

**Review article:**

**Hajj Pilgrimage amidst covid-19 pandemic: a review**

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**Abstract**

Hajj pilgrimage is a nobligation for every Muslim that must be carried out at least once in their lifetime. Every year, more than 3 million pilgrims from over 180 countries travel to worship within a confined area of twelve kilometres in Makkah, Kingdom of Saudi Arabia (KSA). The host country and participating countries need to institute effective measures for a safer and healthier Hajj pilgrimage. In the immediate Hajj season during the COVID-19 pandemic, the number of pilgrims need to be reduced to the optimum number that can be managed individual countries' Hajj missions. Beside proof COVID-19 clearance before travelling and completed Covid-19 vaccination, the stay in KSA should be shortened for Hajj ritual only. The participating countries responsible to thoroughly select individuals with low risk of severe infections, provide health education program, offer all compulsory and recommended vaccines and allocate adequate healthcare/isolation centres in KSA. The participating countries are also liable to prepare adequate quarantine places for hajj pilgrims when returning home. Individual pilgrims are responsible to prevent respiratory pathogens from spreading. Prior to departure for Hajj, they need to undergo a thorough medical examination, received all compulsory and recommended vaccines and follow health education program. During Hajj, they need to follow instructions by Hajj authorities, practicing proper hygiene, wearing a face mask and avoid crowded places. They also need to report to countries' Hajj mission healthcare if having any fever or respiratory syndromes. With adequate measures prior, during and post-Hajj, we hope health security risk during the next Hajj seasons will be minimized.

**Keywords:** Hajj; COVID-19; pandemic; review

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**Key message:** The COVID-19 pandemic has brought so many public health issues, particularly regarding mass gatherings such as the Hajj pilgrimage. Considering the massive crowd experienced during Hajj, pilgrims' enlightenment is imperative for a healthier pilgrimage. Collaborative efforts are needed from the pilgrims, participating countries, and the host country to ensure that Hajj can be conducted amidst the COVID-19 pandemic.

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## **Introduction:**

Hajj is one of the pillars of Islam that attracts millions of pilgrims yearly. The pilgrimage has witnessed a rapid surge in the number of pilgrims performing the Hajj over the years. Over recent years, more than 3 million pilgrims from over 180 countries travel to Makkah, Saudi Arabia, for Muslim's Holy pilgrimage<sup>1</sup>. Based on the Saudi Arabia Ministry of Hajj and Umrah's figures, the 2019 Hajj recorded more than 7 million pilgrims. Over the last ten years, pilgrim numbers have drastically shot up at an overwhelming growth of over 1.7 million pilgrims. Hajj rituals are usually associated with overcrowding, which is a major risk factor in spreading infectious diseases, leading to interchanges of pathogens between the countries. The COVID-19 pandemic currently surging across the world poses a severe challenge to a safe and successful Hajj pilgrimage due to public health implications. The Kingdom of Saudi Arabia as the sole host of Muslim pilgrimage is currently witnessing an uprise in the number of confirmed COVID-19 cases.

## **Coronavirus disease 2019 (COVID-19)**

The coronavirus disease 2019 (COVID-19) was first reported in Wuhan, China, on 31st December 2019, after the local health authority identified some cluster of pneumonia cases and reported them to the World Health Organization (WHO)<sup>2</sup>. By the 12th January 2020, WHO stated that the epidemic outbreak was caused by a novel coronavirus discovered in 2019 and named the disease coronavirus disease 2019 (COVID-19)<sup>3</sup>. Subsequently, the WHO on 30th January 2020 declared COVID-19 as a Public Health Emergency of International Concern and was proclaimed as a pandemic on 11th March 2020. The COVID-19 pandemic presents countries with significant political, scientific, and public health challenges<sup>4, 5</sup>. The virus has emerged as an important human pathogen, presenting severe public health and economic concerns across poor and most industrialized countries<sup>6</sup>. The COVID-19 pandemic is posing a substantial public health risk worldwide, including the Kingdom of Saudi Arabia (KSA) that serves as the Hajj pilgrimage's sole host. As of 9<sup>th</sup> December 2020, WHO reported that worldwide COVID-19 cases were 67,530,912 with 1,545,140 deaths, reported to WHO<sup>7</sup>. Figure 1 showed the confirmed COVID-19 cases and mortality rate across the globe.

