

Epidemiological Investigation of an Outbreak of Acute Diarrheal Disease at Talegaon Dabhade, Mawal Block, Pune, Maharashtra

Ritima Gupta¹, Tikesh Bisen¹, Pradeep Awate¹, Amol Mankar¹

¹Public Health Department, Government of Maharashtra

Corresponding Author

Ritima Gupta

E-mail ID: ritimagupta92@gmail.com

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Abstract

Background: Acute Diarrheal Disease (ADD) affects millions of people across the globe, especially in poor socio-economic regions. Most of the diseases and deaths among children result from diarrhea resulting from contaminated water and food sources. In India, most diarrheal outbreaks can be attributed to contaminated water. These outbreaks can be prevented through the provision of safe drinking water. Outbreak investigation plays a vital role in ascertaining the causes of an outbreak and thereby keeping a check on communicable diseases. This paper explores the investigation that followed an outbreak of diarrhea in one of the interior regions of the Pune district in Maharashtra. **Objectives:** (i) To confirm the existence of an outbreak at Talegaon Dabhade (ii) To identify the source of infection and mode of transmission (iii) To control and prevent the further spread of the outbreak. **Methods:** A ground review of the outbreak situation was done along with the local health authority of Talegaon Dabhade and the Primary Health Centre (PHC) Staff. Information regarding water samples collection and testing was obtained from Talegaon Municipal Council officials. An observational cross-sectional study using a mixed-method approach was conducted. Face-to-face interviews of 8 cases were conducted using a semi-structured interview schedule. **Result:** The frontline workers identified a total of 624 cases during the survey. About 209 patients came to seek treatment at the PHC Outpatient Department (OPD) with three reported hospitalizations. The field workers started reporting cases on 27th December 2021. A total of 217 water samples collected from multiple points were sent for water quality testing. Only one sample from the house of an infected person came out to be positive for coliforms. The source of infection of the outbreak could not be identified. **Conclusion:** Outbreaks can be prevented through training of local health staff, strengthening labs at the government health facilities, and enhancing Information, Education and Communication (IEC) activities. This ensures early identification and timely response to epidemic-prone diseases.

Keywords: Acute Diarrheal Disease, Communicable diseases, Outbreak

Introduction

The majority of the diseases and deaths among children worldwide are due to diarrheal diseases. These primarily result from contaminated water and food sources⁽¹⁾. According to the Global Burden of Diseases, Injuries, and Risk factors study conducted in 2019, diarrheal diseases ranked third amongst the top ten causes of Disability-Adjusted Life Year (DALYs) in children younger than ten years⁽²⁾. Globally, 780 million individuals do not have access to clean drinking water, and 2.5 billion need improved sanitation. Diarrhea as a result of infection is widespread throughout developing countries⁽¹⁾. According to the National Burden Estimates of healthy life lost in India, 2017 Report, diarrhea was amongst the top 15 conditions that accounted for the most DALYs at all ages and caused mortality. Diarrhea contributed to 4.7% of the total DALYs⁽³⁾.

Usually, diarrhea is a symptom of an infection in the intestinal tract caused by several bacterial, viral, and other organisms.

The various modes of infection may be through contaminated drinking water or food or person-to-person due to poor hygiene. Diarrheal diseases can be prevented through simple measures, including the availability of safe drinking water, adequate sanitation, and hygiene⁽¹⁾.

An outbreak is defined as the unusual occurrence of a disease, specific health-related condition or behavior, or other health-related events in excess of normal occurrence in a region or community. The term is used for a small, usually localized epidemic⁽⁴⁾. Outbreak investigation plays a vital role in ascertaining the causes of an outbreak and thereby keeping a check on communicable diseases. This paper explores the investigation that followed an outbreak of diarrhea in one of the interior regions of the Pune district in Maharashtra. Knowing an increase in the number of cases of gastrointestinal infections in Talegaon Dabhade Urban Local Body area, a ground review of the outbreak situation was done.

Objectives

1. To confirm the existence of an outbreak at Talegaon Dabhade
2. To identify the source of infection and mode of transmission
3. To control and prevent the further spread of the outbreak.

Materials & Methods

Study Design

This was an observational cross-sectional study using a mixed-method approach.

