

# Anticipation of COVID-19 spread and prevention strategies in Saudi Arabia, a leader in worldwide pandemics management

Foziah Alshamrani<sup>a</sup>, Mohammed Almuaigel<sup>b</sup>, Noor Mohammad AlMohish<sup>c</sup>, Fatimah Hassan AlMarhoon<sup>d</sup>, Abdulrahman Alzahrani<sup>e</sup>, Bashaier Gubran AlQahtani<sup>f</sup>

Corresponding author: E-mail: [fshamrani@iau.edu.sa](mailto:fshamrani@iau.edu.sa)  
Phone number: 0501865577  
Imam Abdulrahman bin Faisal University-College of Medicine  
King Fahad Hospital of the University  
Neurology Department  
E-mail: [al.muaigel@hotmail.com](mailto:al.muaigel@hotmail.com)  
E-mail: [Together1995@hotmail.com](mailto:Together1995@hotmail.com)  
E-mail: [FatimahAlmarhoon216@gmail.com](mailto:FatimahAlmarhoon216@gmail.com)  
E-mail: [Bashaier.qahtani@gmail.com](mailto:Bashaier.qahtani@gmail.com)

## Introduction

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. These viruses harboring the largest genome of 26 to 32 kilobases amongst RNA viruses were termed "CoVs" because of their crown-like morphology under an electron microscope [2]. Coronaviruses can cause a variety of severe diseases including respiratory tract diseases and gastroenteritis, and have been identified in mice, rats, chickens, turkeys, swine, dogs, cats, rabbits, horses, cattle, and humans [3-4]. Four human coronaviruses have been identified. HCoV-229E and HCoV-OC43 were identified in the mid-1960s [5], Severe acute respiratory syndrome-related coronavirus (SARS-CoV) causes a life-threatening pneumonia [6], and the most recent one is Coronavirus disease 2019 (COVID-19) disease. Since December 2019, the COVID-19 outbreak has become a pandemic that is threatening global health across the world [7].

Infection prevention and control (IPC) is a scientific methodology and practical solution designed to prevent harm caused by infection outbreak to patients and health care providers. It is grounded in infections, the study of disease transmission, sociology and health system reinforcing. IPC occupies a unique position in the field of patient safety and quality universal health coverage. [8].

Saudi Arabia (SA) had a proactive response which has been recognized by doctors and hospitals around the world. This included temporary prohibitions on Umrah and visiting the Prophet's Mosque due to crowds of visitors from all over the world. Another factor was terminating all forms of public transportation. Additional measures will be discussed in this review in detail.

**Keywords:** Anticipation of COVID-19, spread and prevention, strategies in Saudi Arabia

## Background

In one study a complete and partial genome sequencing on 10 samples (from 9 patients) was performed, and the complete viral genome analysis for COVID-19 revealed that the virus is related with 88% to two bat-derived SARS-like coronaviruses [9]. It is believed that the virus belongs to the *betacoronavirus* genus, and the SARS-CoV-2 cluster is situated with the groups of SARS (Severe Acute Respiratory Syndromes)/SARS-like coronaviruses, with fruit bat

coronavirus HKU9-1 as the immediate outgroup [9]. A recent study pointed out that the similarity between SARS-CoV-2 and BatCoV RaTG13, a virus strain isolated from *Rhinolophus yunnanensis*, was as high as 96.2% [9]. Bats are therefore the most probable source of the virus. Bats can carry many kinds of viruses without becoming ill in response to them [10, 11].

## Epidemiology

The outbreak of COVID-19 was first reported in December 2019 in Wuhan, China, marking Wuhan as the center of the outbreak [12]. Wuhan is located in central China and has a wide range of transport links including airplanes, trains, interstate buses, and private transportation. Within a few weeks, the virus had spread rapidly throughout China, and within one month, to several other countries. **Globally**, as of **28 September 2020**, there have been **33,034,598 confirmed cases** of COVID-19, including **996,342 deaths**, reported to WHO [12]. In **Saudi Arabia**, from **Jan 3 to 28 September 2020**, there have been **333,193 confirmed cases** of COVID-19 with **4,683 deaths** [12].

For mode of transmission of COVID-19, people can catch COVID-19 from others who have the virus. The disease can spread from person to person through small droplets from the nose or mouth, which are spread when a person with COVID-19 coughs or exhales. These droplets land on objects and surfaces around the person. Other people then catch COVID-19 by touching these objects or surfaces and then touching their eyes, nose, or mouth. People can also catch COVID-19 if they breathe in droplets from a person with COVID-19 who coughs out or exhales droplets [14-16].

