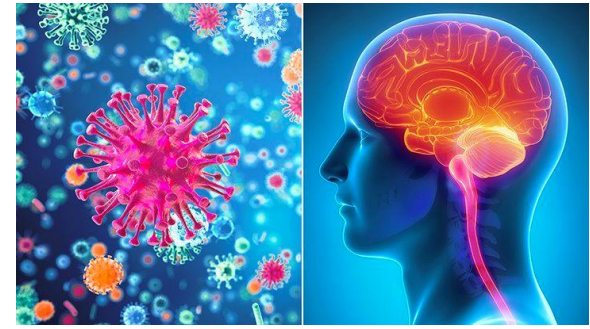
Meningococcal disease



Prevention and control of the disease in the contact individuals

- Close contacts of persons with confirmed meningococcal disease are at an increased risk of developing meningococcal illness.
- Antibiotics are effective in preventing additional cases through eradicating carriage of the invasive strain.
- Most secondary case occur within the first 72 hours after presentation of the index case; risk decreases after 10-14 days.
- Treatment should be started **within 24 hours** of identification of the index case.
- Antibiotics effective for this purpose include rifampicin, ciprofloxacin, ceftriaxone or azithromycin.

Meningococcal disease

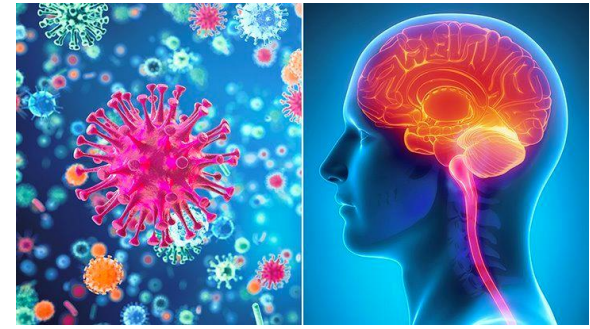


Preventive measures for Meningococcal disease

Chemoprophylaxis

- Chemoprophylaxis is the preferred means of prevention of disease among **close contacts** of sporadic cases
- **Ciprofloxacin** single oral dose of 500 mg, **rifampicin** 600 mg 12 hourly for two days, or **ceftriaxone** 250 mg IM single dose are the options for adults
- The choices for children include **rifampicin** 10 mg/Kg 12 hourly for two days (5mg/Kg for infants) or injection **ceftriaxone** 125 mg IM single dose.

Meningococcal disease

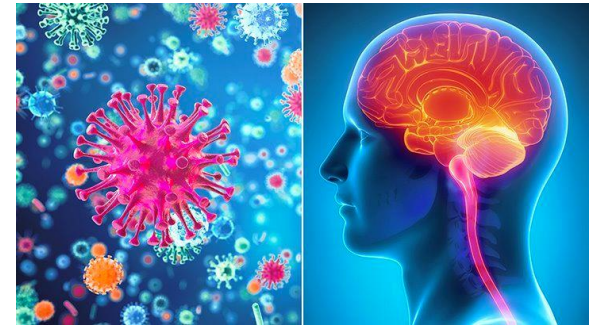


Preventive measures for Meningococcal disease

Meningococcal Vaccines

- Of the common serotypes responsible for more than 90% of meningococcal disease, vaccines are available for group **A, C, Y and W - 135**.
- Currently available meningococcal vaccines include **polysaccharide vaccines** and **polysaccharide-protein conjugate** vaccines.
- The conjugate vaccines are **more immunogenic** and also induce **immunogenic memory**.

