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Chapter 31

Muslim Pilgrimage

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Introduction

Logistically, the Hajj, the most monumental mass migration of humanity today, would challenge the most highly industrialized nations in the world. Saudi Arabia, a relatively young economy, has fostered the most enormous growth in this religious pilgrimage history has yet seen, with aggressive and rapid modernization in all aspects of Hajj planning: Hajj facilities, procedures, healthcare and policy making are all comprehensive and on an immense scale. Still, there is no sign of slowing in the growth of pilgrim attendance. As Hajj congregations grow in the order of millions, the Kingdom of Saudi Arabia rises to new challenges on colossal scales with relentless drive, challenges that are the focus of this chapter discussion.

The Growth of the Overseas Pilgrimage to Makkah

Hajj is the greatest assembly of humankind on earth. More than 2.5 million Muslims attended Hajj this year (Figure 31.1). Of these, 1.5 million were overseas visitors, 89% of whom arrived by air. The majority of the remainder (10%) arrived by land and 1% by sea. We can expect the Hajj to become bigger: Islam now is a growing religion with 1.3 billion followers of diverse ethnicity from communities within 140 countries.

Over the years, not only has there been growth in numbers, but also resulting demands on planning have also increased. Umrah, a 'mini-pilgrimage' (which the Muslim can undertake at any time of the year) also involves traveling to Makkah and circumambulating the Ka'aba. The steady increase in numbers participating in Umrah throughout the calendar year demonstrate both the increased numbers of Muslims and their growing ability and willingness to travel to Makkah.

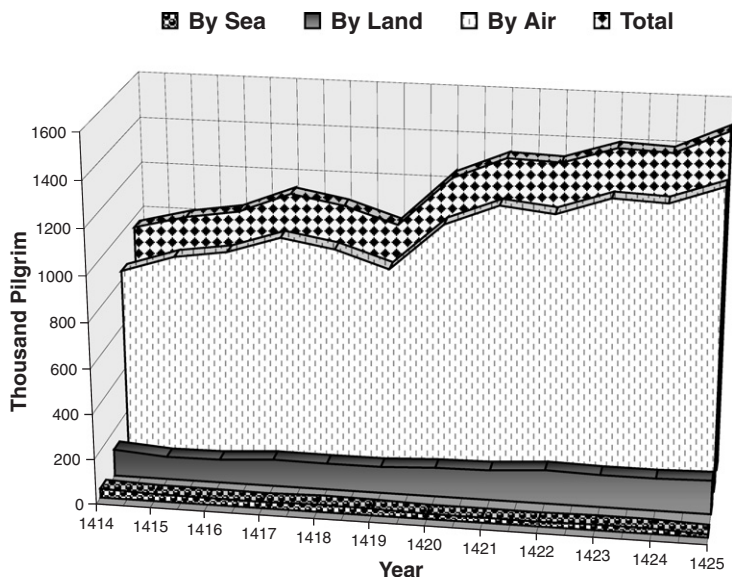


Figure 31.1. The number of overseas pilgrims according to modes of arrival to Hajj between 1414 and 1425H (1994–2005).

The Rites of Hajj

Religious pilgrimage is described in all faiths to a varying degree, but while most are voluntary, the Hajj is considered a mandatory requirement for all Muslims who are eligible. Millions of Muslims make a visit to the Ka'aba, (the house of God) and surrounding holy sites. Over a number of days, their struggle becomes both literal and metaphysical: the pilgrim struggles in a surging current of the faithful as he struggles to absolve his sin through holy rituals. While he seeks to offer prayer, the pilgrim must also struggle against distinct environmental and public health hazards throughout the journey. These hazards have been repeatedly reported for over a hundred years when scientific insights were once limited because few Muslim physicians lived or published in the West.

Each pilgrim, on arrival to Makkah performs an initial circumambulation (*Tawaf*) around the Ka'aba seven times. He then leaves for the Plain of Arafat, a dozen miles east of Makkah, where Hajj culminates in the Day of Standing when all two million stand, supplicating together en masse. Mount Arafat is where the Prophet Mohammed gave his final sermon to his followers and many pilgrims ascend the summit believing prayers here to be most blessed. En route, the pilgrim makes overnight stops for prayer and contemplation in Mina on the way toward Arafat and in Muzdaliffah on return.

