

Concepts in Disaster Medicine

Cite this article: Aghababaeian H and Etedali H (2024). Urgent Warning: Evidence-Based Concerns Regarding Mass Gathering Events During Arbaeen in Hazardous Weather Conditions. *Disaster Medicine and Public Health Preparedness*, **18**, e258, 1–5 <https://doi.org/10.1017/dmp.2024.173>

Received: 25 November 2023

Revised: 24 June 2024

Accepted: 09 July 2024

Keywords:


climate change; health; emergencies; disasters; mass gathering

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Urgent Warning: Evidence-Based Concerns Regarding Mass Gathering Events During Arbaeen in Hazardous Weather Conditions

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Abstract

The Arbaeen ceremony is the largest annual mass gathering in the world, attracting millions of Muslim pilgrims each year. However, the event takes place during the summer in Iraq, coinciding with extreme heat and dust storms. Climate change hazards, such as heat waves and dust storms, can have destructive effects on human health, leading to increased mortality and the spread of various diseases. This manuscript recommends measures to stakeholders in emergency or public health management to develop a preventive plan for the Arbaeen ceremony. These measures include improving planning and risk assessment, enhancing capacities, reducing vulnerabilities, increasing knowledge and awareness among pilgrims, developing communication and support systems, ensuring compliance with safety protocols, and regularly assessing evacuation routes. Implementing these measures will contribute to ensuring the safety and well-being of participants during the Arbaeen ceremony in the years ahead.

The World Health Organization defines mass gatherings as the gathering of a certain number of people who come together in a specific place, for a specific purpose, and in a specific period of time.¹ The Arbaeen ceremony is the largest annual mass gathering in the world and one of the largest collective gatherings globally.² Every year, millions of Muslim pilgrims from approximately 60 different nationalities, including countries such as Iran, India, Pakistan, Afghanistan, and Azerbaijan, as well as Turkey, Lebanon, Kuwait, Bahrain, and Saudi Arabia, participate in this important annual gathering and visit Imam Hussein's shrine for mourning.^{3,4} Recent evidence indicates a growing trend in the number of Muslims participating in this annual gathering⁵ (Figure 1).

In Arbaeen 2023, more than 20 million people participated in this gathering. This event takes place on the 20th day of the second month of the lunar calendar, known as Safar.⁶ Holding this ceremony according to the lunar calendar results in it occurring on different days and seasons each year,⁷ making it susceptible to environmental and seasonal changes in the host country.³ These changes can render previous plans ineffective. For example, Arbaeen in 2013 coincided with the beginning of the winter season in Iraq, while subsequent ceremonies shifted from winter to summer. Consequently, in recent years, this significant religious ceremony has taken place during the summer season and reached its peak during the intense heat in Iraq (Figure 2). The summer season in Iraq coincides with extreme heat and dust storms.

Epidemiological findings indicate that climate change hazards such as dust storms,⁹ heat waves, severe climate changes, and extreme heat have destructive effects on human health. They can lead to an increase in mortality rates and the spread of various diseases, including cardiovascular, respiratory, digestive, and infectious diseases.¹⁰ Furthermore, studies have shown that the prevalence of infectious diseases such as diarrhea and respiratory diseases among pilgrims has increased during the Arbaeen ceremony, presenting a significant health threat.⁶

Considering the growing trend of participants in this ceremony, the increasing average air temperature due to the arrival of the summer season in Iraq, the possibility of dust storms, and the potential security issues in Iraq, we predict the possibility of double and cascading incidents during the Arbaeen ceremony in Iraq from 2024 to 2029.

Emergency Risk Reduction Recommendation

In this concept letter, we recommend important measures to stakeholders for implementing a preventive plan to manage the health of this important annual gathering and reduce the damage caused by possible incidences to mitigate the potential damage caused by such incidents. We