Meningococcal disease

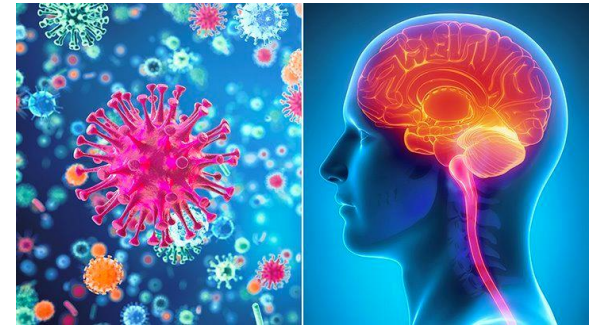


Meningococcal Vaccines

Polysaccharide Vaccines

- Internationally marketed meningococcal polysaccharide vaccines are available in **bivalent** (A, C), **trivalent** (A,C,W 135), and **quadrivalent** (A, C,W135,Y) formulations.
- The dose for primary vaccination for both adults and children older than two years is a **single 0.5 - ml subcutaneous** injection.
- Protective levels of antibody are usually achieved within **7 - 10 days** of vaccination

Meningococcal disease

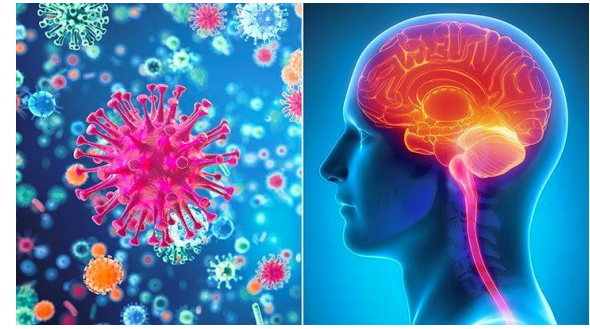


Meningococcal Vaccines

Conjugate Vaccines

- Licensed meningococcal conjugate vaccines are **monovalent** (A or C) or **quadrivalent** (A, C, W135, Y)
- Also include a **combination vaccine** based on Haemophilus influenzae type b and Neisseria meningitidis serogroup C vaccines (**Hib/MenC**).
- Given as **intramuscular** injection, preferably in the deltoid muscle (or in the anterolateral aspect of the upper thigh in children <12 months of age)

Meningococcal disease



Meningococcal Vaccines

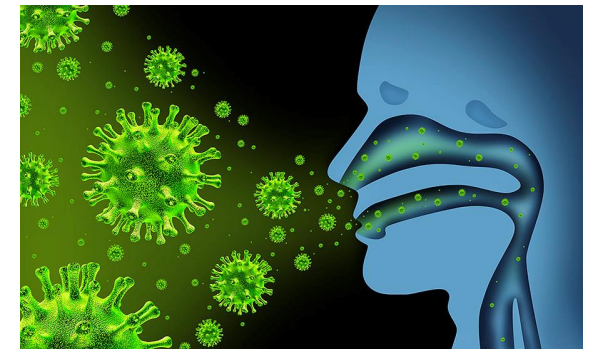
Recommendations for use of meningococcal vaccine

- 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

Other Infectious Diseases



Respiratory tract infection



- Respiratory diseases are the **most common cause of outpatient department visits** during the Hajj, accounting for 41–60.8% of visits
- Upper respiratory tract infections (URTIs), including **pharyngitis, viral URTI, and tonsillitis**
- **Comorbidity is one of the risk factors** for development of URTI.
 - In pilgrims who suffered from comorbidity, there was a significant association with longer duration of cough, longer duration of sore throat, and severe influenza-like illness requiring admission to hospital for further treatment
- Acute respiratory infections were caused by **influenza virus (IV)** or **respiratory syncytial virus (RSV)**. Less commonly, parainfluenza virus, rhinovirus, adenovirus and enterovirus

Respiratory tract infection



Pneumonia

- 94% of whom were aged > 50 years
- Pneumonia is one of the leading causes of **hospitalization** of pilgrims in Mecca, especially among elderly people
- Pneumonia was also the leading cause of **severe sepsis** and **septic shock** among pilgrims admitted to the ICU
- **Candida albicans** being the most frequent pathogen (28.7%), followed by **Pseudomonas aeruginosa** (21.8%), **Legionella pneumophila** (14.9%) and **Klebsiella pneumoniae**