Study setting

The outbreak was reported at Talegaon Dabhade - a town situated in the Mawal block of Pune District, Maharashtra. It is located at a distance of 35 kms from Pune city. It is divided into two parts - Gaothan part and Station part. It lies under the jurisdiction of Talegaon Dabhade Municipal Council. The town comprises of 13 wards with 13,856 households and a population of 56,435 (Figure 1) It is a semi-urban area with well-constructed pucca houses. People have proper toilet facilities at their house.

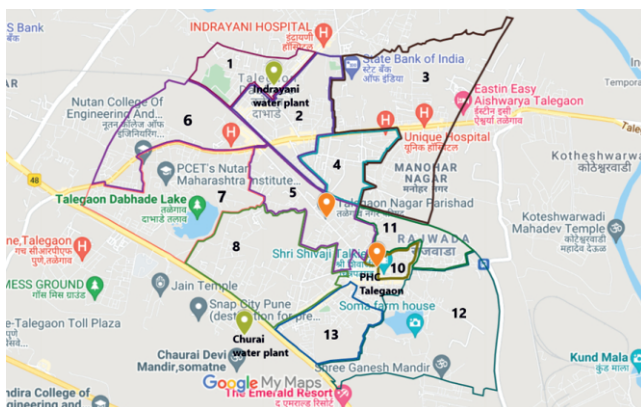


Figure 1: Map represents the 13 wards of Talegaon Dabhade town (Source: Google Maps)

Two water filter plants supply the town - Chaurai filter plant, which supplies the Gaothan part, and Indrayani filter plant, which supplies the Station part. The source of drinking water for the town's people is the public water supply (from Municipality) only. Many people have underground water tanks in their houses, but the water from such tanks is only used for other purposes (like washing clothes etc.) but not for drinking.

Case definition

An operational definition of Acute Diarrheal Disease for this study was as follows:

A suspected case of acute diarrhea was defined as a person experiencing three or more episodes of diarrhea with or without vomiting. Other symptoms may include fever and stomach ache.

Case finding and data collection

The Primary Health Centre (PHC) team clinically examined the cases. Accredited Social Health Activist (ASHA) workers conducted house-to-house visits to identify the suspected cases of acute diarrhea. Information about demographic characteristics including age and sex were collected. Stool samples were not collected. Amongst the infected cases, eight were randomly selected and interviewed using a semi-structured interview schedule to identify the source of infection.

Environmental Investigation

a. Collection and testing of water samples from the affected areas:

A total of 217 water samples were collected by the Municipal Council workers and the state team and sent for water quality testing. The water samples were collected from the two filter plants which supply the town, infected people's houses, public taps from the neighborhood, and the taps of PHC and Municipal Council premises. In all, 205 water samples were collected by the Municipal Council workers from 28th December 2021 to 4th January 2022 and were sent to the Pimpri-Chinchwad Municipal Corporation lab for testing. The State Public health Laboratory team, Pune, also independently collected 12 water samples and four bleaching powder samples for testing on 4th January 2022.

b. Survey to identify any leakage pipes

Municipal Council workers had surveyed the affected areas of the town for any leakage in the local pipeline network.

Data analysis

Cases were identified and line list was prepared. Age and sex wise number of cases were expressed as case proportionate rates across different age groups and sex and was calculated as follows:

$$\text{Case Proportionate Rate} = \frac{\text{Number of cases in males / females of a particular age group}}{\text{Total number of cases in the population}} \times 100$$

The case proportionate rates were expressed as percentage. The attack rate was calculated for male and females separately as the number of cases in specific sex divided by total population of that sex. Census 2011 population for Talegaon Dabhade was considered as denominator to calculate the attack rate and expressed as percentage. The cases plotted against the time were expressed as the epidemic curve.

Qualitative data was analyzed based on the questions to identify the source of infection.

Ethical considerations

This investigation was a part of the public health response to an outbreak. Hence ethical approval is not applicable.

Results

Descriptive Epidemiology

The first information regarding the increase in the number of patients with Gastrointestinal Tract (GIT) infection was received by the officials of Talegaon Dabhade Municipal Council from a few private medical practitioners and medical stores on 27th December 2021. This information was then conveyed to the local health authorities. An ASHA worker reported the first case to the local health authorities on 27th December 2021.

