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Middle East Respiratory Syndrome Coronavirus: Review on Infectious Complications

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Abstract: Present study aimed to review the Middle East respiratory syndrome (MERS) where it may cause viral respiratory illness and also of it's different from Severe Acute Respiratory Syndrome (SARS). Differentially, MERS virus does not appear to be as easily spread between people, whereas the SARS virus spreads very easily and a severe MERS case can cause renal failure, unlike SARS. Prevalence and Incidence rate of the virus happens to be circulating widely throughout the Arabian Peninsula. Currently, all known cases can be directly or indirectly linked to Middle East includes Jordan, Kuwait, Oman, Qatar, Saudi Arabia (KSA), United Arab Emirates (UAE), Yemen and Lebanon. Cases that have been reported outside the Middle East first developed infection in the Middle East and then were exported outside the region. Till now, 22 countries have been affected and globally, 835 laboratory-confirmed cases of infection with MERS-CoV. It has been officially reported till July 14, including 322 deaths. The mode of transmission for MERS-CoV is still a mystery but experts believe that the main way it spreads is through close contact with an infected person. The people who have been recently infected by MERS have all been in a health care facility or among close family members. As per WHO, this upsurge Jeddah's cases can be explained by several hospital-acquired outbreaks that resulted from a lack of systematic implementation of infection prevention and control measures.This review explores the study possibilities to understand this and find out some treatment processes. Unfortunately, there are no treatments available to cure the infection but there are precautions that you can take to protect yourself against infections. However, medical care is provided to support and relieve the signs and symptoms of MERS.

Key words: MERS-Cov · SARS · Viral Infections

INTRODUCTION

Corona virus is accountable to an approximate of 1 of every 3 cases of common cold. Coronavirus belongs to a large family of viruses, widespread in bats but can be found in many other species as well, including birds, cats, dogs, pigs, mice, horses, whales and humans. Apart from illnesses in animals, coronavirus cause a range of illnesses in humans, as common as cold to as critical as severe acute respiratory syndrome (SARS) [1]. On June 24, 2012, a 60 year-old male resident of Saudi Arabia, died from severe pneumonia complicated by renal failure [2] and was reported to have been infected by a novel coronavirus. Its genome was isolated, sequenced and the genetic code put in the public domain. Again on September 22, 2012 the United Kingdom (UK) informed WHO of a case of acute respiratory syndrome with renal failure and with a recent travel to Saudi Arabia and Qatar. This case presented with similar symptoms as that of the case one. The Health Protection Agency of the UK (HPA) compared information from the clinical sample collected in this case with that of a virus sequenced from the first case and confirmed the presence of a novel coronavirus [2,3].

In November 2012, more cases with similar symptoms were identified in Qatar (1 case) and Saudi Arabia (3 cases, including 1 death), Jordan (2 fatal). The onset of this new disease can be mapped back to April 2012, a group of 11 health care workers with severe lower respiratory infection occurred in an intensive care unit of a hospital in Zarqa, Jordan. Subsequently, two of these cases were confirmed to have been infected by this novel corona virus [4]. This resulted in a total of nine

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laboratory-confirmed of novel coronavirus [5-7]. Even though these nine cases correspond to the WHO's definition of probable novel coronavirus infections but their severity was less than the confirmed cases. By this time, it was not possible to confirm its virology or serology.

By May 12, 2013 laboratory-confirmed cases rose to 34, though the number of cases was restricted but the morbidity and mortality of the infection was disquieting. There was an uncanny resemblance of it with the severe acute respiratory syndrome (SARS), especially in its clinical features. Patients of these cases developed mild disease, mostly presented with a severe acute respiratory condition requiring hospitalization. Mortality rate in these patients was approximately 60% [8].

To facilitate communication about the disease and to provide uniformity, on May15, 2013 the coronavirus study group of the International committee on taxonomy of viruses named the new virus as Middle East respiratory syndrome coronavirus (MERS-CoV) [8-10]. MERS is defined as a viral respiratory disease caused by Middle East respiratory syndrome coronavirus (MERS-CoV, HCoV-EMC/2012). MERS-CoV is comparatively a new Coronavirus strain and much more fatal when compared with any other Coronavirus.

MERS is gaining the ability to spread further and faster and has become a cause of concern because of its high fatality rate as compared to other viruses, at the same time it has a low risk of spreading among public members. As per WHO, it is not a public health emergency but it is recommended to be familiar with this virus and take adequate precautionary measures to safeguard ourselves.

Signs and Symptoms of MERS: The signs and symptom reported are similar to those found in SARS-CoV (Severe acute respiratory syndrome) cases. However, SARS infections did not cause renal failure, unlike MERS-CoV. A usual MERS case presents fever, cough, mucous, chest pain and shortness of breath. Gastrointestinal distress, including diarrhea have also been reported. Pneumonia is commonly found on examination and severe cases presented respiratory failure which required mechanical ventilation and support in an intensive-care unit. Some patients have had organ failure, especially of the kidneys, or septic shock.

