Emerging infectious Diseases (SARS,MERS,COVID-19)

- **Definition of emerging & re-emerging diseases**
- **Factors contributing to emergence**
- **examples for emerging infectious diseases SARS, MERS-CoV, COVID-19**
- **National health response to COVID-19 in SA**

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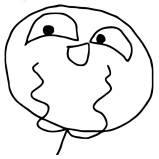


Introduction

Despite advances in medical science and treatment during 20th century, infectious diseases remain the leading cause of death worldwide.

Emergence of new infectious diseases, re-emergence of old infectious diseases and persistence of intractable infectious diseases.

During the last 20 years, at least 30 new diseases has emerged.

These diseases are the leading cause of death worldwide, claiming at least 17 million lives every year.

Emerging & Re-emerging infectious disease

Emerging

- Emerging infectious disease is a new disease, new problem (new threats).
- An emerging infectious disease is a one that is caused by a newly discovered infectious agent

Or

- By a newly identified pathogen, which has emerged and whose incidence in human has increased during the last 2 decades and is threatening to increase in the near future.

Re-emerging

- A re-emerging infectious disease is a one which was previously controlled but once again has risen to be a significant health problem.
- Is an old disease, new problem, (new threats)
- This term also refers to that disease which was formerly confined to one geographic area, has now spread to another areas.

Categories of Emerging infectious diseases

01 New diseases or previously unknown diseases.
Examples; AIDS, SARS Cov, MERS-CoV, Ebola.

02 Previously known diseases that spread to new populations or new geographical area.
Examples: West Nile, Zika.

03 Re-emerging diseases have had a decline in incidence, that are now increasing, worldwide or in groups of countries.
Examples: diphtheria and malaria.

04 Pathogens that have developed resistance to antimicrobial drugs or insecticides.
Examples: tuberculosis or vancomycin resistant Staphylococcus.

Factor contributing to the emergence of infectious diseases[1]

- Human demographics and Behavior
- Technology and industry
- Economic development and land use
- International travel and commerce
- Microbial adaptation and change
- Breakdown of public health measures
- Human susceptibility to infection
- Climate and weather
- Changing ecosystem
- Poverty and social inequality
- War and famine
- Lack of political will
- Intent to harm

Agent

- Evolution of pathogenic infectious agents (microbial adaptation and change)[2]
- Development of resistance to drugs:
- Wrong prescribing practices
- Non-adherence by patients
- Counterfeit drugs[3]
- Use of anti-infective drugs in animals and plants
- Resistance of vectors to pesticides

Environment

- Climate & changing ecosystems
- Economic development & Land use (urbanization, deforestation)
- Technology & industry (food processing & handling)

Host

1. Natural and man made disaster ➡ mass migration[4] ➡ unhygienic conditions.
2. Uninhibited and reckless industrialization ➡ migration (labor population from rural to urban) ➡ unhygienic settlements
3. International travel (trade/tourism) ➡ global dispersion of disease agents, reservoirs and vectors
4. Changes in lifestyle ➡ unhealthy and risky behavior
5. Declining immunity (HIV infection) ➡ vulnerable to infections.

1. These factors are classified into three major pillars. Factors related to Agent, host & environment.
2. Most common cause of this adaptation is the antibiotic misuse
3. This was when antibiotics were available over the counter. However, Now antibiotics are restricted to doctor prescription only.
4. Mass migration is the migration of large number of people from one area to another because of Natural or man made disaster, those people may be poorly oxygenated which they can get infected or can transmit infections from one area to others.
5. Nowadays, one of the most causes of coronaviruses transmission.
6. E.g. sexually transmitted diseases

Some Newly Identified Pathogenic Agents

Bacteria

- 1975: Borrelia burgdorferi
- 1976: Legionella pneumophila
- 1976: Cryptosporidium parvum
- 1977: Campylobacter jejuni
- 1978: Toxic shock syndrome
- 1982: Escherichia coli O157:H7
- 1983: Helicobacter pylori
- 1986: Cyclospora cayatanensis
- 1992: Bartonella henselae

Antibiotic-Resistant Organisms

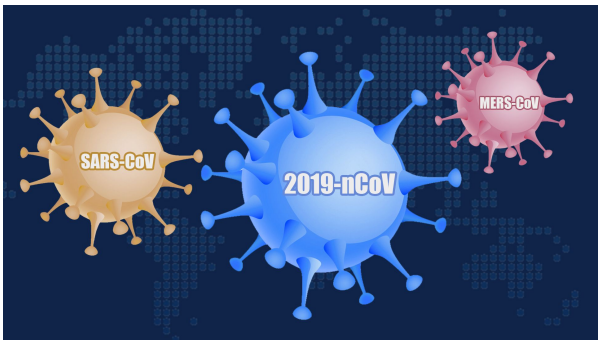
- M. tuberculosis
- S. aureus (MRSA, VRSA)
- N. gonorrheae
- P. falciparum, P. vivax, P. malariae

