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Review article

The Middle east respiratory syndrome (MERS)- Threat to Asian countries

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Abstract

The Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel coronavirus (MERS-CoV) a single-stranded RNA virus of the genus Betacoronavirus that was first identified in Saudi Arabia in 2012. Coronaviruses are a large family of viruses that can cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS). Typical MERS symptoms include fever, cough, and shortness of breath. Gastrointestinal symptoms, including diarrhea, have also been reported. Some laboratory-confirmed cases of MERS-CoV infection are reported as asymptomatic, meaning that they do not have any clinical symptoms, yet they are positive for MERS following a laboratory test. Approximately 35 % of reported patients with MERS have died. Although the majority of human cases of MERS have been attributed to human-to-human infections in health care settings, current scientific evidence suggests that dromedary camels are a major reservoir host for MERS-CoV and an animal source of MERS infection in humans. However, the exact role of dromedaries in the transmission of the virus and the exact route(s) of transmission is unknown. The virus does not seem to pass easily from person to person unless there is close contact, such as occurs when providing unprotected care to a patient. Health care-associated outbreaks have occurred in several countries, with the largest outbreaks seen in Saudi Arabia, United Arab Emirates, and the Republic of Korea. No specific treatment for MERS-CoV infection is currently available. Clinical management includes supportive management of complications and implementation of recommended infection prevention and control measures.

Key Words: The Middle East respiratory syndrome, Coronaviruses, No specific treatment, Transmission unknown, Saudi Arabia

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1. Introduction

After swine flu and Ebola, the Middle East Respiratory Syndrome-Corona Virus (MERS-CoV) is the new global threat that has put many Asian countries, including India, on high alert. This was first identified in Saudi Arabia in 2012 and currently, it affecting 26 countries and 5 continents. The transmission of the virus has occurred in hospitals, including from patients to doctors and between patients, even before MERS-CoV was diagnosed. It is not always possible to identify patients with MERS-CoV at an early stage so to assess the transmission of disease supplemental surveillance strategies is urgently needed beyond the currently recommended measures. According to the WHO, 1,244 MERS cases have been reported globally to date, with at least 446 deaths. [1-3]

Definition

Middle East Respiratory Syndrome (MERS) is an illness caused by a virus (more specifically, a corona virus) called the Middle East Respiratory Syndrome Corona virus (MERS-CoV), it mainly affects the respiratory system. Most MERS patients developed a severe acute respiratory illness with symptoms of fever, cough, and shortness of breath. About 3-4 out of every 10 patients reported with MERS have died. [4]

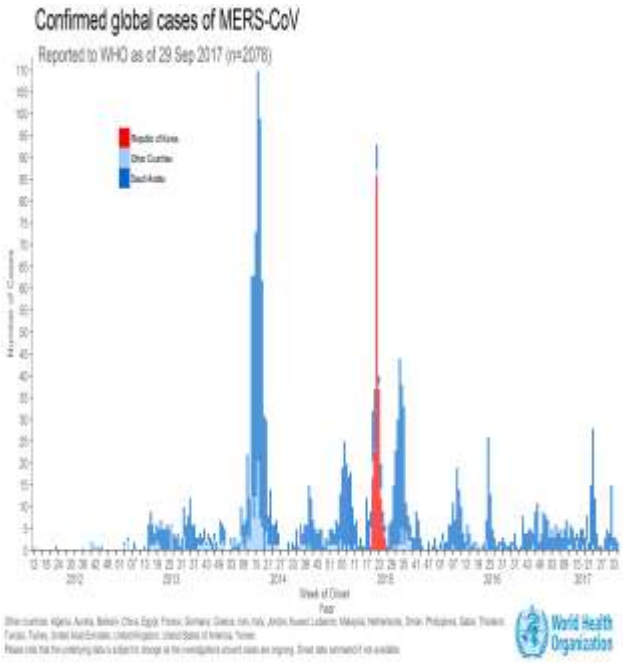

Figure No 1: Global Cases of MERS- CoV between 2012 to 2017

Source of the virus

MERS-CoV is a zoonotic virus that is transmitted from animals to humans. The origins of the virus are not fully understood but, according to the analysis of different virus genomes, it is believed that it originated in bats and was transmitted to camels sometime in the distant past. [5]

Mode of transmission
Animals to human transmission

The route of transmission from animals to humans is not fully understood, but camels are likely to be a major reservoir host for MERS-CoV and an animal source of infection in humans. Strains of MERS-CoV that are identical to human strains have been isolated from camels in several countries, including Egypt, Oman, Qatar, and Saudi Arabia.

Human to human transmission

MERS-CoV, like other coronaviruses, is thought to spread from an infected person's respiratory secretions, such as through coughing. However, the precise ways the virus spreads are not currently well understood.

