



Health Issues of Nigerian Muslim Pilgrims in The Immediate Post-Covid-19 Era Hajj Year 2022– Part II (Non-Communicable Diseases)

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ABSTRACT

Background: Hajj is an important rite in the life of devout Muslims, requiring the devolvement of physical and material resources in its execution. Limitations posed by COVID-19 on the performance of Hajj make the year 2022 hajj to be an atypical one compared to other years' international hajj. Nigerian pilgrims are peculiar as a low-and middle-income country (LAMIC) with the highest number of Muslim pilgrims from Africa. The objective of this article is to review the health implications of Hajj and peculiarities of the post- COVID 19 era, regarding non-communicable diseases in Nigerian pilgrims based on literature, the interaction of authors with pilgrims, and the experiences of an author as a pilgrim.

Results: Commonly encountered non-communicable respiratory, cardiovascular, nutritional, gastrointestinal, endocrine, reproductive, neurological, and musculoskeletal health issues in Nigerian pilgrims were explored. Preventive health strategies by individual pilgrims, the national medical team of National Hajj Commission of Nigeria (NAHCON), the Ministry of Health (MOH) of the Kingdom of Saudi Arabia (KSA) and other stakeholders involved directly or indirectly in conducting Hajj rites were appraised. This includes but not limited to illness screening, chronic illness management, life style modification, medication adherence, and accident prevention.

Conclusions: It was concluded that the efforts of the Kingdom of Saudi Arabia, as well as Nigeria authorities on Hajj health services, are commendable, though there are still a lot of areas that need to be improved upon. Significant importance should be given to pre-hajj and post-hajj screening of pilgrims for communicable health issues in pilgrims to enable optimal execution of hajj task and maintenance of pilgrims' health beyond hajj period.

Introduction

This piece should be regarded as part of a two-series publication, the

complementary part was focused on communicable health issues while this part objective is to elaborate the non-

communicable diseases among Nigerian pilgrims and the necessary mitigating efforts.

Regarding Nigeria, other low and middle-income countries (LAMICs) as well as high income countries, pilgrims have so many prevailing health issues even in the pre-COVID-19 era aside from communicable diseases. These include increased risk of stampedes and injuries, fire outbreak, disease transmission, worsening of non-communicable diseases, complications of exposure to unaccustomed climate such as heat stroke, sunburns, harmattan, dehydration, psychological illness, health hazards from food and environmental hygiene (Memish et al., 2012). Challenges of crowd management, safety, security, and emergency preparedness, are posed. Provisions need to be made for these health factors and it will involve non-health specialists including venue engineers, event planners, security personnel etcetera. to enable the successful performance of hajj rites as well as ensure optimal health of every member of the global community within and beyond the geographical area of the pilgrimage rites. The optimal health still needs to be maintained or improved upon after completion of hajj rites and remain in the cyclical path till the onset of the next hajj season which is usually about 11 days less

than the same date of the preceding year in the Gregorian calendar.

Non-Muslim imperial European powers were actively involved in hajj management before the emergence of the Saudi petrodollar and modern hajj management which is now being done entirely by the Muslims. Saudi Arabia's safety, security, environmental and health policies have evolved after several decades of conducting hajj rites for the Muslim populace (Memish et al., 2012), improving on this will serve as a useful mode of risk management and international collaboration in mass gatherings.

General Health

Screening

Screening for non-communicable diseases such as hypertension, diabetes, obesity, hyperlipidemia, bronchial asthma, neoplasm, osteoarthritis, and mental, neurological as well as other systemic illnesses must be done through detailed but focused history taking, purposeful methodical physical examinations, and relevant cost-effective simple laboratory investigations. Pilgrims should be encouraged to disclose their health status by revealing any chronic medical or surgical conditions they have had in the past or which they are currently on treatment for. This will enable appropriate health education and care for the respective

pilgrims. Long-term medications are usually required for most chronic illnesses, such pilgrims should be advised to visit their specialist at least a month before departure date, to allow ample time for pre-travel medical fitness evaluation, medication review, and refill stock of medications that can last up to two months. Copies of appropriate prescription forms should be available and presented when necessary to avert altercation with drug law enforcement agencies during departure as well as at the entry port.

