

## A comprehensive study of disease pattern in world's largest mass gathering

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**Introduction:** A Comprehensive Study of disease pattern in mass gathering of Simhasth Fair in Ujjain city was conducted. Objective of the study were to know the disease trends in a huge event, to know the risk factor triggered by the surveillance system, to assess the importance of health planning and monitoring in a mass gathering and to provide a pathway to future endowers. To provide complete physical, mental and social well being of the pilgrims, state health department established all necessary arrangements. **Methods:** The period of the data collection of the study was 21 April to 22 May 2016. A stipulated proforma was designed for daily reporting. It was insured that all outbreaks must reported immediately. Analysis and forecasting of the data would be done simultaneously. The data collected on the daily basis. Data were compiled and validated every day. **Results:** A total of 3,21,841 patients were screened in OPD and 19178 patients were treated as IPD. Highest number of cases recorded of fever i.e. 18,700 (6.95%), followed by acute respiratory infection (ARI), 15,834 (5.89%), Acute diarrheal disease (ADD) 14,715 (5.47%), skin disease 3089 (1.15), heat stroke 1225 (0.46%) and rest shared by injuries 1143 (0.42%), conjunctivitis 823 (0.31%), bacillary dysentery 320 (0.12%), malaria 62 (0.02%), Jaundice/Viral hepatitis 58 (0.02%), chicken pox 21 (0.01%). The cases of dog bite were 504 (0.19%), snake bite 6 (0.01%), Burn 84 (0.03%) and drowning 18 (0.01%). A better planning and forecasting system can provide a solid background to reduce the disease in large gathering.

**Keywords:** Disease, Surveillance, Mass Gathering, Outbreak, Simhastha Fair

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## Introduction

Kumbh or Simhastha in Sanskrit means pitcher. 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 Fair in its different forms alternates between these places. The Kumbh Fair 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.

Simhastha Fair is organized in every 12 year Ujjain city. In the summer of 2016 the holy city Ujjain was on test. It was a world's largest gathering more than any Olympics. A estimated 60 to 70 million peoples visited to holy place Ujjain in the one month period [1]. A event with such a large gathering increases many challenges in health sector too.

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 was to identifying the potential risk factors and implementing appropriate preventive measures and secondary focus was to identification of cluster of cases that are of public health importance, limiting mortality and morbidity and analysis of the trends of diseases.

A recent report on the Hajj emphasized the importance of advanced planning of public health surveillance and response at religious events [2]. To strengthen the disease surveillance in the mass gathering in Ujjain city by establishing a decentralized daily based surveillance system for epidemic prone diseases to detect the early warning signals, so that timely and effective public health actions can be initiated in response to health challenges in the Fair area. With this objective, the district Ujjain has already running Integrated Disease Surveillance and Vector Born Disease Control Programmes.

Risk associated with communicable diseases are doubled in mass gathering [3,4]. The city of Ujjain have the baseline data on identified diseases through their already running programmes. The diseases most prevalent and under risks in the area are fever, malaria, dengue, acute diarrheal disease, jaundice/viral hepatitis, acute respiratory infection

/Influenza like illness, chicken pox, measles, bacillary dysentery, conjunctivitis, skin diseases and Non-communicable risks, including heat-related illness, accidents, drowning, dog bite, snake bite and burn. 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 [5].

From the previous four year data of all these identified diseases and events in the area are under the threshold level. On the basis of previous data available, the prone diseases were identified. Though, the event is of national and international concern, the communicable diseases which were prevalent at national and international level were also taken into consideration for alert.

To know the situation of vectors more specific in the study area, a pilot survey in the six zone distributed area of Ujjain was conducted to identify the risk associated with vector born diseases. The Master Trainers reveal the survey and found the House Index of 6.5, Container Index 1.34 and Breteau Index 7.70.

As per the guidelines of Vector Born Disease Control Programme (VBDCP), these indices shows certain amount of risk in the area. On the basis of pilot survey, mass surveillance activities in the Ujjain city to minimize the risk regarding the Vector Born Disease was carried out, it includes the Fair area.

### The rational and objectives of the study

The most basic rationale of the study is to replicate the best practices in many of the mass gathering events in different setup.