After Arafat, pilgrims return through the heaving jams to Muzdaliffah where they gather small stones for the next day's stoning of pillars. On return to Mina, the pilgrimage is complete, and the new Hajjee (a pilgrim who has completed the Hajj) makes an animal sacrifice (often by proxy) as thanks to God for accepting his Hajj. After a final farewell Tawaf of seven circuits around the Ka'aba, the pilgrim leaves Makkah immediately.



Figure 31.2. Extraordinary congestion during the Hajj.

Today we can learn much from Hajj. Pilgrimage presents a unique opportunity to study health issues in a mobile population. Due to massive scale and singular focus on one city, Hajj affords insights no other migration can yet offer (Figure 31.2). Substantial hazards accompany such extraordinary congestion; both health hazards of performing Hajj and the public health concerns relating to the returning pilgrim. Health hazards could be infectious and noninfectious problems encountered during Hajj.

Communicable Hazards at the Hajj

The congestion and the mass migration of the pilgrims bring a number of infectious processes to the fore. Meningococcal disease (MCD), respiratory tract infections, blood-borne, diarrheal and zoonotic diseases all are frequently encountered problems for the pilgrims, either during Hajj or following Hajj. Unique occupational infections affect the abattoir worker at the Hajj and the pilgrims from the barbers, areas that are now firmly addressed by the Saudi authorities. Most concerning are emerging infectious diseases (including SARS/avian influenza) and their devastating potential to spread.

Meningococcal Disease

During Hajj, carrier rates for MCD rise as high as 80% due to intense overcrowding, high humidity and dense air pollution. When carrier rates become so abnormally high, outbreaks

are a real public health threat. Additionally, the risk of invasive infection in carriers is compounded by a loss of upper airway epithelial integrity in the setting of upper respiratory tract infection (URTI), which is very common among pilgrims. Many outbreaks of MCD occurred over the years. It started in 1987 with a large outbreak of meningococcal meningitis serogroup A that affected many pilgrims in Makkah and internationally. Bivalent serogroups (A and C) polysaccharide meningococcal vaccine became mandatory requirement for all pilgrims (local and international) and was successful in eliminating future large outbreaks of serogroup A MCD. In the years 2000 and 2001, two large outbreaks of meningococcal meningitis serogroup W135 occurred among hajjis and their family members. A shift in the vaccine requirements for hajj from bivalent to quadrivalent (serogroups A, C, Y, W135) polysaccharide vaccine was successful in eliminating future outbreaks. Continuing concerns with the lack of efficacy of the polysaccharide meningococcal vaccine in children less than 5 years, the lack of efficacy of the polysaccharide vaccine in eliminating nasopharyngeal carriage and the need for repeat dosing every 3 to 5 years have led to greater interest in investigating the role of the newly licensed conjugated quadrivalent meningococcal vaccine (Menactera) during future hajj seasons, since the conjugated meningococcal vaccine is suppose to address all the shortcomings of the polysaccharide vaccine.

Respiratory Tract Infection at the Hajj

Acute respiratory tract infections are very common during the Hajj, particularly so when the pilgrimage falls in the winter season. In this years Hajj and subsequent Hajjis to follow, the influenza season will begin to eclipse the Hajj season, coinciding with one another for some time, magnifying concern for community-acquired pneumonia (CAP).

The close contact among pilgrims during periods of intense congestion, their shared sleeping accommodations (chiefly in tents) and the dense air pollution all combine to increase the risk of airborne respiratory disease transmission. Acute respiratory tract infections are normally very common at the Hajj, with the majority affecting the upper respiratory tract. Involvement of the lower respiratory tract is also seen and specific pilgrim hosts, many of whom will be elderly, are at increased risk due to preexisting comorbidities such as diabetes, renal disease, age, cardiopulmonary disease or underlying immunosuppression.

A viral etiology of URTI is most commonly implicated at the Hajj but bacterial superinfection often follows. More than 200 viruses can cause URTI but at the Hajj the main culprits are respiratory syncytial virus (RSV), parainfluenza, influenza and adenovirus.

Undoubtedly, the intense congestion, living in close proximity with vast crowds and the aging pilgrims constituting so much of the congregation, are all factors magnifying TB risk. Additionally many Muslims travel from countries of high TB endemicity. Air travel must also be considered as a magnifying risk factor for infection since the bulk of pilgrims now enter the Kingdom by air, often after long-distance plane journey. Any infection acquired or incubating not only may be transported to the pilgrim's home country but actually transmitted to fellow passengers. Confined space, long journey time, recirculated air and limited ventilation all compound the risks of transmission of airborne or droplet-spread infection.

