NARRATIVE REVIEW

Diabetes and Hajj pilgrims: A Narrative review of literature

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Abstract

The performance of the Hajj pilgrimage is a pillar of Islam and is obligatory at least once in the lifetime of every Muslim in good health who can afford to undertake the journey. Hajj creates stressful conditions that require strenuous physical activities which present specific challenges for people with diabetes. A pre-travel consultation with a health professional is highly recommended for people with diabetes. People in poor health should consider the religious dispensation with their doctor to see if the risk of attending the event is too great. Using the available literature, this narrative review discusses and summarises how this event affects diabetes and its management. The review was planned to provide possible practical recommendations for healthcare professionals to deal with this challenge and help their patients perform hajj safely.

Keywords: Diabetes, Hajj, Islam, Pilgrimage, Pilgrims.

Introduction

At least once in every Muslim's lifetime, a pilgrimage to attend the Hajj in Makkah, Islam's most sacred city, is an obligation. Annually, around 3 million pilgrims, belonging to more than 184 countries, perform Hajj where population density can reach seven people per square metre which accounts for the largest mass gathering of people globally on an annual basis.[1,2] In the 12th month of the Islamic calendar, the period from the 8th day through the 12th day marks the Hajj. The pilgrimage begins in Makkah and the Al-Mashaer areas that include the territories of Mina and Arafat in the Kingdom of Saudi Arabia (KSA).

The Hajj originated around 2,000 B.C. when Ishmael, who was the infant son of Ibrahim (referred to as Abraham in the Old Testament), a prophet, and his wife, Hagar, became stranded in the desert. Dangerously close to death from lack of drinking water, the mother ran frantically seven times between the hills of Safa and Marwa searching for water to keep her son alive when the angel Jibril (also known as Gabriel) appeared, lighting upon the earth and bringing forth the Well of Zemzem, a spring of fresh water, for the baby. Receiving his orders from God, Abraham commenced building a monument at Kaaba, a site located around these natural spring waters. The first official Hajj has been recorded in 630 A.D. when the Prophet Muhammad led a pilgrimage with other Muslims there to worship.

Hajj must be carried out in the three locations in or around Makkah - Kaaba, which is located within Makkah, Mena, which is about 5km from Makkah, and Arafat, about 18km away from Makkah. Extreme circumstances exist during Hajj with the close proximity of people assembled together at Holy places with temperatures in the range 37-45°C, and mass movements of people who also use crowded transportation. All can be seen as the likelihood of communicable diseases being transmitted along with pre-existing disease, such as diabetes mellitus (DM), showing exacerbation during this event.[3-5] Using the available literature, the current narrative review was planned to better understand the effect of Hajj on people with diabetes and associated health hazards to improve diabetes management during the Hajj journey. Electronic databases MEDLINE and Google Scholar were searched for articles published in English language up to June 30, 2017. The search terms used were 'diabetes mellitus', 'hajj, 'pilgrims, 'Islam, and 'pilgrimage'. A total of 22 articles were reviewed. Of them, 15(68.2%) were primary studies, 5(22.8%) were reviews and 2(9%) were case series. The search was rerun in October 2017 for any new publications.

Diabetes and Hajj

Over the last several years, diabetic people have contributed to hospital admissions and mortality exponentially during the Hajj period. In 2004, a study showed that hospital admissions during Hajj occurred 8.5% for DM, 7.1% for diabetic ketoacidosis (DKA), 0.7% each for hypoglycaemia and uncontrolled DM. All of these were intensive care unit (ICU) admissions at seven hospitals nearest to the Hajj sites, with 4(57%) in Mena and 3(43%) in Arafat.[6] More than two-thirds (71%) of pilgrims had co-morbid conditions requiring medical attention with more than one-quarter (26%) having DM as co-morbid conditions.[6] One prospective study from France involving 545 Hajj pilgrims in 2007 with median age 61 years found that 21% of the pilgrims had DM.[7]