MERS-CoV has spread from ill people to others through close contacts, such as caring for or living with an infected person. Infected people have spread MERS-CoV to others in healthcare settings, such as hospitals. Researchers studying MERS have not seen any ongoing spreading of MERS-CoV in the community. [6-8]

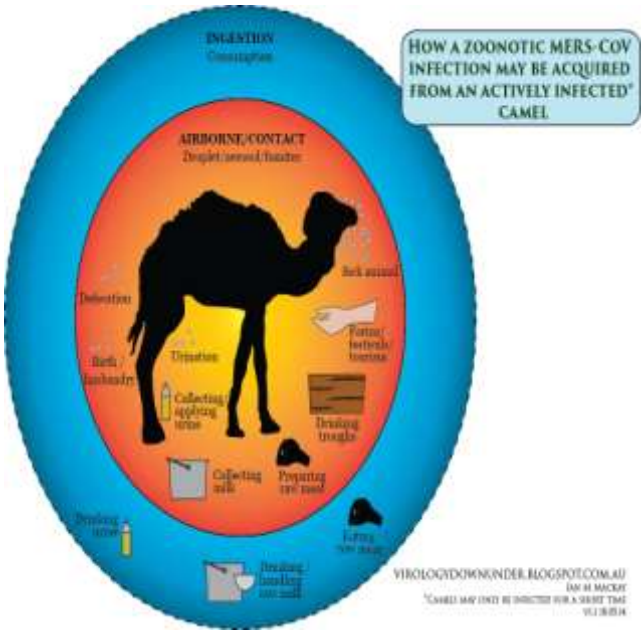

Figure No 2: Mode of Transmission of MERS- CoV (Animal to Humans)

Risk factors

- Recent Travelers from the Arabian Peninsula
- Close Contacts of a Confirmed Case of MERS
- Healthcare Personnel Not Using Recommended Infection-Control Precautions
- People with exposure to camels

Table No 1: MERS-CoV symptoms reported by healthcare personnel, King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia

Symptom	Seropositive, no./No.† (%)	Seronegative, no./No.† (%)	p-value
Muscle pain	13/20 (65.0)	66/260 (25.4)	0.0001
Fever	12/19 (63.2)	42/258 (16.3)	<0.0001
Dry cough	11/20 (55.0)	80/262 (30.5)	0.02
Headache	11/20 (55.0)	80/262 (30.5)	0.02
Diarrhea	7/20 (35.0)	21/262 (8.0)	0.0001
Nausea	7/20 (35.0)	18/262 (6.9)	<0.0001
Shortness of breath	7/20 (35.0)	32/261 (12.3)	0.005
Runny nose	6/19 (31.6)	92/263 (35.0)	0.76
Chills	6/20 (30.0)	23/261 (8.8)	0.003
Sore throat	5/20 (25.0)	118/263 (44.9)	0.08
Vomiting	4/20 (20.0)	10/262 (3.8)	0.01
Productive cough	3/18 (16.7)	39/263 (14.8)	0.74
Rash	1/20 (5.0)	4/259 (1.5)	0.26
None	3/20(15.0)	94/263 (35.7)	0.019

Clinical presentation

Most people confirmed to have a MERS-CoV infection have had a severe acute respiratory illness with symptoms of:

- Fever
- Cough
- Shortness of breath

Some people also had gastrointestinal symptoms including diarrhea and nausea/vomiting. For many people with MERS, more severe complications followed, such as pneumonia and kidney failure. About 3-4 out of every 10 people reported with MERS have died. Most of the people who died had an underlying medical condition. Some infected people had mild symptoms (such as cold-like symptoms) or no symptoms at all; they recovered.

Figure No 3: Symptoms of MERS- CoV

Based on what researchers know so far, people with pre-existing medical conditions (also called comorbidities) may be more likely to become infected with MERS-CoV, or have a severe case. Pre-existing conditions from reported cases for which we have information have included diabetes; cancer; and chronic lung, heart, and kidney disease. Individuals with weakened immune systems are also at higher risk for getting MERS or having a severe case. [9-10]

Clinical course

The median incubation period for secondary cases associated with limited human-to-human transmission is approximately 5 days (range 2-14 days). In MERS-CoV patients, the median time from illness onset to hospitalization is approximately 4 days. In critically ill patients, the median time from onset to intensive care unit (ICU) admission is approximately 5 days, and median time from onset to death is approximately 12 days. In one series of 12 ICU patients, the median duration of mechanical ventilation was 16 days, and median ICU length of stay was 30 days, with 58% mortality at 90 days. Radiographic findings may include unilateral or bilateral patchy densities or opacities, interstitial infiltrates, consolidation, and pleural effusions. Rapid progression to acute respiratory failure, acute respiratory distress syndrome (ARDS), refractory hypoxemia, and extra pulmonary complications (acute kidney injury requiring renal replacement therapy, hypotension requiring vasopressors, hepatic inflammation, and septic shock) has been reported. [11-13]

