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COMMITMENT TO DEVELOPMENT

RESEARCH REPORT

ADVISORY PANEL ON THE QUESTION OF PERSIAN GULF (APQ)

COMBATTING THE SPREAD OF MERS-COV DISEASE IN THE MIDDLE EAST

IRIS BENARDETE

Basic Overview of the Issue

Middle East respiratory syndrome coronavirus (MERS-CoV) is an emerging virus that was first seen in humans in June 2012.

In September 2012, Dr. Ali Mohamed Zaki reported the virus on ProMED-mail, the internet infectious disease alert system run by the International Society for Infectious Diseases. The patient, a 60-year-old male from Saudi Arabia had died from an unknown viral infection in June 2012. This disease, later named the MERS-CoV, is an emerging viral disease which has now caused more than 2,200 laboratory-confirmed infections in people from 27 countries, and close to 800 deaths. The majority of these cases have been reported in Saudi Arabia, however, MERS-CoV is considered a severe emerging disease with the potential to cause a major global health emergency. Currently, MERS-CoV continues to infect humans with a fatality rate of 35%. Further, MERS-CoV is a zoonotic virus. The virus was believed to have originated from bats but it was understood that humans likely acquired MERS-CoV from dromedary camels.

Human to human transmission of MERS-CoV does occur, but it is limited mostly to health care environments. The incidence of hospital infections has been reduced with the employment of strict infection control measures such as ensuring the availability of hand hygiene products more frequently within the hospital or educating and creating the necessary awareness amongst the hospital employees. The international public health community remains on high alert for new introductions.

In 2015, South Korea saw the largest outbreak of MERS-CoV outside of the Eastern Mediterranean with 186 confirmed cases and 38 deaths. New cases of MERS-CoV infection continue to be reported mostly from the Eastern Mediterranean. With no specific treatments or vaccines, MERS-CoV remains a global research and development priority.

Explanation of Important Terms

Zoonotic virus

Zoonoses, also known as zoonosis or zoonotic diseases, are infectious diseases caused by bacteria, viruses , and parasites that spread between animals and humans.

Dromedary camels

The dromedary, also called the Somali camel, is a large, even-toed ungulate with one hump on its back. The dromedary is the tallest of the three species of camel.

One Health Concept

One Health is defined as a collaborative approach working at the local, regional, national, and global levels with the goal of achieving optimal health outcomes which is defined as "a state of optimal well-being, not merely the absence of disease and infirmity." by the World Health Organization, recognizing the interconnections between people, animals, plants, and their shared environment.

Pathogenesis

The manner of development of a disease.

Transmission cycle

Is the cycle of a virus with a direct transmission from the current to the future host where the virus will reproduce.

Detailed Background of the Issue

Coronaviruses

Coronaviruses are a large group of viruses causing many health problems in various species of animals and humans. Six human coronaviruses have been identified yet. Two of them emerged in the past 15 years, namely, the severe acute respiratory syndrome coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

SARS-CoV emerged in 2003 in China and spread to many countries throughout the world. Approximately 8,000 people were infected, and 10% of them died. Only 9 years later, MERS-CoV emerged in Saudi Arabia. This is a relatively short period for the emergence of a new coronavirus.

MERS-CoV continues to pose great challenges to the healthcare system of some countries in the Middle East and the Arabian Peninsula. Since its discovery late in 2012, there are ongoing reports to the World Health Organization (WHO) from some countries in the Middle

East, especially the Arabian Peninsula, with spread to other countries around the globe. According to the latest WHO statistics, there have been a total of 2,428 laboratory-confirmed cases of MERS-CoV infection, including at least 838 deaths. The continuous ongoing reports on MERS-CoV suggesting the presence of some factors that favor its sustainability in certain regions. There are many uncertain aspects of the virus' evolution, pathogenesis, and transmission cycle.

MERS-CoV may infect a wide group of people ranging from very young ages, even infants less than one year of age, to 109 years of age. However, children are less likely to be infected with MERS-CoV when compared to adults. The reason for this is still not entirely clear and requires further study. The case fatality rate is always very high in patients who are suffering from chronic diseases such as cancer, diabetes, blood pressure, kidney problems, etc. due to their weakened immune systems.

Virus Transmission

The One Health concept is a concept outlining the close interaction among humans, animals, and the environment. Currently, there are two coronaviruses candidates representing the One Health concept, SARS-CoV and MERS-CoV. Animals play important roles in the transmission cycle of both viruses. Both viruses were proved to be of zoonotic origin. Many studies made a direct link between the exposure to camels and its meat and milk products and MERS-CoV human cases.