Individuals with pre-existing illnesses of the respiratory system like bronchial asthma and chronic obstructive airway diseases (COPD) should take necessary precautions to avert symptom recurrence. Stress from intense activities, respiratory infective pathogens (Saifuddin et al., 2020) cold air from abuse of air conditioners (D'Amato et al., 2018) can lead to symptoms exacerbation. Most Nigerian families can not afford and maintain air conditioner. Fans are used more in Nigerian homes for adequate ventilation. The affluent Saudi community employs the use of air-conditioners in hotel rooms and Masjids. Cold air in winter/ harmattan season is known to be associated with airway hyper-responsiveness, air pollution, bio-contaminants proliferation, and other negative effects, especially on the lungs. Cold water/ beverages consumptions can

also be irritating to upper airway. There is risk of exacerbation of asthma and COPD when the air temperature drops too quickly by 2 to 5 degree Celsius without gradual adaptation in individuals that are not accustomed to such (D'Amato et al., 2018).

Inhalers and other necessary medications should be carried along with their recent prescriptions during the journey to enable early intervention during symptom exacerbation before hospital presentation. Lukewarm water or warm beverages are preferred to cold water as a thirst quencher in people at risk of airway disease (Saketkhoo et al., 1978).

Cardiometabolic system

Evaluation of cardiovascular risk factors is essential component of pre-hajj medical screening. People with a history of stroke, systemic hypertension, diabetes mellitus, and hyperlipidemia are placed on appropriate treatment and given health education to keep their illness in a stable and controlled state. The incidence of cerebrovascular accidents has been reported to be lower in Iranian pilgrims during hajj compared to the natives in home country. This was attributed to the proper screening for cardiovascular risk factors and intervention efforts that mitigate illness progression and complications (Reza Azarpazhooh et al., 2013).

Authorities of the KSA Ministry of Health (MOH) should be commended for placing Automated Electrical Defibrillators (AED) (figure 1) at strategic places in the premises of the sacred mosques for use in resuscitation during emergencies like cardiac arrest and syncope attacks. The security personnel in the premises of the Grand Holy Mosque (as well as other mosques) should be trained on the basic life support skills and the usefulness of AED in such emergencies before the arrival of an ambulance for conveyance to the hospital.



Figure 1. Automated Electrical Defibrillators (AED) Stationed at Strategic Places in the Precincts of Grand Holy Mosque

As part of hajj preparations, intending pilgrims should engage in regular exercise (Shaikh-omar et al., 2013) to enable them to be fit to perform the rigorous and physically

demanding tasks of hajj without getting exhausted easily. Junk food is considered as high in fat, salt and sugar (HFSS) (Asif, 2016) with little dietary fiber, protein, vitamins, minerals, or other important nutrients. They are considered unhealthy for people with cardiovascular risk factors such as hypertension, diabetes, hyperlipidemia, and obese individuals. These HFSS foods are usually distributed as free packaged meals for pilgrims by some Saudi Philanthropic agencies. Pilgrims from Nigeria and other LAMICs benefit from these meal packs to supplement their dietary needs without any regard or consideration for the effect on their cardiovascular health. Pilgrims with cardiovascular risk factors should be educated to avert getting these meals but can get the fresh fruit and vegetable packs that are also distributed by the philanthropists for their nutritional supplementation.

Pilgrims need to take into cognizance the necessary dietary modifications occasioned by their health. Hypertensive individuals are to abide by the necessary salt restriction in their diet, refined sugars should be avoided by diabetic individuals as much as possible. Catering institutions that got contracts for mass meal supply to pilgrims should be notified and instructed by the company for the Mutawwifs of Non-Arab African countries (MU'ASSASA) of the

need to prepare special dietary needs/dishes for these categories of people.

Nutrition and Gastrointestinal System

Peptic ulcer disease (PUD) is reported as one of the commonest illnesses among Nigerian pilgrims (Abubakar, 2022). Eating habits may be a focus of concern here as some food items may precipitate symptoms recurrence (eg caffeinated beverages) and should be taken with caution. The stress of the journey may also induce or precipitate PUD in the predisposed.