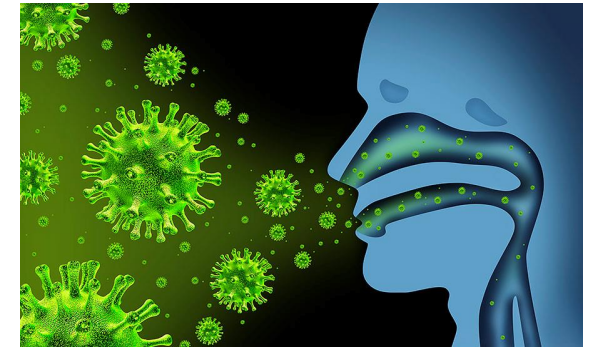
Respiratory tract infection



Tuberculosis (TB)

- The annual risk of tuberculosis (TB) is **3 times higher** in Mecca than the national average in Saudi Arabia
- > 50% of pilgrims come from TB-endemic countries
- TB infection rate was 10% among Hajj pilgrims
- TB during the Hajj has the potential to be a source of TB upon return of pilgrims to their home countries

Respiratory tract infection



Preventive Measures

- Some preventive measures are associated with **reduced risk of respiratory illness**, such as
 - practicing social distancing
 - hand hygiene
 - contact avoidance, and
 - washing the throat and mouth with salt water
- More Preventive Measures recommended by the Saudi Ministry of Health to decrease the risk of respiratory infections
 - the use of facemasks
 - administration of the seasonal influenza vaccine

Diarrhoeal diseases



- Around 9.3% of pilgrims experienced diarrhoeal symptoms during the Hajj period
- Cholera and traveller's diarrhoea are common during the Hajj
- The last case of Cholera reported was in 1989. Since then, **no outbreak has been reported** despite the fact that outbreaks occurred in countries from where pilgrims came

Emerging infectious diseases



- Emerging infectious diseases are of special concern in Hajj health care
- In 2009, IAV H₁N₁ presented a potentially massive threat to Hajj pilgrims, mainly because Saudi Arabia ranked fourth in probable swine flu cases and deaths in the Eastern Mediterranean Region. Moreover, a large number of pilgrims were from resource-limited countries; therefore, only a minority of pilgrims was likely to have had access to IAV H₁N₁ vaccine before they travelled to Saudi Arabia for the Hajj

Key considerations related to communicable disease alert, response, and operation plans for mass gatherings

- **Risk assessment and management**, surveillance and alert systems, and outbreak alert and response twinned to **effective communication** strategies
- Rapid **identification** of attendees with communicable diseases and their contacts for potential quarantining and instituting preventive infection control measures
- **Medical care planning** and guidelines (preventive medicine, mandatory vaccinations, food management, water and waste management, and identification of physical and fire hazards)
- Public health measures

Key considerations related to communicable disease alert, response, and operation plans for mass gatherings, Cont.

- **Emergency planning and response** (rapid access to injured or ill patients, provision of triage in the field and at aid stations, provision of on-site care for minor injuries and illnesses, effective and timely stabilisation and transport of patients requiring evacuation)
- **Disaster medicine**, trauma, and triage and level of care
- **Mobile units**, health stations, and designated hospitals
- Use of modern technologies for **proactive surveillance**, early diagnosis and rapid detection, data collection, analyses, sharing, and communication.
- Updating **travel guidelines**, including vaccinations, for each specific mass gathering event

Non-Communicable diseases



Pre-existing chronic illness



- Pilgrims with **pre-existing cardiac diseases** are at high risk of **physical stress** that leads to ischemia.
 - **Cardiovascular diseases** are the most common cause of **death** during the Hajj, accounting for 66% of all deaths
 - Cardiovascular disease accounted for **63.6% of ICU admissions**, and was the second most common cause for admission to hospital
 - These high rates may have been due to the **high number of elderly people** with chronic diseases among the pilgrims
 - pre-Hajj functional assessment should be carried out to identify patients at a high risk of mortality from cardiovascular diseases

