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The epidemiological characteristics of (COVID-19), recommendations to contain the outbreak in early stage and prevent the disease from getting out of control in Libya.

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Highlights

- Review of Coronaviruses and the history of novel coronavirus-2019.
- Provide epidemiological information of COVID-2019 to guide recommendations for countries, preparedness, and response measures.
- The Epidemiological situation in Libya and how to reduce the risk of occurrence of widespread national community transmission of COVID-19.
- The information on this epidemic changes rapidly and maybe daily.

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ABSTRACT

Coronaviruses (CoVs) are a large family of viruses that cause illness ranging from mild common cold to more severe diseases such as acute respiratory distress syndrome (SARS) in China in 2003, Middle East Respiratory Syndrome (MERS) in Kingdom of Saudi Arabia (KSA) in 2012, and Coronaviruses disease 2019 (COVID-19). COVID-19 is caused by SARS-CoV-2, representing a potentially fatal disease that is of great global public health concern. COVID-19 is suggested to be of zoonotic origin due to the exposure to the wet animal market in Wuhan City in China. Human-to-human transmission of the COVID-19 and direct contact the main mode of transmission. Therefore, the rapid spread of COVID-19 between human transmissions is a big challenge worldwide. As the disease is not completely known, the virus may take off measures by the WHO and the national CDC of Libya should be implemented to suppress the transmission. Ongoing investigations worldwide are important for identifying the animal source and reservoir the disease. Currently no drugs licensed for the treatment or prevention of COVID-19, the WHO and other health organizations should create vaccine or treatment for COVID-19. We highlight in this review article the epidemiology, mode of transmission, symptoms, and recommendations to contain the outbreak in the early stage and prevent the disease from getting out of control in Libya.

1. Introduction

The WHO declared COVID-19 a pandemic due to the progress of geographic spread. Furthermore, the WHO declared the outbreak as a Public Health Emergency of International Concern on 30 Jan 2020 (WHO, 2020). In December 2019, several patients with viral pneumonia were found to be epidemiologically related to Huanan Seafood Market, in Wuhan, Hubei Province in China where non-aquatic animals such as rabbits and birds were on sale. By January 7th, 2020, Chinese scientists have isolated the novel virus and proposed genetic sequencing. The causative agent was named nCoV-2019 was renamed SARS-CoV-2.

On February 11th, 2020, WHO announced the official name for the disease COVID-19. The first two cases of COVID-19 were related to exposure to seafood and animals-located in Wuhan, indicating a possible zoonotic source. The disease was noticed when several patients presented with viral pneumonia. These patients were epidemiologically related to the market where many non-aquatic animals such as birds and rabbits were also in the sale before the outbreak (Euro CDC, 2020).

Coronaviruses (CoV) are a large family of viruses that cause illness ranging from common cold to more severe diseases such as acute respiratory distress syndrome (SARS). Middle East Respiratory Syndrome (MERS) and Coronavirus disease 2019 (COVID-19) (WHO, 2020 & Zaki *et al.*, 2012 & CDC, 2003). As the outbreak of coronavirus disease, 2019 (COVID-19) progresses, epidemiological

data are needed to guide situational awareness and intervention strategies (Sun *et al.*, 2020).

The objectives of this review article are to enhance the understanding of the epidemiology, symptoms, modes of transmission of COVID-19, and to highlight the recommendations necessary to control the spread of this fatal disease.

2. The history of Coronaviruses

Coronaviruses (CoVs) are a group of viruses that co-infect humans and other vertebrate animals. CoVs infections affect the respiratory, gastrointestinal, liver, and central nervous systems of humans, livestock, birds, bats, mice, and many other wild animals (WHO, 2020). Coronavirus disease 19 (COVID-19) which is caused by the SARS-CoV-2 virus is a potentially fatal disease that is of great global public health concern (Xu *et al.*, 2020). Coronaviruses were identified in the mid-1960s. Viruses of the family Coronaviridae possess a single-strand, positive-sense RNA genome ranging from 26 to 32 kilobases in length. Coronaviruses have been identified in several avian hosts, as well as in various mammals: cats, dogs, mice, bats, camels, and masked palm civets (Rothan and Brareddy, 2020 & WHO, 2020).