Viruses

- **1985: Human Immunodeficiency Virus**
- 1986: Human Herpesvirus-6
- 1988: Hepatitis E Virus
- 1989: Hepatitis C Virus
- 1989: Ebola Reston Virus
- 1991: Guanarito Virus
- 1993: Sin Nombre Hantavirus
- 1994: Saba Virus
- 1995: Human Herpesvirus-8
- 1995: Ebola Ivory Coast Virus
- 1999: Nipah Virus
- 2001: Human Metapneumonovirus
- 2002: SARS Coronavirus
- 2003: Avian influenza H5N1
- 2005: Bocavirus
- 2012: Middle East Respiratory Syndrome (**MERS**) coronavirus
- 2019: COVID-19

Coronavirus Background[1]

- A large family of viruses that can cause illness in animals or humans.
- These coronaviruses range from the common cold to more severe diseases such as severe acute respiratory syndrome (**SARS**), Middle East respiratory syndrome (**MERS**), and **COVID-19**.



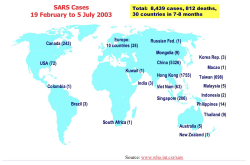
1. Single stranded RNA viruses

SARS
(Severe acute respiratory syndrome)

1 Introduction

- A viral respiratory illness caused by a coronavirus.
- SARS was first reported in Asia in February 2003.
- In few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained.

2 The SARS outbreak of 2003



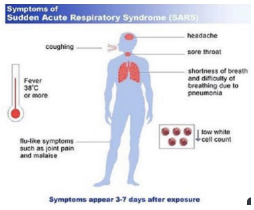
- According to the World Health Organization (WHO), a total of 8,098 people worldwide became sick with SARS during the 2003 outbreak. Of these, 774 died.SARS outbreak is an epidemic NOT pandemic, means that any cases of SARS reported in different countries have actually been in Asia and get infected there, then they travelled to their countries where they diagnosed with SARS.

3 Transmission

The transmission of all corona viruses are mainly through droplets, either direct (person to person) or indirect (touching contaminated objects)

- Close person-to-person contact.
- By respiratory droplets (droplet spread)(generally up to 3 feet).
- Touching a surface or object contaminated with infectious.
- (airborne spread?!). Some Cases were reported to have infection through airborne spread, but the main route is by droplets.

4 Symptoms



- High fever (>38.0°C)
- Headache
- Body aches and discomfort
- Mild respiratory symptoms
- Diarrhea
- Dry cough
- Most patients develop pneumonia The main cause of mortality in SARS patients

5 CDC's response to SARS during the 2003 outbreak

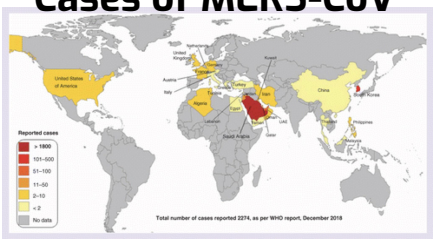
- Activated its **Emergency Operations Center** to provide round-the-clock coordination and response.
- Committed more than 800 **medical experts** and support staff to work on the SARS response.
- Deployed medical officers, epidemiologists, and other specialists to assist with on-site **investigations** around the world.
- Provided assistance to state and local health departments in investigating possible cases of SARS in the United States.
- Conducted **extensive laboratory testing** of clinical specimens from SARS patients to identify the cause of the disease.
- Initiated a system for distributing health alert notices to **travelers** who may have been exposed to cases of SARS.

MERS
(Middle East Respiratory Syndrome)

1 Introduction

- An illness caused by a coronavirus called Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

Cases of MERS-CoV

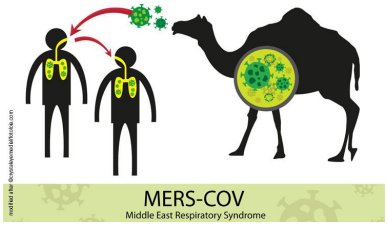


2 All cases are linked to the Arabian Peninsula

- It was first reported in Saudi Arabia in September 2012.
- First known cases of MERS occurred in Jordan in April 2012 (retrospective investigation).[1]
- All cases have been linked to Arabian Peninsula (travel/residence).
- Outbreak in Korea in 2015 associated with traveler returning from the Arabian Peninsula.

