



Uptake and effectiveness of facemask against respiratory infections at mass gatherings: a systematic review



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ARTICLE INFO

Article history:

Received 16 February 2016

Received in revised form 18 March 2016

Accepted 24 March 2016

Corresponding Editor: Eskild Petersen, Aarhus, Denmark.

Keywords:

Facemask

Hajj

Influenza-like illness

Mass gathering

Pilgrim

Respiratory infections

ABSTRACT

Objectives: The risk of acquisition and transmission of respiratory infections is high among attendees of mass gatherings (MGs). Currently used interventions have limitations yet the role of facemask in preventing those infections at MG has not been systematically reviewed. We have conducted a systematic review to synthesise evidence about the uptake and effectiveness of facemask against respiratory infections in MGs.

Methods: A comprehensive literature search was conducted according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines using major electronic databases such as, Medline, EMBASE, SCOPUS and CINAHL.

Results: Of 25 studies included, the pooled sample size was 12710 participants from 55 countries aged 11 to 89 years, 37% were female. The overall uptake of facemask ranged from 0.02% to 92.8% with an average of about 50%. Only 13 studies examined the effectiveness of facemask, and their pooled estimate revealed significant protectiveness against respiratory infections (relative risk [RR] = 0.89, 95% CI: 0.84–0.94, $p < 0.01$), but the study end points varied widely.

Conclusion: A modest proportion of attendees of MGs use facemask, the practice is more widespread among health care workers. Facemask use seems to be beneficial against certain respiratory infections at MGs but its effectiveness against specific infection remains unproven.

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1. Introduction

The risk of acquisition and transmission of respiratory infections amplifies at mass gatherings (MGs) straining healthcare of the host country. For instance, in Hajj, one of the largest annual MG events in the world, more than 2 million people attend each year in Makkah, and over 90% suffer from at least one respiratory symptom, the risk of viral respiratory infections increases several folds and more severe respiratory infections such as pneumonia are

the leading causes of hospital admission.^{1–3} Likewise, a number of influenza outbreaks were reported during the World Youth Day 2008, a large catholic gathering in Sydney.⁴ MGs are also linked to globalisation of various infections. For instance, the Iztapalapa Play Passion, a religious festival in Mexico, was believed to spark the outbreak of swine flu leading to its accelerated dissemination across the world.⁵ Therefore, international public health agencies, including World Health Organization (WHO), have issued guidelines on mass gathering preparedness to minimise the possible risks.⁶

From a public health perspective, one of the key concerns is to prevent global spread of respiratory infections during MGs. Interventions like vaccinations against viral and bacterial respiratory infections, anti-influenza prophylaxis and hand hygiene are

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considered as preventive measures but the measures have limitations. For instance, vaccinations against respiratory infections, such as influenza, are recommended for travellers to MGs such as Hajj,⁷ and even though a recent systematic review generally supports its effectiveness against laboratory-confirmed influenza at Hajj,⁸ frequent mismatch between vaccine strains and circulating strains is an important concern.⁹ Soaring antiviral resistance against both adamantanes and neuraminidase inhibitors is an issue that limits their widespread use in MGs.^{4,10} Similarly, while hand hygiene has been recommended as a protective measure for attendees of MGs, its effectiveness is not fully evaluated in a mass gathering setting and the efficacy is debatable.¹¹ Therefore, the role of another protective measure, facemask, should be explored in the prevention of respiratory infections.¹² Facemask is believed to have a protective role in preventing nosocomial infections since the time of Spanish influenza.¹³ Several studies have assessed the usefulness of facemask in household, community and healthcare settings, the findings of which have been summarised in a few reviews.^{14–16} Noticeable disparities of facemask effectiveness between these studies were observed. Studies conducted in community or health care settings found facemasks to be generally effective against influenza-like illness (ILI) or even against severe acute respiratory syndrome (SARS) but its effectiveness against respiratory infections at MGs remains unknown.^{15,17} A review of non-pharmaceutical interventions against respiratory tract infections among Hajj pilgrims presented data on the uptake of facemask and acknowledged that compliance was generally poor, but did not evaluate its effectiveness during Hajj.¹¹ Subsequently, further data on the uptake and effectiveness have become available, especially from a pilot randomised controlled trial (RCT).¹⁸ The aim of this systematic review is to explore the uptake and effectiveness of facemask against respiratory infections in MGs.