## **The response of the Saudi Authority**

Following the COVID-19 pandemic, on 27th February 2020, KSA temporarily suspended the Umrah pilgrimage to curb the COVID-19 outbreak<sup>1</sup>. The 2020 Hajj pilgrimage was restricted to only a few pilgrims residing in the KSA with strict compliance to guidelines and protocols by the health authorities and testing<sup>8</sup>. Prior to the pronouncement of the restriction by the Saudi authorities, some participating countries have already pulled out of the 2020 Hajj amidst the COVID-19 pandemic to prevent its spread<sup>9</sup>. Therefore, in this unsafe situation for mass gathering, one of the most critical questions in the Muslim world is about conducting a safe Hajj considering the number of pilgrims and countries recorded in the past Hajj.

The 2020 Hajj was conducted amidst the COVID-19 pandemic in what the Saudi Government tagged as a "limited Hajj". On 23rd June 2020, the Saudi Ministry of Hajj and Umrah announced limiting the number of pilgrims for the 2020 Hajj pilgrimage due to the high risk of COVID-19. This measure taken will limit the participants to only pilgrims that reside in Saudi Arabia as well as banning older pilgrims. This implies that only about 1,000 pilgrims would be permitted this year — a small fraction of the 2.5 million who came last year. The Hajj pilgrims were tested for COVID-19 prior to the commencement of Hajj rituals, and they will be required to quarantine at home after the ritual. The World Health Organization and the Centre for Disease Prevention and Control (CDC) guidelines for COVID-19 prevention were made mandatory for all the pilgrims as well as Hajj officials. Other activities, such as touching or kissing the Kaaba, was also banned. Strict compliance with the physical distancing of one and a half meter between pilgrims during the Hajj rituals was observed throughout the period.

## **Hajj and associated Health Risk**

The crowding conditions peculiar with this kind of mass gathering within confined locations during the Hajj increase the incidence of respiratory infections among the pilgrims, representing a significant cause of morbidity and a significant cause of hospitalization<sup>10</sup>. Therefore, as a fundamental pillar in Islam, Hajj poses considerable public health challenges to health authorities and governments. The bulk of Hajj pilgrims traveled to Saudi Arabia from developing countries with low income (66%) with suboptimal health care and disease surveillance or prevention education<sup>11, 12</sup>. Similarly, most pilgrims

belong to the age category above 60 years(43%: 56 years of age or older), and many have pre-existing comorbidities<sup>11, 13</sup>.

Despite the endorsement and implementation of public health measures for mass gatherings by the WHO and Global Centre for Mass Gathering Medicine before the COVID-19 pandemic, the occurrence of respiratory infections during Hajj has been a rise among pilgrims from different countries<sup>14-17</sup>. Previous Hajj pilgrimage is characterized by an almost complete absence of social distancing among pilgrims as they engage in religious rituals due to the crowd and limited spaces at a particular point in time<sup>18</sup>. This scenario amplifies the risk of acquiring and transmitting respiratory diseases. Similarly, the use of face masks during previous Hajj pilgrimage was low among pilgrims during the 2009 H1N1 influenza a pandemic and Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak, which coincided with the Hajj<sup>16, 19-21</sup>.

The Kingdom of Saudi Arabia has been exposed to MERS-CoV; however, there is a paucity of information regarding potential interactions between MERS-CoV and SARS-CoV. Saudi has recorded the outbreak of Middle East Respiratory Coronavirus (MERS CoV) in 2012. However, Hajj has been conducted successfully over the years with relatively safe and without any significant infectious disease concerns. Similarly, Hajj was conducted safely during the WHO declared Public Health Emergencies of International Concern comprising the H1N1 influenza pandemic in 2009, the outbreak of Ebola virus disease in 2014; and the Zika virus outbreak in 2015.