Zamzam is a readily available water source in the precinct of the Holy Mosque, prescribed in the religion to be consumed immediately after completion of sa'ay. It is also used for nutritional and medicinal value based on prophetic recommendations for quenching thirst, and hunger and a healing for several ailments. Modern plumbing and the hydrological system have made the claims of possible contamination or pollution of Holy Zamzam water from Hagar's well a thing of the past (Memish et al., 2012). A recent subject of controversy is the claim of unsafe high concentrations of arsenic and nitrates in Zamzam water. The possible carcinogenicity of arsenic as a heavy metal calls for caution as raised by British Broadcasting Corporation (BBC) in hot health and sociopolitical debate in May 2011 (Lyrin, 2011)



Figure 2. Bottled Zamzam Water by the Custodian of the Two Holy Mosques

Arsenic is a heavy metal, beneficial though to a large extent but has also been described to be carcinogenic (WHO, 2018). Organ toxicity (eg Nephrotoxicity, hepatotoxicity) which are a typical occurrence in acute and chronic heavy metal poisoning like lead, and mercury is not demonstrable during five-week comparative study on experimental animals that were fed with Zamzam water and the control group. (HA et al., 2021) Arsenic has also been used in some cancer chemotherapy. it's not unusual for a chemotherapeutic agent to be found to be carcinogenic (Harris Curtis, 1976). Such paradoxical and bidirectional effects have been described in several classes of drugs. (Smith et al., 2012) A multi-center study of about 30 samples of Zamzam water was obtained from the precincts of the Holy Mosque in Makkah as well as from pilgrims

from several countries, and were analyzed for different micronutrients, minerals, heavy metals, and other constituents. There was no significant difference between the constituents of all the samples even after two-year storage. The concentration of Arsenic and lithium were demonstrably higher than WHO allowable limits in all the samples. The higher lithium concentration may be beneficial for mood stabilization and suicide prevention (Shomar, 2012). A possible rejoinder for higher concentration of arsenic and the scriptural recommendation of healing properties of Zamzam water is the demonstration of the presence of antioxidant minerals like selenium, magnesium, manganese, and strontium which concentration probably counteract the oxidative effect of high arsenic concentration (Aljuhani, 2021).

Ingestion of Zamzam water for the few days or weeks of the annual Hajj and Umrah pilgrimage by pilgrims is unlikely to precipitate carcinogenesis or organ toxicity as demonstrated in experimental animals (HA et al., 2021). Consistent use is more likely for the Meccan dwellers who are more likely to make use of the water on several occasions due to proximity, availability, and the belief in its healing properties. Retrospective epidemiological data may need to be garnered to know if any form of cancer (or other features of heavy metal poisoning) is more prevalent in

Meccans than dwellers of other places that have no access to Zamzam water.

Central Nervous System

Cerebrovascular accidents (CVAs)

Incident of Cerebrovascular accidents was found to be about 8.9/per 100,000 pilgrims during the 2015 hajj, with peak occurrence on the day of Eid-ul-Adha and an 11.6% case fatality rate (Almekhlafi et al., 2017). Azarpazhooh et al estimated the adjusted incidence of first-ever stroke (FES) amidst Iranian Hujajs and compared it with the non-pilgrims Iranian population in a Mashhad city of Iran. The incidence of FES was generally lower than that of the non-pilgrim populations (Reza Azarpazhooh et al., 2013). Hypertension, diabetes mellitus, hyperlipidemia, and other risk factors for CVA should be assessed and controlled before allowing pilgrims to proceed on hajj.

Epilepsy

Epilepsy is a common neurological illness as well. Affected pilgrims are better stabilized on antiepileptic drugs (AEDs) before being certified fit to proceed with Hajj by the medical team (Saad, 2017). ‘

Psychiatric Illnesses

The prevalence of mental illnesses among Hajj pilgrims ranges between less than 1% (Raja et al., 2017) and 7.2 %

(Alzahrani et al., 2021). Patients with Major mental illnesses (like Schizophrenia and related disorders, bipolar, depressive, and anxiety disorders) should be encouraged to disclose their illness to the medical team who should advise or refer such pilgrims to a psychiatrist for assessment of their fitness to proceed on Hajj. An illness remission state must be attained before proceeding on hajj. The stock of medication and prescription notes should be carried along as done for other chronic ailments during the hajj journey for ease of refill and sustaining the maintenance dose to avert recurrence. It is not uncommon for mental illness to recur due to the strenuous nature of hajj rites. Early warning signs and relapse signatures characteristic of the patient illness should be identified and the patient educated on the need for early presentation and early intervention to avert full relapse.