Laboratory findings

Laboratory findings at admission may include leukopenia, lymphopenia, thrombocytopenia, and elevated lactate dehydrogenase levels. Co-infection with other respiratory viruses and a few cases of co-infection with community-acquired bacteria at admission has been reported; nosocomial bacterial and fungal infections have been reported in mechanically-ventilated patients. MERS-CoV virus can be detected with higher viral load and longer duration in the lower respiratory tract compared to the upper respiratory tract and has been detected in feces, serum, and urine. However, very limited data are available on the duration of respiratory and extra pulmonary MERS-CoV shedding. [14-15]

Prevention
Animal to human transmission:

1. Practicing of general hygiene measures, including regular hand washing before and after touching animals, and should avoid contact with sick animals.
2. Avoiding consumption of raw or undercooked animal products, including milk and meat, carries a high risk of infection from a variety of organisms that might cause disease in humans.
3. Camel meat and camel milk are nutritious products that can continue to be consumed after pasteurization, cooking, or other heat treatments.
4. The patients with diabetes, renal failure, chronic lung disease, and immune compromised persons are considered to be at high risk of severe disease from MERS-CoV infection. So, they should avoid contact with camels, drink raw camel milk or camel urine, or eat meat that has not been properly cooked.

Human to human transmission:

CDC routinely advises that people help protect themselves from respiratory illnesses by taking everyday preventive actions:

- Wash your hands often with soap and water for 20 seconds, and help young children do the same. If soap and water are not available, use an alcohol-based hand sanitizer.
- Cover your nose and mouth with a tissue when you a cough or sneeze, then throws the tissue in the trash.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Avoid personal contact, such as kissing, or sharing cups or eating utensils, with sick people.

- Clean and disinfect frequently touched surfaces and objects, such as doorknobs.

Clinical management and treatment

No specific treatment for MERS-CoV infection is currently available. Clinical management includes supportive management of complications and implementation of recommended infection prevention and control measures [16]

Interim infection prevention and control recommendations for hospitalized patients with Middle East respiratory syndrome corona virus

1. Minimize chance for exposures

Ensure facility policies and practices are in place to minimize exposures to respiratory pathogens including MERS-CoV. Measures should be implemented before patient arrival, upon arrival, and throughout the duration of the affected patient's presence in the healthcare setting.

2. Ensure adherence to standard, contact and airborne precautions

Standard precautions assume that every person is potentially infected or colonized with a pathogen that could be transmitted in the healthcare setting. Elements of standard precautions that apply to patients with respiratory infections should be followed. Attention should be paid to training and proper donning, doffing and disposal of any personal protective equipment.

3. Manage visitor access

- Establish procedures for monitoring, managing, and training visitors.
- All visitors should follow respiratory hygiene and cough etiquette precautions while in the common areas of the facility.
- Restrict visitors from entering the MERS-CoV patient's room. Facilities can consider exceptions based on end-of-life situations or when a visitor is essential for the patient's emotional well-being and care.
- Visitors who have been in contact with the patient before and during hospitalization are a possible source of MERS-CoV for other patients, visitors, and staff.

4. Implement engineering controls

Consider designing and installing engineering controls to reduce or eliminate exposures by shielding HCP and other patients from infected individuals. Examples of engineering controls include physical barriers or partitions to guide patients through triage areas, curtains between patients in shared areas, closed suctioning systems for airway suctioning for intubated patients, as well as appropriate air-handling systems (with appropriate directionality, filtration, exchange rate, etc.) that are installed and properly maintained.

5. Train and educate healthcare personnel (HCP)

- Provide all HCP with job- or task-specific education and training on preventing transmission of infectious agents, including refresher training.
- HCP must be medically cleared, trained, and fit tested for respiratory protection device use (e.g., N95 filtering face piece respirators), or medically cleared and trained in the use of an alternative respiratory protection device (e.g., Powered Air-Purifying Respirator, PAPR) whenever respirators are required.
- Ensure that HCP are educated, trained, and have practiced the appropriate use of PPE prior to caring for a patient, including attention to correct use of PPE and prevention of contamination of clothing, skin, and environment during the process of removing such equipment.

6. Implement environmental infection control

- Ensure that cleaning and disinfection procedures are followed consistently and correctly.
- Standard cleaning and disinfection procedures are appropriate for MERS-CoV in healthcare settings, including those patient-care areas in which aerosol-generating procedures are performed.

7. Establish reporting within hospitals and to public health authorities

- Implement mechanisms and policies that promptly alert key facility staff including infection control, healthcare epidemiology, hospital leadership, occupational health, clinical laboratory, and frontline staff about suspected or known MERS-CoV patients.
- Communicate and collaborate with public health authorities.
    - Promptly notify public health authorities of suspected or known patients with MERS-CoV.
    - Facilities should designate specific persons within the healthcare facility who is responsible for communication with public health officials and dissemination of information to HCP. [17]

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