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Healthcare Challenges and Solutions During the Arbaeen Pilgrimage: Perspectives of Nurses and EMS Personnel

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Abstract

INTRODUCTION: The Arbaeen pilgrimage is one of the world's largest annual religious mass gatherings, attracting millions of pilgrims. It presents major challenges to healthcare delivery, medical supply chains, and welfare services due to extreme crowd density, high temperatures, long walking distances, and limited infrastructure. This study explores these challenges and potential solutions from the perspectives of nurses and Emergency Medical Services (EMS) personnel.

METHODS: This qualitative study used inductive content analysis. Semi-structured interviews were conducted with 18 nurses and EMS personnel using purposive sampling until data saturation was achieved.

FINDINGS: The findings identified key challenges, including shortages of human resources (particularly female nurses) and equipment, inadequate accommodation and welfare facilities, limited specialized care for vulnerable groups, sociocultural and communication barriers, healthcare worker exhaustion, crowd congestion, inefficient resource management, and limited patient transfer capacity.

CONCLUSION: Improving healthcare services during the Arbaeen pilgrimage requires targeted interventions. Key strategies include increasing female nurse recruitment, establishing dedicated Mokebs for women and children, deploying mobile clinics and ICUs, integrating Arabic interpreters, implementing electronic health records, strengthening coordination, utilizing intelligent crowd management, and deploying motorcycle ambulances in high-density areas. These measures can enhance care quality, decision-making, and patient referral processes.

Keywords: Arbaeen pilgrimage; Healthcare delivery; Nurses; Emergency medical services; Challenges, Solutions.

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Introduction

The annual Arbaeen pilgrimage in Iraq is recognized as one of the largest religious mass gatherings worldwide, attracting millions of participants from various countries, particularly neighboring nations such as Iran. It is estimated that between 17 and 20 million pilgrims attend this event each year, creating one of the highest concentrations of people in a single place and time. A defining characteristic of this extraordinary event is that most pilgrims undertake long-distance walking journeys, often covering 80 kilometers or more from Najaf to the holy city of Karbala. This prolonged pedestrian movement, combined with extreme environmental conditions, places substantial strain on public health systems, healthcare delivery, medical supply chains, and welfare services along the pilgrimage routes (1–3).

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Several factors significantly complicate the provision of healthcare services during this event. Extreme crowd density increases the risk of stampedes, crush injuries, and delayed access to medical care. High ambient temperatures, particularly during hotter months, elevate the incidence of heat-related illnesses such as heatstroke and dehydration. The prolonged duration of the journey, limited access to sanitation facilities, and inadequate infrastructure further exacerbate public health risks, including outbreaks of communicable diseases (respiratory and gastrointestinal infections), food- and waterborne illnesses, and the worsening of chronic conditions among vulnerable pilgrims (4–9).

Previous studies have highlighted the substantial burden that the Arbaeen pilgrimage imposes on both the host country's healthcare system and supporting medical teams from neighboring nations. Iraq's healthcare infrastructure faces significant challenges in meeting the surge in demand for emergency and primary care services. Persistent issues include insufficient medical facilities, inadequate coordination between national and international responders, and gaps in real-time disease surveillance (8–11).

Nurses and Emergency Medical Services (EMS) personnel serve as frontline healthcare providers during the Arbaeen pilgrimage. They play a critical role in delivering first aid, managing acute emergencies, providing primary care in temporary medical outposts (Mokebs), and facilitating patient transfers under extremely challenging conditions. Despite their essential role in this large-scale mass gathering, considerable logistical and operational challenges persist, particularly for teams affiliated with Iranian organizations operating along the pilgrimage routes in Iraq (11–13).

Although several quantitative and qualitative studies have examined public health challenges, infectious disease risks, and overall system preparedness during Arbaeen, there remains a relative scarcity of in-depth research focusing specifically on the lived experiences, operational difficulties, and practical recommendations of frontline nurses and EMS personnel. Understanding these perspectives is essential for developing evidence-based strategies to improve healthcare delivery in mass gatherings.