Psychoactive Substance Use/Misuse

Hajj season is an opportunity for people who abuse a psychoactive substances to abstain from their addictive behavior as much of their time and attention should be dedicated to worship and not recreational drug use/activities. Consumption of alcoholic beverages is a punishable offense in Islam, the same applies to buy, selling or using in the Kingdom of Saudi Arabia as well as most other Islamic countries of the world. Smoking is prohibited in most holy

sites to avert the exposure of other pilgrims to passive smoking and prevent fire accidents in congested settings/mass gatherings. Most other psychoactive substances are considered khamr (intoxicants) whose consumptions are also sinful in Islam and should be avoided to enable the attainment of the desired spiritual benefit of the hajj. There are anecdotal reports that consumption of Zamzam water reduces addictive behavior possibly because of its sub-therapeutic lithium content (Sudhir Gadh, 2020). Lithium concentration of Zamzam water may be of therapeutic value in people with suicidality, mood, other behavioral disorder, and lead neurotoxicity (Brown et al., 2018).

Emotional Distraught

Some intending pilgrims could not perform the 2022 Hajj due to the stringent measures dictated by the COVID19 pandemic, and the limited period is given to prepare for the operation by the Hajj Ministry of Saudi Arabia, which make NAHCON title it as an “emergency hajj” (Abubakar, 2022). Such people are emotionally distraught as this translated to missing the hajj chance for three consecutive years. NAHCON put measures in place to ensure that such individuals should be given topmost consideration during the subsequent year (2023) hajj year.

Musculoskeletal System

Prevalence of musculoskeletal pain was reported to be as high as 80.46% among pilgrims of different nationalities that were interviewed at various sites of hajj rites such as Grand Holy Mosque, Mina, Arafat and Muzdalifah (Alshehri et al., 2021). The painful conditions (especially lower limb pain) are more prevalent in females, older age groups, and the obese (Alshehri et al., 2021) Disorders of the musculo-skeletal system are next to respiratory tract infection in order of commonality of hospital presentation amidst Nigerian pilgrims (Abubakar, 2022), same was reported in a study of Pakistani pilgrims presenting in Pakistani Hajj Medical Mission` Hospital and Dispensary in Meccas (Raja et al., 2017). This is due to the need to walk in performing most tasks by pilgrims. Some pilgrims also miss their ways and end up walking long distances in search of their destinations. The language barrier makes it difficult for most pilgrims to get appropriate guidance from Saudi security personnel. Making use of a wrist straps which can be read by the Saudi personnel, and the use of maps (including google Maps) can ameliorate this. Pilgrims should also try to make use of the free transport systems (eg train services) provided by Saudi authorities.

Footwear should not be tight fitting (note that shoes and socks are not allowed for

men). It is advisable to use old footwear than new ones to avoid sores and blisters during rigorous tasks like tawaf and sa'ay. Voluntary health workers (VHW eg Red Crescent Society of Saudi Arabia) are readily available and accessible on most walkways to the sites of performance of rigorous rites to assist people that have muscle cramps, osteoarthritis, sprains etcetra.

People with disabling illnesses and advanced age should be informed about the permissibility of delegating a healthier younger person to perform the Hajj on their behalf. This will reduce the burden of illness, cost, and associated discomfort. Stampedes, accidents, injuries, and exhaustion are a common occurrences during the hajj (Al-Harhi & Al-Harbi, 2001). This can be minimized by following Islamic guidelines of rites performance, adoptions of permissible options, devices, and technologies.

Most activities can be done at convenient periods of different parts of the day. Pilgrims can be grouped into batches of genders, regions, or nationalities in performing tasks like the stoning of satan effigy to avert congestion, fall, and stampede that may occur during the task. People with physical disabilities are permitted to do the stoning at an earlier part of the day or delegate a healthy person to perform it on their behalf while able-bodied

pilgrims are encouraged to do their stoning by mid-day. The use of wheelchairs, electronic carts etcera is permissible for the disabled. These are available for rent at some cost which may not be affordable to most Nigerian pilgrims.