As a result, the Ministry of Health (MOH) endeavors to minimize risk of transmission of respiratory illness by modifying high-risk behavior. Pilgrims are encouraged to wear facemasks in order to reduce airborne transmission. Many also wear facemasks to combat air pollution during times of extreme traffic jams.

Influenza vaccine is highly advisable for all pilgrims embarking on Hajj, particularly those over 60 or those with comorbidities to limit complicating bacterial respiratory tract infection. This will become an even more pressing need as the influenza season eclipses Hajj in the lunar years to come.

Skin Infections

Hajj involves long walking, heaving crowds in often hot and humid weather and constant need to perform rituals barefoot when in the Haram mosque. Bacterial skin infections have been well described in the literature in the Hajj pilgrim. Primary pyoderma, including impetigo, carbuncles, furuncles and folliculitis occurred more frequently than secondary pyoderma. Secondary pyoderma complicates eczema most often followed by intertrigo and tinea pedis.

Long rituals of standing and walking, chafing garments, heat, diaphoresis and perhaps obesity in the pilgrim are all factors promoting skin infection. Many reports exist linking pyoderma to heat and physical congestion, so perhaps the findings are unsurprising. Feet and other exposed areas should be protected if necessary, and if the pilgrim notices a new wound, he must seek attention of one of the myriad medical posts at the holy sites. Any pre-existing skin condition should be protected and medicated as appropriate — pilgrims should travel with their usual medications and ointments, which are all permissible during Hajj.

Zoonotic Disease

The proximity of cattle, the massive slaughter of beasts and the intense congestion and chaos of the Hajj period behooves zoonotic disease by a major consideration.

Despite excellent abattoir facilities (Figure 31.3), animals continue to be predominantly slaughtered by laypersons caught up in the joy of ending their Hajj successfully.

Risks of contracting brucellosis, Rift Valley fever (RVF), Crimean-Congo hemorrhagic fever (CCHF) and Orf are significant.

Brucellosis is endemic to Saudi Arabia but to date no outbreak has occurred during Hajj. Imported animals account for about 85% of sacrificed animals, exceeding 6 million in recent years at a cost of \$4 billion annually.

A new flavivirus was isolated in 1995 from six patients from south of Jeddah. Patients presented with dengue-like VHF (viral hemorrhagic fever) and the pathogen has been identified as Alkhumra virus. This virus is closely related to Kyasanur forest disease virus. During the 2001 Hajj season four cases of classical VHF were diagnosed in Makkah. To date there have been 37 cases in total. Patients present with an acute febrile illness with hepatitis (100%), hemorrhagic manifestations (55%) and encephalitis (20%). Any role for arthropods, animals or rodents in transmission of Alkhumra virus is unknown.

Hazards Related to Illegal Barbers at the Hajj

Muslim men observe completion of a successful Hajj by shaving their heads. Head shaving is an important means of transmission of blood-borne disease, including Hepatitis B, C and HIV. Illegal unlicensed barbers continue to operate at the Hajj, shaving hair at the



Figure 31.3. State of the art automated abattoir facilities at the Hajj.

roadside with nonsterile blades, which are reused on multiple scalps (Figure 31.4). Hepatitis B virus (HBV) and Hepatitis C virus (HCV) transmission is increased by the ingress of pilgrim barbers from regions with endemicity for both pathogens.

The MOH continues to take an aggressive legislative stance to eliminate unlicensed barbers from operating during the Hajj. Licensed and approved barbershops/government-related head shaving areas are stationed along the Hajj routes where the rites terminate. Nevertheless, enforcing this restriction continues to be a problem in crowds in excess of a million.

New Hazards: Emerging Diseases

Severe Acute Respiratory Syndrome (SARS)

SARS spread was undoubtedly facilitated by air travel, not in as much as transmission aboard aircraft but the speed at which index cases traveled, often while in their incubating period and arrived at new destinations ready to infect, for it was an American businessman traveling from China to Hong Kong who exported the disease to Vietnam. Still without specific treatment and carrying a high mortality, SARS spreads the specter of a sinister epidemiological threat to Hajj planners and the pilgrims themselves, capable of igniting an epidemic of unprecedented scale. Saudi authorities have issued recommendations concerning SARS and the Hajj following the formation of a scientific taskforce immediately after



Figure 31.4. Illegal unlicensed barbers operating at the Hajj.

the WHO announcement of SARS. A number of strategies were acutely implemented in 2003 to prevent the ingress of SARS into the Kingdom.

