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A comprehensive review of the Kumbh Mela: identifying risks for spread of infectious diseases

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Abstract

The Kumbh Mela in India is the largest mass gathering in the world which witnessed close to 100 million visitors in 2013. An event of this magnitude presents challenges. Increased population density, reduced hygienic conditions and exposure to environmental pollutants pave the way for easy transmission of pathogens. Due to the possibility of epidemics, the primary focus should be on identifying the potential risk factors and implementing appropriate preventive measures. The context of religion and psychology of the pilgrims is also closely associated with the evolution of the risk factors and so forms an important part of the discussion. We provide a brief background to the Kumbh Mela with a description of the existing and potential risk factors that require our attention.

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Introduction

Mass gatherings attract people globally and expose them to a range of health risks [1]. Communicable diseases pose a threat to global health due to international connectivity, primarily through air travel [2,3]. Respiratory, faeco-oral, vector-borne, zoonotic, blood-borne and sexual modes of disease transmissions have been identified previously in Mass gatherings [4]. Non-communicable risks, including stampedes, heat-related illness, accidents and terrorist attacks, also pose complex public challenges including crowd control, management of health services and public security [5]. In addition, rituals in religious events, such as rolling on the floor, or bathing naked in

the river early in the morning, may predispose to skin, respiratory, gastrointestinal and genitourinary infections [6].

A recent report on the Hajj emphasized the importance of advanced planning of public health surveillance and response at religious events [7]. The Ministry of Health and Ministry of Hajj provide regular updates on travel advice and health regulations for pilgrims. There are committees set up for provision of safe water and food supplies, sanitation and vector control to minimize the transmission of food- and water-borne diseases. During Hajj, transmission of respiratory viruses (influenza, rhinovirus, coronavirus 229E, respiratory syncytial virus, parainfluenza and adenovirus), tuberculosis and pertussis were identified [8]. The Ministry of Health has already provided vaccine recommendations for yellow fever, invasive meningococcal diseases, influenza, polio and tuberculosis. Based on recent outbreaks, pneumococcal vaccines are under consideration [7].

Risk assessment provides a basis for risk mitigation [9] and this includes a review of setting, event, climate, likely mixing patterns, the population attending the event and possible infections [4]. The Kumbh Mela, in India, is the largest congregation of pilgrims in the world and 40 million pilgrims are expected to visit the next Mela in 2016 [10]. However, data

concerning the health status of the pilgrims and potential health risks are scarce.

Materials and methods

We searched PubMed and national databases for Indian medical journals (www.medind.nic.in) for 'Kumbh', 'Kumbh Mela', 'Hindu pilgrimage', 'Hindu fair', 'Indian pilgrimage', 'Indian fair', 'religious gathering', and 'Hindu mass gathering' obtaining peer-reviewed articles on the Mela. We obtained grey literature on the history of Mela and its organization using Google search for the same terms. The search was limited to the first three pages of the results. Any news article, reports or government websites containing relevant information about the Kumbh Mela were used as information sources.

Results

History and setting of the Kumbh Mela

Kumbh in Sanskrit means pitcher and *Mela* means fair. In Hindu mythology, it is believed that the nectar of immortality was poured from a pitcher on four different places in India (Allahabad, Haridwar, Nasik and Ujjain), as a result of a long battle between the Gods and the Demons, which lasted 12 days and 12 nights. The Mela in its different forms alternates between these places. The Kumbh Mela happens once every 3 years in one of these locations on the banks of the corresponding rivers; Ganga in Haridwar, Godavari in Nasik, Kshipra in Ujjain and Sangam (confluence of Ganga, Yamuna and mythical Saraswati rivers) in Allahabad (Fig. 1). The Ardh (half) Kumbh is held every 6 years in Haridwar and Allahabad. The Purna (full) Kumbh and the Maha Kumbh (great/supreme pitcher) are held

