EASTERN MEDITERRANEAN HEALTH JOURNAL

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LA REVUE DE SANTÉ DE LA MÉDITERRANÉE ORIENTALE

EST une revue de santé officielle publiée par le Bureau régional de l’Organisation mondiale de la Santé pour la Méditerranée orientale. Elle offre une tribune pour la présentation et la promotion de nouvelles politiques et initiatives dans le domaine des services de santé ainsi qu’à l’échange d’idées, de concepts, de données épidémiologiques, de résultats de recherches et d’autres informations, se rapportant plus particulièrement à la Région de la Méditerranée orientale. Elle s’adresse à tous les professionnels de la santé, aux membres des instituts médicaux et autres instituts de formation médico-sanitaire, aux ONG, Centres collaborateurs de l’OMS et personnes concernées au sein et hors de la Région.

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Preface

Mass gatherings, whether for cultural, political, religious or sports occasions, present governments with complex management challenges, not least to the challenge faced by the public health systems and services. Such events raise demand for healthcare services and usually increase the incidence of health problems such as infectious diseases and injuries, among others. This Region is host to numerous mass gatherings, the largest regular one being the annual Hajj to Mecca and Medina.

In order to meet the challenges presented by a mass gathering, government authorities and event organizers must prepare well in advance, carrying out risk assessment, comprehensive planning and adequate system enhancement as well as undertaking surveillance of the event to assess their public health impact. In this regard, the Eastern Mediterranean Public Health Network (EMPHNET) together with the Centers of Disease Control and Prevention, and Council of State and Territorial Epidemiologists conducted two workshops on “Public Health Surveillance during Mass Gatherings” in 2010 and 2011 for the members of Field Epidemiology Training Programs in the Region with the objective of increasing their understanding of the surveillance required at mass gatherings and also encouraging the publication of the surveillance results by the participants. The workshops were attended by members from Afghanistan, Egypt, Iraq, Jordan, Morocco, Pakistan, Saudi Arabia, Syrian Arab Republic and Yemen.

In the first workshop in Jordan, participants were trained on public health surveillance during mass gatherings and were asked then to conduct, as country groups, a small project for a particular mass gathering event held in their countries. The data of the projects were analysed at the second workshop in Morocco and participants were guided on writing a scientific paper based on the project.

This supplement of EMHJ is published to disseminate the findings of the projects implemented following the first workshop and raise awareness of the public health issues surrounding mass gatherings in the Region. The papers included were peer reviewed with the help of WHO’s Department of Global Alert and Response and the supplement is sponsored by EMPHNET. We thank them all for their generous support.
Editorial

Hajj and the public health significance of mass gatherings

Ziad A. Memish

Mass gatherings (MG) refer to groups of people measured in the thousands, some definitions suggest 25,000 and above. MG present unique health challenges distinct from the average population cohort of the same size. Within the context of an exploding global population, widely accessible air travel and unprecedented frequency of MG, health issues relating to MG medicine are more commonly encountered. Safeguarding individual and mass health at such gatherings is termed public health security.

MG-related infection is an emerging subspecialty in global epidemiology and while an extensive body of information and experiences now exists, not all are published and accessible to MG planners and public health administrators, and vital information awaits dissemination. Infectious diseases have long played a substantial part in shaping human history and continue to be an issue of pressing concern. In this era of the “flat world”, globalization facilitates the spread of numerous infectious agents to all corners of the planet. No locale is too remote for a threatening pathogen, be West Nile Virus arriving in the United States or Rift Valley Fever reaching the Arabian Peninsula.

Public health risks focus on infectious agents both specific to humans (which are broadly and uniformly distributed) and zoonoses (infectious agents transmitted from animals to humans) which tend to be far more localized in their geographical distribution. Research has shown that emerging infectious diseases have roughly quadrupled over the past 50 years, and pathogens that originate in wild animals (wildlife zoonoses) account for the majority of such diseases. Further, the frequency of infectious disease emergence correlates highly with human population density, the density of mammalian species and human population growth. Some data exist indicating that emerging diseases (specifically zoonoses) are more likely to be seen in tandem with progressive global warming.

The role played by travel, migration, trade and human exchanges in the propagation of epidemic infectious disease is well known. Almost one billion people cross international borders each year. In 2008, there were 924 million international arrivals, 16 million more than 2007. Travel-related infection is reaching previously uncharted dimensions of scale and complexity and it is the Hajj experience that provides invaluable insights in predicting travel-related health challenges.

Hajj is the largest and most long-standing annual MG event on earth. It is the site of some of the greatest crowd densities known to man. Following an exponential rise in the past decade, Hajj is now the most internationall, ethnically, demographically and clinically diverse assembly today. The numbers of non-Saudi pilgrims attending the Hajj routinely exceed 2 million people, travelling to Makkah from over 180 countries, pushing the Hajj congregation towards the 3 million mark. The sheer dimensions of Hajj demand extraordinary imagination and agility from planners.

Because of the wide global attendance, international partnerships and collaborations in this process are increasingly necessary, as countries sending pilgrims ensure their fitness for travel and, later, continue to monitor the impact of the returning pilgrims to their countries of origin. The scale and diversity of Hajj presents an enormous public health security challenge to Saudi Arabian authorities who, as functionaries to the Custodians of the two holy sites (Makkah Al Mukarramah and Medina Al Munnawarah) must provide extensive, multi-faceted programmes to serve the “Guests of God.”

Because of this remarkable scale, and its annual occurrence, preparations for the public health safety and security of this event are extraordinarily challenging, requiring an intensely collaborative approach. Multiple domestic agencies must work together to prepare for Hajj within a matter of months. While most MG of this scale have the greater part of a decade to prepare, Saudi Arabia readies itself for the massive influx within a mere 11-month lead time demanding precision in organization and the surge deployment of massive semi-permanent infrastructures and manpower.

Such efforts are accomplished through intense inter-Ministry collaboration. Saudi authorities, including

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the Ministry of Health (MOH), the Ministry of Hajj, the Ministry of Interior (MOI), the Saudi Red Crescent and other government health sectors, including the Saudi Arabian National Guard Health Affairs, the Ministry of Defence and Aviation (MODA) and the Security forces, come together with a common focus of public health security. Collectively these agencies have accumulated decades of experience managing Hajj from every aspect, whether it be management and repatriation of the sick at Hajj, anticipating crowd turbulence or handling the arrival of over a million and a half head of cattle for ritual sacrifice.

With over 1.3 billion Muslims globally, many more seek to make Hajj than can be safely accommodated. In a delicate choreography of diplomacy and service, Saudi Arabia must balance the dual roles of both Custodian to the Holy Sites and Guardians to the Guests of God. Representatives of the Saudi authorities must safeguard Hajj for millions annually while at the same time carefully controlling its access to maintain public health safety and security.

Note must be made of the important work facilitated by the Saudi immigration authorities which safeguards public health, possibly one of the largest public health interventions today. Saudi Arabia provides visas to every eligible pilgrim, setting an annual quota of 1000 visas per million populations for every country. Access to all holy sites is strictly limited to visa and permit holders. The visa application process facilitates enforcement of basic public health requirements by specifying visa eligibility based on evidence of mandatory immunization (including against polio and yellow fever for pilgrims arriving from countries with active disease and meningococcal disease for all pilgrims, all important causes of disease at Hajj). Immigration thus becomes a tool facilitating public health security for such a massive gathering [9].

Given the complex, multi-factorial elements that comprise the preparation for Hajj, Hajj medicine clearly falls within the realm of public health security and must be recognized as such. Further, because of the Kingdom’s ability to effectively surge public health resources at short notice, it is in a position to make a unique contribution to other gatherings facing bioterrorism or disaster preparedness demands through exchange of information and experiences. Surge capacity is integral to public health security in which the Kingdom has exceptional experience. It is for those reasons that Saudi Arabia was recognized and acknowledged to be a World Health Organization Collaborating Centre for MG Medicine in September 2012 tasked with training, research and providing guidance and advice to MG administrators across the globe.

References

Editorial

Health preparedness and legacy planning at mass gatherings in the EMR: a WHO perspective

Nicolas Isla\textsuperscript{1} and Isabelle Nuttall\textsuperscript{2}

As more countries commit to hosting large, international mass gatherings, health preparedness planning is requiring more research and collaborative efforts. A growing body of researchers and policy-makers view mass gatherings as important opportunities for positive legacy for the community and visitors. This special edition of the Eastern Mediterranean Health Journal is a good example of a respected scientific publication offering its pages to researchers to share their experiences studying small, medium and large events; religious, sporting and cultural events; one-off events and events that recur in the same location year after year. This work, and the work of others, will help future hosts to assess options, to adapt and build existing systems and to evaluate their effectiveness through the acquired experience and mounting evidence generated by past organizers.

The Eastern Mediterranean Region (EMR) is host to some of the world’s largest mass gatherings. Each year the Kingdom of Saudi Arabia welcomes upwards of 3 million pilgrims from around the world; the Formula 1 motor racing championship is being held in two EMR countries in 2013 and Qatar is set to host the FIFA World Cup in 2022. There are a large number of other mass gatherings in the Region of all sizes and purposes, each with their own specific risks.

The World Health Organization (WHO) continues to build an interdisciplinary mass gathering programme that offers guidance, tools and expertise that public health authorities can use before planning an event. This mandate was provided by a decision at the 130\textsuperscript{th} Executive Board Meeting in January 2012 advising the Secretariat to, among other activities, “multisectoral guidance on planning, management, evaluation and monitoring of all types of mass gathering events with specific emphasis on sustainable preventive measures including health education and preparedness”. In response, WHO has developed a three-point strategy for supporting countries with mass gathering health planning:

- Capacity development and support for Member States and host organizations – protecting public health at mass gatherings
- Establishment of governance, resources, tools and methodologies
- Shaping the discipline: leadership and communication.

WHO has worked with organizers of some of the largest events including the London Olympics and the 2012 UEFA European Football Championship in Poland and Ukraine, Hajj and the World Youth Day. In addition, over the past year, a network of Collaborating Centres on mass gatherings has been established to act as regional hubs for best practice in mass gathering health preparedness planning. These Collaborating Centres are working with WHO Regional and Country Offices to promote public health planning and positive legacy development as a key area of investment for mass gathering organizers. The Ministry of Health of Saudi Arabia, Public Health England in the United Kingdom, the Institute of Public Health of Vojvodina in Serbia and the Disaster Research Centre and Flinders University in Australia are currently Collaborating Centres.

WHO is also working closely with international sporting federations, such as the International Olympic Committee, to encourage knowledge transfer between successive hosts and to make health preparedness a central pillar of any event.

Health planning, however, is only one component of the complex choreography of preparedness that needs to be undertaken. WHO’s efforts to support health authorities in mass gathering health planning is in line with the all-hazard and whole-of-society approaches driving public health risk management under the International Health Regulations (2005). Mass gatherings, which are most often bound by immutable time frames, known years in advance, are test-beds for achieving better integration between sectors that can be applied in other public health contexts and emergencies. Furthermore, WHO has developed a framework for legacy research based on four areas of health system improvement:

- improved medical and hospital services
- strengthened public health system
- an enhanced living environment
- increased health awareness.

WHO has worked with a number of countries in the EMR including with the

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Ministry of Health of Iraq with which a workshop on mass gathering health preparedness was held in Amman in October 2012. An international team of experts from WHO and a representative from Public Health England worked with responsible health authorities from the Ministry of Health and District Health authorities from Karbala to improve health preparedness in the areas of on surveillance, pre-hospital casualty management, food and water safety, risk communication, coordination, preparedness and social mobilization. Likewise, WHO is currently working closely with Ministry of Health of the Kingdom of Saudi Arabia to manage risks associated with the emergence of the Middle East Respiratory Syndrome Coronavirus in the context of Hajj.

From the articles in this special edition on mass gathering, the reader will understand the complexity involved in planning a mass gathering. This collection of papers will provide a sense of the research being undertaken in the EMR to better understand the risks associated with mass gatherings and potential solutions to prevent and mitigate these risks during the event and achieve a long-term benefit from the experience. WHO will continue to work closely with any Member State on mass gathering health preparedness and planning.

**Information sources**


4. International Health Regulations [webpage] [http://www.who.int/topics/international_health_regulations/en/, accessed 7 October 2013].
Using health educators to improve knowledge of healthy behaviour among Hajj 1432 (2011) pilgrims

A. Turkestani,¹ M. Balahmar,² A. Ibrahim,² E. Moqbel² and Z.A. Memish³

ABSTRACT The main objective of this study was to assess the short-term effect on health knowledge among pilgrims after being provided specific health education messages. A random sample of 6 entry-point buses was selected. A self-administered questionnaire was used to assess knowledge before and after intervention; 278 pilgrims completed the questionnaire. There was a significant increase in the proportion of participants who answered all questions correctly after the educational intervention (P < 0.05). Almost all respondents stated that they benefited from the health education and that the health educator was successful in delivering the messages. Only 19 (7.2%) reported that they had already received relevant health education messages prior to their arrival in Saudi Arabia. Before the intervention just 50% of the respondents knew that safe shaving prevents dissemination of bloodborne diseases; this rose to 84.7% after the intervention. Direct health education to pilgrims is effective in improving short-term health knowledge.

L’éducation sanitaire pour améliorer les connaissances des pèlerins de la Mecque en 2011 (Hajj 1432) sur les comportements favorables à la santé

RÉSUMÉ L’objectif principal de la présente étude était d’évaluer l’effet à court terme de certains messages d’éducation sanitaire sur les connaissances des pèlerins en matière de santé. Nous avons choisi comme échantillon aléatoire les personnes présentes à bord de six bus à l’entrée du site. Pour évaluer les connaissances avant et après l’intervention, nous avons utilisé un questionnaire auto-administré, qui 278 pèlerins ont rempli. Le pourcentage de participants ayant répondu correctement à l’ensemble des questions était significativement plus élevé après l’intervention d’éducation sanitaire (P < 0.05). Presque tous les participants ont affirmé que cette intervention leur avait été utile et que l’éducateur avait bien fait passer les messages. Seules 19 personnes (7,2 %) ont déclaré qu’elles avaient déjà reçu des informations pertinentes en matière d’éducation sanitaire avant d’arriver en Arabie saoudite. Avant l’intervention, seuls 50 % des participants savaient qu’un rasage sans risque contribuait à prévenir la propagation des maladies à transmission hémotogène ; ils étaient 84.7 % à le savoir après l’intervention. Communiquer des messages d’éducation sanitaire directement aux pèlerins est efficace pour améliorer les connaissances à court terme en la matière.

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**Introduction**

Health education has been described as a process by which individuals or groups learn to behave in a manner conducive to the promotion, maintenance or restoration of health [1]. Communication in relation to health education involves various modes, e.g. lectures, discussions, symposia, posters, public address, and radio and television messages. Each mode has its own merits, drawbacks and scope of effectiveness. Messages may also have to overcome communication barriers (e.g. physiological, psychological, environmental and cultural). The effectiveness of a particular mode of health education varies according to the setting in which it is delivered [2, 3] to a specific group [4]. It has been observed that different methods may be especially suitable for different groups of people depending upon their age, sex, educational qualification, background and the nature of their employment [1].

The Hajj has become the epicentre of the mass migration of millions of Muslims of various ethnic diversities. No other mass gathering can compare in scale or in regularity [5]. The preparedness plans made before the Hajj season ensure the optimum provision of health services for pilgrims to Saudi Arabia, and have been set up to minimize disease transmission both during their stay in the country and upon their return home [6]. Health education is one of the principal services provided for pilgrims from their arrival. Health education of pilgrims, through the Health Education Ambassadors (HEA) programme, which was launched as an innovative approach in 1428 AH (2007 CE), is one of the principal activities supporting those plans.