Figure 2: Geographic distribution of dromedary

Animal-to-human Transmission

Since the discovery of MERS-CoV late in 2012, many analysis groups have probe for its potential animal reservoirs. Dromedary camels are the only presently proven reservoir for MERS-CoV. Impressively, others were able to trace the virus back 30 years ago in dromedary camel specimens in detailed studies. All these data suggest that the virus has been circulating for decades without being noticed. Although the actual and typical clinical features of the MERS-CoV natural infection in dromedary camels is not well registered to date, very few studies reported these patterns under experimental infection approaches. These findings suggest differential patterns of

MERS-CoV infection between natural and experimental approaches. Further studies are required to understand the natural MERS-CoV infection in dromedary camels, which may be attained by conducting long-term longitudinal studies as well as careful monitoring of the virus infection in large populations of camels.

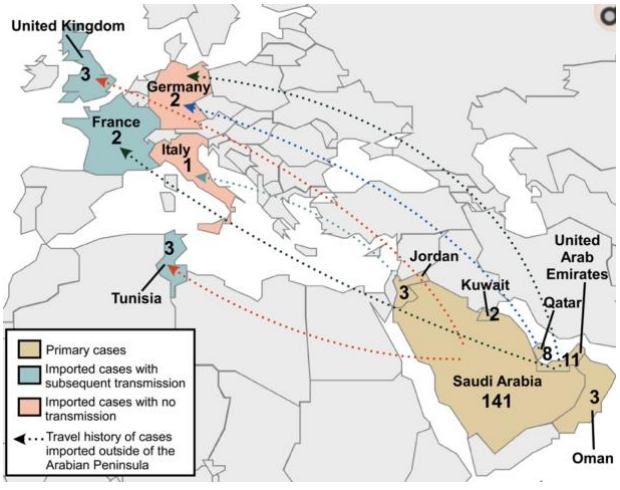
Human-to-human Transmission

Human-to-human transmission is reported in many cases. Moreover, many family clusters and hospital outbreaks were reported in the past 5 years. This confirms the potential spread of MERS-CoV among those who are in close contact with the population. The most at-risk groups are healthcare workers including nurses, medical doctors, and other hospital staff and the elderly with underlying chronic diseases. Since dromedary camels are mostly seen in the Middle East as seen in figure 2, MERS-CoV travel-associated infections were in many cases associated with the Middle East.

Among these reported was the Korean outbreak in early 2015. One Korean citizen visited numerous countries in the Middle East and then returned home ill. This individual visited several healthcare facilities in Korea; thus resulting in the largest MERS-CoV human outbreak outside the Arabian Peninsula. This outbreak confirmed the human-to-human transmission. During this outbreak, MERS-CoV was isolated from air samples from the hallways of the healthcare facilities close to hospitalized patients. This at least explains in part the rapid development of MERS-CoV hospital outbreaks.

Major Parties Involved

Saudi Arabia



After the first case of infection with human MERS-CoV infection was reported at the end of September 2012, a case definition of MERS was devised and circulated to all healthcare workers across the Kingdom of Saudi Arabia. Active surveillance was introduced, and all patients admitted to hospitals with bilateral pneumonia were screened for MERS-CoV infection. The Ministry of Health (MoH) which is an innovative, people-centred organisation, committed to medical excellence, the promotion of good health and the reduction of illnesses, issued a requirement that all cases of

MERS-CoV infection must be immediately notified to it. All cases were reported to WHO within 24 hours and information was placed by Saudi Arabia authorities on ProMED which is the internet infectious disease alert system run by the International Society for Infectious Diseases . After the first case was reported officially, experts were invited from the WHO Eastern Mediterranean Regional Office and headquarters, the Centers for Disease Control and Prevention, Atlanta, Georgia, USA, EcoHealth Alliance, and Columbia University.

South Korea

Figure 3: Geographic distribution of the MERS-CoV outbreak

The first case of MERS-CoV in South Korea was reported on 20 May 2015. The South Korean patient who had traveled back from the Middle East went to four different hospitals before being diagnosed with MERS-CoV, nine days after first seeking medical attention. This diagnosis was immediately reported to the Korean Centres for Disease Control and Prevention. By the time the MERS-CoV outbreak in South Korea was declared over at the end of July 2015, there had been 186 reported infections, 38 deaths, and around 16,000 people put under voluntary quarantine. This short outbreak had major economic impacts on South Korea, with sharp declines in consumer spending and tourism.

World Health Organization (WHO)

The World Health Organization is working with public health and animal specialists, clinicians, and scientists in affected and at-risk countries. The organization internationally works on gathering and sharing scientific evidence to obtain a better understanding of the virus and the disease it causes and to determine outbreak response priorities, treatment strategies, and clinical management approaches.

WHO is also working with the Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE) and national governments to develop public health prevention strategies to combat the virus. Together with affected countries and international technical partners and networks, WHO is coordinating the global health response to MERS, including the provision of updated information on the situation and, conducting risk assessments and joint investigations with national authorities.