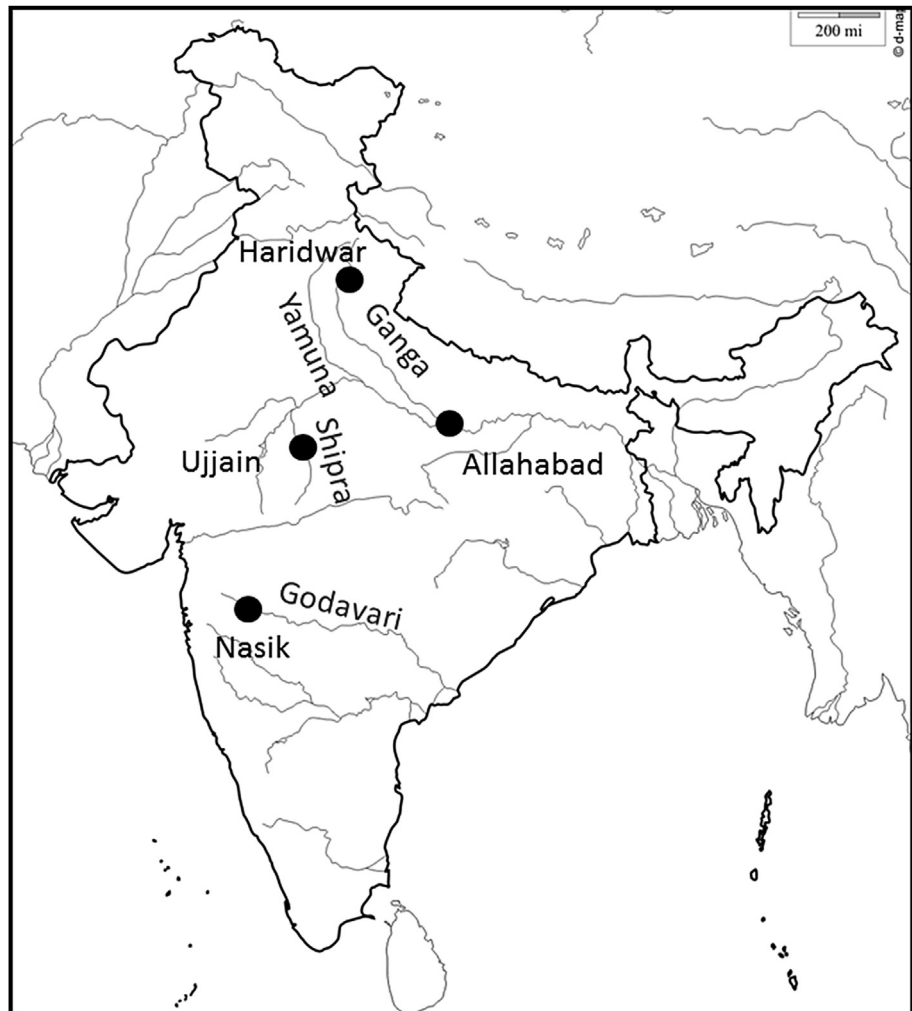


FIG. 1. Map of India showing the 4 places of the Kumbh Mela and associated rivers.



FIG. 2. Pilgrims taking the holy dip in the Sangam on one of the bathing days during the Kumbh Mela at Allahabad in 2013. Courtesy of Rani Bhargav (https://www.flickr.com/photos/the_sandman/).

every 12 years and every 144 years, respectively, only in Allahabad (9). The Sangam, a place where the rivers meet in Allahabad, is very auspicious according to Hindu mythology and people believe that one dip in the waters of the Sangam at a precise moment in time can wash away all of a person's sins [11]. The total number of auspicious days varies depending on the total duration of the festival. In 2013, the festival in Allahabad lasted for 55 days with six important bathing days attracting close to 100 million people [12] (Figs. 2 and 3).

Unlike other religious festivals, the Mela could be well described as a large fair with a religious tone. Participation is voluntary with no restrictions on the duration of the visit. There is no particular deity associated with the Mela but a focus group study revealed that people went there in search of spiritual connectivity and to attain spiritual knowledge. It is a platform where people can unite irrespective of their religious affiliations [13]. The crowd that visits this place varies from hardened spiritual leaders (like *sadhus* who have renounced



FIG. 3. Pilgrims performing morning rituals in the river during Kumbh Mela 2013, Allahabad. Courtesy of Rani Bhargav (https://www.flickr.com/photos/the_sandman/).

worldly pleasures) to curious visitors (from India mostly, but also from abroad) who come just to experience the feel of the place [14].