To date, seven Coronaviruses have been shown to infect humans. Betacoronaviruses are subdivided into 5 subgenera: (Embecovirus, Hibecovirus, Merbecovirus, Nobecovirus, Sarbecovirus). Epithelial cells of respiratory and G.I.T are the primary target cells

(WHO, 2020). Common human Coronaviruses include Betacoronavirus HCoV-OC43, Betacoronavirus HCoV-HKU1 as well as alphacoronavirus HCoV-229E that causes common colds but also severe lower respiratory tract infections in younger and older age groups, Alphacoronavirus HCoV-NL63 is considered an important cause of pseudo croup and bronchiolitis in children. Additional zoonotic Coronaviruses that caused outbreaks in humans: SARS-CoV (2002, betacoronavirus, subgenus: Sarbecovirus) and MERS-CoV (2012), betacoronavirus, subgenus: Merbecovirus). It is suggested that SARS-CoV-2 is divergent enough from SARS-CoV to be considered a new human infecting betacoronavirus (Rothan and Brareddy, et al., 2020). In addition, SARS-CoV-2 has been found genetically similar to SARS-CoV and MERS-CoV (Leung, 2020).

The genetic sequence data of COVID-19 indicated more than 80% identity to SARS-CoV and 50% to the MERS-CoV. Both SARS-CoV and MERS-CoV originate in bats. Accordingly, the evidence from the genetic analysis shows that the COVID-19 belongs to the genus beta-coronavirus, which includes SARS-CoV infecting humans, bats, and other wild animals (WHO, 2020 & Lu Roujian et al., 2020).

Under electron-microscope the virion appeared club shape with spikes peplomer colored red, create the look of a corona surrounding the virion. The virus uses the spike (Spike glycoprotein) to invade human cells. Although polygenetic analysis suggests bats might be the original host, animals sold at Wuhan Seafood Market might be an intermediate host. In addition, structural analysis proposes that SARS-CoV2 binds to Angiotensin-Converting-Enzyme 2 receptor (WHO, 2020).

3. The Epidemiology of COVID-2019

Agent: SAR-COV-2 is a new strain of Coronavirus that has not been previously identified in humans. The Family of Coronaviridae is enveloped single-strand RNA viruses under the order of Nidovirales. They have a characteristic of crown-like surfaces. Subfamily Orthocoronavirinae (Lu Roujian et al., 2020 & WHO China report, 2020).

Host: As to the published report by the Chinese CDC on Feb 18th on the first 72,314 patients: 86.6% of patients were in the age group 30-79 years. Age range: 2-81 years and children <9 years accounted for less than 2.4% of overall cases. Information on cases aged 18 years old and under suggest that there is a relatively low attack rate in this age group (2.4% of all reported patients), severe cases were reported in every age group except children. Elderly aged 80 years or older had the highest mortality at 14.8%. Male to female ratio = 1.06:1. Mortality rate: 2.3%. Mortality among males 2.8%, females 1.7%. The most commonly affected occupations: farmers, laborers, health workers. Yet, the highest mortality was found among retirees. The probability of infection increases rapidly for those traveling/residents in areas of high sustained community transmission. Mortality was high among those with comorbidities such as cardiovascular diseases 10.5%, diabetes 7.3%, hypertension 6%, cancers 5.6%, and those with no co-morbidities: 0.9%, the impact of infection also depends on capacity and availability of health care (WHO China report, 2020). Furthermore, the secondary attack rate varies. In Hubei Province, it was highly spread while in the USA it only happened among few close contacts and has not spread further household SAR in preliminary studies in Guangdong Province 3-10% (WHO China report, 2020).

Environment: Seasonality is uncertain; the virus survives in dry cold conditions. High temperatures and high humidity slow down transmission, very high humidity stops transmission. Warm air holds more moisture and in turn slows the transmission. In humid conditions, small liquid droplets in cough/sneeze gather more moisture as they are expelled and become too heavy to stay airborne. In tropical regions, people cluster indoors during the rainy seasons promoting transmission. Sunlight directly breaks down the viral nucleic acids. Alcohol of concentrations 60% or more readily kills the virus. COVID-19, it starts to show seasonality, may worsen in the southern hemisphere (WHO China report, 2020).