The HEA module aimed at achieving 2 specific objectives:

- Provide effective health education to pilgrims in their mother tongue at their dormitories in the holy places.
- Encourage medical students to actively take a health education role during the Hajj.

Both objectives were achieved through inviting medical and health science students to voluntarily enrol in an HEA team. Volunteers agreed to undergo a training programme focusing on communication skills, the ethics of volunteer work and the important health messages to be delivered to arriving pilgrims. The messages were basically designed to cover issues related to healthy behaviour during the performance of the Hajj, for example, personal hygiene, measures protective against infectious respiratory droplets, avoiding exposure to direct sun, and proper ways of using razors. This programme benefited by making use of the students in Mecca who are often fluent in foreign languages in addition to Arabic.

In Hajj in 1431 AH (2010 CE), the HEA programme was extended to cover pilgrims arriving at King Abdul Aziz International Airport, 19 km north of Jeddah, the main aviation entry port for pilgrims. The messages were delivered to them in the Pilgrim's City, just outside the Hajj terminal, while they waited aboard buses that would transport them to the holy places. Challenges to providing the training included the preoccupied state of pilgrims while completing their registration formalities on arrival. During Hajj 1432 AH (2011 CE), analysis of passenger flow within Pilgrim’s City showed that loading a bus takes about 4–6 minutes for pilgrims and up to 20–25 minutes for their luggage. This meant that the pilgrims waited in the stationary buses for about 20 minutes while waiting for luggage arrival and loading, prior to departure. This was determined to be the ideal time to deliver health messages. The HEA volunteers were organized into teams of 2: one volunteer was responsible for conveying messages aided by a pictorial chart while the other distributed a copy of the multilingual health message pictorial leaflet to each pilgrim.

This method of health education was intended to provide more effective health education. The executive committee of the Hajj recommended studying this new educational approach to determine its effectiveness. Therefore, the main objective of this study was to assess the short-term effect on health knowledge among pilgrim after they had been given specific health education messages.

**Methods**

Through a pre- and post-intervention study design, a random sample of 6 buses was selected from a total of about 300 buses on the last day of work in the Pilgrims City at King Abdul Aziz International Airport. Sample size was calculated to find a difference of at least 20% in improvement of level of knowledge of the participants after conducting the intervention. Considering a confidence level at 95% and a power of 80%, the estimated sample size was 244; this was increased to 300 to compensate for expected missing data. Since each bus accommodated about 50 pilgrims on average, 6 buses were adequate to saturate the estimated sample size giving a total of around 300 pilgrims. The response rate was 92.7%; 278 completed questionnaires returned.

The total number of pilgrims aboard these buses was 300. The health educators boarded the buses, described the purpose of the study, and then invited pilgrims to participate. Those who agreed were asked to fill out a self-administered questionnaire (pre-test). The questionnaire had been designed and validated for a similar trial carried out the previous year for the local authority to assess the knowledge of pilgrims about healthy behaviour during Hajj (unpublished report). Reliability was assured by Cronbach’s alpha test which gave a value of 0.88; this is considered an acceptable reliability level.
The intervention included the health education messages provided through the HEA programme using a pictorial chart as well as the distribution of pictorial pamphlets. This was followed by assessment of knowledge using the same questionnaire (post-test).

Data were verified, assessed for quality, then analysed using SPSS version 16.0.

Results

The response rate for completion of the pre-intervention questionnaire was 92.7% (n = 278) and 89.3% (n = 268) for completion of the post-intervention questionnaire. The proportion of pilgrims giving correct answers showed a significant increase on the post-test (Table 1) (P < 0.05). While around two-thirds of respondents (69.1%) indicated that pilgrims, whether healthy or sick, should consult a physician before departing for the Hajj, the figure was more than 80% after the intervention. Similarly, before the intervention just over two-thirds (68.7%) said that toothpaste is the only item that can be shared between 2 or more individuals; this increased to 94.4% after the intervention (Table 1).

The greatest improvement in knowledge was seen for the item relating to shaving; only half of the respondents knew that safe shaving with disposable tools prevents dissemination of some bloodborne diseases (e.g. HIV and hepatitis B) before intervention; this rose to 84.7% after the educational intervention (Table 1).

Almost all pilgrims (99.6%) agreed the HEA programme aboard the buses was beneficial, with 98.9% evaluating the health educator as successful in delivering the health education messages.

When asked about the importance of receiving health education messages in their home countries before departing to the Hajj, the overwhelming majority of the participants (92.4%) supported the idea. However, only 7.2% (n = 19) stated that they had already received relevant health education messages in their home country.

Discussion

This study showed that using the educational intervention improved short-term knowledge in the population studied.

Volunteers have been documented to be effective health education providers [7]. The HEA programme depends on volunteers from various medical faculties and health institutes in the Mecca region; their enthusiastic participation was essential to the health education programme. Student volunteer opinion, as well as that of mutawefs (guides), about the HEA programme was assessed during previous Hajj seasons (unpublished report), but the impact of these messages on the knowledge of pilgrims was not assessed. Our findings showed significant improvement in the short-term knowledge level among intervention recipients. This effect has been established in previous studies in similar settings, including India [1] and Saudi Arabia [4]; the authors recommended that health education-focused programmes should be conducted in small groups, preferably via specific topic lectures.

The low rate for receiving pre-departure health education messages among those affluent enough to afford to travel by air and participate in the Hajj indicated a notable lapse in pre-travel preparation in the study population, and a need for home country educational interventions.

The limited time available to conduct the current health education intervention presented a significant limitation. It was conducted on the last day that pilgrims were arriving at King Abdul Aziz International Airport, and most were Arabic speakers. This population was not representative of all pilgrims. Also, it was not possible to obtain directly-paired responses from each of the pilgrims, and statistical analysis was therefore based on the overall percentages of pre- and post-test correct questionnaire responses.

Table 1 Knowledge of Hajj pilgrims arriving at King Abdul Aziz International Airport regarding healthy behaviour before and after a health education intervention, 1431 AH (2010 CE)

<table>
<thead>
<tr>
<th>Questionnaire item</th>
<th>Pre-intervention % correct</th>
<th>Post-intervention % correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting a physician before travelling to the Hajj</td>
<td>69.1</td>
<td>83.6</td>
</tr>
<tr>
<td>Items that can be shared by ≥ 2 individuals</td>
<td>68.7</td>
<td>94.4</td>
</tr>
<tr>
<td>Health behaviour on coughing or sneezing</td>
<td>92.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Medicines must be assured</td>
<td>91.4</td>
<td>97.0</td>
</tr>
<tr>
<td>Prevention of sunstroke</td>
<td>89.6</td>
<td>98.9</td>
</tr>
<tr>
<td>Frequency of hand-washing</td>
<td>79.1</td>
<td>95.5</td>
</tr>
<tr>
<td>Diseases prevented by safe shaving practices</td>
<td>50.0</td>
<td>84.7</td>
</tr>
</tbody>
</table>
Recommendations

- The HEA programme should continue in the coming Hajj seasons with the inclusion of pilgrims at other portals of entry to Saudi Arabia, especially in Prince Mohammed Ibn Abdul Aziz International Airport in Medina.
- A study of wider scope should be planned for the next Hajj season.
- An additional study would be worthwhile to determine whether or not the intervention actually resulted in any change in health among pilgrims during the Hajj and in the following weeks, compared with those who did not participate in the intervention, along with the specifics of any diagnosis.
- Methods to provide standardized, pre-departure, health education to pilgrims scheduled to participate in the Hajj should be explored. Health education materials should be prepared in concert with the Ministry of Health. This could include information provided to foreign travel agencies, additional links to health education posts already provided within Saudi Arabia, and shared through working with air carriers and charter companies serving Hajj ports of entry to provide in-flight health education videos.
- Consideration should be given to investigating methods of educating those who enter the country using other means of transportation, including ships.

References

Pattern of morbidity and mortality in Karbala hospitals during Ashura mass gathering at Karbala, Iraq, 2010

F. Al-Lami,1 A. Al-Fatlawi,1 P. Bloland,2 A. Nawwar,1 A. Jetheer,1 H. Hantoosh,1 F. Radhi,1 B. Mohan,1 M. Abbas,1 A. Kamil,1 I. Khayatt 1 and H. Baqir1

ABSTRACT Religious mass gatherings are increasingly common in Iraq and can harbour considerable public health risks. This study was aimed at determining morbidity and mortality patterns in hospitals in Karbala city, Iraq during the mass gathering for Ashura in 2010. We conducted a cross-sectional study on attendees at the 3 public hospitals in the city. The study period was divided into pre-event, event, and post-event phases. Morbidity and mortality data were obtained from hospital registry books and the coroner’s office. About 80% of the 18,415 consultations were at emergency rooms. Average daily emergency room attendance was higher during the event compared with pre- and post-event phases, while average daily admissions decreased. Compared with the pre-event phase, a 7-fold increase in febrile disorders and a 2-fold increase in chronic diseases and injuries were noted during the event phase. There was no difference between the 3 phases for average daily death rate nor for cause of death.

Tableaux de morbidité et de mortalité dans les hôpitaux de Karbala lors du rassemblement de masse pour l’Achoura, à Karbala (Iraq), 2010

RÉSUMÉ Les rassemblements religieux de masse sont de plus en plus courants en Irak et peuvent engendrer des risques importants pour la santé publique. La présente étude visait à déterminer les tableaux de morbidité et de mortalité dans les hôpitaux de la ville de Karbala (Iraq) lors du rassemblement de masse pour l’Achoura en 2010. Nous avons mené une étude transversale sur la fréquentation dans trois hôpitaux publics de la ville. La période d’étude couvrait les trois phases suivantes : avant, pendant et après l’événement. Les données sur la morbidité et la mortalité ont été recueillies à partir des registres des hôpitaux et du bureau du médecin légiste. Le service des urgences a reçu près de 80 % des 18 415 consultations. La fréquentation journalière moyenne au service des urgences était plus élevée pendant l’événement qu’avant et après ce dernier, alors que le nombre moyen d’hospitalisations journalières a diminué au moment du rassemblement. On a constaté que, pendant l’événement, les accès de fièvre ont été multipliés par sept, et les maladies chroniques et traumatismes par deux, par rapport à la phase précédant le rassemblement. Il n’y avait pas de différence entre les trois phases pour ce qui concerne le taux moyen de mortalité journalière et les causes de décès.

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Introduction

Mass gatherings are defined as pre-planned, public events held for a limited time period and attended by a large number of people, typically more than 1000, although some suggest more than 25 000 [1,2]. They can be held for political, social, religious, sports, and other reasons. Comprehensive reviews of mass gathering literature have concluded that medical needs were largely determined by the event type and duration, attendance, weather, crowd mood and density, and other factors [3,4].

Mass gatherings can engender a lot of societal and governmental concerns and can result in health and socioeconomic consequences. They challenge public health vigilance and knowledge because they increase the epidemiological potential for the spread of disease to a maximum, increase the risk of injuries, and exacerbate pre-existing chronic conditions [5]. Mass gatherings add burden to the host countries and to travelers’ countries of origin [6–8]. Public health systems become strained even if they are advanced and effective in preventing and controlling the endemic disease burden and even if the countries have the appropriate resources [9,10]. The mass gathering environment itself also impacts the host population by imposing added burdens on civilian infrastructures [11].

In the Middle East, the Hajj is the best known and most closely studied mass gathering. Many studies have been conducted on describing public health consequences associated with Hajj, particularly outbreaks of communicable diseases and injuries [12–14].

In Iraq, several religious mass gatherings are held throughout the year, mainly in Karbala, Najaf and Baghdad. Ashura is the third largest religious mass gathering in Karbala. It is commemorated by Shi’a Muslims as a day of mourning for the martyrdom of Husayn ibn Ali, the grandson of the Prophet Muhammad at the Battle of Karbala in 61 AH (680 CE). It is attended by millions of Muslims from within and outside Iraq [15]; all should visit the holy shrines on this day. This can result in extreme crowding, leading to increased risk of stampedes. For cultural or religious reasons, some attendees use self-harm practices such as laceration of the scalp using sharp knives, etc. More importantly, owing to the high densities of people, international visibility, and symbolic means through which terrorists might amplify the effects of their action, mass gatherings are often cited as targets for terrorism [16–18]. This is particularly true for Iraq, which has experienced a number of terrorist attacks, making the prevention of such attacks the focus of the government during mass gatherings.

Religious mass gatherings follow the Islamic lunar calendar, so the date moves forward by 10–11 days every year, therefore presenting health risks associated with seasonal variation [19].

The public health impacts associated with mass gatherings are inadequately studied in Iraq. The objective of this study was to describe the pattern of morbidity and mortality in Karbala hospitals, with emphasis on emergency attendance, and type of diseases/injuries, during Ashura in 1431 Hijri (December 2010).

Methods

A cross-sectional study was conducted in the city of Karbala (population approximately 500 000; located 100 km south-east of the capital, Baghdad) on all patients who were admitted to the hospital wards or attended the emergency room (ER) in all 3 public hospitals in Karbala (Al-Husainy General Hospital, the Obstetrical/Gynaecological Hospital and the Paediatric Hospital) during 1–26 December 2010. Morbidity data were obtained from the registry books of the hospital wards and emergency rooms (ERs) of these hospitals. Mortality data were obtained from death certificates issued by the hospitals and from the provincial coroner’s office over the same period.

Data were collected on a daily basis using standardized instrument that included basic patient demographic data and provisional diagnosis or primary cause of death. The study period was divided into three phases: “pre-event” (1–14 December), “event” (15–18 December), and “post-event” (19–26 December). Although Ashura is actually a 1-day event, people usually attend 2 days earlier and stay 1 day afterwards. For planning purposes, the local government considers this as the mass gathering period to take into account the arrival and departure of attendees. We used the same period to define the ‘event’ phase.

Because standardized case definitions or international disease classification standards are not routinely used in Iraq, we grouped provisional diagnoses into broad syndromic or body-system categories. As reliable denominator figures were not available and because the phases were of different lengths, we analysed the data through the 3 phases using average daily health-care contact rates (including hospital admissions, ER consultations, and deaths). Figures were rounded to the nearest whole number. On-way analysis of variance (F-test), Tukey (HSD) test and chi-squared test were used to identify significant differences in average daily figures and frequency data between the 3 phases. Epi Info and SPSS were used for data entry and analysis. \( P < 0.05 \) was considered statistically significant.

Results

Data were collected on a total of 18 415 health-care contacts; Table 1 describes the basic characteristics of the study population. The majority (51%) of patients were in the 15–44 years age range.
with pre- and post event phases, but this was not statistically significant \( P \geq 0.05 \). In the Paediatric Hospital there was an increase of more than 100% in average daily attendance during the event (257) compared with pre-event (109) \( (P < 0.001) \), and post-event (172) \( (P = 0.019) \).

The average daily ER consultation rate was significantly higher during the event phase (772) compared with the pre-event (480) and post-event (607) phases \( (P < 0.001) \). The average daily admissions to the hospital wards was lower in the event phase (127) compared with the pre-event (136) and post-event (169) phases, but the difference was not statistically significant \( (P = 0.907) \).