For the prevention and control of the COVID-19, the main points are hand hygiene, social distancing, and quarantine. With increased testing capacity, detecting more COVID-19 positive patients in the community will also enable the reduction of secondary cases with stricter quarantine rules. [17].

## Clinical presentation

It is important to understand the clinical symptoms of COVID-19, although the clinical symptoms are indicated nonspecific. presentation can vary from being asymptomatic (carrier state), fever, nonproductive cough, dyspnea, myalgia, and fatigue, headache, nausea, and vomiting, diarrhea, anosmia/hyposmia, could be the clinical presentation of COVID-19 [17-19]. Elderlies with

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commodities are prone to have respiratory failure due to severe alveolar damage [20]. Disease onset may progress rapidly to organ dysfunction (e.g., shock, acute respiratory distress syndrome [ARDS], acute cardiac injury, and acute kidney injury) and even death in severe cases [18].

### Diagnosis

History is the first important thing that should be taken from the patient or who contact with COVID-19 patient asked to clarify about any recent travel, contact with a person diagnosed with COVID-19, or with someone recently

arriving from a country known to have COVID-19 being endemic. Nasopharyngeal specimens, deep nasal swabs, throat swabs, or lower respiratory samples (eg, sputum) sent for molecular detection of SARS-CoV-2 by polymerase

**Table 1:** Criteria for Clinical Severity of Confirmed Coronavirus Disease 2019 (COVID- 19) Pneumonia

Types	Findings
Mild	Mild clinical symptoms [fever <38°C (quelled without treatment), with or without cough, no dyspnea, no gasping, no chronic disease] No imaging findings of pneumonia
Moderate	Fever, respiratory symptoms, imaging findings of pneumonia
Severe	Meet any of the followings: a. Respiratory distress, RR ≥30 times/min b. SpO2 <93% at rest c. PaO2/FiO2 ≤ 300 mmHg * Patients showing a rapid progression (>50%) on CT imaging within 24-48 hours should be managed as severe (added in the trial sixth edition)
Critical	Meet any of the followings: a. Respiratory failure, need mechanical assistance b. Shock c. "Extra pulmonary" organ failure, intensive care unit is needed

### Radiology

Radiological examination is important in the diagnosis and treatment of lung diseases [22], and it has great importance in the early detection and management of COVID-19. From the recently published literature, the typical radiological imaging of COVID-19 pneumonia demonstrated clear destruction of the pulmonary parenchyma including interstitial inflammation, extensive consolidation Ground-glass opacity, and Bilateral pulmonary infiltration similar to the previously reported coronavirus infection [23]. However, some patients with COVID-19 pneumonia consistently demonstrated no hypoxemia or respiratory distress during hospitalization.

Thin slice chest CT functions more effective in early detection of COVID-19 pneumonia [24]. Wei Zhao et al [25] presented data on 101 cases of COVID-19 pneumonia and conclude with Patients with confirmed COVID-19 pneumonia have typical imaging features that can be helpful in early screening of highly suspected cases and in evaluation of the severity and extent of the disease.

### Treatment

While some western, traditional, or home remedies may provide comfort and alleviate symptoms of mild COVID-19, there are no medicines that have been shown to prevent or cure the disease. WHO does not recommend self-medication with any medicines, including antibiotics, as a prevention or cure for COVID-19. However, there are several ongoing clinical trials of both western and traditional medicines. WHO is coordinating efforts to develop vaccines and medicines to prevent and treat COVID-19 and will continue to provide updated information as soon as

chain reaction (PCR) are currently the best means of specific diagnosis of COVID-19 in Australia. Fecal samples may also be PCR positive for COVID-19 but the role of the oral-fecal route for transmission remains unclear. Patients with more severe disease tend to have higher viral loads in respiratory samples. Mild cases have been shown to clear the virus earlier, with over 90% returning negative PCR test results by day 10 compared with severe cases who more often remain positive beyond day 10. Viral loads appear to be highest early in the illness. Prolonged viral shedding after the onset of symptoms has been described. The virus has also been detected by PCR in asymptomatic patients with comparable viral loads to those still symptomatic. [21]. Criteria for Clinical Severity of Confirmed (COVID- 19) Pneumonia divided the patients into 4 categories: (A) mild, (B) moderate, (C) severe, and (D) critical shown in table 1 [21].

research results become available [26].