Not all infected people have symptoms, i.e. some individuals may be infected with MERS-CoV and do not get ill. Two such cases were identified, one in Jordan and another one in Illinois where patients were infected with the virus and have not shown any symptoms. According to Mark Pallansch, PhD, director of the Division of Viral Diseases, CDC, if people can become infected and have no symptoms, than it can be reckoned that there may be people out there who are not sick unwittingly spreading the virus [11].

Based on the information we have to date, the incubation period for MERS (time between when a person is exposed to MERS-CoV and when they start to have symptoms) is 2 - 14 days [12]. People with weekend immune system, older people or with pre-existing major medical conditions such as diabetes, chronic lung and heart disease, cancer and kidney disease are more vulnerable to this infection and its complication. [13].

Origin and Transmission Mode of MERS-CoV: A great deal has been learned about MERS-CoV and the disease syndrome since the first case was reported in 2012, but its origin has still been a mystery. Various theories have come from the time of the first case reported to WHO. Initially, it was suspected that the virus was of animal origin and subsequent observations corroborated this view. Later on evidences suggested that the virus is most closely related genetically to viruses found in a number of species of old world and new world insectivorous bats [14-18,1,8] Initial results from a continuing investigation in Qatar show that people who do not have regular close contacts with camels at a lower risk of MERS-CoV infection than people working closely with camels (e.g. farm workers, slaughterhouse workers and veterinarians). Antibodies to MERS-CoV have been investigated for animals, including goats, cows, sheep, water buffalo, swine and wild birds in Qatar and several other countries, with negative results [19]. It can be inferred from this investigation that the probability of other animals having a significant role in transmission of MERS-CoV is very low. It is substantiated by the researches that the likelihood of camels having a considerable role in infecting humans with MERS-CoV is very high [19-21].

Transmission pattern of MERS-CoV is still a mystery. There was a sharp increase in number of laboratory-confirmed MERS-CoV cases reported to WHO in mid-March 2014 to early-May 2014. Large number of cases that has been reported from Saudi Arabia and UAE, can be explained by the numerous hospital-acquired outbreaks in this region. Health care workers have been infected across the country, including Jeddah, Riyadh, Tabuk, Asir and Medina. As per WHO, lack of efficient and systematic implementation of infection prevention and control measures in health care settings resulted in

this upsurge in Saudi Arabia's cases [22-24]. Since mid-March 2014, an upsurge has also been seen in the number of cases acquiring infection from non-human sources. The noticeable increase in primary cases occurring from unidentified reasons may be linked to the weaning of young camels from their mothers in the spring of each year. On the other hand, animal exposures have not been reported in several MERS-CoV infected community cases. The absence of animal exposure reflects the likelihood of either person-to-person transmission or exposure to another source [25].

Transmission of MERS-CoV is not yet fully understood. Infection among family members, patients and healthcare workers suggests human-to-human transmission whereas, results from the antibody investigation suggests camels to be the primary source of the MERS-CoV that is infecting humans. According to WHO, the recent transmission pattern of disease seems to be the result of frequent presentations of the virus from camels to people, resulting in restricted human-to-human transmission, but not in sustained transmission [19]. Therefore, further epidemiological investigation of outbreaks has now become imperative to discover the route of transmission, whether direct or indirect, between camels and people, to preclude transmission of the virus.

The median age of persons with laboratory-confirmed MERS-CoV infection is 49 years (range = <1-94 years); 346 (65%) cases are in males and 104 (19%) occurred in health-care workers. Although 62% of cases involved severe respiratory illness requiring hospitalization, 32 (5%) occurred in persons who had mild symptoms or illness not requiring hospitalization and 110 (21%) were asymptomatic, generally as a result of contact investigations [24].

Where is MERS Occurring?: Arabian Peninsula appears to be extensively affected by MERS-CoV, presumably the virus is circulating widely throughout this geographic region. Currently, all known cases can be directly or indirectly linked to the Middle East include Jordan, Kuwait, Oman, Qatar, Saudi Arabia (KSA), United Arab Emirates (UAE), Yemen, Lebanon, Egypt and Iran [26,27].

The cases that have been reported outside the Arabian Peninsula are all travel-related cases. Infections were first developed in the Arabian Peninsula and then were exported outside the region. These cases did not appear to have infected others in their countries. Countries with travel-associated cases are Africa: Algeria and Tunisia; Europe: France, Germany, Greece, Italy, Netherlands and the United Kingdom; in Asia: Malaysia and Philippines; and North America: the United States of America (USA) [28,23].

Incidence Rate: Ministry of health, Saudi Arabia reported an upward trend in the incidence of MERS cases from the mid-March, 2014 to the early-May, 2014 with a decline in second week of May, 2014 [29]. On June 3, 2014, the Ministry of Health, Saudi Arabia reported 113 previously unreported cases which lead to 20% increase in the cumulative number of cases. Of these 113 cases, 92 cases were fatal thus increasing the mortality rate from MERS-CoV in Saudi Arabia by 48% and raising the case-fatality ratio (CFR) from 33% to 41% [30].