According to provisional diagnosis, the average daily attendance for complications of diabetes was 3 times higher during the event phase compared with pre- and post-event phases \( (P < 0.001) \). Similarly, the average daily attendance for diagnoses of cardiovascular disease was significantly higher during the event phase than pre- \( (P = 0.016) \) or post-event \( (P = 0.025) \). Also, diagnosis of fever and febrile convulsions was 7 times greater during the event than pre-event, and 4 times greater than post-event phases \( (P < 0.001) \). Regarding injuries, the average daily attendance was significantly higher during the event compared to pre-event phase \( (P = 0.041) \). Although in general, the obstetrics/gynaecology attendance was not significantly different between the phases, average attendance for caesarean section was significantly higher during the post-event phase compared with the event \( (P = 0.002) \) and pre-event \( (P = 0.038) \) phases. “Other”, which mainly included less urgent cases, were significantly higher in the post event compared to event \( (P = 0.041) \) phases (Table 3).

In general, in the pre-event phase, the ratio of noncommunicable diseases: communicable diseases: injuries was 2.4:3.7:1 for the ER, and 12.9:6.1:1 for hospital admissions. The corresponding ratio during the event phase was

### Table 1: Demographic characteristics of people \( (n = 18,415) \) who attended 3 public hospitals before, during and after Ashura mass gathering, Karbala, 2010

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pre-event No.</th>
<th>Pre-event %</th>
<th>Phase Event No.</th>
<th>Phase Event %</th>
<th>Post-event No.</th>
<th>Post-event %</th>
<th>Total No.</th>
<th>Total %</th>
<th>( P )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>**Age (years)**a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>643</td>
<td>7.5</td>
<td>247</td>
<td>6.9</td>
<td>505</td>
<td>8.2</td>
<td>1,395</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>832</td>
<td>9.7</td>
<td>663</td>
<td>18.4</td>
<td>763</td>
<td>12.4</td>
<td>2,258</td>
<td>12.3</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>5-14</td>
<td>600</td>
<td>7.0</td>
<td>623</td>
<td>17.3</td>
<td>510</td>
<td>8.3</td>
<td>1,733</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>15-44</td>
<td>4,687</td>
<td>54.5</td>
<td>1,476</td>
<td>41.1</td>
<td>3,188</td>
<td>51.8</td>
<td>9,351</td>
<td>51.0</td>
<td></td>
</tr>
<tr>
<td>45-64</td>
<td>1,380</td>
<td>16.1</td>
<td>423</td>
<td>11.8</td>
<td>911</td>
<td>14.8</td>
<td>2,714</td>
<td>14.8</td>
<td></td>
</tr>
<tr>
<td>65+</td>
<td>451</td>
<td>5.2</td>
<td>163</td>
<td>4.5</td>
<td>273</td>
<td>4.4</td>
<td>887</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4,061</td>
<td>47.3</td>
<td>2,009</td>
<td>55.9</td>
<td>2,820</td>
<td>45.6</td>
<td>8,890</td>
<td>48.4</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4,527</td>
<td>52.7</td>
<td>1,586</td>
<td>44.1</td>
<td>3,366</td>
<td>54.4</td>
<td>9,479</td>
<td>51.6</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Residence</strong>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karbala</td>
<td>8,342</td>
<td>96.9</td>
<td>3,565</td>
<td>99.2</td>
<td>6,065</td>
<td>97.9</td>
<td>17,972</td>
<td>97.7</td>
<td></td>
</tr>
<tr>
<td>Other provinces</td>
<td>241</td>
<td>2.8</td>
<td>15</td>
<td>0.4</td>
<td>112</td>
<td>1.8</td>
<td>368</td>
<td>2.0</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Other countries</td>
<td>23</td>
<td>0.3</td>
<td>15</td>
<td>0.4</td>
<td>15</td>
<td>0.2</td>
<td>53</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8,612</td>
<td>46.8</td>
<td>3,597</td>
<td>19.5</td>
<td>6,206</td>
<td>33.7</td>
<td>18,415</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

aAge missing on 77 records.
bSex missing on 46 records.
cResidence missing on 22 records.
Table 2 Average daily attendance of patients (n = 18 415) who attended 3 hospital departments, and average daily deaths according to event phase, Ashura mass gathering, Karbala, 2010

<table>
<thead>
<tr>
<th>Variable</th>
<th>Daily average (no.)</th>
<th>P-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>P-value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-event Event</td>
<td>Post-event</td>
<td>Pre- vs event</td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husainy</td>
<td>447</td>
<td>564</td>
<td>541</td>
</tr>
<tr>
<td>Gynaecology-Obstetrics</td>
<td>59</td>
<td>79</td>
<td>63</td>
</tr>
<tr>
<td>Paediatric</td>
<td>109</td>
<td>257</td>
<td>172</td>
</tr>
<tr>
<td>Hospital department</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency</td>
<td>480</td>
<td>772</td>
<td>607</td>
</tr>
<tr>
<td>Admission</td>
<td>136</td>
<td>127</td>
<td>169</td>
</tr>
<tr>
<td>Deaths</td>
<td>74</td>
<td>9.8</td>
<td>10.9</td>
</tr>
<tr>
<td>Total</td>
<td>615</td>
<td>899</td>
<td>776</td>
</tr>
</tbody>
</table>

<sup>a</sup>F-test.  
<sup>b</sup>Tukey (HSD).

1.5:2.7:1 in the ER, and 13.8:9.4:1 for hospital admissions. For the post-event phase, the ratio was 2.4:4.2:1 for the ER and 10.7:4.8:1 for hospital admissions.

Across the study period there were 230 deaths; 37 (16%) of these were reported from the provincial coroner’s office, reflecting deaths occurring outside hospital. The proportion of deaths in the pre-event, event and post-event phases were: 45%, 17%, and 38%, respectively. Corresponding average daily deaths were: 7.4, 9.8, and 10.9, respectively but the differences were not statistically significant (P > 0.05) (Table 2). The most frequent causes of death throughout the study were cardiovascular disease (44.3%), respiratory disease (12.2%) and injuries (10.0%). Mortality analysis for cause, age, sex and residence across the 3 phases did not show any specific trends or statistical significance.

### Discussion

Although many religious mass gatherings are held in Iraq, to our knowledge this is the first study that describes public health issues related to such events in this country.

We found a reduction in hospital admissions during the period of the event. This contrasts with the findings of other studies that showed excess hospital admissions during mass gatherings in some neighbouring countries [12–14]. This is likely due to the modification of the health-care delivery system during Ashura and similar mass gatherings: hospitals postponed all services for non-emergency conditions. Although new, simpler, mobile and fixed health-care delivery outlets are located very close to the scene of the mass gathering, they still provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. 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The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals. The new outlets help absorb the health burden attributed to less-serious conditions during the mass gathering, still they provide only the basic ambulatory services and first aid; more serious cases that required more professional intervention are still referred to the hospitals.

A 2-fold increase in injuries was noted; many were related to cultural habits such as intentional scalp lacerations practised by some attendees. Human stampedes are the most feared disaster during mass gatherings because they are frequent and are associated with a high fatality rate [22]. In Iraq in 2005 a stampede resulting in about 1000 deaths was triggered by the false rumour of a suicide bomber [23]. The increase in injuries recorded is consistent with previous studies conducted for other mass gatherings [24–26]. Conversely, the average daily admission for caesarean section, and other conditions (mostly non-urgent cases) greatly declined during the event, but markedly increased after the event. Although this could be due to the planned postponement of admission for less-urgent conditions to after the event, hindered access to the hospitals or poor triage of more severe conditions should...
Table 3 Average daily attendance at 3 hospitals according to provisional diagnosis and event phase, Ashura mass gathering, Karbala, 2010

<table>
<thead>
<tr>
<th>Provisional diagnosis</th>
<th>Daily average (no.)</th>
<th>P-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>P-value&lt;sup&gt;b&lt;/sup&gt;</th>
<th>P-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>P-value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-event</td>
<td>Event</td>
<td>Post-event</td>
<td>Pre- vs event</td>
<td>Pre- vs post-</td>
</tr>
<tr>
<td>Complication of chronic disease</td>
<td>78.5</td>
<td>135.0</td>
<td>78.1</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>61.6</td>
<td>89.5</td>
<td>61.3</td>
<td>0.016</td>
<td>0.016</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>16.8</td>
<td>45.5</td>
<td>16.7</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Fever/febrile convulsion</td>
<td>13.0</td>
<td>92.0</td>
<td>22.4</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Gastrointestinal tract disease</td>
<td>173.0</td>
<td>199.7</td>
<td>210.4</td>
<td>0.475</td>
<td>0.785</td>
</tr>
<tr>
<td>Neuropsychiatric illness</td>
<td>23.0</td>
<td>41.5</td>
<td>39.4</td>
<td>0.039</td>
<td>0.123</td>
</tr>
<tr>
<td>Pregnancy-related disorder</td>
<td>57.5</td>
<td>68.3</td>
<td>60</td>
<td>0.719</td>
<td>0.696</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>6.0</td>
<td>3.0</td>
<td>10.7</td>
<td>0.002</td>
<td>0.124</td>
</tr>
<tr>
<td>Normal vaginal delivery</td>
<td>27.0</td>
<td>34.0</td>
<td>28.7</td>
<td>0.69</td>
<td>0.939</td>
</tr>
<tr>
<td>Other gynaecological/obstetric disorders</td>
<td>24.3</td>
<td>31.2</td>
<td>20.5</td>
<td>0.396</td>
<td>0.602</td>
</tr>
<tr>
<td>Respiratory illness</td>
<td>102.2</td>
<td>154.7</td>
<td>152.7</td>
<td>0.034</td>
<td>0.337</td>
</tr>
<tr>
<td>Injury</td>
<td>74.4</td>
<td>153.7</td>
<td>90.1</td>
<td>0.053</td>
<td>0.042</td>
</tr>
<tr>
<td>Other (general)</td>
<td>93.3</td>
<td>54.2</td>
<td>122.7</td>
<td>0.018</td>
<td>0.163</td>
</tr>
</tbody>
</table>

<sup>a</sup>F-test.  
<sup>b</sup>Tukey (HSD).

be still considered as a contributing factor.

There was a slight non-significant increase in mortality in the post-event phase that could be attributed to an accumulation of excess morbidities in the event phase, particularly complications of chronic diseases, infections and injuries.

There were a number of limitations to this study. Because the temporary health outlets did not keep any health contact information, and data from other health outlets were not included, we were unable to accurately measure the overall burden during the event, especially the less-severe illnesses and injuries. There may have been some degree of misclassification of illnesses both due to the lack of the use of standardized disease classification as well as the use of provisional instead of final diagnoses.

To sum up, the mass gathering we studied was associated with an increase in ER attendance and consultations for febrile conditions, complications of chronic diseases, and injuries, besides a reduction in hospital admissions and no change in mortality. To facilitate better planning and response, we recommend implementing public health surveillance during mass gatherings which covers all the health-care delivery outlets and which is capable of identifying the burden and trend of various health disorders. Finally, it is recommended to implement use of the International Classification of Diseases 10 (ICD-10) in health facilities as this will help in better understanding the pattern and trend of morbidity and mortality and facilitate implementation and evaluation of control and preventive measures.

References


Preparedness and health risks associated with Moulay Abdellah Amghar moussem, Morocco, 2009–2010

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ABSTRACT The objective of this study was to describe the risks and human health outcomes associated with attendance at the Moulay Abdellah Amghar moussem (a pre-planned mass gathering attracting more than 360,000 participants) for the purposes of public health prevention, planning, preparedness and response. We performed an environmental health risk assessment and retrospectively reviewed local health centre records before, during and after the event. In addition, standardized interviews with key stakeholders were performed to qualitatively evaluate local public health preparedness and response capacities. During the event, average daily health centre visits increased 5-fold. The sex ratio of health-care visits changed significantly from an average of 1.8:1 female: male visits per day to 1.2:1. The proportion of injuries varied from an average of 3.7% pre- and post-event to 14.8% (P < 0.01) during the event. A significant increase in digestive diseases was also observed during the event. Recommendations include increasing accessibility to free sanitation and hygiene facilities and improving health communications concerning hand washing and food and water safety.

Préparation et risques sanitaires associés au moussem de Moulay Abdellah Amghar (Maroc), 2009-2010

RÉSUMÉ La présente étude avait pour objectif d’identifier les risques et les résultats sanitaires pour l’homme associés à la participation au moussem de Moulay Abdellah Amghar (un rassemblement de masse prévu à l’avance qui attire plus de 360 000 personnes) à des fins de prévention, de planification, de préparation et d’action dans le domaine de la santé publique. Nous avons évalué les risques environnementaux pour la santé et avons procédé à un examen rétrospectif des registres des centres de santé locaux avant, pendant et après l’événement. Nous avons également réalisé des entretiens standardisés avec les principales parties prenantes afin d’évaluer, en termes de qualité, les capacités locales pour la préparation et la riposte en matière de santé publique. Pendant le rassemblement, le nombre moyen de consultations journalières dans les centres de santé a été multiplié par cinq. Le rapport de masculinité des consultations médicales a évolué de manière significative, passant d’une moyenne journalière de 1,8 femme pour 1 homme à 1,2 femme pour 1 homme. Le pourcentage des traumatismes est passé d’une moyenne de 3,7 %, avant et après l’événement, à 14,8 % pendant le rassemblement (P < 0.01). On a aussi constaté une forte augmentation des maladies digestives pendant l’événement. Il est recommandé, entre autres, d’augmenter l’accessibilité des installations gratuites d’assainissement et d’hygiène et d’améliorer la communication en ce qui concerne l’hygiène des mains et la sécurité sanitaire de l’eau et des aliments.

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Introduction

Moussems are an integral part of Moroccan culture. They are pre-planned, public, mass gathering events held for religious, social and cultural, and/or commercial purposes in urban and rural sites throughout the country. The term “moussem” comes from the Moroccan Arabic dialect and is related to the word “mawssim”, which, in classical Arabic, means “season”. Moussems are typically of short duration, held seasonally, and usually commemorate a saint. There are more than 300 annually, and the timing of many of these events corresponds to agricultural seasons (e.g. ploughing or harvest), well-known social events (e.g. the annual return of Moroccans who work abroad, holidays), and celebration of culture and art (e.g. festivals of roses, festival of engagements, spiritual music events).

The Moulay Abdellah Amghar moussem, one of the largest events, annually attracts more than 360 000 people from across Morocco and internationally for a period of 8 days. It is held in the summer in El Jadida province, Doukkala-Abda region, in the western part of the country on the Atlantic coast. This moussem is held in honour of a religious saint, Moulay Abdellah, and includes music, sport, cultural and religious activities, and fantasia, traditional horse shows in which riders perform military re-enactments with firearms that use powder (gunpowder) explosive.

Although there have been anecdotal reports of acute illnesses, outbreaks, and injuries associated with attendance at a moussem, the reports are typically not validated or surveyed by health officials. Environmental health risks and human health outcomes associated with mass gatherings have been well documented, and include hazards resulting from crowding, traffic, violence and terrorism, adverse weather exposure, unlicensed food and water vendors, and poor access to sanitation and hygiene facilities [1,2]. Additionally, healthcare facilities may not have appropriate surge capacity to manage these events. Information on human health outcomes would help to inform event-based preparedness and response efforts; however, no systematic evaluation of health risks and outcomes associated with moussems has been performed in Morocco [3].

The objectives of this study were to describe the specific health risks and morbidity associated with the Moulay Abdellah Amghar moussem and to evaluate the healthcare infrastructure and public health preparedness capacity for this event.

Methods

We conducted a retrospective study to describe the human health risks and outcomes associated with attendance at the Moulay Abdellah Amghar moussem. To accomplish the study objectives, we compared healthcare encounters before, during, and after the mass gathering from health centre medical records. Additionally, we conducted standardized interviews with key stakeholders to characterize the organizational and health preparedness aspects of this moussem.