Incubation period: The CDC and the WHO reported the incubation period (IP) for COVID-19 ranges from 2 -14 days, most commonly around five days. A published clinical study on the COVID-19 proposed that the incubation period might be more than 14 days, which is the current quarantine period. So (IP) of COVID-19 is not yet fully understood (Linton et al., 2020 & Leung, 2020 & Backer et al., 2020). Upon the finding of a longer and more volatile incubation period in travelers, the duration of quarantine should be extended to three weeks (Leung, 2020).

Modes of transmissions: The WHO report during previous outbreaks due to other Coronavirus SARS & MERS suggesting that the mode of transmission of Novel (COVID-19), can be similar although, the exact nature of transmission is poorly understood. Current evidence suggests that SARS-COV-2 originates from wild animals. The most likely ecological reservoirs of the virus are bats, There is the possibility that transmission to humans involved an intermediate host, this intermediate animal host could be a domestic animal, a wild animal is still unknown. Up to date, there is an insufficient scientific indication to identify the source or to explain the route of transmission from an animal source to humans (CDC, 2020 & Euro CDC, 2020). Recently, snakes have been suggested as the natural reservoirs of SARS-CoV-2 (Leung, 2020).

Human-to-human transmission of the COVID-19 and direct contacts are the main mode of transmission. Close contact within 6 feet allows respiratory droplets produced during coughing and sneezing to land on the mucosa of the mouth/nose or possibly inhaled into the lungs. The indirect mode of transmission was contact with contaminated surfaces/objects then touching the mouth, nose, or possibly the eyes, however, this is not the main way of transmission. There is increasing evidence that infection is not always confined to the respiratory tract but it also invades neurological tissue. Extensive measures to reduce person-to-person (Lu Roujan et al., 2020). Transmission of COVID-19 has been implemented to control the current outbreak. Special attention and efforts to protect or reduce transmission should be applied in susceptible populations including health care providers, and elderly people (Xu et al., 2020). Human-to-human transmission of COVID-19 largely occurs in close contact including families, There are some oral –evidence of fecal transmission (WHO, 2020 & WHO China report, 2020 & Euro CDC, 2020).

4. Symptoms and signs

After an incubation period of approximately 5.2 days the symptoms of COVID-19 appear, the period from the onset of COVID-19 symptoms to death ranged from 6 to 41 days with a median of 14 days. This period is dependent on the status of the patient's immune system and the age of the patient. It was shorter among patients >70 years old compared with those under the age of 70 (Xu et al., 2020).

Common symptoms at the onset of COVID-19 are fever, cough, and, while other symptoms include headache, cough with sputum, hemoptysis, dyspnea, diarrhea, and lymphopenia. Clinical features revealed by a chest CT scan presented as pneumonia, however, there were abnormal features such as RNA-anemia, acute respiratory distress syndrome, acute cardiac injury, and incidence of grand-glass opacities that led to death. The multiple peripheral ground-glass opacities were observed in subpleural regions of both lungs that likely induced both systemic and localized immune response present in some cases, which led to increased inflammation (XU et al., 2020).

It is important to note that there are similarities in the symptoms between COVID-19 and earlier betacoronavirus such as fever, dry cough, dyspnea, and bilateral ground-glass opacities on chest CT scans (Xu et al., 2020 & Zaki et al., 2013). High-risk groups include close contact with animals; medical staff caring for those infected & family members are all risk groups. More, the disease can be fatal in the elderly and those with pre-existing medical conditions (such as hypertension, heart problems, or diabetes) appear to be more likely to develop serious illness (WHO China report, 2020).

Furthermore, PAN American Health organization for surveillance and reporting the case definition for the suspect case include two groups of people:

1- A person with a severe acute respiratory infection (SARI) with no other etiology that fully explains the clinical presentation and a history of travel to or lived in China in the 14 days prior to symptom onset.

2- A person with any acute respiratory illness who, during 14 days before the onset of illness, had contact with a confirmed or probable case of COVID-19 infection, or worked in or attended a health care facility where patients with confirmed or probable COVID-19 infections were treated.