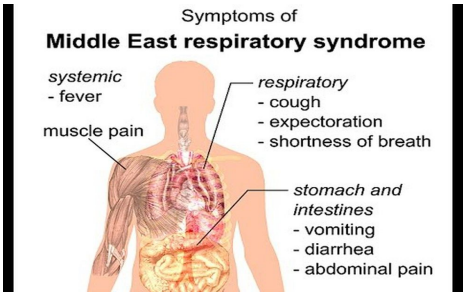
3 Transmission

- Direct contact with infected camels or infected person.
- It can spread from person to person.



4 Symptoms

- Some patients have mild symptoms or no symptoms at all. IP (Incubation Period): about 5 or 6 Last for 2 to 14 days.



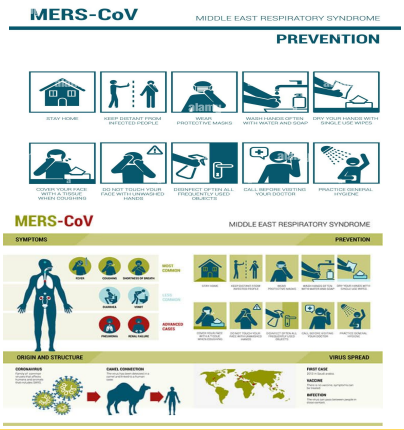
5 Complications

Complications are more common in patient with comorbidities like below

- Pneumonia
- Kidney failure.
- Fatality rate: 34.4%
- Pre-existing conditions increases risk of mortality:
  - Diabetes
  - Cancer
  - Chronic lung disease
  - Chronic heart disease
  - Chronic kidney disease

6 Prevention and treatment

- Currently there is no vaccine against MERS. But scientists are working to develop one.[2]



Treatment:

- No specific treatment.
- Supportive treatment ...

1. By retrospective studies they found that the first few cases were reported in Jordan not Saudi Arebia.
2. For SARS & MERS there is no vaccines, but there are vaccines for COVID- 19.

Coronavirus Disease 2019(COVID-19)

1 Introduction

1. First identified in Wuhan, China in December 2019
2. Caused by the **virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)**, a new virus in humans causing respiratory illness which can be spread from person-to person.

2 Transmission

1. Droplet transmission
2. Inhalation, through mucous membrane, infected hands and objects
3. CDC recommends maintaining a physical distance of at least 1.8 meters between persons.

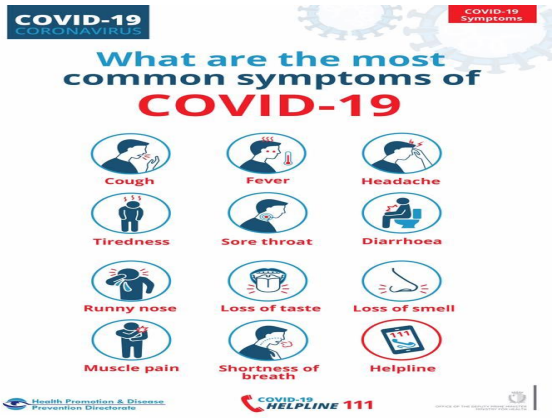
Increased risk(for transmission)**:**
poor ventilation, prolonged exposure, close contact with infected persons, activities that leads to exposure to a greater amount of respiratory droplets and particles.[1]

3 Symptoms: IP: 2 and 14 days with a median of 5 days. Some cases are asymptomatic [2]

- Fever or chills/ Headache
- Cough/ Sore throat
- Muscle or body aches
- Nasal congestion or runny nose
- Diarrhea/ Nausea/Anorexia
- Shortness of breath or difficulty breathing
- Loss of smell or taste[3]

4 People at Higher Risk for Severe Illness

- The risk of severe disease **increases with age** in addition to underlying medical conditions, including **heart disease, diabetes or lung disease**
- Need **hospitalization** and intensive care.
- Might lead to death.



1. There is a high risk of getting infection in During intubation or tracheostomy.
2. Although they asymptomatic, they still can transmit the infection.
3. It is not reported in SARS nor MERS.

Coronavirus Disease 2019(COVID-19)cont..

COVID-19 Preventative Actions

- Pharmaceutical (vaccination)
- Non-pharmaceutical interventions (masking, physical distancing, hand hygiene).

Vaccination

- Different types and doses.
- Important to use preventive measures even after vaccination.
- **Does not prevent infection but decrease risk of infection and severe disease**

Masks

- Have two or more layers of washable, breathable fabric
- Completely cover the nose and mouth
- In a community setting, cloth masks or surgical mask are enough
- During aerosol generating procedures in a healthcare setting N95 is preferred.

Standard Precautions: are a set of practices that apply to the care of patients in all healthcare settings at all times.

