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“Pilgrimage to Mecca” in Saudi Arabia: A Model for Healthcare for Mass Gatherings

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In this article we describe the response of the Saudi Ministry of Health and Hajj authorities to the unique problems of one of the largest annual mass gatherings in the world.

Introduction

The Hajj or pilgrimage to Mecca with its associated rites is one of the five pillars of Islam. It is a ritual that is undertaken by Muslims once in their lifetime if they are physically and financially capable of doing so. All Muslims worldwide aspire to perform this important act of worship.

The Hajj occurs each year in the 12th lunar month; therefore, its timing varies by approximately 11 days each solar year. For example, in 2013, or 1434 Hijraa in the Islamic calendar, the Hajj took place during October 13-18, while in 2012 Hajj occurred during October 24-29. Umrah is a similar pilgrimage that can be undertaken at any time of the year, but it is likely to be more crowded during certain months of the year in the Islamic calendar, such as the whole month of Ramadan.

The Hajj is one of the largest mass gatherings (MG) in the world, with up to four million pilgrims performing its ritual each year (Khan 2010). In 2012, for example, over three million pilgrims performed Hajj, of which 55% came from outside Saudi Arabia. Of the more than 180 countries from which 'Hajjis' originate, approximately 45,000 are from countries in Europe (Memish 2010). Pilgrims of international (non-Saudi) origin tend to be older, with many pre-existing health problems. They are usually poorer than participants in other mass gatherings, with poor access to advanced pre-Hajj health care (Memish 2010).

Government Preparations

Hajj presents enormous challenges to the authorities in Saudi Arabia. It requires coordinated planning from all government sectors in the Kingdom of Saudi Arabia (KSA) the whole year prior to Hajj time. They annually update a comprehensive programme, to ensure that all aspects of Hajj are conducted safely and without major incident. It is no less than organising an Olympics every year. Arrangements includes healthcare services with more than 17,600 specialised personnel to provide state-of-the-art healthcare to all pilgrims free of charge (Memish 2010).

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The Kingdom of Saudi Arabia is continually diligent in responding to logistic issues and health risks that are associated with this assembly of millions of pilgrims in an area of <3 square miles in the environs of Mecca. The Saudi government has spent billions of dollars on measures to reduce crowding and its associated risks, which reached disaster proportions as recently as 2006 (Ahmed 2006). Improvements in crowd management, and establishing facilities and services designed to decrease the physical burden of Hajj, including providing efficient transportation via elevated railways and fabricating more comfortable accommodations, have been its priority.

Trauma is a major cause of morbidity and mortality at the Hajj. Stampede is perhaps the most feared trauma hazard. Particularly dangerous for stampedes is the Jamarat area, where crowds surge around the pillars. To reduce such crowds, and in view of previous Hajj-related disasters, a four-level Jamarat bridge (with 12 entrances and 13 exits) was built with a capacity of 5 million pilgrims over six hours at an estimated cost of \$1.1 billion. Each Hajj-related disaster results in some type of policy change, and extra efforts are made. Many such policy changes have cost billions of dollars to prevent reoccurrence of future incidents. By doing this, KSA has decreased deaths due to stampede from more than 1400 in the 1990 Hajj season to 250 in another similar stampede in 2004 (Qanta 2006).

Travel Precautions

KSA was able to achieve a lot in advancing global health in the largest MG (Shuja Shafi 2008). However, more can be achieved by increasing awareness among individual pilgrims and the authorities in their country of origin. The battle against the spread of travel-related infections is a shared responsibility.

Protection of the pilgrims begins before they leave their home countries. Countries sending pilgrims should coordinate preventive measures by healthcare professionals and community groups. Requirements linked to the issuance of entry visas for pilgrims are updated annually by the Saudi Ministry of Health (MOH) (Kingdom of Saudi Arabia 2013), which include universal vaccination of meningococcal poliomyelitis, yellow fever immunisation and other requirements for pilgrims from specific countries (Memish 2013). A recent study showed a decrease in meningitis cases as well as the case fatality ratio after implementing the immunisation requirement, leading to the conclusion that the vaccination policy has had a positive effect on an invasive meningococcal disease (Memish 2013). Moreover, upper respiratory tract infection is extremely common when Hajj falls during the winter months. For this reason influenza vaccination is recommended for pilgrims, particularly for persons in at-risk groups. (Alzeer 2009)