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While DM serves as a significant co-morbidity in the pilgrims prior to Hajj, hospitalisationwas much lower than in the previous study with only 3 admissions with uncontrolled DM out of 13 total admissions. This study, although highly generalised, of the Hajj medical experience, does offer a good representation in stratification of the pilgrims' age (median 61 years old) who suffer from DM. Attributable to the higher age ranges from 65 to 74 years, this group showed age-related chronic diseases, such as hypertension (27.5%), hypercholesterolaemia (11.4%) and DM (31%), and therefore constituted a higher number of hospitalisations during Hajj.[7] In 2005, one prospective study analysed 689 patients with a mean age of 62 years who belonged to 49 countries. The results found 220 of the patients (31.9%) with DM and 27 patients with diabetes-related complications. Out of those 27 patients, 14(52%) experienced DKA, 8(30%) were in a hyperosmolar state, and 5(18%) had hypoglycaemia. Of all of the cases, 18.5% patients with acute complications of diabetes showed fatality rates in the primary diagnoses.[8] In 2015, Almekhlafi M. investigated the frequency of stroke from a prospective registry of all acute stroke patients admitted during hajj 2015, which shows diabetes as a most common risk factor among the study subjects.[9]

In another study in Oman performed in 1996, the diabetic profiles of 169 Omani pilgrims were evaluated and that can be readily generalised.[10] A special diabetes clinic was set up at a camping site where all Omani pilgrims had gathered. The majority of patients (86%) were using oral hypoglycaemic agents (OHAs). Of those with type 1 DM and 96% of individuals with type 2 DM (T2DM) had carried their medications with them. After testing, a random plasma glucose reading of <72 mg/dl was established in 2.4% patients, 72-108 mg/dl in 14%, and almost half (49%) showed >189 mg/dl readings. Only 9.5% had been trained to test their blood glucose, although about 50% understood the clinical presentation signs of hyperglycaemia and about 25% understanding the symptoms of hypoglycaemia. Their movement activities between the holy sites were recorded as 5-15 km tracts made on foot by 40% patients, 31% travelled by car or bus, and 29% travelled using a combination of both. With 1(0.6%) exception, none of the pilgrims wore protective shoes to the event. Wristbands that identified their condition and labelled their treatment regimen were only worn by 70% individuals. Four percent of those experienced heat exhaustion with wounds had 3% from this pool. Two percent fell into a coma, and pneumonia was present in 1.2% of these patients.

Health Risks

Hyperglycaemic Emergencies

With the onset of DKA or hyperglycaemic hyperosmolar, the two most prevalent factors that contribute to its development are inappropriate use of insulin therapy or existence of infection.[11] A prospective study evaluated 18 episodes of DKA among pilgrims from seven countries admitted to King Abdulaziz Hospital in Madinah. Poor compliance with treatment was found to be the commonest precipitating factor in 94.5% of episodes which could be related to the preoccupation of the pilgrims with rituals of Hajj over their diabetes treatment. Common presenting clinical features were polyuria and polydipsia (94%), nausea and vomiting (33%), and drowsiness (33%) with severe biochemical disturbances. One pilgrim died of metabolic complications of DKA, giving a mortality rate of 6%.[12]

Another important factor is the lack of knowledge about self-management of diabetes and Hajj-specific management. A recent prospective study evaluated 61 pilgrims with diabetes and found that 78% of them had poor diabetes control, 56% received diabetic education before travelling for Hajj, 22% were aware that self-monitoring blood glucose (SMBG) is recommended during stressful times and/or illness with only 38% performing SMBG on a regular basis.[13]

Hypoglycaemia During Hajj

A greater risk of hypoglycaemia is evident during Hajj due to strenuous physical demands, changes in diets and habits, and the potential for delays in meal times. The distance between the holy sites to offer prayers, which can sometimes be several miles from their camps, can not only create physical challenges, but can lead to erratic eating schedules. Additionally, increased temperatures during the Hajj held in summer can cause an enhanced reaction to insulin absorption that in turn produces hypoglycaemia. It is also possible for the heat to cause interference with insulin storage and therefore produce hyperglycaemia. In a prospective study during the 2005 Hajj pilgrimage, 5 of 220 DM patients reported hypoglycaemia.[8] One study evaluating causes of ICU admissions reported 0.7% of the admitted cases owed it to hypoglycaemia.[6] Another study reported that hypoglycaemic episodes during Hajj were not uncommon.[14] The researchers noted how insulin preparations differed from country to country (e.g. 40 U/ml 100 U/ml in Saudi Arabia) which may have contributed to some cases of accidental insulin overdose as they used to inject insulin by the millilitre (ml).Furthermore, they found many patients on regular bolus insulin alone without any basal which could reflect