Understanding the challenges faced by frontline healthcare providers during the Arbaeen pilgrimage is of critical importance. As one of the largest annual mass gatherings worldwide, deficiencies in healthcare delivery may result in increased morbidity, preventable mortality, and substantial strain on both local and international medical resources. Furthermore, lessons learned from this event have broader implications for enhancing emergency preparedness and healthcare planning in other large-scale religious, cultural, and sporting events globally. Addressing these challenges through the perspectives of nurses and EMS personnel is vital for developing effective, context-specific strategies that improve patient safety, staff well-being, and overall system resilience (14–15).

This study aimed to explore the challenges encountered by nurses and Emergency Medical Services (EMS) personnel in delivering healthcare services during the Arbaeen pilgrimage and to identify practical, experience-based solutions to overcome existing constraints and improve the quality of care in this unique mass gathering setting.

Methods

This qualitative study employed an inductive content analysis approach based on the method proposed by Graneheim and Lundman (2004) (16). The study was conducted in the context of healthcare services provided during the Arbaeen pilgrimage, with data collected following the 2024 and 2025 Arbaeen events. The setting included medical outposts (Mokebs) and healthcare facilities where Iranian healthcare teams were deployed.

Table 1. Demographic Characteristics of Participants (N=18)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	13	72
	Female	5	28
Age (years)	20–30	6	33
	30–40	10	55
	40–50	2	12
Profession	EMS	10	55
	Nursing	8	45
Education Level	Bachelor's degree	18	100
Number of Deployments	One time	5	28
	More than once	13	72

Participants were selected through purposive sampling and included Iranian nurses and EMS personnel with at least one experience of providing healthcare during the Arbaeen

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pilgrimage. These individuals were deployed by medical universities across Iran as part of health caravans serving pilgrims at holy sites, including border areas, Mokebs along the Najaf–Karbala route, and the city of Karbala. Data collection continued until data saturation was achieved after 18 interviews (P1–P18).

Most participants were male (72%), with the largest age group being 30–40 years (55%). In total, 55% were EMS personnel and the remainder were nurses. All participants held a Bachelor's degree, and most had prior experience attending the Arbaeen pilgrimage (Table 1).

Data were collected through semi-structured, in-depth interviews guided by a flexible interview framework (Table 2). Written informed consent was obtained from all participants, who were assured of confidentiality, anonymity, and their right to withdraw at any time. Interviews were conducted face-to-face in private settings at participants' workplaces, lasted 45–60 minutes, and were audio-recorded with permission. Open-ended questions were used, with probing based on participants' responses, and participants were encouraged to share additional insights.

All interviews were transcribed verbatim, yielding 210 initial codes. Coding was conducted independently by two researchers, and disagreements were resolved through discussion with a third author. After removing redundant and overlapping codes, 60 codes related to challenges and 21 related to suggested solutions were retained. Data were analyzed using the inductive content analysis approach described by Graneheim and Lundman (16). Through iterative comparison and conceptual analysis, codes were grouped into subcategories and subsequently organized into six main categories (Table 3). Data collection and analysis were conducted concurrently, and saturation was confirmed after 18 interviews, with no new themes emerging in the final interviews.

Trustworthiness was ensured based on Lincoln and Guba's criteria (17). Credibility was enhanced through prolonged engagement, member checking, and rapport building. Dependability and confirmability were supported by independent coding, consensus discussions, and maintaining an audit trail. Transferability was strengthened through detailed descriptions of participants, study context, and supporting quotations.

Table 2. Semi-Structured Interview Guide

Section	Question
Participant Demographics	Full name *(all identifying information remained confidential)* Age, field of study, and educational level Occupational title and years of professional experience Number of deployments to the Arbaeen pilgrimage as healthcare personnel
Interview Questions	What challenges did you encounter while providing healthcare services during the Arbaeen pilgrimage? Please elaborate. What difficulties did you face regarding the availability of facilities, equipment, and medical resources? How would you describe your experience with inter-agency coordination and collaboration? What measures or interventions could improve the deployment and performance of healthcare personnel during this mass gathering? Are there any additional challenges, experiences, or insights you would like to share?