Infectious Diseases and Disease Burden

The extreme congestion of people and vehicles during this time amplifies health risks, such as those from infectious diseases that vary each year. In the midst of an emotionally and physically demanding environment with extreme temperatures that may reach 45°C, noncommunicable and communicable diseases pose a genuine risk to pilgrims (Memish 2010). While most will travel and return safely, crowds and mass gatherings in Hajj and Umrah are associated with unique health risks such as transmission of infections, diarrhoeal disease, cardiovascular disease, heat stroke and trauma. Those given specific attention every year include both mild and severe respiratory diseases, food poisoning and gastroenteritis syndromes, haemorrhagic fevers, and meningococcal diseases. Reports of all diseases, particularly those with worldwide immediate effect, like severe acute respiratory syndrome (SARS) and meningitis, are immediately reported to the WHO epidemiologists. These

work closely with Saudi authorities to analyse information and coordinate a response.

This year the problem is a disease caused by a new virus — Middle East respiratory syndrome, which is caused by a novel coronavirus (MERS-CoV). Most people infected with MERS-CoV had severe illness and pneumonia, and about half of them have died. This virus was first identified in a patient in Saudi Arabia who died in June 2012. It has so far affected nine countries, most of which are countries from which pilgrims would be travelling for Umrah and Hajj. The virus has been shown to spread from person to person through extended close contact, so pilgrims living and travelling in close quarters may be at risk. There is no vaccine currently available to protect against MERS-CoV.

Because of the risk of MERS-CoV, the Saudi Arabian Ministry of Health has put forward some recommendations (Memish 2013), which are supported by the CDC's travel recommendations as well (<http://www.who.int/ith/updates/> 20130725/en/). Both recommend that the following groups should postpone their plans for Hajj and Umrah this year:

- People over 65 years old;
- Children under 12 years old;
- Pregnant women;
- People with chronic diseases (such as heart disease, kidney disease, diabetes, or respiratory disease);
- People with weakened immune systems;
- People with cancer or terminal illnesses.

However, compliance with these voluntary recommendations may not be ideal, particularly considering that the one-time achievement of the qualifications for making Hajj may not occur until later in life, when the prevalence of chronic illnesses is increased. For example, during the 2009 H1N1 pandemic, similar recommendations were issued (Memish 2009). A survey of 406 French pilgrims revealed that one-third were > 65 years

of age and one-fifth had diabetes (Gautret 2012). Fewer had chronic respiratory (5.2%) or cardiac (3%) disease. Similar surveys of French pilgrims in 2012 and 2013 revealed that 59% and 48% respectively had a condition for which postponing Hajj was recommended (Gautret 2013).

These recommendations, along with strict immigration rules, have resulted in a reduction of pilgrims coming from both within Saudi Arabia as well as abroad by 35% this year. These efforts will certainly diminish the likelihood of spread of MERS, but will not eliminate it. Ongoing disease surveillance and data analysis is necessary to better understand health risks and strengthen the evidence base for health policy and prevention. No new cases of MERS-CoV have yet been reported after the 2013 Hajj season in KSA.

Previous studies have shown that the prevalence of H1N1 among pilgrims was extremely uncommon (Memish 2012). No viruses were significantly more prevalent in either arriving or departing pilgrims. In addition to concern for transmission of emerging infections, diligence is also warranted in monitoring re-emerged respiratory diseases such as tuberculosis. In the 1994 Hajj season, Alzeer et al. studied pneumonia during Hajj, and they found that mycobacterium tuberculosis was the aetiological agent in 28% of cases, who were primarily elderly pilgrims, followed by grampositive bacteria (Alzeer 1998). Although housing and crowding improvements can help control the spread of diseases such as tuberculosis, the potential spread from previously infected pilgrims remains, and more research is needed in this area.

In addition, in 2004 severe sepsis or septic shock was treated in 42 pilgrims with the mean age of 65±14 years (Baharoon 2009). These patients comprised 25% of ICU admissions, and most (71%) had an underlying respiratory disease, which was thought to be the source of sepsis in over half.