### **Preparations for immediate Hajj season during COVID-19 pandemic**

In May and June 2020, “limited Hajj” was implemented by Saudi authority; however, some countries comprising Indonesia with the highest number of pilgrims and Malaysia, India, Senegal and Singapore announced the barring of their pilgrims from attending the Hajj 2020 as part of measures to curtail the danger of the infection and prevent further spread associated with the virus in crowded places<sup>9</sup>. To some extent, this measure reduced the transmission of COVID-19 to the regular Hajj participating countries. However, in the coming years, the prevention of international Hajj pilgrims will be the last option. With the possibility of travel restriction lifted in the next couple of months, the international hajj pilgrims’ guidelines to participate

in Hajj seasons 2021 need to be prepared. Some of the participating countries, such as African countries, have very low cases of COVID-19 (Figure 1), suggesting their population is still susceptible to COVID-19 infection.

In the future, especially for immediate Hajj season following pandemic COVID-19, stringent measures to prevent spread need to be planned. It requires adequate arrangement and preparations by the host country as well as the participating countries. The WHO and all collaborating agencies should ensure the best way to contain the COVID-19 pandemic to prevent the outbreak and strengthens its support for preparedness and response. As the epidemic continues to spread globally, the number of pilgrims need to be controlled to the optimum number that can be managed by countries’ Hajj mission healthcare facilities without depending much on KSA facilities. Besides reducing the number of pilgrims, the duration of stay in the Holy Land is also needed to be shortened. There may be a need to cancel the regular visit to Madinah as this visit is not included in Hajj’s compulsory ritual.

In addition to a compulsory self-health declaration of COVID-19 exposure risk, the pilgrims must present a negative PCR test certificate issued within the preceding 72 – 96 hours prior to embarking on Hajj’s journey. There may be a need for quarantine and detection measures of pilgrims from high COVID-19 prevalent countries traveling to the KSA at the points of entry. These quarantine and detection measures have been practiced prior to entry to some Asian and European countries. Additionally, the health authorities reviewed the risk assessment and clinical case definition for direct contacts. Communications to the public regarding risks have been improved. A telephone hotline has been opened between the different ministries in the Government, and multiple other related activities are undergoing.

Post-Hajj situations should also be given priority as they are much more challenging as the stakeholders try to assess “what was transmitted” and “where did it go” in a global landscape of patchy and non-standardized disease surveillance systems. Some diseases may have already been transmitted, and Hajj-related travelers can unknowingly amplify transmission<sup>11</sup>.

### **Responsibilities of Participating Countries**

As stated above, the caring of Hajj pilgrims cannot solely depend on the facility prepared by KSA. The

responsibilities of participating countries are listed in Table 1. Country Hajj Missions' basic healthcare facilities and isolation centres should be adequate to cater to the participating countries' pilgrims without depending so much on the KSA facility. Besides, Ebrahim and Memish<sup>22</sup> suggest that participating countries should prepare an adequate quarantine infrastructure to prevent community transmission caused by returning pilgrims. The border inspection and quarantine strategy should be tightened for returnees from all Muslim countries and not limited to Saudi Arabia.

Besides regular hajj ritual education, the participating countries are responsible for the pilgrims' health education program. Health education is regarded as one of the essential impetus rendered to pilgrims from their arrival through the Health Education Ambassadors (HEA) program, which was originated as an innovative approach for enlightening and educating pilgrims for public health<sup>23</sup>. Several studies have shown the importance of providing health education to Hajj pilgrims to prevent infectious diseases over the last decade<sup>24</sup>. Most health education interventions effectively prevent diseases and increase pilgrims' knowledge, attitudes, and practices towards prevention<sup>25</sup>. This is regarded as an excellent effort to reduce the hazards and enhance compliance with the pilgrims' preventive measures. It is also critical for the advancement of global public health and disease control. A study showed that a majority of pilgrims who received health education on preventive measures in their home countries (n=450, 56.3%) before their departure to Hajj, including aspects of proper hygiene practice (n=799, 78.9%), have better uptake of preventive measures<sup>26</sup>. The study also showed an association between receiving health education and practicing preventive measures by pilgrims, in which receiving health education by pilgrims was significantly associated with wearing masks in crowded areas (P= 0.04)<sup>26</sup>. Health education intervention for Hajj pilgrims should be done so that different age groups and education levels are well-considered. A simplified educational book, mainly with pictures and diagrams, will attract Hajj pilgrims' attention compared to wordy pamphlets<sup>27</sup>.