the lack of education and proper instructions from the diabetes management team. In addition, delayed meal times, especially close to prayer timings, and eating less in alien environment, most of the time lead to recurrent attacks of hypoglycaemia.

Respiratory Infections

Hajj brings on an incredible amount of people in close proximity which is a veritable breeding ground for any infection to spread. Respiratory infection remains a prominent illness reported among Hajj pilgrims, and studies have shown that 36% of hospitalisations are caused by this airborne condition.[15-17] Variances in the clinical spectrum and severity of the disease varied from a mild inconvenience to hospitalisation and even death. Respiratory infections are a well-known provocative factor for hyperglycaemic crisis.[11] Recommendations for people with diabetes to be vaccinated annually against influenza are in place and should remain a priority for those attending Hajj.[18] Since 2005, the Saudi Ministry of Health (MOH) has advised to reduce the risk of transmission of influenza at Hajj by recommending annual seasonal influenza vaccinations for all Hajj pilgrims in general, but in particular for those at high risk of developing severe complications of influenza such as people with diabetes.[19] Regarding vaccination, the incidence of influenza-like illnesses decreased in a 10-year retrospective study where data was collected between 2005 and 2014 among 33,213 pilgrims. This study showed that when vaccine inoculation increased, the occurrence of influenza and influenza-like conditions decreased with relative risk =0.2 ($p<0.01$).[20] In a study among Malaysian pilgrims in 2013 Hajj season, pilgrims with diabetes were associated with higher risk of respiratory illness (odds ratio [OR] 1.80; 95% confidence interval CI] 0.53-6.02).[21]

Diabetes and Heat

The body's normal response to heat may vary in patients with chronic medical conditions such as T2DM. Epidemiological data from extreme heat events demonstrate that T2DM individuals are more likely to die or be hospitalised during a period of severe heat compared with those without diabetes.[17,22-24] T2DM, its associated co-morbidities, the medications that can cause dehydration, reduced sweating, and a lower skin blood flow are conditions that can severely reduce the body's thermoregulation and the ability to transfer heat from its core.[25] Individuals with poor blood glucose control are especially vulnerable. Literature shows a few studies that have examined whole-body heat loss in T2DM patients.[25] However, several studies have showed impairments in local heat loss responses of sweating and skin blood flow in T2DM patients compared to matched controls.[26-28] In spite of T2DM being associated with impairments in local heat loss responses of sweating and skin blood flow, in more physically active T2DM patients, it is possible that a higher tolerance for heat can be realised compared to those of similar ages and body types.[29]

Foot Problems

In a 2003-04 study evaluating the parallels of surgical admissions in two major hospitals during two consecutive Hajj years, diabetic foot was found to be the most common cause for admission to a surgical ward.[30] Hajj involves walking long distances and sometime walking barefoot.[31] An earlier study mentioned pointed to the movement patterns between the holy places.[10,32] Due to extreme ground temperatures that can reach 50-60°C, foot-burns can occur.[31] At particular risk are patients with diabetic neuropathy or peripheral vascular disease. Add the susceptibility to increased risk of infection and the complications of poor healing for this group, and the risks expand. Twelve cases of foot-burn were reported from standing in place or walking barefoot after the Friday prayers.[33] All injuries occurred during the summer months. People with diabetes showing significant peripheral neuropathy were 8 among the 12 adults. With non-diabetic individuals, the anterior part of the soles developed second-degree burns among those with intact sensibility. However, people with diabetic neuropathy encountered deep burns on the feet throughout the entire weight-bearing surface of the soles. Care needs to be taken to avoid walking barefoot at all times and following foot-care advice from the physician because of the serious risk of diabetic foot complications.