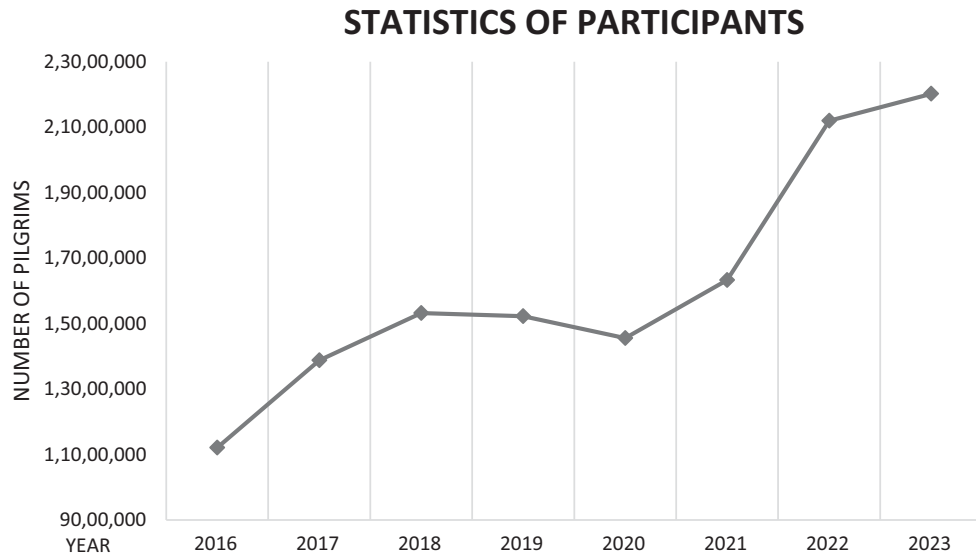


Figure 1. Chart of the number of pilgrims in Arbaeen 2016–2023

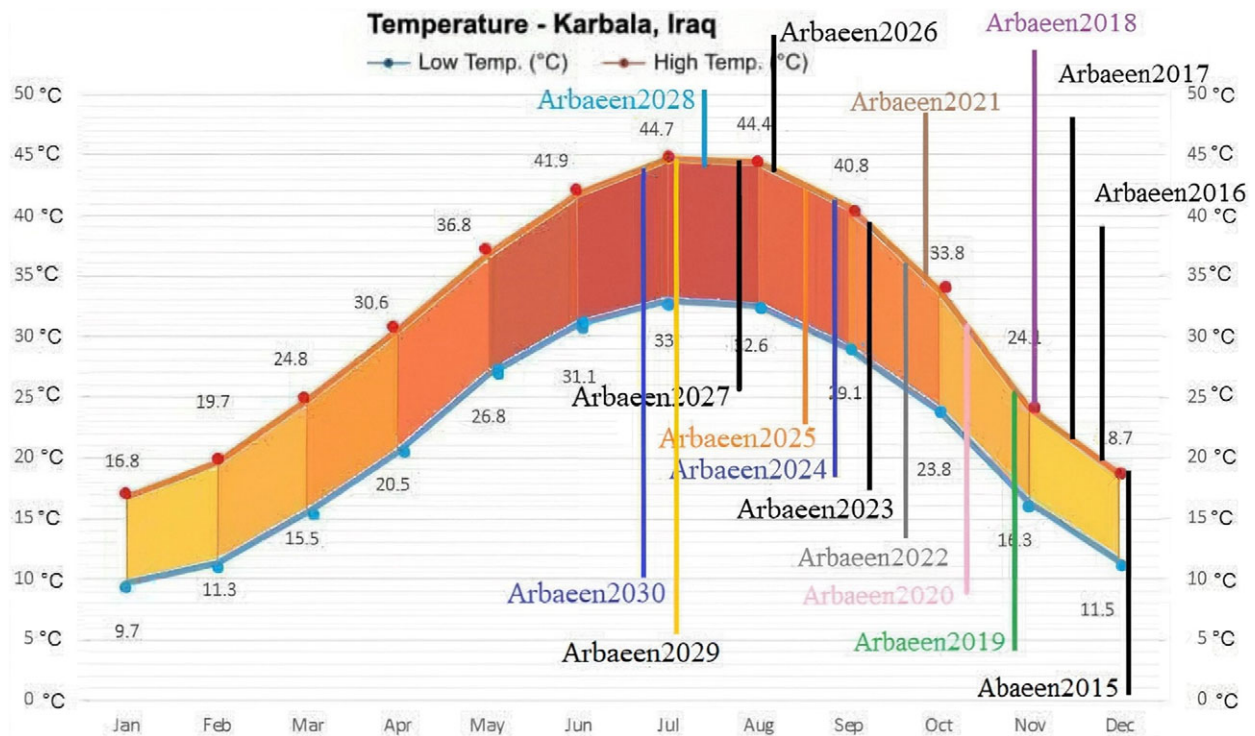


Figure 2. Weather condition in Karbala during summer.⁸

recommend the following measures to the stakeholders for implementing a preventive plan for the health management of this important annual gathering:

1. Coordination, Collaboration, and Developing a Contingency Plan

Improving planning and developing a contingency plan for the Arbaeen ceremony should be done in collaboration with the World Health Organization, the Saudi Mass Incident Research Center, and other relevant stakeholders. The Saudi Mass Incident Research Center is an experienced partner that manages the annual Hajj ceremony in coordination with the WHO.^{11–13}

Enhancing the preparedness of responsive organizations for the Arbaeen ceremony requires skilled and experienced managers with the necessary expertise.¹⁴ Event planners and organizers should also consider the worst-case scenarios to minimize potential negative impacts. The experiences gained from medical operations in past mass gatherings can provide valuable lessons and opportunities for training exercises to prepare for potential responses during the Arbaeen ceremony.¹⁵

2. Risk Assessment and Training

Risk assessment, emergency scenario development, and practice drills are crucial to improve the knowledge and performance of medical personnel in preventing and

effectively responding to mass casualty incidents during mass gatherings.^{11,13} Pre-event risk assessment, particularly for terrorism risks, is of utmost importance for large-scale events.^{16–18} Various scenarios should be simulated and assessed to prepare for different types of risks and accidents.¹⁹ Training can help medical teams better manage the critical early stages of mass casualty incidents.¹⁵ Exercises should be tailored based on previous challenges to allow medical and relief forces to acquire skills in areas like incident command, triage, inter-agency coordination, and the use of new technologies.²⁰ These preparedness measures are essential for increasing the readiness of medical personnel to respond to potential incidents during mass gatherings.

3. Incident Command System

Strengthening the Incident Command System (ICS) is crucial for effectively coordinating the response to mass gathering incidents. The ICS should be utilized by all organizations involved, regardless of the scope, duration, or complexity of the event.²¹ One of the key shortcomings identified in the management of mass gathering incidents is the absence of a hospital command system. To address this, it is important to ensure local hospitals participate in the emergency planning process and prepare to respond to potential incidents at mass gatherings.^{15,22} Coordinating with local hospitals and integrating them into the overall ICS is essential for enhancing the medical management and response capabilities during mass gathering events.

4. Health Infrastructure

To enhance capacities for managing mass gathering events like the Arbaeen ceremony, it is crucial to improve the overall health conditions at the gathering place. Key areas that need to be addressed include: accommodation, water, nutrition, and transportation arrangements for the attendees/pilgrims; enhancing sanitary facilities; and infrastructure. Past studies have highlighted major health challenges during the Arbaeen ceremony, such as: weak performance in the health system, Poor environmental hygiene at the route and gathering site, inadequate compliance with health guidelines for food preparation and distribution, and insufficient health infrastructure.²³ Addressing these health-related factors and enhancing the overall health conditions at the mass gathering site can significantly improve the capacity to manage and respond to potential incidents.

5. Early Warning System

To enhance preparedness for mass gathering events, it is crucial to establish and strengthen an early warning system that can monitor: water hazards, air quality, environmental conditions, and disease surveillance.

A robust disease surveillance system can help quickly identify potential outbreaks or deliberate use of chemical, biological, or radioactive agents, allowing for a faster emergency response.²⁴ Additionally, having a weather monitoring and forecasting system in place is important to mitigate the impact of adverse weather conditions that can catch both organizers and participants off guard.²⁰ Implementing this comprehensive early warning system can significantly improve the ability to detect and respond to various health, environmental, and weather-related risks during mass gathering events.

6. Mitigating Vulnerabilities

To reduce vulnerabilities during mass gatherings like the Arbaeen ceremony, key measures should include:²³ implementing age restrictions for attendees, ensuring foreign pilgrims have no underlying diseases or disabilities, and promoting timely vaccinations against diseases such as COVID-19, influenza, meningitis, etc. Identifying and addressing the vulnerabilities of individuals in these mass gatherings can help reduce the occurrence of injuries and other adverse health outcomes.