We reviewed medical records of all patients seen at the health centre in Moulay Abdellah Amghar during the pre-event period (− 14 days to − 7 days), the 8 days of the event and the post-event period (+ 7 days to + 14 days) for the past 2 annual moussems (2009 and 2010). Periods were selected because they are outside the period when attendees congregate at the event site (visitors begin to arrive several days before the event and stay several days after). Health centre visits such as chronic conditions were not validated or surveyed by health officials. Environmental health risks and human health outcomes associated with mass gatherings have been well documented, and include hazards resulting from crowding, traffic, violence and terrorism, adverse weather exposure, unlicensed food and water vendors, and poor access to sanitation and hygiene facilities [1,2]. Additionally, healthcare facilities may not have appropriate surge capacity to manage these events. Information on human health outcomes would help to inform event-based preparedness and response efforts; however, no systematic evaluation of health risks and outcomes associated with moussems has been performed in Morocco [3].

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A semi-structured questionnaire was administered to key stakeholders including health workers (provincial directorate, hygiene team health centre), an official from the Economic and Control unit of the Ministry of the Interior at the provincial level, representatives of the moussem organizers and the captain of the provincial civil protection unit. Questions included characteristics of the moussem, social and behavioural risks (e.g. animal sacrifice, ritual dancing in a state of trance, and other rituals specific to the Moulay Abdallah Amghar moussem), organizational attributes, and the health system structure in place.

Data analysis

Medical records and questionnaire data were collected and entered into a Microsoft Excel spreadsheet. Statistical testing using the chi-squared test to compare proportions was performed using Epi Info, version 6.

Ethical considerations

All aspects of this study, including access to medical records, were approved by the Ministry of Health of Morocco. Interviews were conducted after having obtained informed consent. Information obtained from medical records and other health service providers was kept strictly confidential and no names or other identifying information on patients was collected. The key stakeholders and their supervisors were contacted in advance to explain the objectives of the study and official permissions were obtained prior to the interviews.
Results

Health outcomes associated with the Moulay Abdellah Amghar moussem

The average number of health centre visits during the moussem period in 2009 and 2010 was 1577 per year. While the average daily number of visits was 36 outside the moussem period, it increased to 197 during the event.

The average daily ratio of female to male health centre visits during the moussem was 1.2. This ratio in the pre- and post-event time periods was 1.8, indicating an increase in health centre visits by males during the moussem.

Among the 3153 health centre visits during the event in 2009 and 2010, 704 (22%) were potentially due to an infection other than a respiratory or gastrointestinal illness, 467 were classified as accidents and injuries, 448 were for digestive disorders, 188 were likely an acute respiratory illness (Figure 1). Other chronic and acute conditions accounted for the unclassified (“other”) health centre visits (42%).

Comparing the average for the pre- and post-event time periods with the event time period, a significant increase was observed during the event for digestive disorders (10.9% pre- and post-event vs 14.2% during the event, \( P < 0.05 \)) and accidents and injuries (3.7% vs 14.8%, \( P < 0.01 \)). In contrast, a significant decrease was recorded for the number of acute respiratory disorders (9.4% vs 6.0%, \( P < 0.001 \)) (Figure 1).

During the moussem, men were nearly twice as likely to be injured or involved in an accident compared with women [331 (70.9%) visits vs 136 (29.1%) visits, \( P < 0.01 \)], while women were more likely to be seen for digestive disorders [286 (63.8%) visits vs 162 (36.2%) visits, \( P < 0.01 \)] and infections other than acute gastrointestinal or respiratory infections [402 (57.1%) vs 302 (42.9%), \( P < 0.01 \)].

Risk assessment and event planning analysis

The Moulay Abdellah Amghar moussem typically attracts approximately 360,000 national and international attendees each year for 8 days in July or August. Approximately 40,000 (11%) of these stay in the area for the duration of the moussem, either in tents or in rented houses. The moussem is hosted in a small rural village of 9000 residents, located on the coast near a small fishing port. The site is only accessible by a single 10 km secondary road (1 lane in either direction) from a main highway.

Potable well water is provided by water fountains equipped with many faucets; the well water is treated and monitored by a hygiene team from the Ministry of Health. However, private unregulated vendors selling well water can be found throughout the site. Bathroom and shower facilities are available for a fee, but few people use them because of the cost. Many attendees relieve themselves outdoors without the use of hand washing stations. Food is prepared by the attendees themselves in their tents and rented rooms. However, many small restaurants are available on site, often without the minimum requirements for food storage and conservation, including refrigerators.

Solid waste is handled by the city’s waste management service and garbage collection is carried out twice a day. A private company is contracted to provide insect and rodent control. The hygiene team from the Ministry of Health, in collaboration with the Ministry of the Interior and the Ministry of Agriculture, inspect and manage the animal slaughter facilities and ensure food safety.

The local health centre is transformed into an emergency care facility during the moussem and operates 24 hours a day during the event. This health centre has 4 beds for short-term observation. Three clinical teams, each consisting of 2 general practitioners and 4 nurses, work 8-hour shifts. During the moussem, the health centre is equipped with surge capacity of common pharmaceuticals and medical equipment. In addition, 2 ambulances and staff are co-located with the health centre.

Planning for the moussem begins each year in January and is managed and coordinated by a provincial committee led by the governor of El Jadida province.
The provincial committee designates 7 specific commissions (Equipment and Site Management, Fantasia and Folklore, Safety and Security, Surveillance and Consumer Protection, Health and Hygiene, Communication and Coordination, and Religious Activities). These commissions are charged with all organizational and planning aspects. The Health and Hygiene Commission is supervised by the Ministry of Health. Coordination is done through meetings and periodic reports sent to the governor. During the moussem, the event site is divided into 6 areas, each of which is overseen by the head of the local authority (caïd). A coordinating centre is established and daily meetings are held to discuss and assess the activities and problems.

Discussion

Moussems are culturally important and widely popular mass gatherings held throughout Morocco. This was the first study to conduct a risk assessment and identify human health outcomes associated with a moussem, specifically Moulay Abdelah Amghar, the most popular one in Morocco.

The finding that there was an increase in the average number of daily visits to the health centre confirms the large increase in workload during the event and amply justifies the implementation of a continuous, 24-hour, service.

The sex ratio of persons seeking healthcare has changed significantly in favour of males during the moussem, suggesting a high male predominance among the attendees. This finding could explain the increase in the proportion of health centre visits for accidents and injuries during the event. In fact, a large proportion of these accidents were related to falls from horses and from exploding firearms during the fantasia performances, which are exclusively male activities. Several other accidents and injuries, such as drowning and intentional injuries, are much more attributed to males and could be explained by the use of drugs and alcohol reported by all interviewed stakeholders in our study.

We also found that during the moussem, digestive disorders increased overall, particularly among females. This was likely a result of poor sanitation or water and food contamination, despite the sanitation and hygiene measures implemented by the organizers. In fact, the supply sources of private water vendors, as well as storage and distribution conditions, may be very suspect. Other aspects of hygiene may also be a source of suspicion, especially preparation of food in the many small restaurants on the site and their storage conditions. The most important source of suspicion could be, however, the limited access to sanitation facilities because they are only available for a fee; this would have lead to deficiencies in personal hygiene, including a lack of hand washing.

In this study, we expected greater proportion of digestive disorders during the moussem compared with accidents and injuries, but surprisingly, this was not the case. This finding is concordant with a descriptive study of all moussems in Morocco that was conducted in parallel to this one [Akrim M et al., unpublished report]. Otherwise, it is possible that the number of cases reported during the event was a significant underestimate since the incubation period of many acute illnesses is longer than the duration of time spent at the moussem.

Limitations

The quality of our results may have been affected by certain limitations, especially in relation to the information abstracted from medical records. Firstly, the reasons for health centre visits (e.g. complaints and diagnoses) were recorded by the clinical teams using different medical notations and abbreviations that do not refer to any specific criteria or uniform standards. Secondly, no international standard was used to validate illnesses and injuries categories for classing patients during data compilation for our study; therefore, selection bias could have been introduced. Thirdly, we were unable to epidemiologically link the reasons for the visits to the health centres absolutely to the event, and specifically we were unable to confirm etiologies for most acute illnesses.

Additionally, and owing to the lack of reliable data on the population distribution of the attendees, we were unable to calculate specific incidence rates of different health problem categories, especially by age and sex, in order to compare them with outside the event.

Despite these limitations, the results of our study allow us to make some recommendations for the attention of decision-makers, moussem organizers and officials of the health system for better preparedness and management of the event with a view to minimizing health risks.

Recommendations

To minimize the risk of acute gastrointestinal illness during moussems, we recommend that the health and hygiene committee enhance their public health interventions targeting hygiene and sanitation, especially through increasing accessibility to sanitation and hygiene facilities and making such facilities free to the public.

Unregulated water sellers should be prohibited. If this proves to be impossible, their sources must be identified and treated and containers should be checked and treated if necessary.

Small restaurants and food vendors should also be controlled and particular attention should be paid to the conditions of preparation as well as storage. Connection of their facilities to electricity should be provided by the organizers and the availability of refrigerators should be mandatory.
These measures should be complemented by appropriate health education on hygiene of water and food, particularly on hand washing. A variety of communication channels should be used, such as interpersonal communication, audio messages and pamphlets. The installation of a dedicated moussem radio station could be useful for the dissemination of health education messages.

To reduce the number and severity of accidents and injuries, safety and security measures need to be strengthened. They should focus on the regulation of access to the site and the management of the public, traffic control and maintaining permanent access for emergency vehicles, prevention of risks related to the use of gas and electric equipment and facilities [4]. Special attention should be paid to improving safety related to the organization of fantasia shows, in particular storage conditions of explosive powder and loading guns.

All these measures should be planned during the preparation phase while providing simulations to test and make the necessary improvements, according to World Health Organization recommendations [5].

Additionally, an annual risk assessment prior to and during the moussem should be conducted in order to identify potential health hazards and to implement specific public health interventions.

In this context, and having regard to the intensity of the workload at the health centre during the event, it is recommended that health authorities strengthen the systems in place, including both human and material resources. Particular attention should be given to drugs and equipment needed to care for trauma and injury.

Because of the difficulties we experienced understanding the information contained in the health centre registers, we recommend implementing a surveillance system using appropriate surveillance forms and specific case definitions to rapidly identify and respond to adverse health outcomes during this moussem [6].

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**References**

The objective of this study was to identify health related problems encountered during an annual mass gathering in Pakpattan, Pakistan, the anniversary of the death (urs) of Baba Farid, and to make recommendations for planning and prevention activities. A surveillance system was established to capture health related data for the event. A list of reportable diseases was developed. Data were collected pre-, during, and post-event by health care workers trained for the purpose. A total of 5918 people reported to the 15 health care facilities providing services during the event; 58% of consultations were because of communicable diseases, 21% of which were respiratory tract infections and 26% gastrointestinal illness. Injuries accounted for 31% of cases and noncommunicable diseases for 11%. Prevalence of reportable disease during the event showed sizeable increases. No major disease outbreak was observed.

Surveillance de santé publique lors d’un rassemblement de masse : l’anniversaire de la mort de Baba Farid, dans le district de Pakpattan, au Pendjab (Pakistan), décembre 2010

L’objectif de la présente étude était d’identifier les problèmes de santé rencontrés lors d’un rassemblement de masse annuel à Pakpattan (Pakistan), en l’occurrence l’anniversaire de la mort (urs) de Baba Farid Ganj Shakar, et de formuler des recommandations pour les activités de planification et de prévention. Un système de surveillance a été mis en place afin de relever les données sanitaires pour l’événement. La liste des maladies à déclaration obligatoire a été établie. Les données ont été recueillies en trois phases (avant, pendant et après l’événement) par des agents de santé formés dans ce but. Au total, 5918 personnes se sont rendues dans l’un des quinze établissements de santé qui fournissaient des services pendant l’événement. Les maladies transmissibles étaient à l’origine de 58 % des consultations, dont 21 % pour des infections des voies respiratoires et 26 % pour des maladies gastro-intestinales. Les traumatismes et les maladies non transmissibles représentaient respectivement 31 % et 11 % des cas. L’évolution de la prévalence des maladies à déclaration obligatoire pendant l’événement a enregistré une hausse significative. Toutefois, aucune flambée épidémique majeure n’a été constatée.
Introduction

Event history

Pakpattan is located 180 km from Punjab’s provincial headquarters, Lahore. According to district health department data, the population is 150,000. The anniversary of the death (urs) of Baba Farid (Hazrat Fariduddin Mas’ud Ganjshakar) is observed in this city during the first 10 days of the Islamic calendar month Muharram. Bahishti Dawaza (the Gate of Paradise) at the shrine of the saint is the centre of the event. This gate is open from sunset to sunrise during 5–9 Muharram. Thousands of devotees form long queues that may extend up to 5 km. The 768th urs was celebrated from 12 to 16 December 2010. The actual celebrations started on 8 December 2010 (1 Muharram). Devotees from across the world started arriving in the city as early as 3 December. The Bahishti Dawaza was opened at sunset 12 December and closed each morning before sunrise. This practice continued till 16 December 2010.

Previous experiences

The event is celebrated every year but there is no record of disease frequencies or injuries for previous years. There have been reports, however, from local health clinicians of increased numbers for a range of diseases, particularly gastrointestinal conditions, respiratory illnesses, and injuries. In previous years there has been no established surveillance system for such events in Pakistan, so most health events went unrecognized and uninvestigated. In 2001, 27 people lost their lives in a stampede and another 125 were injured [1]; afterwards extensive security arrangements were made to prevent any such occurrence in the future. Temporary gates and walls are installed before the urs to control all roads leading to the shrine. This is done to manage human as well as automobile traffic. Narrow passages are constructed using metallic bars leading to Bahishti Dawaza so people can safely walk through the door. These gates and walls are removed after the event.

On 25 October 2010 (around 6 weeks before this event), about 6 people died and more than a dozen were injured in a bomb blast at the shrine [2]. Due to the intensity of religious sentiments attached to events such as these, there is always a threat of terrorism, and this can pose serious issues in regard to public health response.

Public health importance

Mass gatherings over extended periods of time pose unique challenges to the existing systems [2]. The urs of Baba Farid attracts people from all walks of life; the local health administration estimates about 500,000 people attended the event in 2010. Large gatherings such as this one held in small towns or cities strains the local administration, which has to allocate additional resources to manage the event [3]. A large number of security personnel from adjacent districts are deputed to ensure the security and safety of attendees.

The numbers and diversity of the population attending the event poses many challenges. Such large numbers gathered in close quarters for variable periods of time pose a risk of spreading communicable diseases, particularly respiratory and gastrointestinal ailments. There is a high risk of outbreaks in such gatherings. Overcrowding of the streets with people and vehicles leads to road traffic accidents. Many hotels in the city are booked to capacity forcing people to stay on the pavements on open streets. People with various diseases visit the shrine in the belief that they will be cured. People are obliged to eat on the roadside, buying food from mobile vendors. Such practices make them susceptible to gastrointestinal problems.

Aim

The aim of this study was to determine the prevalence of communicable and noncommunicable diseases and injuries important to public health at this annual event. This information could be used to prevent both diseases and injuries and therefore may lead to healthier and safer mass gatherings in future. Specifically, we aimed to:

- identify stakeholders and include them in surveillance implementation and response;
- prioritize diseases under surveillance and collect data from selected sites;
- analyse the collated data and disseminate information for timely action;
- make recommendations for future events.

Methods

After gaining approval from the local administration to carry out surveillance at this mass gathering event, a list of stakeholders was prepared. The local administration and the health and rescue departments were involved in implementing this surveillance system. Representatives of the security agencies were also an integral part of the system. Stakeholders agreed to a high priority risk assessment exercise and daily evening coordination and debriefing meetings. The local health department ran a campaign on disease prevention and hygiene.