Preparations for Hajj

Hajj creates stressful conditions that require strenuous physical activities which present specific challenges for diabetics. A pre-travel consultation with a health professional is highly recommended for people with diabetes.[34] People in poor health should consider a religious dispensation with their doctor if the risk of attending the event is too great.[35] Any co-morbid condition, the enhancement of diabetes control requirement under the demanding circumstances the Hajj presents, or surveillance and management of any complications should be discussed during the pre-travel consultation with the medical practitioner. Education is the single-most predominant factor during this meeting. A change in dosage may be necessary to accommodate travel, especially between the Makkah, Al-Mashaer and Medina areas. A healthcare team might also recommend mid-morning snacks during these strenuous travel times.

Additionally, patients need to ensure adequate diabetic

control by regular monitoring of blood glucose, eating regular healthy meals and maintaining good compliance with treatment.[13,36,37] All pilgrims with diabetes should be aware of sick-day rules before embarking on Hajj (Figure).

Poorly-controlled diabetes, excessive activities and high temperatures (>40°C in summer) can have a serious effect on Hajjis. Patients should be advised to use an umbrella to reflect the sun and remain properly hydrated by drinking about 0.4-0.8 L of water per hour during intense Hajj activity.[38] Appropriate footwear must be worn by pilgrims with diabetes at all times along with foot self-inspection that should be performed on a daily basis. Hygiene is a critical component due to the fact that pilgrims sometimes walk several kilometres or more to complete Hajj rituals. Hygiene care can present a significant pathology to the feet in people with diabetes. Petroleum jelly can be useful to the groin area where people with diabetes tend to show irritation from walking in the heat over long distances.

Pilgrims should take sufficient supplies of their usual drugs, needles and monitoring instruments.[13] A cooling case is useful (one with a temperature monitor is highly recommended) to carry insulin, glucagon-like peptide-1 receptor agonists, and glucagon. The effectiveness of diabetes equipment and medication is climate-sensitive; therefore, an ideal average room temperature of about 25°C/77°F for metres and strips is the goal. Insulin should be used within a maximum of 28 days, and requires a temperature of 4°C and 24°C. Any insulin not being used must never be frozen or kept near the freezer storage area, and must be stored in a refrigerator at a temperature around 4°C for maximum effectiveness. Most injectable