Moreover, researchers stated that currently there is no specific medication recommended for 2019-nCoV. Antibiotics are not effective against viruses. Some antiviral medications have shown promise in treating MERS and are now being tested for their effectiveness against 2019-nCoV. The COVID-19 treatment is only symptomatic; supportive care with oxygen therapy, fluid management. Experimental vaccines are also in development. A study for genomic analysis for novel coronavirus 2019 reported that spike protein just mapped leading way and opening the door to the development of a vaccine for the treatment of COVID-19 (Lu Roujian et al., 2020 & CDC European, 2020 & Pan, American, 2020 & Epidemiological report Australia, 2020)

Testing for COVID-19 enables infected individuals to be identified and isolated to reduce spread, allows contact tracing for exposed individuals, and provides knowledge of regional and national rates of infection to inform public health interventions. Current diagnostic tests for coronavirus include Reverse transcriptase-polymerase chain reaction (RT-PCR) and High-resolution CT scan (HR-CT). World Health Organization, encouraging countries to “test, test, test” (Watson et al., 2020).

5. Interpreting a COVID-19 test

The detection of the genome of COVID-19 early in the epidemic led to the rapid development of the RT-PCR test. The accuracy of COVID-19 PCR tests reported false-negative rates of between 2% and 29% (equating to the sensitivity of 71-98%), based on negative RT-PCR tests which were positive on repeat testing. Accuracy of PCR varies depending on the sampling method (i.e. broncho-alveolar lavage, sputum, nasal swabs, and throat swabs). Accuracy is also likely to vary depending on the viral load. Additionally, Higher accuracy was noted when specific gene targets were used. In addition to the characteristics of the test itself (sensitivity and specificity), the pre-test probability of disease should also be considered in the process of interpreting a test result. For example, pre-test probability is high in a patient with typical symptoms of COVID-19 and working in a high prevalence region, and negative test results can, therefore, be misleading. False negatives carry big risks; infected patients may be misdiagnosed allowing the spread of disease, and infected healthcare workers risk transmitting COVID-19 to non-infected people. Clear evidence-based guidelines on repeat testing are needed, to reduce the risk of false negatives (Watson, 2020).

6. Recommendations

Due to the COVID-19 pandemic, the guidelines for countries by the emerging COVID-19 are drawn from the Chinese Center for Disease Control and the World Health Organization and the previous studies on the SARS 2003 disease. It is classified into four different groups according to the following (WHO China report, 2020 & CDC, 2020).

6.1. Recommendation for uninfected countries

a. Prepare to immediately activate the highest level of emergency response level with the government and community as a whole. Rapid testing of national preparedness plans for the effectiveness of national resources including rapid case detection and isolation, respiratory support, and contact tracing.

b. Surveillance for COVID-19 must be implemented immediately to contain the spread of the disease once it occurred. All patients with atypical pneumonia must be tested for COVID-19. Also, consider adding COVID-19 testing to an existing influenza surveillance system.

c. Reinforcement of rigorous infection prevention and control measures in health care facilities with a focus on emergency departments and outpatient clinics, which are entry points into the health system.

d. Rapid assessment of how much general populations understand COVID-19 with adjustment on promotional activities and communications with the media (WHO China report, 2020).

6.2. Recommendations for countries with imported cases and/or outbreaks of COVID-19

a. Immediate activation of the highest level of national response management protocols with governmental and societal approaches to ensure containment of COVID-19.

b. Active and meticulous case finding with immediate testing, case isolation, contact tracing, and quarantine.

c. Educate the public of COVID -19 and their role in preventing its spread.

d. Immediate expansion of COVID-19 surveillance by testing all patients with atypical pneumonia and screening of some patients with upper respiratory tract infections or recent COVID-19 exposure. In addition to incorporating COVID-19 to the influenza surveillance system.

e. Development of more stringent measures to interrupt transmission such as the closure of schools and workplaces and suspension of large gatherings.