**Table 1.** Responsibilities of Participating Countries for immediate Hajj season After Covid-19 Pandemic

<b>Prior to Hajj</b>	
1.	To reduce the number of Hajj pilgrims based on the countries/ Hajj missions' healthcare facilities and quarantine places in Saudi.
2.	To thoroughly select the individuals with low risk of severe infections to participate in Hajj a. Age <50 year-old b. No associated premorbid illnesses such as chronic kidney disease and chronic pulmonary disease
3.	To provide all compulsory and recommended vaccines to hajj pilgrims prior to travel to Saudi, which includes meningococcal, influenza and pneumococcal
4.	In case COVID-19 vaccine available, to give priority to Hajj pilgrims of this COVID-19 vaccine.
5.	To postpone the journey of Hajj pilgrims with respiratory illness
6.	To provide COVID-19 clearance test prior to departure
7.	To allocate part of the expenses as a research grant to improve Hajj missions.
<b>During Hajj</b>	
1.	To regularly remind their Hajj pilgrims to avoid crowded places
2.	To regularly remind the Hajj pilgrims on the need to follow the standard procedure to prevent droplet transmission such as the use of face mask, regular hand washing and keep social distance
3.	To have space to isolate and to quarantine COVID-19 positive Hajj pilgrims
<b>Post Hajj</b>	
1.	To prepare adequate quarantine places for Hajj pilgrims returning home.
2.	To screen and quarantine Hajj pilgrims after returning home countries

### **Responsibilities of Individual Hajj Pilgrims**

Responsibilities of individual Hajj pilgrims are stated in Table 2. While planning to participate in the next Hajj season, the pilgrims need to physically and mentally prepare themselves. Besides regular hajj ritual education, they need to follow health education modules to understand the measures to reduce infectious agents' transmission during Hajj. After their names have been listed as pilgrimage candidates, they need to undergo a thorough medical examination, as well as receive all compulsory and recommended vaccines for Hajj. If the COVID-19 vaccine available, they should receive this vaccine as well.

Immediately prior to the journey, the Hajj pilgrims must be honest to declare COVID-19 exposure risk, thus, voluntarily to be quarantine whenever asked by the authority. The pilgrims need to have COVID-19 clearance before entry to KSA and show a PCR test certificate issued within the preceding 72 – 96 hours before embarking on Hajj’s journey. Any respiratory symptoms need to be declared, and the health authorities from host countries will further evaluate these pilgrims.

While in the holy land, the pilgrims need to follow instructions by countries’ Hajj mission authorities. They need to avoid crowded places and report to countries’ hajj mission healthcare staff if having any fever or respiratory syndromes. Practicing proper hygiene and wearing a face mask is of paramount importance. Face mask use is an affordable and effective method to control the exposure to pathogens and high-risk environments, reduce the risk of transmittable infectious diseases including COVID-19 and protect from the inhalation of aerosols containing organic and inorganic particulates<sup>28, 29</sup>. Similarly, proper hand hygiene through the use of hand sanitizers and washing with soap and water regularly is strongly recommended<sup>30</sup>. With proper hand hygiene, the prevention of disease transmission has a 24% to 31% likelihood of decreasing the spread of transmissible disease<sup>31</sup>.

**Table 2.** Responsibilities of Individual Hajj Pilgrims for Immediate Hajj season After Covid-19 Pandemic

<b>Prior to departure</b>	
	Follow Health Education Modules while preparing for Hajj.
1.	This includes regular exercise, proper hygiene and wearing a face mask.
2.	Undergo a thorough medical examination before Hajj
	Receive all compulsory and recommended vaccines for Hajj.
3.	This includes meningococcal, influenza and pneumococcal vaccines. If the COVID-19 vaccine available, the candidate for Hajj pilgrims should receive this vaccine as well.
4.	Self-health declaration of COVID-19 exposure risk
5.	Undergo COVID-19 PCR test within 72-96 hours prior to embarking on the journey to Hajj
<b>During Hajj</b>	
1.	Always the following instruction by countries’ Hajj mission authorities
2.	Always practice proper hygiene and wearing a face mask
3.	Avoid crowded places

<b>Prior to departure</b>	
4.	Report to countries’ Hajj mission healthcare staff if having any fever or respiratory syndromes. In case the healthcare staff order for quarantine, the Hajj pilgrims need to follow their instructions.
<b>Post Hajj</b>	
1.	Always follow the instruction by health authorities, which include quarantine after returning home
2.	Report to local clinics whenever any COVID-19 symptom develops