Chronology of Important Events

Date	Description of Event
24 June 2012	The first confirmed case was reported in a 60-year-old male who died from severe pneumonia and renal failure in Jeddah, Saudi Arabia.
September 2012	A 49-year-old male living in Qatar presented with symptoms similar to the first case.
22 September 2012	The emergence of a novel coronavirus causing severe respiratory disease in two separate parts of the Middle East led to notifications through the International Health Regulations (IHR) and the EU Early Warning and Response System.
November 2012	Four additional cases with similar symptoms were diagnosed in Saudi Arabia and two fatal cases from Jordan were confirmed retrospectively.
7 May 2013	A French resident with a history of travel to Dubai, UAE showed the symptoms of the illness.
18 July 2013	88 confirmed cases of MERS-CoV infections were reported worldwide of which 45 have been fatal.
2 May 2014	The Centers for Disease Control and Prevention (CDC) confirmed the first diagnosis of MERS in the United States.
May 2015	2015 Middle East respiratory syndrome outbreak in South Korea occurred.

27 July 2015	Two patients were treated for suspected MERS virus in the United Kingdom.
May 2019	14 cases of MERS were reported to the World Health Organisation (WHO) by Saudi authorities.

Relevant International Documents

- Middle East respiratory syndrome coronavirus Joint Kingdom of Saudi Arabia / WHO mission, June 4th to 9th, 2013
- Surface sampling of MERS-CoV in health care settings, WHO, January 2019
- Seroepidemiological investigation of non-health care worker contacts of Middle East respiratory syndrome coronavirus (MERS-CoV) infected patients, WHO, January 2019

Past Attempts to Resolve the Issue

There is no specific treatment or vaccine for the infection, and there is no cure yet, but supportive medical care can relieve symptoms and reduce the risk of complications. To reduce the risk of MERS-CoV infection amongst travelers, health authorities have urged travelers to wash their hands frequently, avoid undercooked meat or food prepared under unhygienic conditions, ensure fruit and vegetables are properly washed before consumption, report any suspected case to the local health authorities to help with worldwide disease monitoring and minimize close contact with others if they develop an acute respiratory illness with fever, including wearing a medical mask. They also strongly advise people to seek immediate medical attention if an acute respiratory illness with fever appears within 14 days of returning from travel.

After confirming two cases of MERS-CoV in the United States, the Centers for Disease Control and Prevention (CDC) were opened. These centers recommend investigating any person with fever and pneumonia or acute respiratory distress syndrome, and anyone with a history of travel from countries in or near the Arabian Peninsula within 14 days before symptom

onset, or close contact with a symptomatic traveler who developed fever and acute respiratory illness within 14 days after traveling from countries in or near the Arabian Peninsula.

Solution Alternatives

Firstly, most people are completely unaware of the spreading MERS virus. Awareness should be obtained to be able to take precautions about the situation. World residents traveling to the Middle East need to be informed about the MERS-CoV circulating in these areas, and that close contact with dromedary camels, consumption of raw camel products such as milk, or transmission in hospital settings are the main sources of the disease. Travelers should be made aware of the importance of good hand and respiratory hygiene, and obedience to good food-safety practices. Travelers should also be advised to avoid contact with sick people as much as possible. This is particularly significant for elderly travelers with pre-existing medical conditions like diabetes, chronic lung disease, immunodeficiency, etc. Travelers with pre-existing medical conditions should also be encouraged to enroll in a trusted healthcare facility prior to travel in case of a health emergency during their stay. Also, travelers who demand medical care should minimize contact with other sick people when visiting healthcare facilities since human to human transmission is highly seen in this disease.

Secondly, to stop MERS-CoV outbreaks, there are several strategies to be adopted in the context of the One Health concept. Some strategies are related to the animal, while others are related to human health. The main aim is to minimize or stop the viral shedding from dromedary camels to the environment. This may be achieved in many ways including regular monitoring of the population of dromedary camels. Active animal shedders need to be identified, and quarantine measures should be applied until they stop shedding the virus. Vaccination of young dromedary camel calves should occur during their first 6 months of life, which will minimize the chances of these animals becoming infected and actively passing the virus to older animals and then to the environment. Reorganization and reshaping of the camel industry include allocating the camel markets away from the cities.

Lastly, for the Middle Eastern countries who are already exposed to the disease several measures should be taken. Animal to human transmission can be minimised by the methods listed above. When it comes to minimising human to human transmission, medical centers and hospitals should be the places that measures should be taken first. Doctors and medical attendants should approach the infected people in very high hygienic precautions. The infected

people can also be located in a different section of the hospital to prevent the disease spreading amongst the medical center.

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Useful Links

- A detailed report which tackles the MERS-CoV by the Georgetown University Medical Center: http://www.glopid-r.org/wp-content/uploads/2019/07/Georgetown_MERS-Case-Study-Report-1.pdf

- General overview of the illness: https://www.who.int/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov)

- Further possible solutions: https://isid.org/guide/pathogens/mers/