Table 3. Categorized challenges in healthcare service delivery

Main Category	Subcategory	Challenges
Insufficient Operational Resources	Human Resources	Shortage of nurses (especially female nurses);Shortage of assistant nurses; Heavy shift workloads.
	Emergency Equipment	Shortage of resuscitation equipment; Shortage of first aid equipment; Lack of mobile blood banks; Shortage of equipment for emergency cases (e.g., myocardial infarction, stroke); Shortage of well-equipped ambulances.
	Medication	Shortage of medication storage equipment; Shortage of specific drugs (hypertension, diabetes); Shortage of high-demand painkillers; High demand for serum and injectable fluids exceeding available supply.
Welfare and Amenity Challenges	Rest and Personal Hygiene Facilities	Inadequate accommodation; Inadequate sanitation facilities; Poor cooling and ventilation systems; lack of spare clothing and footwear; Long distance between resting place to water sources.
	Communication facilities	Poor mobile network; Weak internet coverage; Shortage of wireless phones (walkie-talkie)
Insufficient Specialized Care Services	Women's Health Services	Shortage of separate medical tents for female patients; Shortage of female nurses.

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	Child Health Services	Shortage of pediatric specialists; Shortage of pediatric medical equipment; High vulnerability of children to dehydration, heatstroke, and physical exhaustion.
	Elderly Health Care Services	Shortage of rehabilitation equipment; Challenges in medical history taking; Complexity of managing multiple chronic disease.
	Dental Healthcare Services	Shortage of dental equipment; Insufficient number of dentists; High number of patients with acute dental pain.
Socio-Cultural and Communication Barriers in Healthcare Delivery and Acceptance	Language Barriers	Shortage of interpreters; Ineffective communication with non-Persian language patients; Limited English proficiency among Iraqi emergency personnel; Unnecessary interference by local interpreters.
	Gender Considerations	Women's preference for receiving health care services from female personnel; Families' concerns about the transfer of female patients to distant medical facilities; The need for a companion during medical procedures.
Physical and Psychological Vulnerability of Personnel	Physical Health	Severe physical exhaustion; Muscle spasm; Sleep deprivation.
	Mental Health	Stress and anxiety; Personnel's distress over the inability to perform pilgrimage due to work shifts; Lack of organizational psychological support.
Management and Coordination Challenges	Disruption of Rapid Response Due to Overcrowding	Delayed access to patients; Delays in patient transfer to medical centers; Obstruction of designated ambulance routes; Disorder in pilgrim transit routes.
	Inadequate Information Management	Absence of patient-carried medical records; Difficulties in clinical history taking; Poor medication recall among patients; Unknown allergy status (food and pharmacological); Inaccessibility of transferred patients' medical records; Lack of inter-facility patients' data sharing; Lack of accurate health care statistics.
	Inadequate Unified Surveillance and Management	Duplication of efforts among various agencies; Absence of a unified on-site operational commander; Inadequate supervision of volunteer personnel; Inadequate coordination between healthcare facilities for patient admission and transfer; Misalignment of responsibilities among responding agencies.

Findings

The challenges faced by nurses and EMS personnel during the Arbaeen pilgrimage were categorized into six main category (Table 3):

1) Insufficient Operational Resources

a. ***Human Resources:*** One of the most prominent challenges reported by participants was the severe shortage of human resources, particularly nursing staff. The limited number of nurses—especially female nurses—and assistant nurses led to heavy workloads and prolonged shifts with minimal rest. This imbalance between the large influx of pilgrims and the available workforce compromised both the quality and timeliness of care. It also increased the risk of burnout and physical exhaustion, reducing the overall effectiveness of healthcare services during the pilgrimage. *"The shortage of trained personnel, particularly female nurses, was one of our main problems."* (P5) *"The workload was exceptionally heavy… we had no time for adequate rest."* (P10)

b. ***Emergency Equipment:*** Participants highlighted a significant shortage of essential emergency equipment. Limited availability of resuscitation tools, first aid supplies, mobile blood banks, and equipment for managing life-threatening conditions (e.g., myocardial infarction, stroke) restricted timely and effective responses. In addition, inadequately equipped and insufficient ambulances contributed to delays in transferring critically ill patients. These limitations increased the risk of complications and adversely affected patient outcomes. *"The lack of portable oxygen devices or defibrillators… posed a significant challenge."* (P7) *"Ambulances were either inadequately equipped or insufficient in number…"* (P11)

c. ***Medications:*** Medication shortages and inadequate storage facilities were also frequently reported. Limited access to essential drugs for chronic conditions such as hypertension and diabetes, along with insufficient high-demand painkillers, hindered continuity of care. These constraints posed serious risks for patients with chronic illnesses and underscored the need for improved logistical planning and supply management. *"We faced a shortage of drugs for chronic conditions like diabetes or hypertension."* (P7) *"There was a shortage of painkillers such as Acetaminophen and Ibuprofen."* (P18)