### Kingdom of Saudi Arabia and COVID-19

#### History of COVID-19 in the Kingdom of Saudi Arabia

The first confirmed case of COVID-19 was announced by the Saudi Ministry of Health (MOH) on 2<sup>nd</sup> of March 2020 in Qatif city, located in eastern SA, for an adult recently been in Iran.

#### Measures Taken By the Saudi Government to Fight against COVID-19 [27-29]

According to the plans of the government outlined in the last few months, prioritization of the wellness of the citizens of SA is of utmost importance. The government through different steps enacted both preventive and curative measures for managing COVID-19 spread. One of the major initiatives undertaken was in the suspension of Umrah. The decision arose from the realization that participation in the religious event demands interaction in a common public setting, which exposes the masses to the risk of contracting the disease. The government disclosed to the public of the reasons for this decision and cited measures for addressing related challenges at the national level. The suspension included also holding the use of Gulf Cooperation Council states identity for Saudi travelers in the region and advised them to use the passport instead. Reports issued by the relevant state authorities indicate that the state is cognizant of the possible economic implication of the decision. The suspension of Umrah will equally bear negative consequences. However, the pros of the restrictive initiative outweigh the risks to the economy. The state might opt to allow travel in the long-term results in health and economic

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risks. As things stand, the World Health Organization has hailed the decision as a commendable step towards curbing coronavirus.

Another initiative directed by the state involved the evacuation of ten Saudi students from and other countries. The state reached the decision following the realization that the students posed the risk of contracting the disease and then transferring it to relatives and associates upon return to SA. However, if they remained in China, they would be at risk of contracting the disease, which has the potential to a wide range of different complications. The initiative commenced with the screening of the students in Wuhan, China, for infection with the virus COVID-19. The sampling of the group determined that the students had not yet contracted the virus. However, the State progressed with the quarantine measures for the group as a precaution. The issuance of a statement followed in addition to the creation of a toll emergency line (937) for vulnerable individuals to communicate any concerns or risks associated with COVID-19. The State ensured that the public was informed of the best measures to adopt in the possibility of interaction with the infected. This unified measures at the point of entry and the ministry of health by standardizing precautions. The state encouraged the public to avoid unnecessary travel except in emergency and similar situations. The government of SA also provisioned equipment to the public in its efforts to curb the spread of coronavirus.

Additional measures initiated by the state included monitoring and regulation of the movement of people at points of entry into the country. These areas include airports that serve as a link between the people of SA and people from other parts of the world. The measures aim to avoid the same results as Thailand, Japan, and South Korea, who have suffered for failing to regulate the movement of people at the entry points to their respective countries. SA's government is still enforcing the action besides initiating stringent surveillance in the borders of the country. The state accords travelers from China special attention by conducting screenings that check travelers for the possible symptoms of COVID-19, such as difficulty in breathing, fever, and colds. Beginning February, the SCDC and the MOH coordinated their efforts with directive from the government. The typical measures at the point of entry included routine training of the medical staff to work in collaboration with the state agencies and representatives in tackling the disease. The A group consist of a combination of medical staff and governmental agents checked the health status and travel history of the people at the entry points to the country. The government advises travelers to china in addition to tracking passengers for vulnerabilities. The collaborative endeavors involved both preventive actions and curative treatment for anyone infected –or suspected to be infected– with the coronavirus.

All Saudis outside SA hosted isolated in a comfortable and secured back to the homeland. Suspending holding of events in wedding halls, rest houses, events halls, and hotels. Suspending sport activities, closing gyms and private sports centers. Suspending attendance at workplace in all government facilities for 16 days except for the health, security, military sectors, and the National Cybersecurity center. Closing markets and commercial complexes except pharmacies and grocery activities. Closing men barber shops