A line list of the cases was prepared by the PHC staff. A total of 624 cases were reported to the PHC through the field survey by ASHAs from 27th December 2021 to 9th January 2022. The majority of cases reported frequent loose motions and/or vomiting 3-4 in a day, while some reported 7-8 loose motions in a day. People from all age groups have been infected from all the 13 wards of the town as shown in Figure 2.

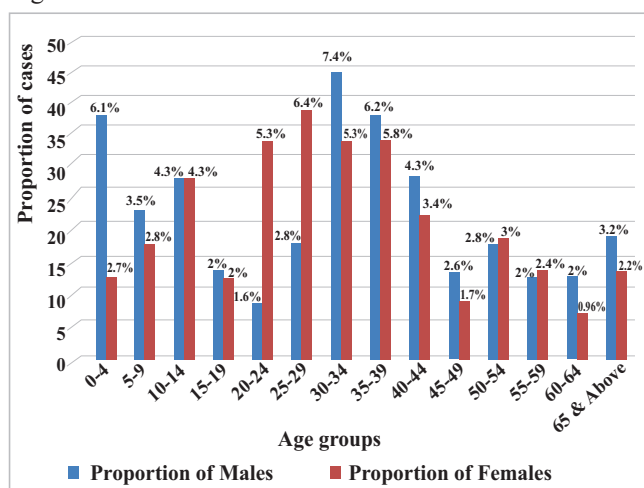


Figure 2: Case Proportionate rates by age and sex distribution

The attack rate in the population was 1.10% (Table 1). About 209 patients came to seek treatment at the PHC OPD with three reported hospitalizations.

Table 1: Attack rates in the population

	Total	Males	Females
Population (Census 2011)	56435	29033	27402
No. of cases	624	321	303
Attack rate	1.10%	1.10%	1.10%

The epidemic curve (Figure 3) depicts that the first case occurred on 27th December 2021. The peak was observed on 1st January 2022, followed by a gradual decline in the number of cases reported daily.

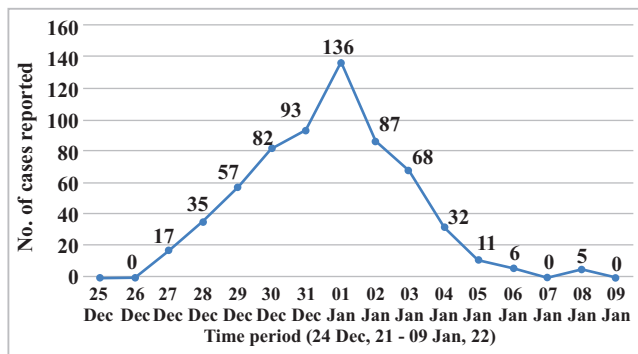


Figure 3: Epidemic Curve

Source of infection

No leakage in the local pipeline was found by the Municipal Council workers during their survey of the affected areas of the town. The results of all the 16 samples (12 water samples and 4 bleaching powder samples) sent to the State Public health Laboratory, Pune, for chemical and bacteriological testing were negative.

The results of the 205 water samples sent to the Pimpri-Chinchwad Municipal Corporation lab were negative except for one sample, which came out to be non-potable. The bacteriological examination of that particular sample revealed the presence of 18 + coliform bacteria in 100ml water. It was collected on 4th January 2022 from the house of an infected person in Tukaram Nagar.

Since no stool samples were taken by the PHC staff, the disease could not be microbiologically confirmed. Nevertheless, since the symptoms were clinically compatible with the diagnosis of acute diarrheal disease, it was classified into this category.

The interviews of eight infected people found that none of them had any travel history, none had attended any mass gatherings (ceremonies, functions, etc.) 3-4 days prior to illness, nor had any of them consumed food items other than home-cooked food. They came in contact with their neighbors and friends from the neighborhood only. All had proper toilet facilities at their houses, and the household garbage was emptied daily by the municipality people. The majority consumed the drinking water that was filled directly from the public water supply, only a few used filters at home.

Public Health Response Initiated

People were made aware of the outbreak situation. In order to prevent the further spread of the disease, the ASHA workers conducted house-to-house visits announcing contamination of the local water supply and guiding people to drink potable water using chlorination or boiling methods. The Municipal Council had also organized public announcements through auto rickshaws regarding the same.