**Prospect, Future Directions and Plans**

Currently, there are a few vaccine candidates for COVID-19 across the globe. A few vaccine candidates are in a clinical trial<sup>32</sup>, with one or two potentially approved in the near future. While many trials are conducted to develop a COVID-19 vaccine, this will prove efficient for safer Hajj and other mass gatherings in the future. However, with a vaccine breakthrough for COVID-19 eminent by different institutions, vaccination of other respiratory infections prevalent during Hajj is paramount to effectively check the spread of other respiratory diseases that could exacerbate the health conditions of the pilgrims and making them susceptible to COVID-19 infection. The coverage for the influenza vaccination recommended by the Saudi Ministry of Health<sup>33</sup> for Hajj pilgrims was reported in several studies<sup>34, 35</sup>. So far, the studies reported the uptake of the vaccines from France (44.2%), Malaysia (28.6%)<sup>34, 36</sup>. Some studies also reported the effectiveness of the vaccine in reducing the incidence of respiratory tract infection prior to the COVID-19 pandemic.

Based on the WHO report, there is a paucity of data regarding the effectiveness of antibody-mediated immunity to support the exactness of an “immunity passport” or “risk-free certificate.” Therefore, the perception of people being immune to a second infection because they have received a positive test result may increase the risk of the spread of the disease in future Hajj preparation public health advice<sup>37</sup>. In preparation for a smooth and successful future Hajj pilgrimage following the COVID-19 pandemic, it is imperative to create hypothetical scenarios and formulating advisories to proffer solutions for the spread of COVID-19. Future Hajj planning should also allude to the possibility of “what if” (potential spread of ongoing disease outbreaks) and “what will” (emerge as new threats during the Hajj)<sup>11</sup>.

Hajj in the face of a global pandemic accompanied by an economic recession across many countries in the world may prove difficult to control. Saudi Arabia and several countries across the world adopted and implemented a total lockdown on their international borders and movement control orders within their domain to control the pandemic and prevent further spread of its people's virus and well-being. In addition, strict enforcement of social distancing and face mask were also put in place. Regrettably, despite the measures adopted by most countries, the pandemic surge appears across many countries. Therefore, with all the preventive measures taken into consideration during future Hajj pilgrimage, intensive and regular testing of all intending pilgrims will be a cardinal pointer for a hitch-free and smooth Hajj pilgrimage. It will be imperative for the Hajj and Umrah ministry in Saudi Arabia to employ the latest technology-aided detection and contact-tracing for COVID-19 infection to contain and reduce the spread of the infection<sup>38-42</sup>.

Similarly, it is equally important to explore other alternative testing methods that are rapid such as the use of alternative non-laboratory-based rapid easy-to-use devices such as the point-of-care lateral flow immunoassay kit and the field-effect transistor (FET)-based biosensing device<sup>43-45</sup>. In the same vein, there is the need to improve on effective risk communication to enhance public education on the mode of transmission of the disease as well as the importance of personal hygiene, physical distancing and other modes of preventions. Proper and effective communications strategies and counseling support can improve the response to the intricacies and anxieties related to the COVID-19 among the pilgrims during Hajj preparations, particularly

with comorbidity. Handling a pandemic of this kind will entail a meticulous and robust facility. Extensive capacity building and training of frontline healthcare workers involved in Hajj operations are vital components of public health preparedness and handling emergencies.

In conclusion, the future Hajj preparation and plans post-COVID-19 pandemic should be focused on measures that are effective and productive comprising of risk communication and health education of the pilgrims in compliance with WHO guidelines, the KSA Ministry of Hajj and Umrah as well as the Hajj commission or agencies responsible for Hajj from various participating countries. Hajj should be a period for additional enhancements of surveillance of infectious diseases, including COVID-19, to prevent more additional cases.