7. Participant Knowledge and Awareness

Enhance knowledge and awareness among pilgrims to prevent diseases and accidents. In this context, Karampourian (2018) concluded that educating pilgrims, along with effective planning and control measures, can transform the challenges of the Arbaeen gathering into opportunities and enhance the health of the participants in the region.²³

8. Upskilling Medical Teams

Improve the knowledge and performance of emergency medical personnel to prevent accidents and effectively respond to mass casualty incidents. Education can indeed help prepare the medical team to better manage the early and critical stages of a Mass Casualty Incident (MCI).¹⁵

9. Emergency Operation Plan

Emergency Operation Plan for mass gathering events should include: capacity expansion planning, developing plans to prevent disease spread, and establishing protocols for emergency response. The U.S. CDC emphasizes that public health surveillance and preventive measures are crucial for to prevent diseases and incidents during mass gatherings.^{20,25} Additionally, having a comprehensive emergency plan in place is necessary to ensure a better response capability.²⁰ These measures of capacity planning, disease prevention, and emergency preparedness are essential for effectively managing mass gathering events. Also, the health system must predict the locations of pre-hospital vehicles and designate dedicated routes for transportation to local hospitals and increase the capacity of manpower, equipment, medicine, and pre-hospital and hospital services, as well as security measures. Brown emphasizes that the preparation and equipping of medical teams, especially for medical emergencies, and having a plan for such events can improve the healthcare conditions.²⁰

10. Technological Preparations

Develop electronic surveillance, equip special medical care facilities, communication, and support systems tailored to weather conditions, environmental factors, and surrounding events in the place of mass gathering. In Saudi Arabia, the provision of equipped medical facilities, helicopters, electronic monitoring, shading, and cooling fog has helped reduce the death rate of the population in mass gatherings during the Hajj.²⁶ Indeed, studies have shown that providing on-site medical care at the doctor level in mass gatherings and offering on-site treatment can lead to a reduction in hospital referrals.^{27,28}

11. Considering CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive) Threats

Ensure compliance with security and safety protocols and prepare for incidents involving CBRNE hazards. Arbon (2007) states that planning for harm reduction, preparedness,

response, and recovery against CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive) risks is one of the key elements of mass gathering medicine (MGM).²⁹

12. Evacuation and Access Plan

Forecasting evacuation routes reduces population pressure and regular assessment of the accessibility of evacuation routes is recommended. Soomaroo (2012) states that one important element for choosing a location for mass gatherings is providing adequate access to the site for participants and emergency medical services.¹⁷ Many injuries that occurred in such gatherings were due to the lack of sufficient access for people to leave and for services to be provided.^{17,26,30–33}

Implementing these measures will contribute to ensuring the safety and well-being of participants during the Arbaeen ceremony in the years ahead. In this context, Soomaroo (2012) states that proper planning for mass gatherings may reduce morbidity and mortality in the event of a disaster.¹⁷

Conclusion

The Arbaeen ceremony is the world's largest annual mass gathering, attracting millions of pilgrims to Iraq during the summer months when extreme heat and dust storms pose significant health risks. To safeguard the well-being of participants, we have outlined a comprehensive set of recommendations for stakeholders to implement a preventive plan. Key measures include enhancing planning and risk assessment, bolstering response capacities, reducing vulnerabilities, increasing knowledge and awareness, strengthening communication and support systems, ensuring compliance with safety protocols, and regularly evaluating evacuation routes. By proactively addressing these critical areas, stakeholders can better prepare for and effectively manage the health and safety challenges associated with the Arbaeen ceremony. Implementing these recommendations will be crucial in ensuring the safety and well-being of the millions who travel to participate in this important annual religious event.

Statement on IRB Approval. The method and results presented in this manuscript have been reviewed and approved by the Health in Emergencies and Disaster group at Dezful University of Medical Sciences. As this study does not involve the collection or analysis of primary data from human participants, but rather presents a review of existing literature and recommendations for emergency and public health management, formal IRB approval was not required. The Health in Emergencies and Disaster group at Dezful University of Medical Sciences has evaluated the appropriateness of the approach and findings and endorses the publication of this work.

Author contribution. HA designed the study; HA, and HE collected the data; HA analyzed and interpreted the data. HA, and HE prepared the manuscript. Both authors contributed to the drafting and final review of the manuscript. The author(s) read and approved the final manuscript.

Funding. The authors received no financial support for the research, authorship, and/or publication of this article.

Declaration of Conflicting Interests. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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