2) Welfare and Amenity Challenges

a. Rest and personal hygiene facilities: Inadequate welfare and accommodation facilities were among the most frequently mentioned challenges by the healthcare personnel. Participants reported poor living conditions including overcrowded dormitories, insufficient sanitation facilities, inadequate cooling and ventilation systems in the extreme heat, and lack of basic necessities such as spare clothing and footwear. Additionally, the long distance between

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resting places and water sources further exacerbated the physical exhaustion of the staff. *"The dormitories were overcrowded and lacked sufficient amenities. Given the extreme heat, the lack of showers and restrooms was a major challenge." (P13) "One of our problems was the poor cooling and ventilation systems. In that extreme heat, when we entered the service area or medical tents, we expected the temperature to be more tolerable, but unfortunately, it wasn't." (P15)*

b. Communication Facilities: Poor communication infrastructure was another significant welfare challenge reported by the participants. Inadequate mobile network coverage, weak or absent internet connection, and insufficient wireless communication devices (such as walkie-talkies) severely disrupted coordination between healthcare teams, emergency responses, and contact with higher-level medical centers. "*Most of the time, we either had no internet access, or the connection was extremely weak. The number of wireless phones was limited, and not all team members had access to them." (P3)* "*Sometimes, even making simple phone calls was impossible, and we had to spend several minutes looking for a spot with mobile network coverage. This made the workflow much more difficult." (P9)*

3) Insufficient Specialized Care Services

a. Women's Health Services: The findings suggest that the limited availability of separate medical spaces for women may create discomfort for female pilgrims. Many participants noted that the shortage of dedicated medical tents for women, along with the insufficient number of female nurses, can make female patients feel uneasy when receiving care, particularly during physical examinations. This situation appears to stem from cultural and religious sensitivities regarding privacy and gender preferences, which may reduce some women's willingness to seek or continue treatment. *"During some shifts, the shortage of female nurses was truly palpable. A larger number of female nurses and nursing assistants should be deployed to the medical outposts." (P8) "Some female pilgrims complained about the lack of female personnel on the medical team; they felt uncomfortable receiving care in the presence of male staff." (P10)*

b. Children's Healthcare Services: The findings suggest that there is room for improvement in specialized pediatric care during the Arbaeen pilgrimage. The limited number of pediatric specialists and the shortage of age-appropriate medical equipment may hinder timely diagnosis and suitable treatment for children. Children appear to be more vulnerable to common environmental risks such as dehydration, heatstroke, and physical exhaustion. These challenges seem to arise partly from the unique demands of mass gatherings and the difficulty of providing tailored care for children in such settings. *"When dealing with certain pediatric patients, a specialist's consultation was truly necessary, but rapid access was rarely possible. This made clinical decision-making much more difficult for us." (P3) "Children were highly vulnerable to the harsh environmental conditions of the walk. Many of them presented with symptoms of severe dehydration, heatstroke, and physical exhaustion." (P17)*

c. Elderly Healthcare Services: The findings suggest that there are opportunities to improve care for the elderly population during the Arbaeen pilgrimage. The limited availability of rehabilitation equipment may restrict mobility support and functional recovery for older adults. In addition, challenges in obtaining a complete medical history — due to factors such as cognitive issues, communication difficulties, or missing prior records — can make accurate diagnosis and timely interventions more difficult. These challenges are often compounded by the complexity of managing multiple chronic conditions in a resource-limited and crowded setting. "*Many older adults presented with acute joint pain, muscle spasms, or severe exhaustion, but we simply did not have enough wheelchairs or walking canes to assist with their mobility or safe transfer." (P14) "Most of elderlies presented with exhaustion or weakness, and they frequently couldn't remember their underlying diseases or the exact dosages of their home medications, which complicated our clinical decision-making." (P15)*

d. Dental Healthcare Services: The findings suggest that there is considerable room for improvement in oral health service delivery during the Arbaeen pilgrimage. The limited availability of dental equipment, including basic diagnostic and treatment tools, along with an insufficient number of dentists, appears to restrict the capacity to provide timely dental care. This situation often results in long waiting times and a high number of pilgrims presenting with acute dental pain.