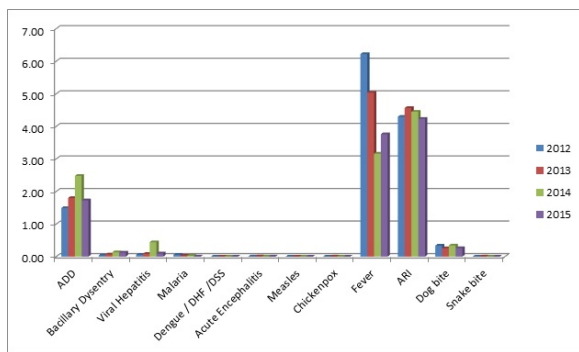
The objectives of the study are as follows-

01. To know the disease trends in a huge event.
02. To know the risk factor triggered by the surveillance system
03. To assess the importance of health planning and monitoring in a mass gathering
04. To provide a pathway to future endowers

## Materials and Methods

**Plan of action-** From the four year data analysis of city Ujjain , if we restrict it to one month i.e. the same main Fair period, 21 April to 22 May, the disease pattern of the Ujjain city shown in the Fig. 1.

In the Simhastha period, a 24X7 call center run for all type of health related reporting. In all 6 zones trained epidemiologist and VBD Consultants were specially deputed to deal any type of health issue and to assess the surveillance in the region. All the 6 zones were further divided into 22 sectors and each sector will 24X7 covered by team of Doctors and health workers with all logistic and administrative facilities. To identify the health facility in a huge area, marking of health facilities were done through balloons in the sky. On the river Ghat, health workers were moving 24X7 to catch any patient.

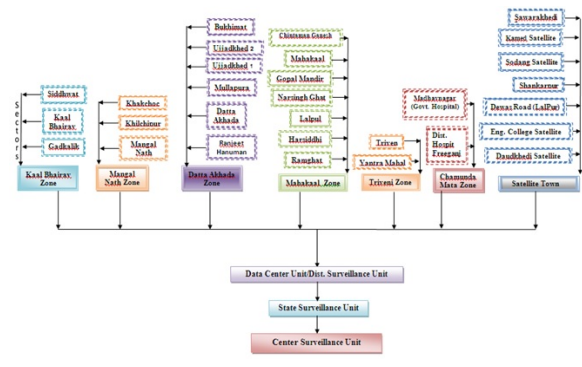


**Fig.-1: Four year disease & incidence-wise distribution pattern in same period i.e. 21 April & 22 May of city Ujjain**

**Health setup in the Fair-** The infrastructure of the city, including pipelines, electricity, sewage and healthcare facilities, were re-built for every Fair. A study by the Harvard School of Public Health [6] during the 2013 Fair 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.

To provide complete physical, mental and social well being of the pilgrims, state health department established four 20 bedded, sixteen 6 bedded temporary hospitals with all facilities available for Simhasth. The Fair area with city covers 36 square KM. These facilities supported by permanent 700 bedded District Hospital, 450 bedded newly constructed "Charak" Hospital, 100 bedded civil hospital and nearby three Primary Health Centres. Ten private hospitals including a private Medical College were also recognized to provide health services. In the area total sixty-three 108 facility were available in which 10 vehicle were available with advance and 53 with basic life support system.

**Period and flow of data collection-** The period of the data collection of the study was 21 April to 22 May 2016. A stipulated proforma was designed for daily reporting. The flow of reporting was like Sectors to Zones and Zones to District than SSU and CSU as shown in Fig. 3. It was insured that all outbreaks must reported immediately. Analysis and forecasting of the data would be done simultaneously.



**Fig.-2: Surveillance during Simhastha Fair – Flow Chart of data flow**

**Data Collection-** The data collected on the daily basis. Data were compiled and validated every day. They were analyzed and summarized on the same day. Any trigger mark in trends of disease data, initiated an action for the field to investigate the actual situation. Whether it is clustering of cases in a specific area or all are scattered cases. This was the prime importance of the whole study. Vector prevention activities were also carried out through these data inferences.

**Result**

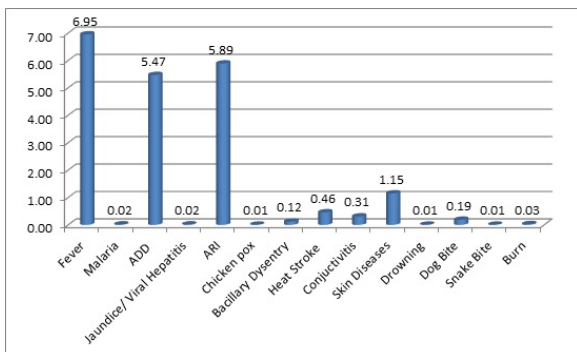
A total of 3,21,841 patients were screened in OPD and 19178 patients were treated as IPD. The OPD includes the Ghat OPD of 52957 patients. In the Fair period there is no death due to any disease and no epidemic erupted. Highest number of cases recorded of fever i.e. 18,700 (6.95%), followed by acute respiratory infection (ARI), 15,834 (5.89%), Acute diarrheal disease (ADD) 14,715 (5.47%), skin disease 3089 (1.15), heat stroke 1225 (0.46%) and rest shared by injuries 1143 (0.42%), conjunctivitis 823 (0.31%), bacillary dysentery 320 (0.12%), malaria 62 (0.02%), Jaundice/Viral hepatitis 58 (0.02%), chicken pox 21 (0.01%). The cases of dog bite were 504 (0.19%), snake bite 6 (0.01%), Burn 84 (0.03%) and drowning 18 (0.01%). There were no case reported of dengue and measles. All these are shown in Table 2 & Fig. 3.