Treatment and prophylaxis were given to the infected and their contacts, respectively. Oral Rehydration Solution

(ORS) sachets, Zinc tablets, Paracetamol tablets, syrup bottles (for children) were distributed in the wards.

Discussion

This outbreak of acute diarrheal disease may be due to the consumption of contaminated drinking water or food or improper hygiene and sanitation; although the source of infection could not be identified. One water sample was identified positive on 4th January 2022, when the number of cases had started declining and major preventive measures had already been taken. Since only one sample out of the total 217 water samples sent for water testing tested positive for coliform bacteria, the possibility of contamination of the public water supply is ruled out.

Diarrhea diagnostic kits and culture were not available at the Talegaon Dabhade PHC. So, the staff was unable to take stool samples of the patients. The health facilities often fail to timely detect outbreak source due to a lack of laboratory capacity. This influences the distribution and reporting pattern of cases of a particular disease in the region and leads to underestimating the burden. There is a need to strengthen laboratory capacity at local levels in India, as appropriate laboratory capacity is the key to improving surveillance and response in resource-challenged settings⁽⁵⁾. On the other hand, many previously conducted investigations had found contamination of the drinking water as the source of infection for diarrheal outbreaks in India⁽⁵⁻⁷⁾.

However, the present outbreak was contained by preventive public health measures taken by the PHC Staff and the field workers. To make the people aware of the outbreak situation and prevent the further spread of the disease, the ASHA workers conducted house-to-house visits. They guided people to drink chlorinated or boiled water. The Municipal Council had also organized public announcements through auto rickshaws regarding the same. Thus, a proper surveillance system needs to be developed for the early identification of cases and initiate and implement prompt control measures⁽⁸⁾.

The present study has some limitations. The stool samples of the cases were not taken by the PHC staff due to the unavailability of a transport media. Data from the private sector was also not considered. There this could be an underreporting of the cases. Also due to time constraint, interviews of only 8 cases were conducted.

Conclusion

There is a dire need to strengthen the laboratories at the government health facilities, especially at the local level. The diagnostic laboratory capacity of the laboratories should be enhanced so that they support early detection and timely response to epidemic-prone diseases. Also, there is a need to train the facility staff regarding the early detection of warning

signals of an impending outbreak and the basics of an outbreak investigation. A proper surveillance system for early identification of cases and continuing health education will help initiate and implement prompt control measures.

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Conflict of interest: Nil

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ORCID

Ritima Gupta  0009-0009-6010-8869

References

1. World Health Organization, Diarrheal disease factsheet (2022), Available at: <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>. Accessed on: 25th January 2022.
2. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*. 2020 Oct 17;396(10258):1204–22.
3. Menon GR, Singh L, Sharma P, Yadav P, Sharma S, Kalaskar S, et al. National Burden Estimates of healthy life lost in India, 2017: an analysis using direct mortality data and indirect disability data. *Lancet Glob Health*. 2019 Dec;7(12):e1675–84.
4. Park's Textbook of Preventive And Social Medicine (23rd ed.) (2015) Jabalpur (M.P.), India: Banarsidas Bhanot.
5. Sheoran P, Rammayyan A, Shukla HK, Dikid T, Yadav R, Sodha SV. An outbreak investigation of acute Diarrheal Disease, Nagpur District, Maharashtra, India. *Indian J Public Health*. 2021 Jan;65(Supplement):S14–7.
6. Patel N, Patel A, Patel R, et al. An Epidemiological Investigation of Acute Diarrhoeal Disease Outbreak in Sojitra Village of Anand District by Rapid Response Team of B. J. Medical College, Ahmedabad. 2017;8(2):5.
7. Joshi MS, Lole KS, Barve US, Salve DS, Ganorkar NN, Chavan NA, et al. Investigation of a large waterborne acute gastroenteritis outbreak caused by group B rotavirus in Maharashtra state, India. *J Med Virol*. 2019 Oct;91(10):1877–81.
8. Patil SB, Deshmukh D, Dixit J, Damle A. Epidemiological Investigation of an Outbreak of Acute Diarrheal Disease: A Shoe Leather Epidemiology. *J Glob Infect Dis*. 2011;3(4):361–5.