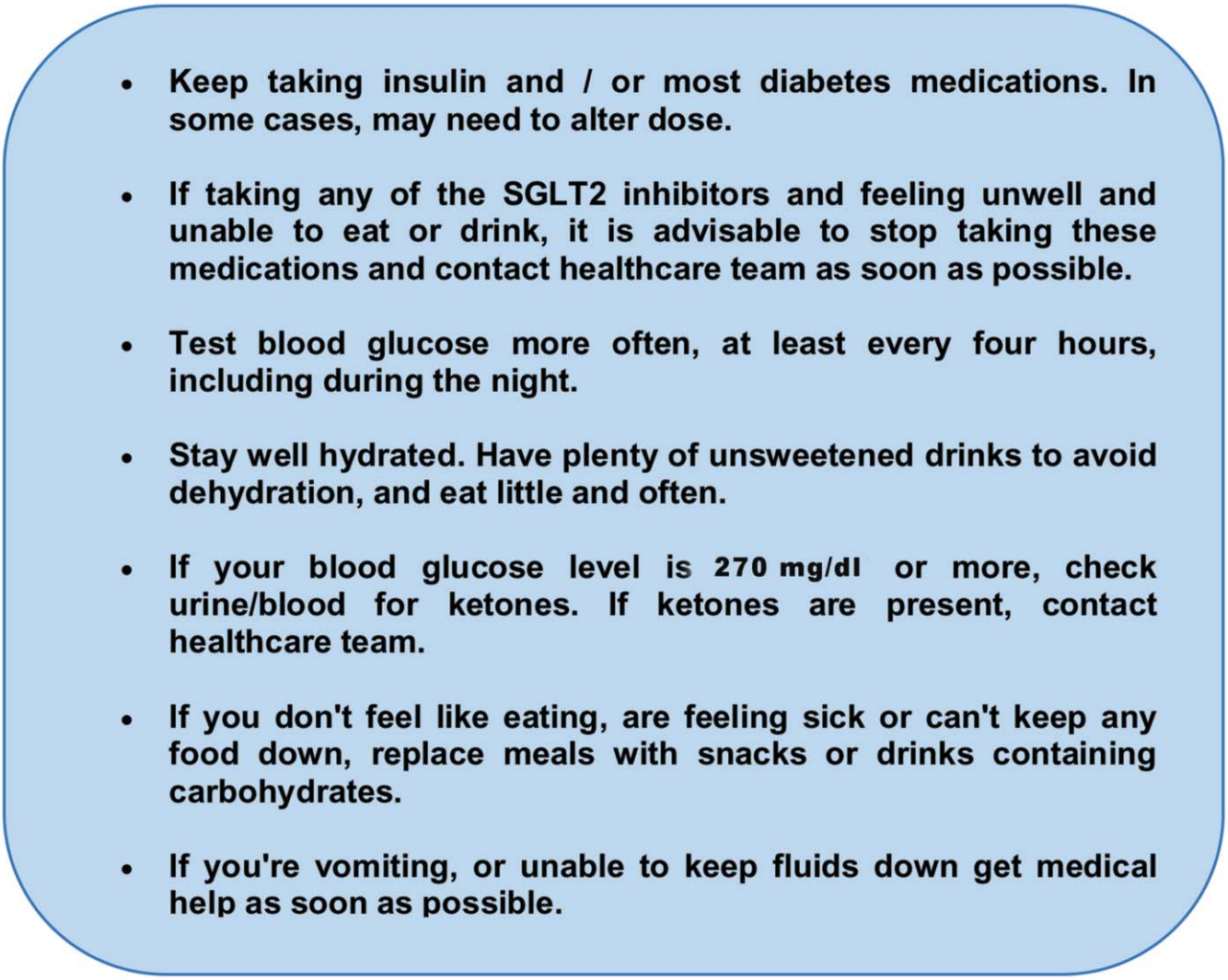

Figure: Tips for dealing with illness (Sick day rules).

diabetes treatments, such as glucagon-like peptide 1 (GLP-1), should follow the same rules. Additionally, the strength of insulin prescribed in the home country must be noted as other countries can use different means of measurement. Many countries use a 40 U/ml dosage, but in Saudi Arabia, 100 U/ml is the more common strength. Before travelling, one shall check the dosage requirements with one's healthcare provider.

Identifying wristbands and paperwork specifying the medical need to bring along syringes and needles on flights should be obtained prior to departure from any airport location.[36] Furthermore, a written medical report, including current medical history, medication generic names, allergies and contact details of the diabetes care providers, should be carried at all times during the journey. People who are treated with insulin or sulphonylurea should carry a diabetes emergency kit during the journey. The kit should contain sugary foods or glucose tablets to use in case of low blood glucose, and glucagon kit for ready use in insulin-treated patients.

While travelling, injection schedules with less than a four-hour time zone change do not require any deviation or consideration.[39] For pilgrims using the basal bolus regimen to manage their diabetes, a disruption in schedule when crossing time zones should not pose any issues.[40] Quadrivalent meningococcal vaccines (A, C, Y and W-135) are now required to obtain a Hajj visa. This requirement stems from outbreaks of meningitis previously and should be obtained more than 10 days and less than 3 years prior to departure.[36,41] Also, it is advisable to confirm that influenza, hepatitis A, hepatitis B, typhoid, pneumococcus, polio, and an array of other vaccinations for children and adults are current.[36,41,42] A drop in mortality has been shown with a pre-Hajj formal assessment and proper management of the disease.[43]

Conclusion

Hajj pilgrimage often demands substantial financial preparation on the part of the pilgrims and many do not attain the necessary financial readiness until much later in life when age has become an important predisposing factor for chronic disorders, especially DM. In order for patients to stay healthy during Hajj, healthcare practitioners should enrich themselves with knowledge to serve their patients with guidance, advice and any possible medication changes at a pre-Hajj counselling session.

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