A pre-event risk assessment exercise was undertaken a few weeks prior to the urs; this included reviewing any data available at local health department and local administration office from previous experience. The most important considerations were diseases prevalent in the area, especially those with an outbreak potential, and environmental factors, which included both weather conditions and the nature/characteristics of the crowd, e.g. enormous crowds performing rituals
and activities both indoors and outdoors, extended exposure, and mobility in large open spaces and in small closed areas. Security and terrorism threats during the event were also considered.

The initial assessment exercise resulted in a breakdown of priority diseases into 3 main groups of reportable diseases/conditions: communicable diseases, noncommunicable diseases, and physical trauma and injuries. Reportable conditions were:

- respiratory tract-related illness
- chronic obstructive pulmonary disease
- asthma
- gastrointestinal tract-related illness
- diarrhoea
- dyspepsia/gastro-oesophageal reflux disease
- febrile illness
- malaria
- fevers other than malaria
- chronic disease
- ischaemic heart disease
- hypertension
- diabetes
- injury resulting from:
  - road traffic crashes
  - falls
  - riots.

Based on the priority disease list, a hybrid syndromic and injury surveillance procedure was established. All 15 health facilities providing health care around the locations of this event were selected for collection of data: 8 public, 6 private and 1 nongovernmental (NGO)-based. Public health sector facilities were established within and near the shrine area as usual for this event and these were provided with medicines and first aid kits by the local health department. Health facility counters established the purposes of this survey were made prominent with banners and signboards. Staff at these facilities had pre-event training on tasks like case definitions and patient data recording and sharing.

After initial medical care, patients could be referred to the main district hospital if necessary. Patients were treated even if they were not willing to participate in the survey or share their information. Almost all those treated agreed to participate and all were assured that their identity would remain confidential and would not be shared without their consent.

Everyone attending the selected health care facilities, irrespective of their permanent place of residence, was included in this study.

**Case definitions**

Case definitions were developed based on history and clinical examination, discussions with general physicians, and consultation of standard references \[4,5\]. Case definitions were pre-tested at the district health facility as a part of the pre-event phase.

### Table 1 Case definitions used for patients presenting at participating health facilities during the mass gathering for the **urs of Baba Farid, Pakpattan, December 2010**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Case definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute respiratory illness</td>
<td>&lt; 4-hour history of cyanosis or dyspnoea, plus Breathing rate (for age group): 40/min (&lt; 1 year) 30/min (1–5 years) 20/min (&gt; 5 years)</td>
</tr>
<tr>
<td>Asthma</td>
<td>At presentation history of at least 2 recurrent episodes of: cough dyspnoea wheeze</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>At presentation history of at least 2 recurrent episodes of: cough sputum history of smoking</td>
</tr>
<tr>
<td>Dyspepsia</td>
<td>At presentation having at least 2 recurrent episodes of: anorexia vomiting tender epigastrium</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>Presenting with complaint of &gt; 2 loose stools in 1 day</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Having a single record of blood pressure &gt; 140/90 at the time of presentation</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>History of ischaemic heart disease or complaining of chest pain on exertion at presentation</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Presenting with history of diabetes or blood sugar levels recorded as: fasting blood sugar &gt; 7 mmol/L or random blood sugar &gt; 11.1 mmol/L</td>
</tr>
<tr>
<td>Malaria</td>
<td>History of episodes of fever with chills and malaria positive confirmed by rapid diagnostic tests at health facility counter</td>
</tr>
<tr>
<td>Other febrile cases</td>
<td>Fever recorded as &gt; 100 °F due to any illness except malaria</td>
</tr>
</tbody>
</table>
and edited based on the diversity of symptoms encountered (Table 1). For injury surveillance at this venue, road traffic accidents, falls, riots or stampedes during the event were recorded.

**Data collection and analysis**

On-site, temporary health facility counters were established to provide health care and surveillance. Staff at these facilities were trained to carry out the survey. A central data collection unit was established in the control room at the executive district health office and all the public health surveillance activities were coordinated there. In consideration of the outbreak potential, increased numbers (more than the usual levels) of high impact events like food- or waterborne illnesses and mass injuries had to be reported by telephone as early as possible.

Daily data collation and the database were managed using Microsoft Excel.

**Results**

A total of 5918 consultations were recorded at the 15 selected health facilities. Most of the patients (76.2%) reported at the 8 public sector facilities, 18.5% reported at the 6 private facilities, while 5.3% reported at the 1 NGO facility. Case definitions were agreed for 4896 of the patients. About 80% of the complaints were about reportable, high priority diseases. The majority (67%) of the reporting patients were male.

Among the reportable diseases, observed frequency 58% of consultations were for communicable diseases during the event period. This was up from 51% during the week prior to the event (Table 2). Among the communicable diseases, respiratory tract infections accounted for 21% and gastrointestinal infections for 26% during the event phase.

Although the majority of the patients reported at the public sector health facilities, the data from the private and NGO sectors were also important (approximately 24% of the total recorded encounters). There were participants of all ages, but the majority (62.3%) were aged 15–49 years. The second largest group was those aged 50+ years (23.3%).

Prevalence of acute respiratory illness showed the most dramatic increase, rising from 6.7 per 100 000 in the week before the event to 167.0 per 100 000 during the event (Table 3). Prevalence of diarrhoea and dyspepsia increased considerably, from 6.0 and 4.0 per 100 000 to 82.0 and 114.0 per 100 000 respectively. Among the chronic diseases, the greatest increase in prevalence was for hypertension, from 12.0 per 100 000 in the week prior to the event to 66.0 per 100 000 during the event. Malaria prevalence showed no appreciable change, however, during the event period. Prevalence of fever other than malaria was reported as 72 per 100 000 (Table 3).

**Discussion**

Communicable diseases accounted for the greatest number of visits to healthcare facilities in all 3 phases of the event. There were some small clusters reporting identical health related complaints; district health departments and other response units were informed on a real-time basis, but no outbreaks or common sources were found. There were mobile vendors selling food in the city without any inspection of hygiene practices or food quality. Failure of various efforts to capture any common source for the gastrointestinal-related conditions may be because these vendors changed location frequently as well as the huge influx of people and overcrowding during the event.

Before the event started, the city experienced a great influx of vehicles. This not only put a strain on the traffic system but also contributed to air pollution. The number of road traffic accidents and respiratory tract-related illnesses are also a result of the heavy traffic influx.

This study had certain limitations. As health facilities were scattered around the event centre over different parts of the city, this may have resulted in some cases reporting to more than 1 facility to seek support at various times during the course of the same illness. Owing to resource limitations, we had a limited workforce available for case

**Table 2** Distribution of medical conditions according to type recorded during the three phases of the mass gathering for the Urs of Baba Farid, Pakpattan, December 2010

<table>
<thead>
<tr>
<th>Type of disease/condition</th>
<th>Pre-event (n = 74)</th>
<th>During event (n = 4719)</th>
<th>Post-event (n = 103)</th>
<th>Total (n = 4896)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Communicable</td>
<td>38</td>
<td>51</td>
<td>2742</td>
<td>58</td>
</tr>
<tr>
<td>Noncommunicable</td>
<td>23</td>
<td>31</td>
<td>504</td>
<td>11</td>
</tr>
<tr>
<td>Injury</td>
<td>13</td>
<td>18</td>
<td>1473</td>
<td>31</td>
</tr>
</tbody>
</table>

*Of the 5918 patients recorded and treated in total, case definitions were agreed for 4896.
follow-up, active case finding and contact or source tracing. It is possible there were more cases who did not report to the health facilities or who sought over-the-counter treatment. The source of the significant rise in acute respiratory infections during the event could not be verified because of the limited laboratory resources available.

An improved traffic control plan, put in place prior to the event, may serve to decrease traffic-related injuries. Local health and other related departments should collaborate to improve sanitation and food quality for this mass gathering. In future, during such events laboratory services should be considered part of the surveillance systems.

It is necessary to have surveillance mechanisms in place so that the health events are both recorded and responded to. The participation of a trained epidemiologist may prove helpful in case investigations of reportable diseases during future events.

Although we did not directly experience a terrorist attack during our study, considering the current wave of such attacks, local administrative and health departments should be trained for disaster management in order to deal with any unforeseen event.

Lastly, surveillance should continue, not only for this event, but for other mass gatherings in Pakistan and a comparative study over the coming years needs to be implemented so that common health problems at mass gatherings are seen holistically. The data collected would lead to the implementation of adequate preventive measures that would improve community health and make such gatherings safer.

## Acknowledgements

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- Executive District Officer Health, Pakpattan District;
- Executive District Officer Health, Muzafar Garh District;
- Medical Superintendent, District Headquarters Hospital, Pakpattan District;
- Medical Superintendent, Tehsil Headquarters Hospital, Ali Pur, Muzafar Garh District;

## References

ABSTRACT During the 5-day Eid Al Adha holiday, Aqaba is the site of one of the largest mass gatherings in Jordan. Public health concerns during this holiday included: food- and waterborne diseases, drowning, injuries by marine creatures, road traffic crashes, and pressure on emergency departments at hospitals. This cross-sectional study was carried out in Aqaba during the period 16–20 November 2010 and aimed to identify and prioritize the major public health risks and to overview the preparedness plans of the Health Directorate during previous Eid events in Aqaba. All related stakeholders participated in the study. An exploratory visit to Aqaba was made and an introductory workshop was conducted for participants. Relevant data were collected and compared with the figures for the week prior to the event. No food poisoning outbreaks were reported during the event. There was a 23% increase in emergency department attendance, a 33% increase in hospital admissions, and road traffic crashes increased by more than 300%. More males were affected than females.

Rassemblement de masse à Aqaba pendant l’Aïd Al-Adha (Jordanie), 2010

RÉSUMÉ Pendant les cinq jours de l’Aïd Al-Adha, Aqaba est le théâtre d’un des plus grands rassemblements de masse en Jordanie. Durant ce congé, les problèmes de santé publique sont notamment les suivants : maladies d’origine alimentaire et hydrique, noyades, blessures causées par des animaux marins, accidents de la circulation routière et surcharge des services des urgences dans les hôpitaux. La présente étude transversale avait pour but d’identifier et de hiérarchiser les principaux risques pour la santé, et de présenter les grandes lignes des plans de préparation établis par la Direction de la Santé lors des précédentes fêtes de l’Aïd à Aqaba. Toutes les parties prenantes ont participé à cette étude. Une visite d’exploration a eu lieu à Aqaba et un séminaire-atelier préliminaire s’est tenu à l’intention des participants. Des données pertinentes ont été recueillies et comparées avec les chiffres de la semaine précédant l’événement. Pendant le rassemblement, aucune flamée épidémique due à une intoxication alimentaire n’a été signalée. La fréquentation au service des urgences a augmenté de 23 %, les hospitalisations de 33 % et les accidents de la route de plus de 300 %. Davantage d’hommes que de femmes ont été affectés.

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Introduction

Mass gatherings are characterized by large crowds of spectators and participants, and are an increasingly common feature in many cultures. There is growing recognition of public health concerns in mass gatherings. These include water and sanitation management, emergency preparedness, transportation, crowd management and bioterrorism. All of these are challenges to control during mass gatherings [1]. Enhanced surveillance is needed to detect events in a timely manner and to communicate information on public health concerns. Other methods of surveillance during mass gatherings include additional community-based systems and setting up event-specific surveillance [2]. Integration and coordination of surveillance systems is critical to ensuring comprehensive and coherent results [3].

Extensive planning and preparedness are required in the provision of public health services for mass gatherings, and important to the planning is a thorough knowledge of the incidence and types of health problems that may occur [4].

Studies have been done at mass gathering events in many countries. In Virginia, United States of America, health authorities conducted a daily syndromic surveillance to monitor diseases symptoms and injuries at a sport summer camp. Gastroenteritis outbreaks and heat-related injuries were recorded [5]. A study conducted at a 9-day agricultural and horticultural show in Australia in 2002 demonstrated the high injury burden and the increased strain placed on medical services [6]. Another study in Australia during a World Youth Day celebration in 2008 showed that implementing continuous re-evaluation of case definitions and ongoing laboratory testing helped in the early identification of an influenza outbreak among attendees [7]. All this suggests a definite role for planning strategies to reduce injury outcomes, including live surveillance of injury type and cause, risk management and public education.

Many mass gatherings are held in the Middle East and North Africa region, however only the Hajj has been addressed in the literature [8,9]. This is one of the largest mass gathering events in the world: millions of pilgrims from almost every country gather annually over several days. Throughout its long history, Hajj has been witness to a series of major health issues, with respiratory infections the most frequently reported complaints [10]. There is also the potential for further spread infectious diseases when participants return home from mass gatherings. This was demonstrated after Hajj 2000 and 2001, when clusters of meningococcal cases (serogroup W135) were reported [11]. These were linked to either a history of recent returnees from the Hajj or of household contacts of returned pilgrims.

The lack of information regarding other mass gatherings in the region has highlighted the importance of concentrating on this ignored area, which is of great consequence to public health.

Jordan has a population of 6 million [12]. It has a stable political, social, and economic situation that encourages hundreds of thousands of people to visit the country. Annually, many mass gathering events are held, including religious, cultural, and recreational events. To the best of our knowledge, no studies have been conducted to investigate public health concerns during such mass gatherings in Jordan.

Aqaba, population 70 000, is the only coastal city in Jordan. It is located on the Red Sea 350 km south of the capital, Amman. It is visited by large number of people, mainly young adults and families, from Jordan, the region, and other countries for tourism. Aqaba is also a duty free zone, and is visited for trading purposes. The number of visitors increases greatly during Eid, a Muslim religious occasion, and a national holiday in Jordan.

Eid Al Adha (5 days) occurs during the Hajj. The timing depends on the Islamic (Hijri) calendar, which is 11–12 days shorter than the solar year. The majority of visitors come to Aqaba by car via the Dead Sea highway and the Desert highway. Visitors participate in a number of activities including swimming, cruising, and shopping.

The aims of this study were to overview the preparedness plans executed by Aqaba Health Directorate and other stakeholders during previous Eid events in Aqaba and review the success, effectiveness, and limitations of these plans. We also aimed to identify, prioritize, and analyse public health risks during the Eid mass gathering, and create tools for the surveillance of public health concerns that are not included in the current Jordanian surveillance system, e.g. drowning.

Methods

Eid Al Adha vacation lasted for 5 days (16–20 November) in 2010. The expected number of visitors to Aqaba during this period ranges from 30 000 to 70 000.

Our study was multisectoral; stakeholders (partners in this project) included: the Communicable Diseases Directorate; Aqaba Health Directorate; the Islamic Hospital; the Modern Aqaba Hospital; Princess Haya Hospital; Aqaba Governorate; the Police Directorate; the Civil Defence Directorate; Aqaba Special Economic Zone Authority; and the Tourism Directorate.

The existing surveillance system in Jordan is basically passive (notification by health facilities), and is monitored by the Ministry of Health Directorate of Communicable Disease. The list of about 45 notifiable diseases and events is divided into 2 groups: Group A, diseases which must be notified to the public health authorities within 24
hours (e.g. cholera, food poisoning) and Group B, diseases and events that must be notified via the weekly report (e.g. chicken pox, hepatitis) [13]. For surveillance purposes, health centres, clinics, and hospitals report to one of the 21 reporting sites, which in turn report to the Directorate of Communicable Diseases.