Between June 4, 2014 and July 2, 2014, 25 cases of MERS-CoV reported by Ministry of Health, Saudi Arabia, 1 case by health authorities of United Arab Emirates and Iran each, demonstrating a decline in the number of cases. The most recent case was reported on July 10, 2014 in Saudi Arabia resulting Saudi Arabia's MERS count to 721 cases with 295 deaths [31,32] and making a total of 851 cases of MERS and 324 deaths worldwide [33]. Recently, MOH, Saudi Arabia reported an upward trend in MERS-CoV cases between last week of March and first week of May [34].

Treatment and Prevention: According to the US Centers for Disease Control and Prevention (CDC) and WHO, vaccines or specific treatments are not available yet to cure the infection. Supportive medical care that is providing treatment to prevent, control or relieve complications and side effects, as well as attempting to improve the patient's comfort and quality of life is the only resolution so far [35].

Precautions That Can Be Taken to Protect Against Infections:

- Avoid direct or close contact with people suffering from acute respiratory infections. Make sure to frequently disinfect common surfaces such as door knobs and tables with an antibacterial cleanser.
- Wash hand frequently with soap for at least 20 seconds, especially after immediate contact with infected people or their surroundings. If no soap is available, use an alcohol-based hand sanitizer.
- Avoid touching your nose, mouth and eyes with unclean hands, as they are the common ways for a virus to enter your body.

- Adhere to food safety and hygiene directives such as avoid unsafe water or undercooked meats, raw fruits and vegetables unless they have been skinned.
- Avoid close contact with live farm or wild animals.

Who Advises to Health Care Workers?: As per center for disease research and policy 25% of recent Saudi MERS patients were health care workers [25]. WHO advises health care facilities to take suitable measures to lower the risk of transmission of virus from an infected patient to other patients, health care workers and visitors while taking care of confirmed or suspected cases of MERS-CoV infection. Early identification of MERS-CoV infected patients is not every time possible as some have mild or atypical symptoms. Therefore health care workers are advised to exercise national or international guided infection control measures not only for caring patients under investigation for MERS-CoV but also caring for patients in all situations.

Who Advises to Travelers?: Even though the source of MERS-CoV and its transmission pattern is unidentified, it is advisable for all travelers to take preventive measures to minimize the common risk of infection. WHO does not impose any travel or trade limitations in regards to MERS-CoV though, WHO advocates European Union citizens to be conscious of the incidence of MERS-CoV and its related infection when travelling to the Arabian Peninsula and neighboring countries. It would be prudent for pilgrims to consult a health care giver before travelling to evaluate the risk and assess whether making the pilgrimage is advisable.

People who have travelled to the Middle East and have developed symptoms either during travel or after their return are advised to seek medical attention and to share their travel history. People having symptoms of acute respiratory infection should observe cough etiquette that is to keep distance, cover coughs and sneezes with disposable tissues or clothing and wash hands and to delay travel until they asymptomatic.

Summary and Risk Assessment: In 2012, a deadly novel coronavirus was first identified in Saudi Arabia causing viral respiratory disease from the common cold to Severe Acute Respiratory Syndrome (SARS). The Coronavirus Study Group of the International Committee on Taxonomy of Viruses named this Middle East respiratory syndrome coronavirus (MERS-CoV). So far, 851 cases of MERS-CoV infection have been identified. Sudden increase in number of cases during March to May 2014 can be associated with the reported health care-related infections. It can transmit from person-to-person and circulate easily in a hospital setting with "considerable morbidity". In some communities, people have become ill but no potential source of infection has been found. It is possible that these persons were infected by exposure to an animal or perhaps another source or person. It is now clear that the virus does transmit from person to person. However, sustained human-to-human transmission has not been observed. Middle east is believed to be the main source of MERS-CoV infection and, it is highly probable that the cases will continue to be exported to other countries by tourists, travelers, guest workers or pilgrims who might acquire infection following exposure to an animal or human source (Possibly in a health care setting).

In order to restrain the ongoing spread of this virus it has now become imperative to better understand MERS-CoV and investigate its outbreak in detail. An answer to the questions like how humans become infected from animal or environmental source or how much risk is involved is required to investigate. WHO and Ministry of Health, Saudi Arabia are working together to find out answers to these questions. They are monitoring the situation worldwide to prevent its transmission from the assumed animal reservoir to humans and identify the risk factors involved in health care settings and strengthen surveillance for community-acquired pneumonia. Until more is understood about the transmission pattern of MERS-CoV and its contact to human and non-human sources or environmental exposures in health care settings and systematic implementation of infection prevention and control measures, cases will continue to be reported.

Conflict of Interest: Authors have no any conflict of interest.

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