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These challenges highlight the importance of strengthening oral health services as part of primary healthcare provision in mass gathering events. "*One of the problems we faced was the shortage of dentists, dental equipment, and dental units. A large number of pilgrims presented to our outposts complaining of toothaches." (P2) "The number of deployed dentists was completely inadequate for the massive crowd. The few available dentists were overwhelmed by the high volume of pilgrims presenting with acute toothaches." (P18)*

4) *Socio-Cultural and Communication Barriers*

a. *Language Barriers:* The findings suggest that language barriers can pose a notable challenge to effective healthcare delivery in this multicultural setting. The limited number of trained interpreters may lead healthcare staff to rely on informal communication methods, which are sometimes insufficient for conveying detailed medical information. This can make it more difficult to obtain accurate medical histories, ensure proper informed consent, and support treatment adherence, particularly when communicating with non-Persian-speaking patients. *"Many of the Iraqi personnel had limited proficiency in English. This language barrier made the coordination process between the teams longer and more complicated." (P6) "We need to have interpreters embedded within the healthcare team. It would be highly beneficial, especially for elderly and frail patients, to have an interpreter accompanying them." (P9)*

b. *Gender Considerations:* The findings suggest that paying attention to gender-sensitive approaches can play an important role in providing acceptable and comfortable healthcare services. Many female pilgrims prefer to receive care from female healthcare providers, reflecting deeply rooted cultural and religious norms. This preference, along with families' concerns about transferring female patients to distant medical facilities, may create hesitation in accepting certain medical recommendations. Additionally, some women expressed a need for a companion during medical procedures, which appears to be important for providing emotional support in unfamiliar clinical settings. *"For cultural reasons, most of the female pilgrims preferred to be examined exclusively by female healthcare personnel." (P5) "Some families were reluctant to have their sick female relatives transferred to distant medical centers." (P6) "Many female pilgrims insisted on having a companion present during certain medical procedures. They did not feel comfortable without a companion, even for basic steps like obtaining a medical history." (P13)*

5) *Physical and Psychological Vulnerability of Personnel*

a. *Physical Health:* The findings suggest that working in demanding environments such as Arbaeen route can significantly affect the physical well-being of healthcare personnel. Many participants reported experiencing considerable physical exhaustion due to long working hours and limited opportunities for rest. This exhaustion was often accompanied by muscle spasms, likely resulting from prolonged standing and repetitive physical tasks. Sleep deprivation was another common issue, which may impair concentration and decision-making. "*Standing for long hours during shifts caused severe physical exhaustion among the colleagues." (P10) "Due to prolonged standing and frequent bending over stretchers to attend to patients, I experienced muscle spasms in my lower back and legs, to the point where I had to take painkillers during my rest breaks." (P14)*

b. *Mental Health:* The findings suggest that working in high-pressure environments such as Arbaeen route can place a considerable burden on the psychological well-being of healthcare personnel. Many participants reported experiencing stress and anxiety, which appear to stem from long working hours, high patient volumes, and the need for rapid decision-making in challenging situations. This strain is often compounded by the emotional difficulty of being unable to participate in pilgrimage rituals due to heavy workloads, creating a sense of personal and spiritual sacrifice. Additionally, the limited availability of organized psychological support services may leave staff with few structured opportunities for emotional debriefing or counseling. "*Due to the heavy workloads in our shifts and staff shortages, we were unable to visit the holy shrines and perform the pilgrimage." (P1) "There were few or no psychological services to alleviate the stress of the healthcare staff." (P6) "The high volume of pilgrims presenting to the healthcare stations and continuous shifts caused significant stress and drained a lot of energy." (P9)*

6) *Challenge in management and coordination*

a. *Disruption of rapid response due to overcrowding:* The findings suggest that overcrowding can significantly affect the efficiency and timeliness of emergency