Trauma



- The mass movement of millions of pilgrims from one ritual place to another, in a short time and in a small area, significantly increases the risk of trauma
- Numerous accidents and injuries face Hajj pilgrims, such as **falling**, **sliding**, **stampede**, and **traffic accidents**
- Most of the traumas usually occur during the rituals of Tawaf, Sae and Ramy al-jamarat.
- Trauma accounted for 9.4% of hospital admissions and 6.4% of ICU admissions
- The rate of all-cause fractures was high, perhaps because of increased overcrowding

Heat injury



- **Heat stress** is one of the main complaints among Hajj pilgrims
- The high air **temperatures**, **sun exposure**, and **heat wasted** from the large number of people and vehicles all contribute to the problem of heat stress
- The highest incidence of **heat fatalities** occurred when the maximum air temperature reached 48.7° C.
- In recent years, the incidence of heat stroke and exhaustion has been low, probably due to improvement in climatic conditions since the Hajj seasons have been

Heat injury



- Minimize heat exposure by
 - developing **awareness** of the signs and symptoms of heat stress
 - avoiding excessive sun exposure by using **umbrellas** and **seeking shade**, use of **sun block creams**, and **drinking adequate fluid**.
- Preventative measures established by the Saudi authorities:
 - making drinking **water available** for all pilgrims, and
 - providing **water mist** sprayers that operate regularly in the places where the Hajj rituals are performed

Surveillance and Reporting

Surveillance Systems during Hajj

- Infectious diseases surveillance systems are **operational** during the annual Hajj
- Evolved from paper-based reporting tools to **automated electronic systems**, recording and storing large datasets
- Reporting from mobile units, clinics, primary health facilities, and hospitals that serve pilgrims.
- All these data are fed directly to a **central command** and **control unit**, enabling rapid incorporation and analyses of data and necessary public health interventions.
- These advances in **real-time surveillance** have improved public health security for the mass gatherings at the Hajj.

Surveillance Systems during Hajj

Infectious Diseases Surveillance Tools during Hajj

Electronic Surveillance Systems (HESN, CITREX)

- **HESN** is a web-based electronic solution, introduced by the Saudi MoH to improve **communication** among public health professionals involved in outbreak management
- Also it use to provide **quality health data** for planning and effective allocation of resources.
- HESN was initially implemented as a pilot in Makkah region of Saudi Arabia in 2012.
- By January 2014, a country-wide implementation was initiated to control the outbreak of MERS-CoV in the Kingdom

Surveillance Systems during Hajj

- **CITREX** is an electronic statistical system for Hajj
- It is a web-based electronic solution
- Unlike HESN which is implemented country-wide, CITREX is **used only during Hajj** to manage infectious diseases data captured in real time from the health facilities in the Holy areas (Makkah, Medina, Arafat and Mina).
- Although the hospital surveillance teams handled data entry into HESN, the fixed surveillance teams captured the same health data into CITREX for analysis and notification on distinct electronic dashboards at the CCC

KSA's Efforts for a Healthy Hajj

KSA's Healthcare System during Hajj

- The Saudi Ministry of Health takes the Hajj season seriously.
- It starts to plan for the next season immediately after finishing the current season by gathering feedback from local and international health agencies

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**.
- The preventive services include
 - infectious disease surveillance
 - outbreak investigations
 - mass vaccinations
 - mass administration of prophylactic medications
 - environmental health services, and
 - health education

KSA's Healthcare System during Hajj

- Health education activities include
 - awareness campaigns,
 - distribution of booklets to arriving pilgrims, and
 - establishing toll-free telephone lines operated by trained healthcare providers.

KSA's Healthcare System during Hajj

- Every year the Saudi Arabian Ministry of Health issues updates on [travel immunisation recommendations](#) for pilgrims.
- 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



THANK YOU

References

- Aldossari M, Aljoudi A, Celentano D (2019) Health issues in the Hajj pilgrimage: a literature review. *East Mediterr Health J* 25(10):744–753
- Memish ZA, Steffen R, White P et al. Mass gatherings medicine: public health issues arising from mass gathering religious and sporting events. *Lancet*. 2019; 393: 2073-2084
- A community medicine or public health textbook by AFMC, Pune, India
- Park's textbook of Social and Preventive medicine. 24 rd edition.