**Table-1: Past Mass Gathering Incidents in India**

Date	Place	Trigger	Injured	Dead	Source
26th Aug, 2003	Ardh Kumbh Mela, Nashik	Chaos while looting silver coins thrown at crowd	57	39	The Hindu
25th Jan, 2005	Mandra devi Temple, Maharashtra	Electric Short Circuit leading to blast	Not Available	300	The Hindu
18th Dec, 2005	Relief Distribution, Tsunami, TN	Unorganized relief distribution	37	42	Time of India
3rd August, 2008	Nainadevi temple, HP	Rumor of Landslide	47	162	Time of India
30th Sep, 2008	Chamunda Devi Temple, Jodhpur	Rumor of Bomb Blast	60	150	Time of India
14th April, 2010	KumbhMel, Haridwar, UK	Car lost control creating chaos in crowd	17	9	Time of India
18th Nov, 2012	Chhat Pooja, Patna	Rumor of live electric wire falling in water on Ganges Ghat	17	0	Time of India

**Table-2: Zone-wise and overall Disease distribution in Simhastha**

Diseases	Kaal Bhairav	Mangalnath	Datta Akhada	Mahakal	Chamunda Mata	Triveni	Pvt. Hosp.	Satellite Town	Total
Fever	1325	2105	3178	2528	7193	604	1547	220	18700
Malaria	3	7	28	2	6	4	8	2	60
Dengue	0	0	0	0	0	0	0	0	0
ADD (Acute Diarrheal Disease)	1035	1694	2846	2217	5397	417	864	245	14715
Jaundice/ Viral Hepatitis	0	0	0	0	31	2	24	1	58
ARI (Acute Respiratory Infection ) / ILI (Influenza like Illness)	1543	1696	2915	1901	6225	160	1156	238	15834
Chicken pox	3	1	6	1	9	0	0	1	21
Measles	0	0	0	0	0	0	0	0	0
Bacillary Dysentery	19	20	4	34	0	10	231	2	320
Heat Stroke /Heat Exhaustion	54	24	112	33	107	34	852	9	1225
Major Injury /Trauma	146	29	21	22	629	119	149	28	1143
Drowning	2	1	3	2	0	4	4	2	18
Any other (Specify)	0	0	0	0	0	0	0	0	0
Dog Bite	24	15	11	17	435	2	0	0	504
Snake Bite	1	2	0	0	3	0	0	0	6
Conjunctivitis	97	60	56	263	185	116	0	46	823
Skin Diseases	693	971	212	570	186	351	0	106	3089
Burn	5	12	4	4	53	4	0	2	84
Total IPD	741	679	1696	1199	13062	139	1615	47	19178
Total OPD	22203	58894	49160	40685	78402	9021	16385	4537	279287



**Fig.-3: Disease & incidence-wise distribution pattern in period i.e. 21 & 22 April 2016**

## Discussion

From the past years metrological data of Ujjain city the temperature of the city varies from 41 to 46 degree Celsius in summer. In total screened patients about 20% were suffered from heat related illness. In the study period only three outbreak were reported. This shows the best efforts done in terms of public health concern.

The planned health infrastructure, availability of safe drinking water, good sanitation facilities, proper crowd control were the key to success. The basic idea of "pilgrims never become patient" gives the health officials and health workers a road map to deal with every situation.

Basic aim of public health is "prevention is better than cure." The present study shows that with best planning according to the population and adequate health arrangements can restrict the prone diseases in the area. Of course, the awareness level about health of the Indian population is increased in last 10-12 years and Information, Education and Communication (IEC) about health in the Simhastha was reflecting fantastic picture.

Prevention is better than a cure because it literally prevents the discomfort and costs of becoming sick or experiencing a similar preventable event. It also often takes less effort to prevent something than to cure it, hence the popular expression "an ounce of prevention is worth a pound of cure."

If we analysis the data only fever, ADD, ARI and skin disease cases are more significant than other disease or incidences. Comparison between fig. 2 and fig. 4 reveals that the disease pattern of the disease were show the way crowd impacts. Cases of ADD and ARI are more during Simhastha and fever has shows the same trends. The vector born disease like malaria, dengue were somehow same in the period.