Peshwai marks the beginning of the festival when all the *sadhus* (religious saints) and participants of the Mela are welcomed to the Mela as guests. There is a huge procession with loud music and dance followed by *Langar*, where mass feeding of visitors take place. The food is vegetarian and usually something simple. The *bathing* ritual is the most important ritual and is started by a group of *sadhus* called *naga sadhus* who are considered spiritually and physically the most powerful of all. They are strong followers of Lord Shiva (the lord of destruction in Hinduism) and have given up all material possessions on this earth including family, wealth and clothes. They bath in ash and smear it over their body as a sign of divine protection and are naked except sometimes for a loin cloth.

Every Kumbh Mela witnesses thousands of followers aspiring to become *naga sadhus* and they are welcomed into the group through a secret process of initiation. After the initiation, the hair on their heads is shaved (ritual shaving) as a sign of death of one's self and renunciation of the materialistic body. Following this, they chant holy scripts all through the night and at dawn of the next day they commence the bathing ritual for everyone. After the *sadhus* have had their dip in the holy waters, the other millions of pilgrims are allowed to enter the water (*ghat*). Also there are various boats on which the *sadhus* perform rituals and an offering (flowers, coconut or garlands) is placed in the river.

Hawans are fire offerings made throughout the festival at various locations within the Mela. Other than these, various religious discourses, *pujas* (prayers) and chants occur all across the pop-up city. There are also cultural performances of different regions of India to demonstrate diversity. Pilgrims are free to go anywhere and follow any leader as they like. There are no obligations regarding the number of days one has to spend at the Mela, nor is there any compulsion to take the holy dip in the river. A group of people, called *kalpawasis*, stay for the whole duration of the Mela under difficult circumstances such as low temperatures in winter coupled with staying in tents with no heating mechanisms [15].

Building of the Mela city starts 2–3 months before the festival starts, in the delta of the Sangam where the water recedes during the dry months of Jan–May. The entire establishment is spread over roughly 56 km² and is dismantled 8 weeks after its conclusion. It is designed to support the one million 'permanent' residents of the Mela who stay for the entire duration, and more than 80 million travelling pilgrims who enter and leave the festival grounds [16]. Tents are set up throughout the city and each group of tents, called *akharas*, belongs to a religious saint or preacher and is registered with a

central government body [13]. The remaining area is used for pop up temples, ceremonial halls and space for other activities.

Living conditions and disease risks identified

The infrastructure of the city, including pipelines, electricity, sewage and healthcare facilities, is re-built for every Mela. A study by the Harvard School of Public Health [17] during the 2013 Mela reported that the government constructed extensive pipelines to supply each *akhara* with drinking water. Even though drinking water areas are clearly demarcated, the pilgrims drink potable and non-potable water indiscriminately in many cases.

According to a case study published by the state Disaster Management Authority, the Mela was divided into 14 sectors for all administrative purposes [18]. The health department installed a 20-bed hospital in each sector which had five or six doctors and six or seven supporting staff. There was a main hospital in sector 2 with 100 beds, manned by 70 doctors. One of the major findings of the Harvard health team was the gross inequity between the inpatient and outpatient departments [17].

Food regulations are not enforced in a strict sense except for the ban of polythene bags within the Mela site. Supplies like oil, wheat and rice are provided cheaply for pilgrims below the poverty line. *Langars* provide free food to all those who visit them, although the cooking process is not supervised or regulated. Apart from these there are individual food stalls that sell anything from snacks to sweets for the pilgrims. Alcohol and non-vegetarian food is banned in the Mela for religious reasons.