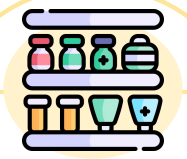
Hand hygiene

Personal protective equipment (PPE)

Respiratory hygiene and cough etiquette

Cleaning and disinfection of devices and environmental surfaces

Safe injection practices



Medication storage and handling

Coronavirus Disease 2019(COVID-19)cont..

COVID-19 PPE(Personal Protective Equipment)

Used before entering the room of suspected or confirmed COVID-19 patients.

- Use a medical mask (at least a surgical/medical mask)[1]
- Wear eye protection (goggles) or facial protection (face shield)
- Wear a clean, non-sterile, long-sleeve gown
- Use gloves

COVID-19 Transmission-Based Precautions

For suspected or confirmed COVID-19 patients:

1. **Contact** and **droplet** precautions in addition to standard precautions

2. If aerosol generated procedure -->**airborne precautions**

3. Disposable or dedicated patient care equipment, such as stethoscopes, blood pressure cuffs, should be used[2]

4. Adequately ventilated single rooms or wards are suggested

5. If equipment needs to be shared among patients, it should be cleaned and disinfected between use for each patient using products containing **ethyl alcohol of at least 70%**

6. When single rooms are not available-->suspected patients grouped together with beds at least 1 meter (3ft) apart based on WHO's recommendations,

7. Dedicated bathrooms, cleaned and disinfected at least twice daily.

8. Designating healthcare workers to care for patients with COVID-19 and restricting the number of visitors[3]

Transportation: avoided unless medically necessary; patient-> mask, Healthcare workers-->appropriate PPE when transporting patients.

1. In hospital settings, cloth mask is not enough, the mask should be at least surgical mask or N95
2. Disposable equipments are better to use. However, some equipments can not be disposed so it should be dedicative.
3. Health Workers who work in COVID- 19 wards are restrictive to give care to those word only in order to limit the transmission.

Coronavirus Disease 2019(COVID-19)cont..

COVID-19 Infection prevention and control (IPC) Priorities:

Rapid identification of suspect cases
- Screening/triage and rapid implementation of source control
- Limiting entry of healthcare workers visitors

Immediate isolation and referral for testing
- Group patients with suspected or confirmed COVID-19 separately
- Test all suspected patients for COVID-19

Safe clinical management
- Immediate identification of inpatients and healthcare workers with suspected COVID-19

Adherence to IPC practices
- Appropriate use of personal protective equipment (PPE)
- Stress on the importance of vaccination to hcw and community

COVID-19 in Saudi Arabia: the national health response:

Country-level coordination, planning and monitoring
- National emergency response committee
- Risk assessment tool for mass gathering events

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Risk assessment and community engagement

Surveillance, rapid response team and case investigation
- Health electronic surveillance network
- Mass screening programs (mawed, tetaman, tawakalna)

Points of entry, international travel and transport

Maintaining essential health services and systems (virtual clinics)

COVID-19 vaccination

Research

National laboratories

Infection prevention and control
- Health care awareness guidance
- Public awareness guidance

Case management
- Readiness of healthcare facilities in SA (mawed, tawakalna, tabaod)
- Quarantine process
- Free healthcare services
- National treatment protocol (best evidence)

Operational support and logistics
- Inventory control (availability of medical stocks, national factories: masks, sanitizers, ventilators)
- Electronic health support
- Community volunteering

Practice Questions

1. In which year SARS outbreak appears?

A. 2005	B. 2003	C. 2012	D. 2019

2. Which one of these countries has an outbreak of MERS outside the arabian peninsula :

A. Japan	B. China	C. Korea	D. India

3. A one which was previously controlled but once again has risen to be a significant health problem. Is the description of :

A. Emerging	B. Re-emerging	C. Pandemic	D. Endemic

4. During aerosol generating procedures in a healthcare setting you should wear:

A. Homemade Mask	B. N95	C. Paper Mask	D. Nothing

5. when entering a room with suspected COVID-19 patient you should wear:

A. medical mask	B. eye protection (goggles)	C. long-sleeve gown	D. All

6. If equipment needs to be shared among patients, it should be cleaned and disinfected by:

A. ethyl alcohol of at least 70%	B. ethyl alcohol of at least 90%	C. Water	D. No need

Answer key:
1 (B) , 2 (C) , 3 (B) , 4 (B) , 5 (D) , 6 (A)

Team leaders

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سنين الجهد وإن طالت ستُطوى
لها امدٌ وللأمد انقضاءُ

حمداً لله انتهينا من النصف الاول لهذا المقرر. أطباء المستقبل، كونوا فخورين بأنفسكم على هذا الانجاز و الصبر اللي صبرتوه على هالكورس الى وفقكم هذه اللحظة، هذا إن دل دلّ على عزيمتكم واصراركم لبلوغ الهدف.
الله وسدد خُطاكم