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medical responses. Participants described difficulties in reaching patients quickly due to the high density of pilgrims, which sometimes caused delays in providing care. Patient transfers to medical centers were also reported to take longer than expected because of congested pathways and heavy foot traffic. In addition, the obstruction of designated ambulance routes and the disorder in pilgrim transit paths appear to create challenges for emergency movements. *"The high density of pilgrims on the Najaf to Karbala route made it difficult to reach the casualties." (P6)* *"The large number of pilgrims blocked the ambulance route, and the route that was supposed to take one hour took 4 hours." (P9)* *"Unfortunately, most of the pilgrims did not use the predetermined walking routes." (P11)*

b. ***Inadequate Information Management:*** The findings suggest that it is necessary for improvement in health information management during the Arbaeen pilgrimage. The lack of patient-carried medical records and limited access to previous medical information may make it more difficult for healthcare providers to obtain a complete clinical history. Participants noted that many pilgrims, especially the elderly, had difficulty recalling their medications or allergies, which can complicate treatment decisions. Additionally, the inability to readily access medical records of transferred patients and the lack of systematic data sharing between facilities appear to affect continuity of care. *"Many patients did not carry their medical records or a list of their current medications, which complicated treatment decisions." (P7)* *"The lack of documentation and sharing of patient information across medical outposts hinders the provision of coordinated and effective care to the pilgrims." (P14)* *"One of the issues that genuinely challenged us was the lack of accurate statistics regarding the patients and the healthcare services we were providing. " (P18)*

c. ***Inadequate Unified Surveillance and Management:*** The findings reveal that it is necessary for improvement in coordination and collaboration among the various agencies involved in the healthcare response. Participants described instances of duplicated efforts and occasional confusion regarding responsibilities, which may lead to inefficient use of resources. The absence of a clear unified command structure appears to contribute to fragmented responses and challenges in decision-making. In addition, limited supervision of volunteer personnel and varying levels of coordination between healthcare facilities for patient admission and transfer were mentioned as areas that could be strengthened. "*There was no unified command structure across the various organizations. Some organizations had disagreements and made decisions independently of one another." (P9)* *"Duplication of efforts across various agencies leads to the wastage of resources and reduced efficiency in delivering services to pilgrims." (P12)*

Following the identification of the primary challenges, participants' recommendations and proposed strategies for addressing these issues were extracted and organized into three main categories (Table 4).

Table 4: Categorized solutions in Arbaeen healthcare service delivery

Main Category	Sub Category	Solutions
Strengthening infrastructures	Welfare facilities	Provision of appropriate accommodation and rest areas for personnel, Establishment of satellite communication stations; Deployment of portable restrooms and shower facilities for personnel; Provision of safe drinking water and adequate meals for personnel.
	Healthcare infrastructure	Establishment of mobile medical clinics; Deployment of mobile ICUs, Provision of sufficient and surplus injectable fluids; Implementation of an integrated patient registry system; Establishment of dedicated medical posts for women.
Human resource development and empowerment	Staff recruitment	Recruitment of more nurses particularly female nurses; Recruitment of interpreters.
	Staff training	Training and enhancing communication skills; Training personnel on the technical issues and equipping ambulances; Familiarizing personnel with transit routes in border provinces.
Improvement of managerial and operational processes	Inter-organizational coordination	Enhancing coordination with Iraqi healthcare facilities; Establishment of a unified command among responsible agencies; Preventing operational interference among responding agencies.
	Equipment and logistics management	Equitable distribution of personnel and equipment across all medical posts (Mokebs); Increasing the number of mobile power generators for the storage of essential medications; Equipping ambulances: Providing spare clothing and footwear for personnel.

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Discussion and Conclusion

The religious mass gatherings such as the Arbaeen pilgrimage pose substantial challenges to healthcare systems due to high population density, diverse needs, and limited resources. This study explored the challenges faced by nurses and EMS personnel, highlighting several critical issues.

This study identified nursing workforce shortages, particularly among female nurses, as a major challenge during the Arbaeen pilgrimage. Consistent with previous studies conducted during Arbaeen and other mass gatherings, inadequate staffing compromises healthcare quality, increases workload, and contributes to occupational stress (18-21). The present findings further emphasize the unique impact of female nurse shortages on delivering culturally appropriate care to female pilgrims, highlighting the need for more effective workforce planning in this setting.

This study identified shortages of essential emergency equipment, medications, mobile blood banks, and specialized response systems as major barriers to healthcare delivery during the Arbaeen pilgrimage. These findings are consistent with previous studies conducted during Arbaeen and other mass gatherings, which reported inadequate medical supplies and logistical constraints that delayed treatment and limited emergency response capacity (8-9,22). The present findings underscore the continuing need to strengthen logistics, resource allocation, and emergency preparedness to ensure timely and effective care for pilgrims.