and women beauty salons. Restricted orders to take away and delivery in cafes and restaurants. Prevent gatherings in public places such as parks, beaches, resorts, camps, and wild parks. Suspending work attendance in headquarters facilities of private sector organizations. Supporting by 120 billion riyals to mitigate the effects of corona on the economy. A royal order setting a national curfew from 7 pm to 6 am for 21 days to all cities of SA except some area like some parts of AlMadina and some parts of Makkah (the restriction extended for 24 hours). King Salman orders full free COVID19 treatment for citizens, residents, and residency violators. Saudi Arabia started from a complete curfew to increasing the number of non-curfew hours till Complete removal of the curfew and this was done over weeks to months from the stratal of the virus spread in the country. This accompany significant assistant factor to control the spread of virus by cleverly choosing the appropriate time to return to normal and social life. Table (2) The time interval was different among regions of the country depending on the virus spread among each. The more endemic, the more hours of curfew. However, mobility is allowed during the car curfew limit in excluded activities which are food sectors including supplies, bakeries, supermarkets and vegetable stores, poultry shops, meat stores, and factories. Accommodation facilities including furnished apartments and Hotels. The telecom sector including Internet and communication network operators. Financial and insurance sectors. Direct accidents "Najm" and critical health insurance services for authorizations, and remaining insurance services. The health services including pharmacies and the primary healthcare clinics, hospitals and laboratories, factories and laboratories of medical materials and devices. Transport facilities including transport of goods and parcels, Customs clearance warehouses and stores, Logistics facilities and supply chains for food, health, and port operation. Energy sector including fuel stations, emergency services for the electricity company. Water sector including Emergency services for the water company And delivery service for drinking water for homes. E-commerce workers in electronic procurement applications, and delivery of excluded activities. The media sector, with its various means, and the muezzin. For instance, The Ministry of Interior announced that within the framework of the Kingdom's strenuous efforts to confront the effects and consequences of the Coronavirus pandemic, and in order to ensure the sustainability of male and female citizens' access to services without disruption, they decided to extend the validity time of the expired national identity during the time of suspension of attendance at workplaces in government agencies and thus the relevant authorities must accept the expired national identity according to the approved mechanism and for Resident ID for Commercial and industrial occupation was extended for a period of three months which was Free of charge and the extension is done electronically without the need to check passports. Technological solutions have facilitated the completion of services provided by passports through the 'Absher' platform, without the need to review the passports, in a way that contributes to supporting the precautionary measures to confront the Corona virus. The application of the sanctions regime distinguished itself in preventing the Corona pandemic from spreading further. Table (3)