Figure 3. Pilgrims performing strenuous Hajj rites n Electric Scooters

Adoption of apps and online portals (like tawakalna, absher, eatmarna, maqam, etc all available for free download on play store) enable pilgrims to book an appointment for timing specific period one want to do task like visitation of Holy Rawdah; the sacred place between the mimbar (pulpit) and the house of the noble prophet PBUH in Medinah during the ziyara (visitations). This has been tried as part of technological approaches for easing hajj tasks. Some recognized limitations therein include non-

compatibility of some devices with the apps, the requirement of valid and specific types of credit cards, affordability, and availability of internet access.

Reproductive {urogenital} system

Pregnancy and Pilgrimage

Islam encourages accompaniment by one’s legally married spouse(s) in the hajj ritual, sexual cohabitation is however a forbidden act during Hajj and can nullify the validity of Hajj. Separate accommodation facilities are provided for each gender during hajj. Pregnancy is not a contraindication for pilgrimage. The pregnancy test is part of a routine tests conducted for women during pre-hajj medical screening. Pregnant women are encouraged not to perform Hajj to avert possible complications that may arise due to the strenuous nature of the rites. At least, a case of miscarriage was reported among Nigerian pilgrims in the Hajj year 2022 (Gbadamosi, 2022) despite the inclusion of pregnancy tests and ultrasound scanning as parts of pre-hajj medical screening. There are possibilities that such women get fecundated after the conduct of the pregnancy test. It may therefore be recommended during pre-hajj health education that married female pilgrims should practice sexual abstinence or be on contraceptives after the conduct of medical screening, especially during the menstrual

cycle preceding their departure for Hajj, if there are no other gynecological reasons against such.

Menstruation

Menstruating women have some limitations in performing most of their worship generally in *Islam* as seen in solat (prayer) and sawm (fasting). However, most of the Hajj and Umra activities are not limited by menstruation factors except Tawafs which is one of the obligatory aspects of the pilgrimage rites. It however allowed for women to defer the period of performance of compulsory Tawafs (tawaful ifada) till the cessation of menstruation, while other forms of the (voluntary) tawaf (eg Tawaful wada: farewell tawaf) may be left undone. It is also allowed for a woman to take medications (eg norethisterone, combined oral contraceptive pills) that can suppress/postpone her menstruation cycle during the Hajj period till a later time to enable prompt/timely performance of these rites. This should be done after discussing such with her gynecologist to avert the possibility of any adverse effect that may arise upon the use of such medication (Islam et al., 2019).

Dehydration

To avert dehydration from extremely hot arid weather, pilgrims are advised on the

need for frequent water drinking. Bottled Zamzam and non-Zamzam water are readily available, and freely distributed in the city of Mecca and the precinct of the Holy Mosques. Dysuria may be a feature of urine hyper concentration in an individual that is not taking enough water. Heat stroke characterized by a sudden loss of consciousness can result from excessive heat. Pilgrims are therefore advised to make use of an umbrella to avert heat from intense sunshine.

Conclusion and Recommendation

A holistic approach to healthcare is applicable in a mass gatherings like hajj as it is for other aspects of the health sector. The tremendous and continuous developmental efforts by the Ministry of hajj and Umrah and the Ministry of Health of the KSA is commendable. Continuous improvement in services, technological innovations, adaptations, collaborations, and training avenues like the Hajj University concept in KSA, Hajj Institute of Nigeria, {HIN} (Aljoudi, 2013; Usara, 2022) should not cease.

Health education of pilgrims during pre-hajj seminars and workshop needs to be given priority among Nigerians and other LAMICs. Pilgrims should be encouraged to disclose their health status and assured that this may not necessarily prevent them from performing hajj but may serve to improve

their health during hajj. Warm water/ beverages should be made available the same way as cold water is made to be readily available as a thirst quencher, prophylactic and therapeutic modality for people who are prone to respiratory illnesses (Saketkhoo et al., 1978) .