This study identified shortages of medications for chronic diseases, analgesics, and IV fluids as major challenges during the Arbaeen pilgrimage. Consistent with previous studies on Arbaeen and Hajj, medication shortages may increase the risk of complications among pilgrims with chronic conditions (23-25). In addition to limited drug availability, the present findings highlight weaknesses in pharmaceutical logistics, including forecasting, storage, transportation, and cold-chain management, emphasizing the need to strengthen both medication supplies and supply chain systems.

This study identified inadequate specialized services for children, elderlies and women as important challenges during the Arbaeen pilgrimage. Consistent with previous studies, vulnerable groups face greater healthcare needs in mass gatherings, while access to dedicated services remains limited. Unlike earlier research that mainly described these health needs, the present findings highlight frontline providers' concerns about shortages of specialized personnel and facilities, emphasizing the need for targeted healthcare services and improved planning for these populations (26-29).

Furthermore, the pilgrims' need for dental services was another issue raised during the interviews. Previous research has also indicated a significant demand for dental care during the Arbaeen pilgrimage; however, there is a lack of official infrastructure to support these services, and the care is predominantly provided by volunteer medical Mokebs (5).

This study identified language and cultural barriers, particularly the shortage of medical interpreters, as major challenges during Arbaeen. Consistent with previous studies, these barriers compromise care quality and patient safety (30-31). The findings highlight the need for trained interpreters, bilingual staff, and language and cultural training to improve healthcare delivery.

This study found that healthcare personnel experienced substantial psychological stress and physical exhaustion during Arbaeen. Consistent with previous studies reporting burnout and occupational stress in mass gatherings (32-33), the present findings additionally highlight the unique spiritual distress of Iranian healthcare workers who were unable to perform pilgrimage rituals while caring for others, underscoring the need for better workforce planning and staff support.

This study identified overcrowding and shortages of adequately equipped ambulances as major barriers to timely emergency response during Arbaeen. Consistent with previous mass gathering studies, these challenges delayed patient access and transfer, reducing the effectiveness of emergency care (34-36). The findings further highlight the operational impact on Iranian EMS teams in Iraq and emphasize the need for intelligent crowd management systems, equitable ambulance distribution, and stronger logistical planning to improve emergency response.

This study identified weak inter-agency coordination, the absence of a unified command structure, and poor volunteer management as major systemic challenges during Arbaeen. Consistent with previous studies, these deficiencies impair collaboration and healthcare performance in mass gatherings (37). The present findings further demonstrate their impact on emergency response and resource allocation in the cross-border setting, highlighting the need for a

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unified command system, standardized protocols, and stronger inter-agency coordination.

This study identified poor health information management, including limited access to medical records and the absence of integrated information systems, as a major challenge during Arbaeen. Consistent with previous studies, these deficiencies hinder continuity of care and increase the risk of medical errors (38-39). The findings emphasize the need for integrated electronic health records, unified patient registration, and real-time data sharing to improve clinical decision-making and coordinated care.

This study identified multiple interconnected challenges affecting healthcare delivery during the Arbaeen pilgrimage, including workforce shortages, resource limitations, logistical inefficiencies, and systemic coordination gaps. Addressing these issues requires comprehensive planning, improved resource allocation, strengthened inter-agency collaboration, and investment in digital health and workforce support systems to enhance preparedness for future mass gatherings.

Compliance with Ethical Guidelines

Although formal ethical approval was not obtained, this study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants prior to participation, and they retained the right to withdraw at any stage. All data were collected and analyzed anonymously, with no identifying information disclosed. Participants' dignity, autonomy, and confidentiality were strictly maintained throughout the study.

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Author's Contributions

This study was initially conceptualized based on the idea proposed by Faezeh Rahmani, who also contributed to the study design, data collection, data analysis, and drafting of the manuscript. Zohreh Ghomian served as the corresponding author and played a key role in supervising and guiding the research process, refining the study design, and critically revising the manuscript. Meysam Mohammadi Behnoush and Masoud Jobaneh contributed to the data collection, interpretation of the findings, development of the discussion, and revision of the manuscript. All authors read and approved the final version of the manuscript.

Conflict of Interests

The authors declare no conflict of interest.

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