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<b>2020</b>	<b>March</b>	<ul style="list-style-type: none"> <li>○ Suspending entry for the purpose of Umrah.</li> <li>○ Additional precautionary measures at borders of the kingdom.</li> <li>○ Temporarily restricting entry to the Kingdom.</li> <li>○ Suspending entry to Qatif.</li> <li>○ Suspending traveling of citizens and residents.</li> <li>○ Suspending of events and attendance to workplace in all government for 16 days.</li> <li>○ Suspension of all internal flights, buses, taxis, and trains for 14 days.</li> <li>○ Curfew from 7:00 PM to 6:00 AM for 21 days.</li> <li>○ Suspending entry to Makkah, Madinah, and Riyadh and curfew of 24 hours in some area of Makkah</li> <li>○ Extend of suspending attendance at workplaces in all governments, private sectors, international and internal flights until further notice</li> </ul>
	<b>April</b>	<ul style="list-style-type: none"> <li>○ Curfew of 24 hours in Makkah, Jeddah and Madinah.</li> <li>○ Advancing the start time of the curfew first in Dammam, Taif and Qatif to 3:00 pm and then applied for the rest of regions.</li> <li>○ Curfew for 24 hours in Tabuk, Riyadh, Dammam, Dhahran, Al-Hofuf, Taif, Jeddah, Qatif, and Khobar with no entry or exit from them.</li> <li>○ Updating united permission for movement curfew hours for excluded group.</li> <li>○ Isolation of Al-Atheer district in Dammam Samitah and Addayer in Jazan, Al Faisaliah and Al-Fadaliah districts in Alhasa for 24 hours.</li> <li>○ Updating non-curfew hours in Ramadhan month to be from 9:00 am to 5:00 pm and permission of restaurants to open from 3:00 pm to 3:00 am</li> <li>○ Launching 'Awdah' initiative for those residents who wish to return to their country.</li> <li>○ Partially lifting curfew in all regions of the Kingdom except Makkah and districts isolated previously.</li> <li>○ In April, 30 allowing entry and exit from AlQatif</li> </ul>
	<b>May</b>	<ul style="list-style-type: none"> <li>○ lifting the precautionary measures done to of Al-Atheer district in Dammam, Samitah and Addayer in Jazan, Al Faisaliah and Al-Fadaliah districts in Alhasa, and some regions of AlMadinah.</li> <li>○ Isolation for second industrial city in Dammam and curfew of 24 hours in Bish in Jazan.</li> <li>○ Curfew of 24 hours in all regions from May, 23 to May,27.</li> <li>○ Applying first, second stage gradually to return to normal previous life:</li> <li><b>1. First stage:</b></li> <li>✓ From 28\05 to 30\05</li> <li>✓ Non-Curfew hours from 6:00 AM to 3:00 PM except in Makkah.</li> <li>✓ Allowing movement using cars in curfew hours.</li> <li><b>2. Second stage:</b></li> <li>✓ From 31\05 to 20\06</li> <li>✓ Non-Curfew hours from 6:00 AM to 8:00 PM except in Makkah</li> <li>✓ Allow praying all mosques in the kingdom except in Makkah.</li> <li>✓ lift the suspension of all governments and private sectors, return back to schools.</li> <li>✓ lift suspension of internal flies buses, taxis, and trains.</li> </ul>
	<b>June</b>	<ul style="list-style-type: none"> <li><b>3. Third stage:</b></li> <li>✓ At 21\06</li> <li>✓ A return to normal life in all regions of the Kingdom except for Makkah with full adherence to preventive health instructions and social distancing.</li> </ul>
	<b>August</b>	Allow entry of male and female citizens, and their non-Saudi family members to the kingdom through land crossings.
	<b>October-November</b>	<p>Allow performing Umrah gradually in 3 stages:</p> <ul style="list-style-type: none"> <li><b>1. First stage:</b></li> <li>✓ Start at 04\10</li> <li>✓ Allow citizens and residents in the kingdom to perform Umrah in a range of 6000\day (30%).</li> <li><b>2. Second stage:</b></li> <li>✓ Start at 18\10</li> <li>✓ Allow citizens and residents in the kingdom to perform Umrah in a range of 15000\day and 40000\day for praying (75%).</li> <li><b>3. Third stage:</b></li> <li>✓ Start at 01\11</li> <li>✓ Allow citizens and residents from and outside the kingdom to perform Umrah in a range of 20000\day and 60000\day for praying (100%).</li> <li><b>4. Fourth stage:</b></li> <li>✓ Start when pandemic end</li> <li>✓ Allow citizens and residents from and outside the kingdom to perform Umrah (100%).</li> </ul>
<b>2021 January</b>	Permission to open ports for all means of transport through the land, sea and air ports, after January 1, 2021	