Health facilities in Aqaba include 1 military hospital (127 beds), 2 private hospitals (40 beds each), 4 Ministry of Health health centres and many private clinics. All of these facilities report to Aqaba Health Directorate. Aqaba Special Economic Zone Authority is responsible for food safety, and during Eid the authority strengthens the measures on food safety in the city to prevent food poisoning outbreaks. In the event of an outbreak, food poisoning, the epidemiological investigation is done by the surveillance department in Aqaba Health Directorate under the supervision of the Directorate of Communicable Diseases, while food and environmental investigation is done by the Aqaba Special Economic Zone Authority. The Food and Environmental Department in Aqaba Health Directorate is responsible for water safety in the city in collaboration with the Directorate of Environmental Health in Amman. Sources for drinking water and the water network are tested chemically and biologically. Once contamination is detected, provision of water is discontinued immediately till the contamination is removed.

**Preparedness**

The main stakeholders in Aqaba, such as hospitals, the Health Directorate and the police administration, were visited by the Field Epidemiology Training Programme study team on 20 October, 2010. These visits aimed to examine the experiences of all partners during previous Eid holidays, the expected number of visitors, and the preparedness of each partner for the coming Eid holiday. Visits also targeted hospitals to check their capacity to deal with expected events. An introductory workshop was conducted on 20 October 2010, where the study objectives, its importance to public health, and cooperation between stakeholders were addressed and discussed.

The available data from hospitals, police administration, and Civil Defence administration for the Eid events during the previous 2 years were analysed to assess public health concerns during the holiday. These data included the number of patients who attended emergency departments, numbers admitted to hospital, and numbers of road traffic crashes and drownings. Preventive measures were also identified. These were discussed and agreed upon by stakeholders so they could be implemented during Eid Al Adha 2010.

**Surveillance system for the Eid event, 2010**

This cross-sectional study was approved by the Ministry of Health and Aqaba Governorate.

Surveillance activities began 14 days before the event and extended until 10 days afterwards. An enhanced surveillance system was conducted between 2 and 30 November 2010. The existing surveillance system was enhanced by:

- operating an additional paper-based reporting system from hospitals, police administration, and Civil Defence administration;
- increasing the frequency of reporting from weekly to daily (case definitions were the same as in the surveillance guidebook);
- including drowning in the system;
- enhancing laboratory capacity and reporting by facilitating the immediate delivery of laboratory samples to Amman in cases (e.g. meningitis and food poisoning) where the local laboratory is not qualified to perform the tests;
- enhancing awareness among clinicians during visits of the FETP team to hospitals;
- training clinicians on the new paper-based surveillance system and case definitions of diseases;
- strengthening ties with clinicians and other partners;
- collecting data on a form specifically designed for the purposes of the study, covering age, sex, nature and time of the concern, and outcome.

During Eid Al Adha, the Jordan Field Epidemiology Training Programme team as well as the Ministry of Health focal point were present in Aqaba. Daily meetings to follow the situation with relevant focal points, receiving and reviewing daily reports, and daily visits to health facilities were among the team activities during the event.

**Post event activities**

A closeout workshop was held in Aqaba on 3 December, 2010 to present the study.

**Previous data review**

No baseline data could be drawn up owing to the poor quality of the information in there porting forms. The reports from hospitals, the police administration and the Civil Defence administration during 2008 and 2009 were in the main administrative rather than epidemiological.

**Risk assessment**

Through reviewing the reports as well as from discussions with stakeholders, the following public health issues were given priority since all are of high likelihood and have urgent consequences:

- food- and waterborne diseases,
- drowning,
- injuries by marine creatures which are present in the Red Sea,
- road traffic crashes,
- pressure on emergency departments at hospitals.
Preventive measures
The following preventive measures were introduced:

- strengthening of control measures on food and drinks street vendors to prevent food- and waterborne diseases;
- preparedness of health facilities including health personnel, equipment, etc.;
- establishing a mobile health station on the beach to deal with emergency cases promptly and effectively;
- advising people to swim in safe places and only where lifeguards are available (health messages were delivered via signs/signals placed on beach);
- banning driving in specific streets identified (based on previous experience) as being crowded with pedestrians;
- banning visitors from camping in the streets and other areas in the city.

Results
During the 5 days of the event, the weather was moderate with temperatures ranging between 15 °C and 29 °C.

The number of drownings increased from 0 in the previous week to 7 during the event. There was a more than 3-fold increase in road traffic crashes. No food poisoning outbreaks were detected during the study period. The main public health events are shown in Table 1.

Males accounted for 92% of road traffic crash victims, 87% of injuries by marine creatures, and 71% of drownings (Table 2).

There were 39 road traffic crashes during the Eid period. Collisions were the most common type (69%) followed by being run over (18%) (Table 3).

All the preventive measures that were introduced were implemented except preventing camping in the streets.

Discussion
For this study, the reviewed data and reports from previous similar events in Aqaba demonstrate the poor capacity of the existing surveillance system to identify cases of public health concern during mass gathering events.

To ensure public health safety during mass gatherings, the surveillance system must provide sufficient numerical findings to plan, implement, and evaluate public health actions related to the event.

Our results showed a considerable increase in the occurrence of certain public health risks during the Eid holiday in Aqaba even though many preventive measures had been implemented. Large numbers of participants in mass gatherings usually lead to increased demand on food vendors; consequently, the incidence of foodborne diseases often increases. A study in Saudi Arabia showed that diarrhoea was the third most common cause of hospitalization during the Hajj [14]. Many factors may contribute to this problem including inadequate standards of food hygiene, shortage of water, the presence asymptomatic carriers of pathogenic bacteria, and inappropriate storage of food. However, the strict monitoring measures on food and water safety in force during the event we studied may explain the absence of food poisoning outbreaks. The health authorities responded appropriately

Table 1 Variation in public health concerns during Eid Al Adha, Aqaba, 2010

<table>
<thead>
<tr>
<th>Incident</th>
<th>No. of cases in week before Eid</th>
<th>No. of cases during Eid</th>
<th>Increase*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road traffic crash</td>
<td>11</td>
<td>39</td>
<td>345%</td>
</tr>
<tr>
<td>Hospital admission</td>
<td>56</td>
<td>75</td>
<td>33%</td>
</tr>
<tr>
<td>Emergency room attendance</td>
<td>1442</td>
<td>1766</td>
<td>23%</td>
</tr>
<tr>
<td>Injury caused by marine creatures</td>
<td>0</td>
<td>22</td>
<td>+22</td>
</tr>
<tr>
<td>Drowning</td>
<td>0</td>
<td>7</td>
<td>+7</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Expressed as percentage or absolute number.

Table 2 Distribution of public health concerns according to sex, Eid Al Adha, Aqaba, 2010

<table>
<thead>
<tr>
<th>Incident</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Emergency room attendance</td>
<td>905</td>
<td>53</td>
</tr>
<tr>
<td>Hospital admission</td>
<td>39</td>
<td>52</td>
</tr>
<tr>
<td>Drowning</td>
<td>5</td>
<td>71</td>
</tr>
<tr>
<td>Injury caused by marine creatures</td>
<td>19</td>
<td>87</td>
</tr>
<tr>
<td>Road traffic crash</td>
<td>36</td>
<td>92</td>
</tr>
</tbody>
</table>
to the increased population during the Eid event.

The number of hospital admissions and emergency cases increased noticeably during the Eid period. The location of Aqaba so far from other cities may also have increased the load on the city health facilities.

Swimming is one of the main activities enjoyed by visitors, since the Gulf of Aqaba is the foremost place in Jordan for outdoor swimming. Many visitors, however, go swimming without adequate training. These are the most likely reasons for the increase in drowning cases and injuries by marine creatures during the Eid event. This would, of course, be reflected in the increase in hospital admissions.

Most of the participants use their own cars to visit Aqaba. Thus, the vastly increased number of vehicles within a small confined area resulted in the huge increase recorded in the number of traffic crashes, again having an effect on the hospital admission figures.

There was a predominance of males in the public health consequences during Eid in Aqaba, particularly for drownings, injuries caused by marine creatures and road traffic crashes. The greater numbers of males taking part in these activities is likely to be the reason for this.

Recommendations

There is a need to strengthen the preventive measures during the Eid holiday period in Aqaba. The enhanced surveillance system that was put into place was effective in linking the related sectors with the public health situation on a daily basis.

- A permanent committee should be established headed by the health authorities to deal with public health issues during Eid.
- This study should be shared with decision-makers to highlight the importance studies on mass gatherings.
- Rigid control measures on food and water safety should be continued.
- Educational pamphlets should be prepared for future Eid events targeting road traffic crashes, drownings, and injuries by marine creatures. These pamphlets should be distributed to visitors before they arrive in Aqaba.
- Assess the safety of beaches and the possibility and efficacy of employing lifeguards.

Table 3 Distribution of road traffic crashes according to type, Eid Al Adha, Aqaba, 2010

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collision</td>
<td>28</td>
<td>72</td>
</tr>
<tr>
<td>Run over</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Overturning</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

References

ABSTRACT

Objectives: To identify the occurrence of upper respiratory tract infections (URTI), diarrheal diseases and trauma during the Hajj season, and the practice of some preventive measures by pilgrims.

Methods: A cohort study during November and December 2009 among hajjis registered while visiting Primary Health Care Centers of Riyadh, Kingdom of Saudi Arabia to get mandatory meningococcal meningitis vaccination. On return from hajj, hajjis were contacted on telephone to collect information on occurrence of URTI and diarrhea along with other associated activities in Hajj.

Results: Out of 1507 hajjis, 54.7% developed symptoms; 97% reported upper respiratory tract symptoms, and 9.3% reported diarrheal symptoms. Those <40 years of age were more likely to develop an URTI. The incidence of diarrheal diseases or trauma was not statistically associated with age. No statistical difference for educational level was found for URTI or trauma, but there was a statistically significant difference for diarrheal diseases. There was no statistical difference for nationality in relation to diarrheal diseases and trauma, but there was a statistically significant difference for URTI. There was a statistically significant difference of URTI between those pilgrims who used the face mask most of the time and those who used it sometimes.

Conclusion: Upper respiratory tract infections is a common health problem among studied domestic hajjis. Generally, there is room for improvement in the adoption of preventive measures by hajjis; and there is still limited information on the use of facemasks in spite of the fact that using it significantly decreases the risk for URTI.

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Introduction

Hajj (pilgrimage) is a yearly event in which more than 2 million Muslims from around the world gather in Mecca, Saudi Arabia. It is the largest annual gathering of its kind in the world bringing millions of people in a small and geographically confined area. All adult Muslims who are physically and financially able to do so have a religious obligation to make the pilgrimage once in their lifetime. The limited time and space in which this mass gathering takes place exposes these hajjis to several risk factors [1]. Overcrowding increases the chances of trauma and transmission of communicable diseases. Transportation to the Hajj area is mainly through air for international hajjis. Domestic hajjis can reach the Hajj area either by air or surface transport, which is a cheaper mode of transport. Hajjis can use buses for transport within the Hajj area or can move around on foot. In this Hajj season, the services of train transportation between key locations in the Hajj area were made available. A hamla is a company that is specialized in Hajj services. These hamlas are responsible for travel arrangements, accommodation and food arrangements for every hajji who paid for their services [2–5]. The changing of Hajj season from summer to winter changes the pattern of diseases that are detected among hajjis. Since Hajj season has changed in the last few years from summer to winter, diseases that were seen in summer season (such as heat stroke, food poisoning and exhaustion) are not seen anymore [6]. In Hajj season diseases are expected to be more common such as influenza, asthma and chronic obstructive pulmonary disease. During Hajj rituals, hajjis are exposed to several health risks. Physical exertion is a health risk itself and it can aggravate pre-existing health conditions (such as diabetes mellitus, cardiovascular and renal disease) [2,4]. During animal slaughter, as part of Hajj rituals the risk of exposure to zoonotic diseases is increased [7]. Another Hajj ritual which poses a health risk is head shaving for men. Head shaving is performed with razors or blades which if used without changing for several hajjis can transmit blood borne infections (HIV, hepatitis B and hepatitis C) [8]. Many Hajj studies showed a change in the pattern of diseases detected among hajjis from infectious diseases to chronic diseases [9–11]. Mina is a key place in the Hajj area. It is where the hajji spends the most of the time in the Hajj season (at least 4 days). This relatively long duration account for the burden on health services in this area. Many researchers studied pattern of diseases among hajjis visiting Mina hospitals. Those cases that reach hospitals are usually the tip of the iceberg and they are mostly advanced stages of the disease, which can be less representative to the real Hajj population [5,12–14]. Currently there is no surveillance system for some hajj-related and post hajj illnesses. The primary objectives of this study were to assess the incidence of selected diseases and injuries among hajjis and to use this information by the Ministry of Health (MOH) for future surveillance of specified conditions at the Hajj, and to assess preventive measures practiced by hajjis. Specific conditions of interest included upper respiratory tract illnesses (URTI), diarrhoeal illnesses, and injuries.

Methods

Study setting

This cohort study was conducted during November and December 2009 in Riyadh City, the capital of Saudi Arabia with a population of nearly 5 million. Since there is no common station to identify and recruit hajjis returning to Riyadh from Hajj, subjects were recruited as they sought their required pre-Hajj meningococcal vaccination. Riyadh City has 87 primary health care centres (PHCC) that give meningococcal vaccination as an obligatory requirement for those who will perform the Hajj. These PHCC are distributed in 7 health sectors. The number of PHCCs in each health sector ranges from 7-20 centres. Therefore, the study population consisted of all adults older than 20 years of age living in Riyadh City with the intention to perform the Hajj in 2010, who sought their required meningococcal immunization at a PHCC. Vaccinations started on 16th October 2010 and continued on daily basis until 7 November 2010, which was the first day in the Hajj season.

Case definition

For the purpose of this study, URTI was defined as any person who reported having developed at least one of the constitutional symptoms (fever, headache, myalgia) and one of the local symptoms (running nose, sneezing, throat pain, cough with /or without sputum) after reaching Makkah for the Hajj or within 2 weeks from return to Riyadh [15]. Diarrhoea was defined as the passage of 3 or more loose or liquid stools per day after reaching Makkah for the Hajj or within 2 days from return to Riyadh to ensure that diarrhoea infection was acquired during hajj period not after return home.

Sampling

A 2 stage sampling technique was used. In the first stage, Riyadh City was stratified into 7 strata according to the number of health sectors. Simple random sampling of 1-2 PHCC from each stratum was carried out according to the number of PHCC in each health sector. From health sectors with 10 or fewer PHCC, one PHCC was selected. Two PHCC were randomly selected from health sectors with more than 10 PHCC, resulting in a total of 11 centres. In the second stage, study subjects were systematically selected from each of the 11 centres by selecting every third sample
person seeking meningococcal vaccination for their Hajj requirement.

A sample size of 1,499 was calculated using Epi-Info version 3.5.1 to estimate diseases with proportion of 1% or more in the study sample with a precision of 0.5% at 95% confidence level, and was then increased to 1,804 to account for the anticipated non-responders.

Recruits were asked to give their contact information and consent at the time of recruitment so that they could be contacted 48 hours upon return from the Hajj up to a period of 4 weeks after return. A standardized phone-based questionnaire regarding selected illnesses (which include diabetes, hypertension, cardiac diseases, renal diseases and bronchial asthma), injuries, and preventive measures was developed and pilot-tested prior to administering it to returning hajjis. Three trained interviewers contacted participants during working hours, with follow-up calls at other times to improve the response. Those who were not contacted after 4 days of attempts were classified as non-responders and were excluded.

Statistical analysis
The collected data were organized, tabulated, and statistically analysed using SPSS software statistical package version 19. The number and percentage distribution for each variable was calculated. Observed differences were statistically analysed using Chi square test and risk estimation was carried out using relative risk and 95% confidence intervals. The level of significance was adopted at \( P<0.05 \).