A review of the burden of cardiovascular disease during Hajj reported that, for the 2002 Hajj, cardiovascular diseases were responsible for 46% of deaths in that study group, with 14% attributable to respiratory causes (Al-Shimemeri 2012). In response to this serious health issue, a Strategic Cardiac Hajj Interventional Programme (SCHIP), which provided three 24-hour cardiac catheterisation laboratories, launched in 2009 (Al Faraidy 2012). In the three years preceding SCHIP introduction, cardiac death rates were approximately 50%. However, during the 2009 through 2011 Hajj seasons that followed implementation of SCHIP, cardiac death rates were substantially reduced to 27%, 33% and 22%, respectively.

Healthcare Provision

The Ministry of Health (MOH) has always been a major contributor to planning for the wellbeing of the pilgrim guests. Infection Control and Preventive Medicine Policies are established every year, based on knowledge of epidemiology of infectious diseases and global outbreaks. Around 40 preventive medicine teams (stationary and mobile) rotate through the different pilgrim camps to oversee all key public health and preventative matters during the Hajj. These teams report directly to the command centre on communicable diseases (like influenza and influenza-like illness, meningococcal disease, food poisoning and so on), using an electronic surveillance form to be submitted via mobile phones.

The Saudi response to the global H1N1 pandemic in 2009 in preparation for this MG alerted the world to the complex implications and opportunities afforded by similar MGs (Khan 2010). In addition, the KSA government mobilises large resources to areas involved in Hajj. For example, the MOH has in total 5185 hospital beds (permanent and seasonal hospitals). Thirty percent of these beds are considered ICUs, which run as closed units with on-site 24-hour intensivist coverage. To meet this demand, healthcare professionals are mobilised from all over the country (Arabi 2006). Moreover, for the management of heatstroke, all hospitals involved in Hajj are well equipped with special cooling units. Other services provided during this MG include security services and crowd control to ensure that there will be no major incident throughout the 6 days of Hajj.

The MOH continually enhances its ability to manage health issues that may affect Hajj; services are free, regardless of the sophistication of the treatment or intervention. Several hospitals are allocated to receive thousands of pilgrims each day. In 2013 there were 45* new mobile intensive care units that placed a doctor, nurse and essential technology in crowded areas where they are most needed. In the upcoming years from now Hajj will fall during summer months. Accordingly, the Saudi MOH will face another challenge, which is heat-related illnesses, particularly heat stroke and heat exhaustion.

Hajj: Implications for International Clinicians

Hajj presents a unique challenge that impacts international public health. World wide clinicians must be aware of potential risks for disease transmission. Appropriate strategies should then be applied before the departure of pilgrims. Practitioners must also be aware of the risks presented by the returned pilgrim and the potential post-Hajj illnesses. In addition, international collaboration in planning vaccination campaigns and managing health hazards has become essential. Such collaboration should cross all political considerations. The Saudi MOH every year publishes the Hajj requirements for the upcoming Hajj season (in collaboration with the WHO), which is a good guide for the required precautions to ensure safe Hajj for all pilgrims (WHO, 25 July 2013).

In addition to the effort by the Saudi MOH, countries from which pilgrims originate should be diligent in providing appropriate surveillance of returning pilgrims for possible domestic transmission of contagious illnesses including MERS, which may not have been symptomatic at the time the pilgrims departed from Saudi Arabia (Khan 2010). This can be challenging, considering that two-thirds of the pilgrims will be returning to countries where healthcare capacity is limited.

Conclusion

Protection of the health of pilgrims making Hajj to Mecca is an important and often challenging responsibility of the Kingdom of Saudi Arabia. Improvements in the environment and services provided are being made continuously. Pre-Hajj efforts focus on promulgating specific health requirements, which are updated annually, and recommendations for pilgrims to implement personal protection measures. During the Hajj are provided expanding, free MOH healthcare specialised clinics, dedicated hospitals, and mobile intensive care units. More epidemiological research is needed, as is diligent surveillance, as appropriate, of Hajjis after they return to their countries.

After decades of planning for the annual event of the Hajj MG, Saudi Arabia's experience is now well developed. Previous lessons learned added tremendously to this experience. Hajj, which is not the only MG (though the largest), is a useful model to understand the nature of risk management of any MG and the benefits of international collaboration and cooperation. Hajj poses complex challenges that require a broad expertise. No doubt, Saudi Arabia has the experience and infrastructure to provide unique expertise with respect to MGs.

* Print issue contains the number 95. The authors have corrected this to be 45.

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