Clearly, prevention of entry for SARS is a feasible strategy for the Hajj. Even one case of SARS during the Hajj would carry cataclysmal implications. So far no cases of SARS have been reported in the Kingdom and regionally only one case in Kuwait in 2003 was documented.

Noncommunicable Hazards at the Hajj

Noncommunicable hazards are probably the best known dangers of Hajj in this current era of continuous news feed. Hajj is now a widely televised event and a stable news bulletin for audiences across the globe. Even with the best intentions, crowd behavior engenders specific risks, which continue to generate causalities and even fatalities.

Stampede Trauma at the Hajj

The unparalleled congestion during all stages of Hajj compounds risks of traumatic injury to pilgrims enormously. Stampede is perhaps the most feared trauma hazard. Once established, little can be done to abort ripples of panic spreading through crowds, contributing rapidly to casualties and all too often fatalities. Even several pilgrims losing their footing,

falling can precipitate a mass stampede. In the confusion, others fall, the 'blind' crowd continues to surge forward and people are lost in the subsequent crush. Crush and trauma injuries are worst at points of exit where huge crowds bear down in a panic to escape. Fatalities result from asphyxiation or head injury, neither of which can be attended to quickly in the mass crowds.

Those at risk of stumbling or falling (the elderly or less surefooted) should be advised to avoid the worst times of Hajj rites and to be clear of the most congested areas. For instance, when making the Tawaf (circuits around the Ka'aba), the pilgrims should be advised to circumambulate on the higher levels of the Mosque rather than in the center of the Mosque next to the Ka'aba. As each circuit commences and finishes at a specific corner of the Ka'aba, crowd densities focus there foremost. Close to the Ka'aba, though the circuits are shorter (and therefore of shorter duration), the jam of humanity pulls individuals inward like a current forcing them into the congestion and unable to break free or assume a slower pace. Pedestrian cross traffic constituted by those who have completed seven circuits or are embarking on their Tawafs is significant and adds to the congestion and delays feasible exit from the tightening spiral. Inward movement towards the confined center of this dense crowd is therefore inevitable and pilgrims can do little to avoid this. A single stumble here, therefore, could be disastrous.

Particularly dangerous for stampedes is the Jamarat area where mass stoning of effigies symbolizing Satan occurs.

Trauma risks also present themselves outside of the immediate holy sites. For a major part of the Hajj, pilgrims move about either on foot in dense traffic or in vehicles themselves. Extreme traffic buildup and poor compliance with seatbelts together with disordered traffic flow contribute to trauma risk. Motor vehicle accidents are inevitable and contribute to trauma casualties and even fatalities during the Hajj.

Fire-Related Injury

Fire has caused substantial loss of life at the Hajj in recent years. Risk increases with the increased scale of the Hajj, which has followed modern travel. In 1997 fire devastated the Mina area, where tents were set ablaze by open stoves, since banned at Hajj. The loss of life was significant, with 343 deaths and over 1500 estimated casualties. Since then all the makeshift tents, which had been in place at the time of the blaze, have been replaced by permanent fiberglass installations. At the time of Hajj, Teflon-coated awnings are added providing accommodations for the migrant millions at the Hajj. The aluminum frames remain in place the rest of the year. These simple though costly measures have ensured that fire of this scale has since never been repeated.

Occupational Hazards of the Abattoir Worker

Islam stipulates three specific occasions for animal sacrifice, of which one is an offering during the Hajj. The true meaning of sacrifice is submission to the will of God. The sacrificer (who may be male or female) invokes the name of God at the time of slaughter, and killing the animal quickly and mercifully and in doing so demonstrates that God has power to give and take life of all His creatures and that the Muslim is obedient to His will.

Annually, therefore, Hajj sees the slaughtering of millions of sheep, cows, camel and goat for which a sophisticated system of abattoirs has developed. The scale of slaughter is colossal, with over one million heads of cattle slaughtered each Hajj.