Results
Out of 1,804 initial enrolled, 1,507 Hajj pilgrims responded and were included into the study. Males predominated the study population (61.7%). The mean age was 37.9 ± 12.1 years with a range of 21–83 years of age. The main nationalities were Saudi and Arabs (84.5%). Hajjis from South Asia comprised 7.4%, South East Asia 4.9%, and Africa 3.2% of the study population. Half of the study population (49.5%) had a university education, including Master’s and Doctorate degrees. The occupational status of study participants was reported as 31.4% unemployed, 13.7% manual workers, 21.4% employee, 21.3% professional, 3.8% retired, 4.9% were students, and 3.5% self employed. All participants were vaccinated for meningococcal meningitis. Some hajjis received vaccines upon their request other than meningococcal meningitis (n = 218); 5.9% were vaccinated against Hepatitis A, 6.4% against Hepatitis B, and 94.4% were vaccinated for seasonal flu (categories not mutually exclusive).

Different modes of travel to Makkah were available; 50.6% of hajjis travelled by bus, 20.2% by plane and 29.2% by car. The travel coordination services of a Hamla were utilized by nearly all Hajjis (95.7%). The average length of stay at the Hajj (Makkah and Mina) was 7.04 ± 1.78 days and all but 2 pilgrims were able to complete the Hajj.

Illness symptoms were reported by 825 (54.7%) of the returning Hajjis. These symptoms were used to categorize participants into disease groups. Of the 825 reporting symptoms, 97% reported upper respiratory tract symptoms (53% of total studied group), and 9.3% reported diarrhoeal symptoms (5.1% of total studied group) (not mutually exclusive). Of the 825 with symptoms, 51% reported contact with a person having similar symptoms and 43.2% sought medical care at a health care facility whether during hajj or upon return home. Traumatic injuries were reported by 2.9% (Table 1).

Face masks were used by 851 (56.5%) of participants. Of those, 216 (25.4%) reported using it most of the time and 635 (74.6%) reported using it sometimes. Of the 577 females in the study population, 333 (57.7%) reported

| Table 1 Distribution of domestic hajjis in relation to health problems in Hajj |
|---------------------------------|---------|-------|
| Health problems in Hajj          | n       | %     |
| **Having symptoms: n = 1507**   |         |       |
| Yes                             | 825     | 54.7  |
| No                              | 682     | 45.3  |
| **Diseases** n = 825            |         |       |
| URTI                            | 800     | 97.0  |
| Diarrheal diseases              | 77      | 9.3   |
| Others*                         | 16      | 1.9   |
| **Contact with similar case: n = 825** |       |       |
| Yes                             | 421     | 51.0  |
| No                              | 259     | 31.4  |
| Do not know                     | 145     | 17.6  |
| **Visited any health care facility: n = 825** | | |
| Visited any health care facility | 356     | 43.2  |
| **Trauma: n = 1507**            |         |       |
| Fractures                       | 1       | 2.3   |
| Cut wounds                      | 16      | 36.4  |
| Contusions                      | 13      | 29.5  |
| Strain                          | 14      | 31.8  |
| *More than one disease were sometimes reported. |
| *Allergy, chest pain, hemorrhoids, joint pain, blocked nose, neck pain, sinusitis, sputum, URTI- upper respiratory tract illnesses.
Nearly half of the hajjis used hand sanitizer during Hajj (45.5%). None of the females reported smoking, and among males, 307 (33.3%) were smokers (Table 2).

Selected chronic diseases were reported by 278 (18.4%) of study participants. Of those, diabetes was reported in 55.7%, hypertension in 60.7%, other cardiac disease (7.5%), and bronchial asthma (11.5%) (not mutually exclusive). Hajjis who had a chronic disease were using their medications regularly (82.0%); of those with a chronic disease, 89.2% reported that they had enough supply of their medications (Table 3). Gender was found to be significantly associated with the occurrence of diarrhea were males reported an incidence of 6.3% compared to 3.1% for females (RR=2.03, P=0.006). On the other hand, nationality (whether Saudi or non-Saudi) did not affect the risk of diarrhea. The incidence of diarrhea was highest among hajjis who stayed 4 days or less (11.5%). Longer durations of stay were found to have lower risk for diarrhea, which was lowest for those 7 days of stay where the incidence was reported to be 2.9% (RR=0.25, P=0.021).

Source of food, eating raw vegetables, frequency of hand washing and use of hand sanitizers did not significantly affect the incidence of diarrhea among studied hajjis (Table 4). Gender, nationality whether Saudi or non-Saudi did not show significant effect on risk of occurrence of URTI. The incidence of UTRIs significantly increased with increased level of education where it was highest among those with primary education (RR=1.65, P=0.002). Concerning duration of stay in hajj areas, those who stayed 8 days or more were significantly suffering from lower risk of infection (RR=0.78, P=0.006) compared to other hajjis spending shorter periods. Never or sometimes using face mask was found to significantly increase the risk for URTI (RR=1.17 and RR=1.21) compared to those who used it most of times. On the other hand,
the use of face cover was not found to significantly decrease the risk of infection (Table 5).

**Discussion**

Acute respiratory tract infections, diarrhoeal diseases and injuries occur worldwide throughout the year and are not limited to any specific age, gender, or nationality. For example, several factors contribute to the wide spread of URTIs including direct contact with affected person, change in climate, and crowded places; all of these contributing factors are present in the Hajj environment [16]. Significant proportion (53%) of hajjis from Riyadh reported experiencing an URTI during or immediately after the Hajj. This high incidence of an illness reveals a high burden of disease. While outside the scope of this study, potential secondary spread among the susceptible population in the hometown of returning hajjis can occur. The disease is uniformly distributed between both genders both old age and diabetes mellitus is known to reduce the immunity and increase the risk for URTIs and other viral infections. The reduced risk between these 2 groups can be due to the reduced mobility of these groups making them less exposed to URTI cases [11]. The present study showed that those who stayed more than 8 days suffered less URTIs. This could be explained by the fact that hajjis who tend to spend shorter periods were in hurry to perform all rituals during the rush time, which increases the physical burden and possibility of getting infected. On the other hand those spending a relatively longer duration had more opportunity to avoid periods of overcrowdings and perform rituals relatively more comfortably.

As in many mass gatherings, it is important to understand how to prevent the occurrence of a heavy burden of URTI. Given the circumstances of Hajj, it is almost impossible to adequately control the spread of illnesses, facilitated by crowding. The use of personal protective measures such as vaccination, chemoprophylaxis, frequent hand washing/sanitizing and the use of a face mask provide some protection [15].

Use of a face mask in our study population, was the most important practical protective factor against development of an URTI, although the research evidence regarding the effectiveness of face masks does not include consensus agreement. The use of face masks has been advocated to protect from inhalation of aerosols containing organic and inorganic particulates [17]. Therefore, as a preventive measure, the recommendations for the prevention of influenza include wearing face mask [18]. Although wearing mask may not provide complete protection from infection; it may reduce exposure to droplet nuclei, considered one of the main modes of transmission of most URTIs [18].

The use of face cover (Hijab/Niqab) by women can also be treated as use of face mask. As most of the female hajjis were Saudis, who practices face cover more often during Hajj as compared to other nationalities, the usage of face mask was quite frequent. But there was no evidence of significant decrease in the incidence of URTI, among women in the present study related to using face mask or face cover. This difference from males can be explained on the basis of other customary practices. Women when alone in their tents with other females do not cover their face (as the use is meant mainly for Hijab and not for personal hygiene) thus having the same high risk of disease transmission in a closed environment with exposure to droplet infection. Thus, the use of face cover as proxy of face mask in status. This change of practice within tents may not be so prominent in men, who are using face mask as personal hygiene measure, independent of the place where they were.

In this study, 9.3% of hajjis from Riyadh who reported symptoms had an attack of diarrhoeal disease during or immediately after the Hajj. The high risk of diarrhoea among males could be explained by the liability of males to get food from different sources due to their wide range of movement compared to females who are usually in the tents most of the time. The Hajj season this year was in the month of November, which means that the weather was cool and that was not in favour of food born diseases. Also, most of the study participants ate food prepared by a Hamla

<table>
<thead>
<tr>
<th>Chronic diseases</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any chronic (n = 1507)</td>
<td>278</td>
<td>18.4</td>
</tr>
<tr>
<td>Type of chronic diseases (n = 278)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>155</td>
<td>55.7</td>
</tr>
<tr>
<td>Hypertension</td>
<td>169</td>
<td>60.7</td>
</tr>
<tr>
<td>Cardiac diseases</td>
<td>21</td>
<td>7.5</td>
</tr>
<tr>
<td>Bronchial asthma</td>
<td>32</td>
<td>11.5</td>
</tr>
<tr>
<td>Renal diseases</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Having exacerbations of current disease (n = 278)</td>
<td>79</td>
<td>28.4</td>
</tr>
<tr>
<td>Diabetics (n = 155)</td>
<td>50</td>
<td>32.2</td>
</tr>
<tr>
<td>Hypertensive’s (n = 169)</td>
<td>57</td>
<td>33.7</td>
</tr>
<tr>
<td>Using medications regularly during Hajj (n = 278)</td>
<td>228</td>
<td>82.0</td>
</tr>
<tr>
<td>Have enough supply of medications during Hajj (n = 278)</td>
<td>248</td>
<td>89.2</td>
</tr>
</tbody>
</table>

Types of chronic diseases were not mutually exclusive.
and drank bottled water. Nearly half of the studied hajjis were using hand sanitizers and mostly was washing their hands more than 5 times per day. The high percentage of diarrhoea among those with high educational level may be contributed to their chance to live in better housing conditions and neighbourhood compared to those with low educational level and low income. At hajj, and due to overcrowdings, the environment suffers much from pollution which can be relatively tolerated better by the low educated who may be exposed to similar conditions at their homes while the highly educated cannot leading to their more suffering from diarrhoea.

In the present study, more than half of the hajjis had used the razor blades to shave their head during hajj. Head shaving exposes hajjis to scalp wounds especially in case of unexperienced barbers, hastiness due to rush or the hajjis shaving for each other. Due to inability to find barber shops and their crowdedness, hajjis were forced to rely on other hajjis for head shaving or hair cutting, which gave a good chance for the unlicensed mobile barbers to be active or hajjis learning head shaving on their fellow hajjis with increased risks of cuts. Less than 15% of hajjis who get their head shaved were aware of having at least one cut wound in their scalps. Excessive scalp wounds with the added risk of poor personal hygiene create ideal environment for skin infections and wound contaminations. It is good

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Table 4 Factors affecting incidence of diarrhoea among Hajjis from Riyadh (1431 Hijra [2009 Gregorian])

<table>
<thead>
<tr>
<th>Source of food</th>
<th>Total hajjis (n = 1507)</th>
<th>Cases of diarrhoea (n = 77)</th>
<th>Incidence (%)</th>
<th>Relative risk</th>
<th>95% confidence interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>930</td>
<td>59</td>
<td>6.3</td>
<td>2.03</td>
<td>1.21-3.41</td>
<td>0.006</td>
</tr>
<tr>
<td>Female</td>
<td>577</td>
<td>18</td>
<td>3.1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi</td>
<td>610</td>
<td>31</td>
<td>5.1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Saudi</td>
<td>897</td>
<td>46</td>
<td>5.1</td>
<td>1.01</td>
<td>0.65-1.57</td>
<td>0.968</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>53</td>
<td>2</td>
<td>3.8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>159</td>
<td>4</td>
<td>2.5</td>
<td>0.67</td>
<td>0.13-3.54</td>
<td>0.632</td>
</tr>
<tr>
<td>Intermediate school</td>
<td>188</td>
<td>8</td>
<td>4.3</td>
<td>1.13</td>
<td>0.25-5.15</td>
<td>0.876</td>
</tr>
<tr>
<td>High school</td>
<td>362</td>
<td>12</td>
<td>3.3</td>
<td>0.88</td>
<td>0.20-3.82</td>
<td>0.863</td>
</tr>
<tr>
<td>University</td>
<td>745</td>
<td>51</td>
<td>6.8</td>
<td>1.81</td>
<td>0.45-7.325</td>
<td>0.385</td>
</tr>
<tr>
<td><strong>Duration of stay in Hajj area in days</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;4</td>
<td>26</td>
<td>3</td>
<td>11.5</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>144</td>
<td>8</td>
<td>5.6</td>
<td>0.48</td>
<td>0.14-1.70</td>
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</tr>
<tr>
<td>6</td>
<td>520</td>
<td>28</td>
<td>5.4</td>
<td>0.47</td>
<td>0.15-1.44</td>
<td>0.186</td>
</tr>
<tr>
<td>7</td>
<td>344</td>
<td>10</td>
<td>2.9</td>
<td>0.25</td>
<td>0.07-0.86</td>
<td>0.021</td>
</tr>
<tr>
<td>&gt;8</td>
<td>473</td>
<td>28</td>
<td>5.9</td>
<td>0.51</td>
<td>0.17-1.58</td>
<td>0.248</td>
</tr>
<tr>
<td><strong>Source of food</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street vendor</td>
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<td>13</td>
<td>4.8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamla</td>
<td>1109</td>
<td>58</td>
<td>5.2</td>
<td>1.09</td>
<td>0.61-1.97</td>
<td>0.763</td>
</tr>
<tr>
<td>Self cooked food</td>
<td>126</td>
<td>6</td>
<td>4.8</td>
<td>1.00</td>
<td>0.39-2.56</td>
<td>0.994</td>
</tr>
<tr>
<td>Eat raw vegetable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1265</td>
<td>64</td>
<td>5.1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>242</td>
<td>13</td>
<td>5.4</td>
<td>1.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hand washing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>&lt;5 times/day</td>
<td>146</td>
<td>8</td>
<td>5.5</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;5 times/day</td>
<td>1361</td>
<td>69</td>
<td>5.1</td>
<td>0.93</td>
<td>0.45-1.89</td>
<td>0.831</td>
</tr>
<tr>
<td><strong>Use of hand sanitizer</strong></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>686</td>
<td>42</td>
<td>6.1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>821</td>
<td>35</td>
<td>4.3</td>
<td>0.70</td>
<td>0.45-1.08</td>
<td>0.103</td>
</tr>
</tbody>
</table>

The reference group is the one with relative risk = 1.
to find that 95.5% of hajjis asked for a new blade before shaving which was similarly found by other studies where the hajjis who got their head shaved with the used razor were only 6% (Choudhry et al. Behavioural risk factors for diseases during the pilgrimage to Makkah, [unpublished]). This reflects an increase in awareness about the danger of using used blades for head shaving and reduces transmission of blood-borne disease such as HIV, Hepatitis B and C.

### Study limitations

Limitations of this study included the self-reported nature of information collection, and possibly recall bias since some of our recruits were contacted a week post Hajj while others were contacted 4 weeks post Hajj. Also demographic data of nonrespondents were not available to determine if they differed from respondent or not. The strengths of this study included the use of trained interviewers, use of standardized questionnaire and collecting information regarding symptoms rather than disease names, which should reduce variation in participant description. A substantial study size (n=1507) provided for ample statistical power. While comparing the results of the present study with previous behavioural risk factors studies conducted in 1998, 2002, and 2066 [19,20] improvements were noticed in some of the variables, such as increase in proportion of hajjis for whom Hamla was the main source of cooked food, for whom sealed plastic bottles/bags were the main source of drinking water, who get their hair cut by professional barber, who used face mask during hajj, who had both influenza and Hepatitis A vaccination coverage; and decrease in proportion of hajjis who suffered from injuries.