Only twelve Nigerian pilgrims reportedly died during the 2022 Hajj and this is the lowest mortality (3/10000) in the preceding ten years (Aremu, 2022). Despite strong scriptural admonition of performing Hajj when one is healthy, so many wheel-bound pilgrims partake in Hajj and Umrah. Some sick pilgrims anecdotally give advance DNR (do-not-resuscitate) directives/orders if they go into cardiac arrest that they may attain the spiritual benefits of dying during the hajj (Memish et al., 2012). This has big ethical and religious implications. To avert such occurrence, people deemed unfit for hajj should be sermonized of the permissibility of a younger /healthier person to perform the hajj on their behalf while they will still get the spiritual benefit/reward as documented in the authentic hadith of the Noble Prophet Muhammad PBUH.

Pilgrims should be advised (if not mandated) to undergo post-hajj health screening. Similar importance given to pre-hajj screening should be accorded to post-hajj screening to mitigate the risk of disease

transmission in the native countries of all pilgrims.

References

- Abubakar, R. (2022). *Speial report: inside NAHCON medical center at Hajj 2022*. Muslim News Nigeria. <http://muslimnews.com.ng/2022/07/31/special-report-inside-nahcons-medical-center-at-hajj-2022/>
- Al-Harthi, A., & Al-Harbi, M. (2001). Accidental injuries during Muslim pilgrimage. *Saudi Medical Journal*, 22(6), 523–525.
- Aljouidi, A. S. (2013). A University of the Hajj? *The Lancet*, 382(9906), 1689. [https://doi.org/10.1016/S0140-6736\(13\)62340-5](https://doi.org/10.1016/S0140-6736(13)62340-5)
- Aljuhani, N. (2021). Antioxidant properties of Zamzam water : a review for arsenic concerns and potential modulation of drug toxicity. *International Journal of Medicine in Developing Countries*, 5(11), 1988–1995. <https://doi.org/https://doi.org/10.24911/IJMDC.2.1.7>
- Almekhlafi, M. A., Alhazmi, M. A., Alsulami, S. S., & Almorsy, S. A. (2017). Incidence and impact of stroke during Hajj: results of 2015 Hajj stroke registry. *Neurosciences*, 22(3), 181–185. <https://doi.org/10.17712/nsj.2017.3.20160246>
- Alshehri, M. A., Alfaqeh, A., & Alzahrani,

- H. (2021). The prevalence and factors associated with musculoskeletal pain among pilgrims during the Hajj. *Journal of Pain Research, February*. <https://doi.org/10.2147/JPR.S293338>
- Alzahrani, A. S., Alqahtani, A. M., Elmorsy, S. A., Alhazmi, M., Mahdi, H. A., Albarakati, B., Alkhiri, A., & Hakeem, A. (2021). Prevalence of psychiatric disorders in Hajj pilgrims using MINI as a diagnostic tool. *Journal of Public Health (Germany)*, 29(1), 169–175. <https://doi.org/10.1007/s10389-019-01110-3>
- Aremu, M. (2022, September). 2022 Hajj, Matters Arising. *Hajj Reporters*. <http://www.hajjreporters.com/2022-hajj-matters-arising>
- Asif, M. (2016). Health impact of high fat, sugar and salt (HFSS) and poor nutrition foods. *Acta Medica Scientia*, 3(3). <http://asdpub.com/index.php/ams/article/view/348/216>
- Brown, E. E., Gerretsen, P., Pollock, B., & Graff-Guerrero, A. (2018). Psychiatric benefits of lithium in water supplies may be due to protection from the neurotoxicity of lead exposure. *Medical Hypotheses*, 115, 94–102. <https://doi.org/10.1016/j.mehy.2018.04.005>
- D’Amato, M., Molino, A., Calabrese, G., Cecchi, L., Annesi-Maesano, I., & D’Amato, G. (2018). The impact of cold on the respiratory tract and its consequences to respiratory health. *Clinical and Translational Allergy*, 8(20). <https://doi.org/DOIhttps://doi.org/10.1186/s13601-018-0208-9>
- Gbadamosi, S. (2022, July 7). 2022 Hajj: NAHCON medical team laments presence of pregnant Nigerian pilgrims. *Nigerian Tribune*. <https://www.tribuneonline.com/2022/07/2022-hajj-nahcon-medical-team-laments-presence-of-pregnant-nigerian-pilgrims/amp/>
- HA, A. D., RM, A.-S., UM, O., & HA, A. (2021). Biochemical and histological effects of five weeks ingestion of zamzam water on the liver and kidneys of wistar rats. *Saudi Pharmaceutical Journal*, 29(1), 91–95. <https://doi.org/10.1016/j.jsps.2020.12.007>
- Harris Curtis, C. (1976). Carcinogenicity of anticancer drugs: a hazard in man. *Cancer*, 37, 1014–1023.
- Islam, N., Ayaz, A., & Farooq, M. U. (2019). Awareness and experiences of female pilgrims about menstrual suppression during Hajj 1437 Hijrah : a cross-sectional study. *Saudi Journal for Health Sciences*, 8(1), 12–16. <https://doi.org/10.4103/sjhs.sjhs>
- Lyrin, G. (2011). *Contaminated “zamzam” holy water from Mecca sold in UK*.