Table (3), Timeframe of measurements taken during corona virus pandemic.

Violation	Punishment	Punishment after repetition	Non-Saudi resident punishment
Spread false information that causes panic or incites to violate the relevant procedures and measures	One of the following: 1. Fine of not less than 100,000 SR and not more than 1 million SR. 2. Prison for a period of not less than one year and not more than five years 3. Both of fine and prison.	Doubled the previous time	Punished by deportation from the Kingdom after final execution of the penalty taken against him\her.
Family gathering inside houses, farms, or rest houses of more than one family and they are not bound by one residential relationship	10,000 SR for institution	<b>First time repetition:</b> Doubled the previous time and closure of private sector for a period of three	

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Non-family gathering inside houses, camps, chalets, farms, rest houses, or open areas for the individuals of the same district or others	15,000 SR for institution	months	
Gathering at weddings, funerals, parties, seminars, and salons	30,000 SR for institution	Doubled the punishment, closure of private sector facilities for a period of six months, and refer the responsible facility to the public prosecution	
Gathering of customers or workers outside or inside the commercial store beyond the numbers specified in the preventative and precautionary measures.	5000 SR For every person who exceeds the specified numbers by no more than 100,000		
Non-compliance by private sector establishments with preventative precautionary measures and protocols by allowing entry of those who do not wear a medical or cloth mask or anything that covers the nose and mouth, providing disinfectants and sterilizers in the places designated for the temperature measuring device for staffs and customers at the entrances of the commercial centers, disinfecting shopping baskets and carts after each use, and disinfecting the store, surfaces, and closing children's play areas and places where clothes are measured, etc.	10,000 SR		
Attending any of the gatherings of the violation referred above or calling for it or causing it	5000 SR for person	<b>First time repetition:</b> Doubled the previous time <b>Second time repetition:</b> Refer the responsible person to the Public Prosecution	
facilitating having a permit to a person whose work nature or circumstances do not require obtaining permission to move at the time of curfew	One of the following: 1. Fine not less than 10,000 SR and not more than 100,000 SR 2. Prison for not less than 1 month and not more than 1 year 3. Both fine and prison	Doubled the previous time	
Using the permit or permission granted to person to move in other than what was designated for at the time of curfew	One of the following: 1. Fine not less than 10,000 SR and not more than 100,000 SR 2. Imprisonment for not less than 1 month and not more than 1 year 3. Both fine and prison with Withdrawing of the permit or permission granted to the violating person	Doubled the previous time	
Violates the isolation or quarantine instructions	One of the following: 1. Fine not more than 200,000 SR 2. Prison for not more than 2 years 3. Both fine and prison	Doubled the previous time	
Intentionally violating precautionary measures including preventive protocols, not to use a medical or cloth mask or what covers the nose and mouth, failure to adhere to social distancing, refusal to take temperature when entering the public and private sectors, or refusal to adhere to the approved procedures when the temperature rises above 38 degrees Celsius	1000 SR	Doubled the previous time	
intentionally spreading the infection to others	One of the following: 1. Fine not more than 500,000 SR 2. Prison for not more than 5 years 3. Both fine and prison	Doubled the previous time	
Violates the provisions of the curfew	10,000 SR for person	<b>First time repetition:</b> Doubled the previous time <b>Second time repetition:</b> imprisonment for a period not exceeding 20 days <b>*It does not apply to cases of extreme necessity - including emergency health cases - as determined by the competent authority.</b>	-
Violates the instructions banning entry to the holy sites (Mina, Muzdalifah, Arafat) without a permit	10,000 SR	Doubled the previous time	-

Table (3), Sanctions regulations in Saudi Arabia during corona virus pandemic. SR: Saudi Riyals

**Measures Taken By the Ministry Of Health to Fight against COVID-19 [30-36]**

Aside from the government, the ministry of health (MOH) is initiating measures aimed at preventing the spread of the disease in the country. One such raft measure includes conducting sensitization to enlighten the public on the suitable course of action to adapt and prevent the possibility of contracting the disease. The directives to medical practitioners focus on helping patients who display symptoms associated with and are assumed to be infected with, the disease. The MOH has categorized patients into two main groups: 'confirmed cases that do not need specialized

treatment' and 'confirmed cases that need careful attention at the facility'. In all cases, the focus is on the approach that prioritizes the safety of the medical practitioner treating the patient, and to the treatment of the patient while adhering to care guidelines. According to the ministry of health, the practitioners caring for the persons are obliged to observe hand hygiene in addition to using protective measures when dealing with patients in facilities in SA. The treatment of the patients suffering from respiratory disease demands caution in droplet transmission prevention. The ministry discourages moving these patients and recommends distance interaction of a range of more than one meter. Medics should cease



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from exposing patients to equipment those risks spreading the disease.

The mitigation involves the identification of suspected cases that are unverified. The measures have to apply in the workplace setting. The first step involves the isolation of the person either at home or at the facility of admission for the suspected case. The step that follows is the involvement of a medic in monitoring and treating the person. The conduct of the professional must adhere to the prescribed care guidelines for dealing with contagious ailments. The recommendable action is hand washing, covering the face and mouth for coughs, and observing hygiene in disposals of wastes. The minimum handwashing times on regular occasion is 20 seconds. The cleansing of touchable places is also regular to minimize risks of exposure. People at home must exude caution in action to restrict posing harm to others in the same environment. For the most part, people are encouraged to stay indoors and only move when soliciting for essentials.

The directive by the ministry of health on ways for dealing with the coronavirus acknowledges the preventive action by the family members. The care facilities in the country in collaboration with the ministry of health guidelines similar to the ones enacted in public areas. However, the emphasis is on the action of the medics and the relatives of those suspected to be infected. The family members have to minimize or restrict hand contact and regularly clean their hands using soap and water. The recommendation of alcohol-based sanitizers applies in a situation where soap is lacking. Just as reiterated by the government in controls at the points of entry, the ministry coordinates the efforts locally. The agency representative conducts the screening has to prioritize precautionary measures in all parts of the country. The recommendable self-isolation for persons from Egypt, Lebanon, Italy, and South Korea is applicable at the entry points. Lastly, the tightening of the measures at the land port is among the strategies advanced by the ministry of health in SA. The MOH is championing preventive measures in line with the government recommendation on the procedures for averting the disease.

### **Conclusion**

In conclusion, SA has undertaken a lot of major preventive steps to minimize the spread of the new highly infective virus (COVID-19) which reflects positively on limiting the outbreak of this infection as compared to all other countries.

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