In conclusion, URTI is a common health problem among studied

### Table 5 Factors affecting incidence of upper respiratory tract illnesses (URTIs) among Hajjis from Riyadh (431 Hijra [2009 Gregorian])

<table>
<thead>
<tr>
<th>Source of food</th>
<th>Total hajjis (n = 1507)</th>
<th>Cases of URTI (n = 800)</th>
<th>Incidence (%)</th>
<th>Relative risk</th>
<th>95% confidence interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>930</td>
<td>483</td>
<td>51.9</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>577</td>
<td>317</td>
<td>54.9</td>
<td>1.06</td>
<td>0.96-1.16</td>
<td>0.256</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Saudi</td>
<td>610</td>
<td>326</td>
<td>53.44</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Saudi</td>
<td>897</td>
<td>474</td>
<td>52.84</td>
<td>0.99</td>
<td>0.90-1.09</td>
<td>0.819</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>53</td>
<td>20</td>
<td>37.73</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Primary school</td>
<td>159</td>
<td>99</td>
<td>62.26</td>
<td>1.65</td>
<td>1.14-2.38</td>
<td>0.002</td>
</tr>
<tr>
<td>Intermediate school</td>
<td>188</td>
<td>99</td>
<td>52.65</td>
<td>1.40</td>
<td>0.96-2.02</td>
<td>0.055</td>
</tr>
<tr>
<td>High school</td>
<td>362</td>
<td>190</td>
<td>52.48</td>
<td>1.39</td>
<td>0.97-1.99</td>
<td>0.045</td>
</tr>
<tr>
<td>University</td>
<td>745</td>
<td>392</td>
<td>52.61</td>
<td>1.39</td>
<td>0.98-1.98</td>
<td>0.036</td>
</tr>
<tr>
<td><strong>Duration of stay in Hajj area in days</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;4</td>
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<td>14</td>
<td>53.84</td>
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</tr>
<tr>
<td>5</td>
<td>144</td>
<td>84</td>
<td>58.33</td>
<td>1.08</td>
<td>0.74-1.59</td>
<td>0.670</td>
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<tr>
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<td>296</td>
<td>56.92</td>
<td>0.98</td>
<td>0.83-1.14</td>
<td>0.762</td>
</tr>
<tr>
<td>7</td>
<td>344</td>
<td>192</td>
<td>55.81</td>
<td>0.96</td>
<td>0.81-1.13</td>
<td>0.609</td>
</tr>
<tr>
<td>&gt;8</td>
<td>473</td>
<td>214</td>
<td>45.24</td>
<td>0.78</td>
<td>0.65-0.92</td>
<td>0.006</td>
</tr>
<tr>
<td><strong>Used face mask</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most of the time</td>
<td>216</td>
<td>98</td>
<td>45.37</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>635</td>
<td>341</td>
<td>53.70</td>
<td>1.17</td>
<td>1.00-1.38</td>
<td>0.045</td>
</tr>
<tr>
<td>Never</td>
<td>656</td>
<td>361</td>
<td>55.03</td>
<td>1.21</td>
<td>1.03-1.43</td>
<td>0.014</td>
</tr>
<tr>
<td><strong>Used face cover (Hijab/Niqab)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most of the time</td>
<td>300</td>
<td>164</td>
<td>54.66</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>33</td>
<td>22</td>
<td>66.66</td>
<td>1.22</td>
<td>0.94-1.59</td>
<td>0.188</td>
</tr>
<tr>
<td>Never</td>
<td>244</td>
<td>131</td>
<td>53.68</td>
<td>0.98</td>
<td>0.84-1.15</td>
<td>0.820</td>
</tr>
</tbody>
</table>

*The reference group is the one with relative risk = 1.*

*total number was 577 as the question was for females only.
domestic hajjis. Generally, there is improvement in the adoption of preventive measures by hajjis, however still face mask use is limited in spite of the fact that using it significantly decreases the risk for URTI.

In recommendations, the surveillance system for URTI need to be enhanced by the Ministry of Health due to its high incidence and the burden it has on health system both in Hajj area and the city of residence of the hajjis. Health education programs should be organized to all those who intended to perform hajj to increase the awareness about protective measures against URTI, diarrheal diseases, injuries and exacerbations of chronic diseases.

References

Abstract This review describes major mass gatherings in the MENA region and the public health implications of these events, and provides recommendations for public health officials of the host country. Through our search of the literature for peer-reviewed publications, we identified relevant 77 papers; all were related to the annual Hajj. Using the information obtained from the literature review, the Eastern Mediterranean Public Health Network (EMPHNET) and the Centers for Disease Control and Prevention (CDC) developed and conducted 2 workshops on Public Health Surveillance during Mass Gatherings for field epidemiology training programmes and ministry of health focal points from 10 countries. The main potential public health concerns associated with mass gatherings include: infectious diseases (e.g. respiratory disease, gastro-intestinal tract disease, foodborne disease), injuries, traffic accidents, heat-related illnesses, insect stings, non-communicable diseases and terrorism.

Considérations de santé publique pour les rassemblements de masse dans la région du Moyen-Orient et de l’Afrique du Nord

RÉSUMÉ Le présent article porte sur les principaux rassemblements de masse dans la région du Moyen-Orient et de l’Afrique du Nord ainsi que sur leurs conséquences pour la santé publique. Il fournit des recommandations à l’intention des responsables de la santé publique dans le pays d’accueil. À l’issue d’une recherche de publications parues dans des revues à comité de lecture, nous avons identifié 77 articles pertinents, relatifs au pèlerinage annuel de la Mecque (Hajj). À partir des informations tirées de cet examen de la documentation, le Réseau de la Méditerranée orientale pour la santé publique (EMPHNET) et les Centers for Disease Control and Prevention (CDC) ont préparé et organisé deux séminaires-ateliers sur la surveillance de la santé publique lors des rassemblements de masse, à l’intention des programmes de formation à l’épidémiologie de terrain et des points focaux au ministère de la Santé de dix pays. Les principaux problèmes de santé publique lors de tels rassemblements sont notamment : les maladies infectieuses (maladies respiratoires, de l’appareil gastro-intestinal, d’origine alimentaire, etc.), les traumatismes, les accidents de la circulation, les maladies liées à la chaleur, les piqûres d’insectes, les maladies non transmissibles et les actes terroristes.
Introduction

Mass gatherings, defined as planned or spontaneous events for a specific purpose, in a specific location, and for a specific period of time and typically with attendance exceeding 25,000 persons, may increase the likelihood of acute public health threats and strain the response resources of the hosting site [1]. Due to potential risk factors such as overcrowding, exposure to unsafe food and water, improper sanitation, and adverse weather, these threats may manifest in an increased risk for communicable disease transmission, acute injuries, and opportunities for terrorism. Increasingly, international mass gatherings, such as the 2010 FIFA World Cup in South Africa, are being held in developing countries and provide an economic boon to the host country. Public health preparedness is necessary to support public safety and minimize potential health risks to residents and travellers. Although many areas of public health preparedness are needed, efforts for international and high profile mass gatherings should include, at a minimum, a thorough risk assessment coupled with some form of enhanced epidemiologic surveillance and response [1].

While there have been publications that have addressed the public health threats associated with mass gatherings in the Middle East and North Africa (MENA) region, those available have described acute outcomes associated with The Hajj. During The Hajj, communicable disease outbreaks have been reported repeatedly [2]. However, no publication to date has addressed the scope and scale of mass gatherings in the MENA region and the public health implications of these events for countries in the region.

This review describes major mass gatherings in the MENA region and provides recommendations for public health officials of the host country. It also includes a description of the mass gathering training workshop that took place as part of this project.

Methods

We conducted a literature search for peer-reviewed publications regarding mass gatherings in the MENA region by using the following search terms in PubMed: “Hajj”, “mass gatherings”, “sporting events”, “social events”, “festival” and “pilgrimage”. Our search focused only on planned mass gatherings. Manuscripts were excluded if the focus of the mass gathering event was outside the MENA region.

We consulted with ministries of health across the MENA region and used internet search engines to describe the purpose, scale and frequency of major mass gatherings in the region.

Using the information obtained from the literature review, The Eastern Mediterranean Public Health Network (EMPHNET) and the Centers for Disease Control and Prevention (CDC) designed, developed and conducted the first workshop on Public Health Surveillance During Mass Gatherings for field epidemiology training programmes and ministries of health focal points in the MENA region in Amman, Jordan during 25–29 September 2010. The workshop was aimed at enhancing preparedness, surveillance and response during mass gathering events in the MENA region. The workshop was supported by Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET), and the Council of State and Territorial Epidemiologists (CSTE).

Results

Our search identified 77 peer-reviewed manuscripts with a research or public health focus on planned mass gatherings in the MENA region [3–79].

All 77 were related to the Hajj. Specifically, 71 were research papers and 6 were reviews. Most (50, 65%) focused on communicable diseases such as an investigation of an outbreak; 7 assessed all potential risks associated with attendance at a planned mass gathering; 5 examined noncommunicable diseases and 10 investigated heat stroke-related issues; 5 focused on other issues specific to Hajj such as skin-related disease and vaccination requirements.

Although our research addressed only the Hajj as a major mass gathering event, there are many other planned mass gatherings in the MENA region still not addressed in the literature. Table 1 shows various examples of planned mass gatherings in the region. Some of these events attract only a few thousand participants, but many attract millions. The main potential public health concerns associated with such gatherings include: infectious diseases (e.g. respiratory disease, gastrointestinal tract disease, foodborne disease), injuries, traffic accidents, heat-related illnesses, insect stings, noncommunicable diseases and terrorism.

Residents on field epidemiology training programmes and Ministry of Health focal points from 9 countries (Afghanistan, Egypt, Iraq, Jordan, Morocco, Pakistan, Saudi Arabia, Syria, and Yemen) attended the Public Health Surveillance during Mass Gatherings workshop. Attendees discussed the existing strategies and experiences of their countries with mass gatherings. They worked with external CDC and EMPHNET experts to identify ways in which those strategies might be strengthened. The workshop provided the participants with comprehensive training on dealing with public health risks pre-, during, and post-event. Training focused on risk
assessment, surveillance, training, risk communication, response, and post event activities.

By the end of the workshop, residents had developed the mass gathering plan for their countries. Participants then implemented their country projects within the following 6 months under the guidance of experts from CDC, CSTE, and EMHNET.

In February 2011, the field epidemiology training programme residents attended a second mass gathering workshop which gave them the opportunity to present their country’s mass gathering plan and the findings of their surveillance evaluation. They also received training on scientific communication skills, especially manuscript writing, and then worked closely with CDC, CSTE, and EMPHNET experts to translate their surveillance evaluation results into scientific manuscripts for publication in peer-reviewed public health journals.

In working closely with the workshop participants and Ministry of Health focal points from 9 countries in the MENA region, it was clear that many routine and sporadic mass gatherings events are held in the MENA Region, including cultural, religious and sporting events. While the literature review shows that prior research in the region has concentrated solely on the Hajj, one of the largest mass gatherings in the world, it is evident there

### Table 1 Attendance at major mass gatherings in the Middle East and North Africa region

<table>
<thead>
<tr>
<th>Event</th>
<th>Type</th>
<th>Estimated attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Afghanistan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nawroz</td>
<td>Cultural</td>
<td>150 000–300 000</td>
</tr>
<tr>
<td><strong>Egypt</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Egyptian marathon</td>
<td>Sport</td>
<td>&gt;1500</td>
</tr>
<tr>
<td>Mohammed’s (BPUH) birthday (Nile Delta)</td>
<td>Religious</td>
<td>3 million</td>
</tr>
<tr>
<td><strong>Iraq</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anniversary of death of Imam Alhussain</td>
<td>Religious</td>
<td>3–4 million</td>
</tr>
<tr>
<td>40th day of Imam Alhussain</td>
<td>Religious</td>
<td>5–6 million</td>
</tr>
<tr>
<td>Anniversary of birth of Imam Almahdi</td>
<td>Religious</td>
<td>5–6 million</td>
</tr>
<tr>
<td><strong>Jordan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dead Sea Ultra Marathon</td>
<td>Sport</td>
<td>&gt;4000</td>
</tr>
<tr>
<td>Jerash Festival of Culture and Arts</td>
<td>Cultural</td>
<td>100 000</td>
</tr>
<tr>
<td>Eid event in Aqaba city</td>
<td>Religious</td>
<td>70 000–100 000</td>
</tr>
<tr>
<td><strong>Morocco</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moussemes</td>
<td>Religious</td>
<td>30 000–100 000</td>
</tr>
<tr>
<td>Marrakech international marathon</td>
<td>Sport</td>
<td>&gt;5000</td>
</tr>
<tr>
<td><strong>Pakistan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basant Festival</td>
<td>Cultural</td>
<td>100 000</td>
</tr>
<tr>
<td>Tablighi jtema</td>
<td>Religious</td>
<td>&gt;500 000</td>
</tr>
<tr>
<td>Dawat-e-Islamie</td>
<td>Religious</td>
<td>200 000</td>
</tr>
<tr>
<td>Urs events of famous saints</td>
<td>Religious</td>
<td>300 000–400 000</td>
</tr>
<tr>
<td><strong>Saudi Arabia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hajj</td>
<td>Religious</td>
<td>3 million</td>
</tr>
<tr>
<td>Riyadh Motor Show</td>
<td>Trade</td>
<td>96 000 during 5 days</td>
</tr>
<tr>
<td>Saudi International Motor Show</td>
<td>Trade</td>
<td>&gt;100 000 during 5 days</td>
</tr>
<tr>
<td>Al Janadriyah Heritage and Cultural Festival</td>
<td>Cultural</td>
<td>&gt; 1 million during 2 weeks</td>
</tr>
<tr>
<td><strong>Syrian Arab Republic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bosra festival</td>
<td>Cultural</td>
<td>1.2–2.5 million over 10 days</td>
</tr>
<tr>
<td>Anniversary of death of Imam Alkadhem</td>
<td>Religious</td>
<td>5–6 million</td>
</tr>
<tr>
<td><strong>Yemen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al-Hamdi mass gathering</td>
<td>Religious</td>
<td>12 000–45 000</td>
</tr>
<tr>
<td>20th Gulf Cup (football)</td>
<td>sport</td>
<td>60 000</td>
</tr>
</tbody>
</table>
is a gap in research focusing on other significant mass gatherings that occur in the region. Public health practice and research must address other mass gathering events to determine risks and identify adverse health outcomes to improve the safety of these events for the region.

Absence or weak surveillance systems at mass gathering events, lack of information for decision-makers, poor advocacy supporting the establishment and/or strengthening of surveillance systems at mass gatherings, a shortage of skilled public health personnel, lack of specific training programmes, and the absence of, or poor, comprehensive plans for mass gathering events, are major challenges that face the countries in the MENA region. These challenges can vary between different countries.

The World Health Organization developed guidance for "communicable disease alert and response for mass gatherings" [1]. This guidance assesses the operations and methods required to strengthen health systems for alerts and response to communicable diseases. It is recommended to develop mass gathering guidance specific to the MENA region.

Further recommendations for strengthening public health surveillance in the MENA region were:

- Assign mass gatherings focal points of contact at EMPHNET.
- Develop policies for sharing the results of mass gatherings surveillance and utilizing experience of others.
- Develop a system for sharing health information of travellers to track the health situation of the attendees.
- Enhance the involvement of field epidemiology training programmes in the region in conducting mass gatherings surveillance projects by providing technical assistance for the participants on these training programmes to analyse the data collected during gatherings.
- Organize and support related projects and activities.
- Enhance the exchange of field epidemiology training programme participants in the region so they are able to participate in different mass gathering events.

References


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