In 1895, an epidemic report [19] suggested interplay of three factors leading to cholera epidemics during the Mela. These were; fouling of river waters by the exceptionally large proportion of bathers to the quantity of water available, growth of the *Vibrio cholerae* assisted by the unusually hot weather at the site and increased virulence of the bacteria elsewhere in India. The last cholera epidemic in the Mela was reported in 1906 despite good sanitary arrangements. The reasons were attributed to drying up of the rivers and subsequent drinking of water from polluted beds, failure of patients to destroy soiled clothes and excreta of cholera patients and superstitious beliefs regarding drinking treated well water [20]. No epidemics have been reported since then, although there are studies cautioning about potential epidemics in the future [20,21]. A study in 2003 reported encouraging results from the use of telemedicine during the Mela for evading cholera epidemics [22]. The surge in cases of diarrhoea during the fair was reported to a tertiary referral centre using a telemedicine service that uses electronic signals to transfer medical data from one site to the other. *Vibrio cholerae* was isolated in 7/31 cases (22.6%) and this information was communicated to the fair authorities. Following this, strict

measures were taken to improve hygiene and the number of diarrhoea cases rapidly declined thereafter so averting a potential epidemic situation.

Some of the pilgrims can be considered as unimmunized because in India, 56% of children aged 1–2 years are either unimmunized or partially immunized [23] and the Mela is attended largely by people from the lower socio-economic group, tuberculosis is endemic in India with rising concerns for the spread of multidrug-resistant disease [24]. The elderly population, over-crowding, exhaustion and other co-morbid conditions predispose the pilgrims to acquiring tuberculosis [25]. There have been a number of serogroup A meningococcal outbreaks in India affecting mainly the cities of northern India [26] and over-crowding during the Mela might provide a conducive environment for transmission of meningococci [27]. Other air-borne or droplet-borne infections also have the potential to spread during the Mela (like influenza, measles, chicken pox, pertussis and mumps). Most of these diseases are vaccine preventable and meticulous data collection will help decision making.

To add to the existing sanitation issues, there is a persisting problem of open air defecation. In the rivers themselves, tons of rotting marigolds, coconuts and other offerings form a scum on the surface, as worshippers drink the holy water. All these activities brew various enteric diseases. The Harvard School of Public Health reported a 5% incidence of diarrhoeal diseases over a 23-day period during which they followed 30 000 patients in four sector hospitals. It is interesting to observe that there was a surge in non-bloody diarrhoea just 2 days after the bathing day that was on 29 January 2013. They also reported a peak in upper respiratory tract infections and cough, which coincided with the peak in non-bloody diarrhoeal disease during the 10-day observational period during the 2013 Mela [17]. They also reported that use of cow dung or firewood by pilgrims to light fires resulted in over 23% seeking medications for cough. Also, smoke from *choolahs*; a device used for cooking on fire created by wood or coal was the largest cause of respiratory illnesses among 15 000 patients who visited the various hospitals over 20 days [28].

Another potential health risk is the shaving process where thousands of aspiring *sadhus* undergo initiation. The ritual is kept a secret and any outside access to view it is denied. Transmission of blood-borne diseases is a possibility during this ritual, although hepatitis B is preventable through vaccination. Again, lack of evidence for hepatitis B transmission limits immunization recommendations. Vector-borne diseases (malaria and dengue fever) and parasitic infections (*Giardia*, amoebiasis) also have the potential to proliferate during the Mela because of the poor sanitary conditions and areas of water stagnation.

Stampedes have been a common occurrence and have been reported many in the past [16]. In 2013, there was an incident involving the collapse of a foot bridge killing about 40 people, although the unofficial statistics may be more [29]. According to one study [30], high noise levels were recorded, especially during *Peshwai* and pujas when loud religious songs were played on speakers. Consequently, 78% of the people reported their sleep being affected by the noise and 76% complained about a difficulty to concentrate.

Conclusions

Kumbh Mela poses a complex public health challenge. The difference in healthcare seeking attitude and religious beliefs combined with high crowd mobility make it particularly difficult to measure the disease burden accurately. However, the focus should not be only on accurately measuring the disease burden but also on mitigating the potential risk factors. Disease diagnosis, treatment and prevention will become more targeted if doctors and public health authorities are aware of the common health risks involved during the pilgrimage.

Transparency declaration

The authors declare that they have no conflicts of interest.

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