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Communicable diseases as health risks at mass gatherings other than Hajj: what is the evidence?

Philippe Gautret [a,b,*], Robert Steffen [c]

[a] Aix Marseille Université, URMITE, UM63, CNRS 7278, IRD 198, Inserm 1095, F-13005 Marseille, France
[b] Institut Hospitalo-Universitaire Méditerranée Infection, Marseille, France
[c] Epidemiology, Biostatistics and Prevention Institute, World Health Organization Collaborating Centre for Traveller's Health, University of Zurich, Zurich, Switzerland

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SUMMARY

Mass gatherings are characterized by the concentration of people temporally and spatially, and may lead to the emergence of infectious diseases due to enhanced transmission between attendees. This is well-demonstrated in the context of the Hajj and Umrah pilgrimages in Saudi Arabia. The goal of this review was to present the available evidence on outbreaks associated with a variety of pathogens, or also the lack thereof, as assessed by thorough surveillance at any mass gatherings with the exception of those in Saudi Arabia. A systematic search for relevant articles in the literature was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Sixty-eight studies were identified. Although outbreaks have not been reported frequently in or after mass gatherings outside the Hajj and Umrah pilgrimages, they have sometimes occurred at Muslim, Christian, and Hindu religious events, at sports events, and at large-scale open air festivals. In this review it was found that the most common outbreaks at these mass gatherings involved vaccine preventable diseases, mainly measles and influenza, but also mumps and hepatitis A. Meningococcal disease has rarely been recorded. Additionally it was found that the transmission of various communicable diseases that may not be prevented by vaccination has been recorded in association with mass gatherings. These were mainly gastrointestinal infections, caused by a variety of pathogens. It was also noted that some outbreaks occurring at mass gatherings have resulted in the international spread of communicable diseases.

1. Introduction

Mass gatherings are characterized by the concentration of people at a specific location for a specific purpose over a set period of time and which have the potential to strain the planning and response resources of the country or community.[1] These gatherings might be planned or unplanned and recurrent or sporadic. The number of attendees may vary from hundreds to millions. Large religious events like the Hajj Muslim pilgrimage gather two to three million people in Saudi Arabia annually, while the Kumbh Mela in India is attended by up to 40 million worshippers. Around 8.8 million tickets were sold for the London Olympic Games in 2012 and over three million people attended the 2014 FIFA World Cup in Brazil. Attendance at the top 20 European music festivals and street parades ranges from 17 000 to one million in a single day. Most mass gatherings are characterized not only by a large attendance, but also by crowding. There may be poor sanitary conditions at some mass gatherings, and at some events there may be promiscuity.

Large-scale sports events are usually well-organized by highly specialized teams of staff and are often organized in the setting of large cities. The legacy of events such as the Olympics includes improvements in infrastructure, economic benefits for various sectors, and improved surveillance. A characteristic of large-scale open air festivals, including music festivals, may be that they are not always organized and managed by professionals and may involve inexperienced volunteers as staff members. Music festivals in particular have specific characteristics, including an outdoor setting, on-site housing and food supplies, participants of a young age, recreational motivations, and the potential for excessive alcohol and/or drug consumption.

At such mass gatherings, the concentration of people temporally and spatially may lead to the emergence of infectious diseases due to enhanced transmission between attendees. The annual Hajj and Umrah pilgrimages in Saudi Arabia are the mass gatherings at

* Corresponding author. Present address: CHU Nord, Chemin des Bourrely, 13915 Marseille, France. Tel.: +33 (0)491 96 35 35/36; fax: +33 (0)491 96 89 38.
E-mail address: philippe.gautret@club-internet.fr (P. Gautret).

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which communicable diseases have been most closely assessed. Meningitis outbreaks, respiratory tract infections, and the transmission of infectious diarrhoea have been described extensively.[2–4] However, many other mass gatherings take place in various parts of the world, some also religious, others athletic, socio-cultural, or commercial, and some are very spontaneous, such as funerals or political rallies. The goal of this review was to present the available evidence on outbreaks associated with a variety of pathogens, or also the lack thereof, as assessed by thorough surveillance at any mass gatherings with the exception of those in Saudi Arabia.