- British Broadcasting Corporation.
<http://www.bbc.com/news/uk-england-london-13267205.amp>
- Memish, Z. A., Stephens, G. M., Steffen, R., & Ahmed, Q. A. (2012). Emergence of medicine for mass gatherings: lessons from the Hajj. In *The Lancet Infectious Diseases* (Vol. 12, Issue 1, pp. 56–65).
[https://doi.org/10.1016/S1473-3099\(11\)70337-1](https://doi.org/10.1016/S1473-3099(11)70337-1)
- Raja, W., Aziz, A., Hassan, T. B., Jalil, M., Niazi, I. uallah, Jawaaid, N., & Tariq, M. (2017). Disease patterns among Hajj pilgrims attending medical facilities of Pakistan Hajj medical Mission 2016 (1413 Hijri). *Pakistan Armed Forces Medical Journal*, 67, 825–831.
- Reza Azarpazhooh, M., Bavarsad Shahripour, R., Kapral, M. K., Mokhber, N., Shoeibi, A., Taghi Farzadfard, M., Reza Rafati, M., Thrift, A. G., Morovatdar, N., Aidin Sajedi, S., & Azarpazhooh, A. (2013). Incidence of first ever stroke during Hajj ceremony. *BMC (Biomedcentral) Neurology*, 13(193).
<https://doi.org/doi:10.1186/1471-2377-13-193>
- Saad, A. (2017). Health issues during Hajj. *The Egyptian Journal of Internal Medicine*, 29(2), 37–39.
https://doi.org/10.4103/ejim.ejim_31_17
- Saifuddin, A., Nasir, U. Z., Rengganis, I., & Shatri, H. (2020). Risk factors for asthma exacerbation among Hajj pilgrims, a case study from DKI Jakarta, Indonesia. *Medical Journal of Indonesia*, 29(2), 190–197.
<https://doi.org/https://doi.org/10.13181/mji.oa.204170>
- Saketkhoo, K., Januszkiewicz, A., & Sackner, M. A. (1978). Effects of drinking hot water, cold water, and chicken soup on nasal mucus velocity and nasal airflow resistance. *Chest*, 74(4), 408–410.
[https://doi.org/10.1016/S0012-3692\(15\)37387-6](https://doi.org/10.1016/S0012-3692(15)37387-6)
- Shaikh-omar, O. A., Header, E. A., & Bukhari, H. M. (2013). Digestive discomforts and effect of ingested food in people performing Hajj. *Journal of Basic & Applied Sciences*, 9(January), 341–347. <https://doi.org/10.6000/1927-5129.2013.09.44>
- Shomar, B. (2012). Zamzam water: concentration of trace elements and other characteristics. *Chemosphere*, 86(6), 600–605.
<https://doi.org/10.1016/j.chemosphere.2011.10.025>
- Smith, S. W., Hauben, M., & Aronson, J. K. (2012). Paradoxical and bidirectional drug effects. *Drug Safety*, 35(3), 173–189. <https://doi.org/10.2165/11597710-000000000-00000>
- Sudhir Gadh. (2020). Low-dose lithium

impact in an addiction treatment setting.

Personalized Medicine in Psychiatry,
21–22.

<https://doi.org/https://doi.org/10.1016/j.pmp.2020.100059>

Usara, F. S. (2022, November 22). Hajj Institute of Nigeria Received Federal Government's Approval. *PR Nigeria*.
<https://prnigeria.com/2022/03/30/hajj-institute-nigeria/>

WHO. (2018). *Arsenic*. World Health Organization.

<https://www.who.int/news-room/fact-sheets/detail/arsenic>