6.3. Recommendations for the public

a. Recognize that COVID-19 is of international concern but outbreaks can be managed with the right measures and response and that the vast majority of infected people will recover.

b. Immediate adoption of the most important preventive measures e.g. frequent hand washing and covering mouth and nose when sneezing or coughing.

c. To be continuously updated on COVID-19 signs and symptoms (i.e. fever and dry cough), as strategies and response activities will constantly improve based on new information every day.

d. To be prepared to support more stringent COVID-19 response measures such as social distancing and helping elderly and high-risk populations (WHO China report, 2020).

6.4. Recommendations for the international community

a. To recognize the importance of collaboration between nations to face the common threat of COVID-19.

b. Rapid share of detailed information including those about imported cases as required under the International Health Regulations (IHR) to facilitate contact tracing and inform international containment measures.

c. To recognize the changing risk profile of COVID-19 and its trends and control capacities for a reassessment of health measures that might interfere with international travel and trade (WHO-China report & EMRO WHO, 2020).

7. The current epidemiological situation in Libya and how to reduce the risk of occurrence of widespread national community transmission of COVID-19

The first case of COVID-19 in Libya recorded on 24 March 2020 after that there were a total of 2424 cases confirmed up to the date of 24 July 2020, active cases 1863, recovery 504 cases, and deaths 57 cases (NCDC Libya, 2020). Despite that all measures have been taken and clearly illustrated by WHO and CDC, such measures cannot be easily applied and followed due to the social pattern of life in Libya. Few studies were carried on the impact of immigrants and

military fighting on the spread of infectious diseases in Libya. The situation for many migrants and refugees, and military conflicts are very alarming (Dawo, 2020 & EMRO WHO, 2020). Now the disease has moved from the containment stage to the spreading stage as a result of the lack of commitment of citizens to the precautionary measures.

8. Recommendations were applied before and after the emergence of the first COVID- 19 case in Libya (NCDC Libya, 2020 & WHO, 2020 & The Consultative Medical Committee to combat COVID-19 Epidemic, 2020).

a. Official recommendations from health minister/government officials for people all across Libya to practice infection prevention and control in the community, environmental cleaning and ventilation decontamination, and the use of personal protective measures (i.e. rigorous hand hygiene, cough etiquette, and face masks) is recommended in all community settings.

b. The closure of boundaries of Libya as well as prevention of the internal movement between cities for delaying or mitigating a pandemic.

c. Rapid case detection, immediate testing and isolation, contact tracing, and quarantine of close contacts and entry and exit screening of travelers for COVID-19 using thermal scanning and/or symptom screening.

d. Quarantine for 14 days was applied for people with a history of travel.

e. All wedding parties were canceled. In case mass gathering events take place as in funerals or weddings (allow only a limited number of people). Practice physical distancing by strictly maintaining a distance of at least 1 meter between people at all times.

f. Hygiene materials for the care and management of COVID-19 cases.

9. Conclusion

COVID-19 is caused by SARS-CoV-2, the causative agent of a potentially fatal disease that is of great global public health concern. As the disease is still unclear, the virus may take off again and with the upcoming cases in our country, where there is a weak application of the recommendations that illustrated by the WHO and the national CDC of Libya. Overall, the risk of further escalation of the outbreak is very high with the health and safety of the country's entire population are at big risk. The rapid spread of COVID-19 is the biggest challenge. To prevent the disease from getting out of control. We call and recommend serious agreement and needs assessment to save the situation by increasing the awareness of people and health workers will help in breaking the chain of transmission by persuading people and health workers through the media that the epidemic is in a dangerous situation and not reassuring, people must be responsible and respond to health instructions, and it requires always wearing a protective mask when going out and avoiding crowding, and washing hands constantly. Therefore, increasing the awareness of these measures helps to mitigate the impact of the epidemic and to delay the epidemic peak, thus preventing the overwhelming of the health care system. Testing should be necessary for clinically suspected cases or cases that are admitted in any hospitals and dealt with according to the procedures used to protect medical personnel. Furthermore, the Ministry of Health and the National Center for Disease Control must monitor adequate resources to enhance the capacity of the health sector to combat COVID-19 widespread as well as create a program to enhance the immunity of citizens, especially the high risk group. Finally, WHO should have a greater role in Libya due to the refugees and military conflict to conduct life until the epidemic is clear revealed by discovering a vaccine.

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