2. Methods

2.1. Search strategy and selection criteria

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (http://www.prisma-statement.org). The following databases were searched, attempting to identify all relevant studies published from January 1980 to January 2016: Scopus (http://www.scopus.com/), PubMed (http://www.ncbi.nlm.nih.gov/pubmed), and Google Scholar (http://scholar.google.fr/). The most recent search was conducted on January 18, 2016. The topic search terms used for searching the databases were the following:

#1: "mass gathering" OR "mass gatherings" OR "pilgrimage" OR "festival"; OR "sport" OR "Olympics" OR "FIFA" OR "EURO"
#2: "outbreak" OR "infection" OR "infectious diseases"
#3: #1 AND #2

Only articles published in English were included, based on the common language of the authors. For inclusion, an article had to fulfil the following criteria: (1) be related to a mass gathering, (2) report outbreaks, and (3) report the pathogen responsible for the outbreak when possible. Case reports were excluded. The reference lists of reviews were screened to identify studies possibly missed in the search.

Both researchers independently performed the screening of the abstracts. Any discordant result was discussed in a consensus meeting. After screening the abstracts, the full texts of the articles were assessed for eligibility by the same two researchers and selected or rejected for inclusion in the systematic review.

2.2. Data collection process

The following data (if available) were extracted from each article: year, place of event, number of attendees, syndromic classification of outbreaks, pathogen responsible, and number of cases. A distinction was made between outbreaks occurring at religious meetings, sports events, and large-scale open air festivals because of the distinct characteristics of these mass gatherings.

2.3. Data synthesis and analysis

As a result of the nature of the studies and the heterogeneity in patient populations, a formal meta-analysis was not possible. Therefore, the study results were summarized to describe the main outcomes of interest (i.e., the occurrence of outbreaks at mass gatherings other than Hajj and Umrah). If possible, percentages not presented in the articles were calculated from the available data.

3. Results and discussion

3.1. Study selection

A total of 257 articles were identified in the database search and seven additional articles were found through the manual search. After screening the titles and abstracts, 68 articles were eventually retained for full-text assessment. All 68 articles were included in the qualitative synthesis of the systematic review (Figure 1).

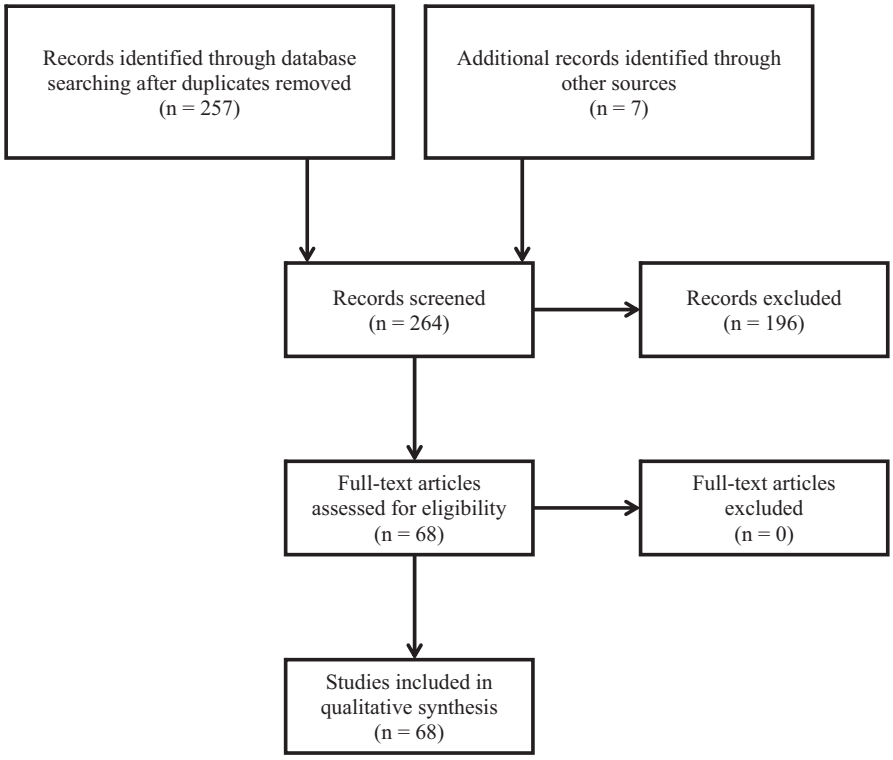

Figure 1. Flow diagram of the search strategy.