#### **Abbreviations**

KSA: Kingdom of Saudi Arabia

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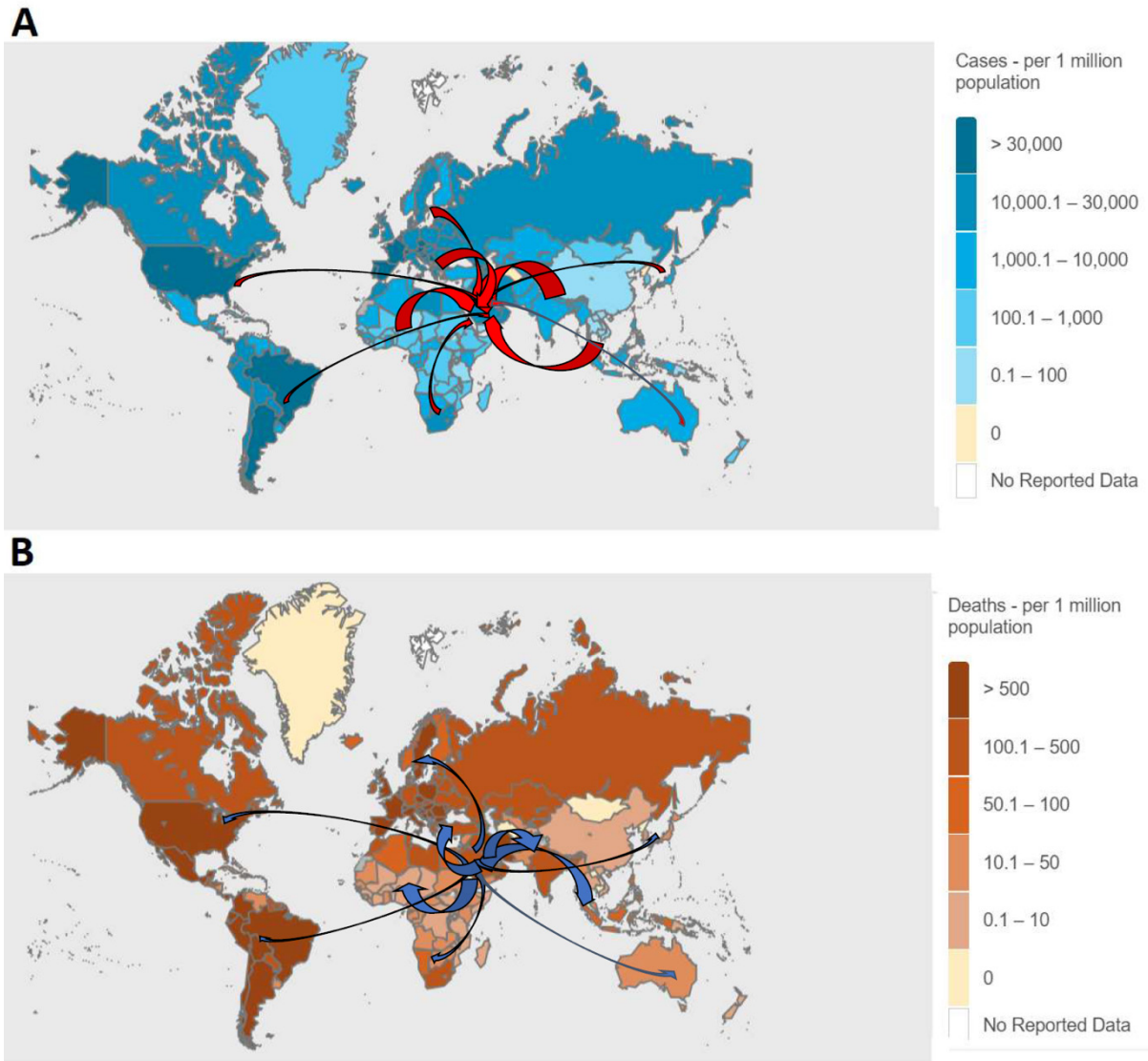
#### **Authors' contributions**

All authors contributed and approved the final manuscript.

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**Fig. 1:** (A) Global confirmed cases of COVID-19 and (B) mortality rate per 1 million populations as on 09<sup>th</sup>December 2020. The red arrow indicates Hajj pilgrims across the world coming to Makkah during Hajj, and the blue arrow indicates they return home with potential new pathogens. The size of the arrow is a relative number of Hajj pilgrims. Data from World Health Organisations in reference <sup>7</sup>

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