2. Methods

Studies were identified through searching electronic databases including; Medline (PubMed and Ovid), EMBASE, SCOPUS and CINAHL from database inception to February 8, 2016. We used a combination of MeSH terms and text words including: 'crowding' OR 'mass gathering' OR 'large event' OR 'group assembly' OR 'holiday' OR 'travel' OR 'sport' OR 'Olympic' OR 'FIFA' OR 'festival' OR 'Hajj' (also alternative spelling 'Hadj' or 'Haj') OR 'pilgrimage' AND 'mask' OR 'facemask' OR 'surgical mask' OR 'medical mask' OR 'simple mask' AND 'infection' OR 'respiratory tract diseases' OR 'disease outbreaks' OR 'infectious disease' OR 'respiratory tract infections' OR 'influenza' OR 'pneumonia'. Additionally, an online search of pertinent epidemiology journals, including those not indexed in the mentioned databases (e.g. Saudi Epidemiology Bulletin) was carried out through free hand Google engine search. Finally, manual search was performed reviewing reference lists of included studies to identify additional potentially relevant studies. The search result was presented according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines (Figure 1).¹⁹

In the first phase, three authors (OB, SM and HB) identified the potential titles, and sifted the titles and abstracts against the inclusion criteria. Titles of all studies published in English language and reported the use or effectiveness of facemask against respiratory infections in MGs were preliminarily included. Studies that dealt with attendees of MGs of any age, gender and country were considered for inclusion. At the end of the screening phase, full texts of potentially relevant studies were retrieved for detailed study. Finally studies that met the inclusion criteria were included for data synthesis. Duplicates were excluded.

Five authors (OB, MA, HB, SM and JA) independently extracted the data from each study into a data extraction sheet which was

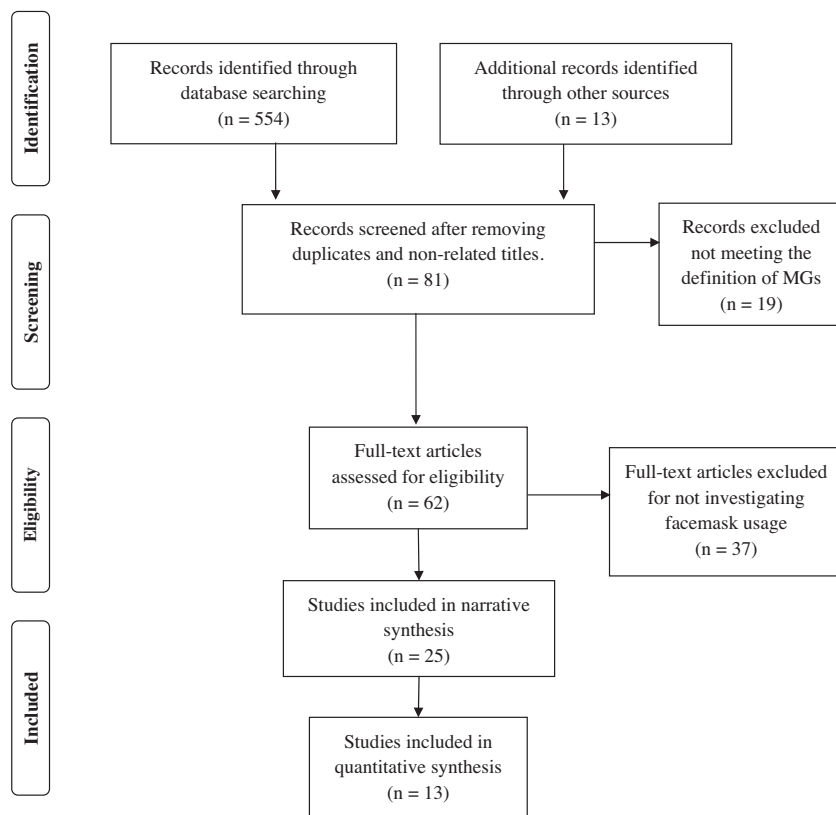


Figure 1. Flow diagram of searching strategy.

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