The MOH advises against slaughtering of animals by laypersons and encourages the use of accredited and monitored facilities in designated areas for the slaughtering of animals.

The five abattoirs cover an area of 42.3 hectares; the largest, Al-Badilla, is the only unit to slaughter all four permitted species (cows, goat, camel and sheep). Wadi-al-Nahr is the smallest and most efficient slaughtering on an industrial scale. Revolving conveyor belts remove carcasses to incinerators. At The Trial Unit Slaughterhouse hydraulic scissors cut the neck and legs of the sheep and modern facilities dispose of the resulting blood and other fluids. At all slaughterhouses, blood and animal fluids drain into an underground collecting system into storage tanks. In 1983 quick freezing equipment was installed, which allowed 69,000 sheep to be frozen and immediately exported to the needy Muslims overseas. Fleets of planes await this frozen cargo to transport out of the Kingdom of Saudi Arabia immediately.

For the abattoir worker, Hajj is an unimaginably busy time and even the most experienced butcher can sustain injury. Seasonal orf has been reported in this population in association with the slaughter of sheep. Orf is a viral disease of sheep and goats, caused by the parapox virus. Human infection results from direct contact with infected animals and produces skin lesions.

Environmental Heat Injury

Heat exhaustion is a leading cause of morbidity and occasional mortality during the Hajj, particularly when Hajj falls in summer. Heat stroke (HS) is a medical emergency characterized by hyperpyrexia, altered mentation and even multiorgan failure. HS can be exertionally related.

Makkah lying at 20 degrees north of the equator routinely achieves ambient air temperatures in excess of 45°C during summer months. With the oppressive congestion of humanity during the Hajj, HS is an anticipated complication. Lack of acclimatization and the arduous physical rituals, exposed spaces with limited or no shade and the turmoil of Hajj all combine to produce HS in many pilgrims.

Heat-related illness accounts for 70% of all hospital admissions. Adequate fluid intake and seeking shade is essential to combat heat stroke, but often caught in the emotional turmoil of Hajj, the distracted and supplicating pilgrim may not notice the dangers of extreme heat exposure until symptoms are pronounced.

Though pilgrims can perform rituals at night in the darkness, sun exposure is a major problem. Sunburn, though seemingly trivial, is a serious risk. Umbrellas, especially white umbrellas are highly advisable and, to our understanding, permitted without invalidating Hajj.

Seeking shade and wearing high-SPF sunblock creams is highly recommended even for those with the darkest skins. Children who may be accompanying their parents must be especially protected. Nighttime rites are to be encouraged whenever possible and pilgrims must know that timings of rites are flexible and acceptable at the pilgrim's convenience.

The heat in Makkah is such that even full thickness foot burns have been documented. Walking barefoot in holy sites precipitates foot injury, and one report documenting a pilgrim who sustained full-thickness burns to the sole of both feet during Hajj points to the extreme

environmental temperatures a pilgrim has to face. Though shoes are forbidden in the holy mosque, footwear is permitted in Arafat, Mina and Muzdaliffah. Also, socks may be worn within the Mosque to protect feet.

The Future of Hajj

Hajj has become, for an intense, brief period, the epicenter of mass migration of millions Muslims of enormous ethnic diversity. No other mass migration can compare, either in scale or in regularity, or at this stage, in 2006, there are no signs of Hajj growth slowing.

Travelers to Makkah face specific environmental hazards, both through the physical environment, and through the unique microbiological milieu created at Makkah.

With the prevailing influence of globalization and an increasing, previously unequalled, mobility of the Hajj pilgrim, infectious disease ‘hoofbeats’ will increasingly signal less well-recognized processes rippling in the transmission envelope the Hajj produces. Not only the scale, but also the massive global migration involved in Hajj magnifies public health risk. Hajj presents a unique infection control challenge that impacts the international public health arena, which is continually expanding as the globe becomes more mobile.

Clinicians everywhere must be aware of potential risks and suggest appropriate strategies, which can be both applied before departure and implemented in the field. Practitioners must also be aware of the risks presented by the returned pilgrim, and be alert to reporting any post-Hajj illness.

Increasingly, international collaboration (in planning vaccination campaigns, developing visa quotas, arranging rapid repatriation, managing health hazards at the Hajj and providing care beyond the holy sites) has become essential. Planning and supporting Hajj has become a forum for collaboration crossing any political considerations.

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