It reflects the activities carries about regarding the prevention aspects of malaria works a lot. Regular fogging, spray of insecticide and powerful anti larva activities done in the area makes the things so comfortable to the pilgrims. Total 4140 test done for malaria through "Rapid Diagnostic Test (RDT)" and found only 62 positive. The overall reports represents the good depth of planning, optimum utilization of health human resources, best clinical practices and extraordinary prevention plan helps the disease pattern under the control.

Mass gathering means any big event of human at a certain time and at a certain place. Mass gathering are typically defined as more than 25000 people at a specific location for a defined period of time [7]. Medical care in a mass gathering is also used and the definition is given in the form, "The provision of preventive measures or definitive, primary care or hospital referral to persons attending or participating in major sports, recreational or political event [8]." It is also emphasis by Franaszek J., in a mass gathering, large attendance, duration of the event and security mostly affects the public health services. The incidence of illness and injuries in mass gathering is believed to be higher than would occur naturally in a population of comparable size [9].

Mass gathering have been associated with significant morbidity and deaths. A large outbreak of meningococcal disease was reported among pilgrims from 12 countries who contracted the disease while attending the Hajj in Mecca [10]. Ehresmann KR et al reported an outbreak of measles in the United States at the International Special Olympic Games (1991) involved athletes, spectators and volunteers [11].

In 1996 about 10000 cases of malaria were reported to be imported into the European Union (EU) [12]. Rowbothorn TJ explains the cruise ships berthed in harbours near mass-gathering venues have the potential for experiencing outbreak of disease, including gastroenteritis, Legionnaires disease, influenza and tuberculosis [13].

In large congregations, many people go missing, and in some cases die in instances such as stampedes, fires and collapse of buildings. For example, during 1997 and 2005, several hundred Hajj pilgrims died of fire or stampede (Yamin, 2005). The things have been no different in Indian perspective. Table 1 shows some of the major mishaps that caused people loss of lives and damage to property [14].

The referral and district hospital laboratory network was also used for different type of testing of human samples. Thirteen Stool samples were sent for testing of cholera to referral lab Mahatma Gandhi Medical College, Indore and found 2 cholera positive. A study in 2003 reported encouraging results from the use of telemedicine during the Fair for evading cholera epidemics [15].

As per the triggers given by surveillance, the water samples around 3754 were collected and tested. Among these samples 1442 samples found less than 0.5 ppm Residual Chlorine. Action were initiated according to the situation.

During the event time three outbreaks were reported. The first outbreak was of food poisoning in a ashram where 30 people eaten contaminated food at night. Eight of the person admitted in hospital through 108 facility. No death registered. After treatment patients were discharged. The second outbreak was of heat stroke.

The event happened after bathing in holy river Kshipra, 41 Japanese and European people got heat stroke. All were admitted in two govt. hospitals and discharges after treatment. No death registered.

The third outbreak was happened in Fair area of 33 cases reported loose motion and vomiting. All were discharged after treatment and no death registered. A cyclone as a natural calamity appears during the Fair period. It injured 166 and 12 death of pilgrims. Among 12 deaths, five deaths were due to crush in fall of temporary structure, two were died due to electrocution, two from drowning and three from other accidents. In 2013, there was an incident involving the collapse of a foot bridge killing about 40 people, although the unofficial statistics may be more [16].

**Recommendations-** As every spiritual path says, each and every event teaches a lesson, whether it is good or bad. Simhastha was another huge event which carried many happenings and it teaches learning lessons. Some of the recommendations are as follows-

01. To facilitate the health to the population which is unexpected, it is require a best plan of implementation.
02. Planning must be done on the basis of "more than anticipated" concept.
03. Assessment of the situation from all fronts, right from top to bottom.
04. A clear-cut picture of previous years trends of diseases in the area for better planning.
05. Deep micro analysis of the season (in present study it was hot summer) and operational aspects of the health set up.
06. Reporting from the trained persons gives better results.
07. Surveillance will be successful only when the hospital administration is equipped enough.
08. Main data centre must be exclusive for the surveillance.
09. Daily review and analysis of the data gave a holistic approach towards treatment part.

## Conclusion

A mass gathering like Simhastha Fair poses a complex public health challenge. The difference in healthcare seeking attitude and religious beliefs combined with unknown crowd mobility make it particularly difficult to do the surveillance and 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 surveillance, diagnosis, treatment and prevention will become more targeted if doctors and public health officials are aware of the common health risks involved during the pilgrimage. The disease pattern of the Simhastha shows the clear picture of role played by the surveillance. The area was on high alert to do the public health activities. If prevention is better than the next burden will be half.

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