

SHORT ARTICLE

Investigation of community outbreak of enteric fever associated with drinking water in Borsad, Anand, Gujarat

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Abstract

Background: Enteric fever is an endemic health problem and frequently associated with outbreaks. **Objectives:** Investigate sudden surge in gastroenteritis cases to confirm the outbreak, describe it in terms of time place and person, identify source of infection, modes of transmission and suggest remedial measures. **Material & Methodology:** Field visit was undertaken by the rapid response team (RRT) at Borsad town of Anand district in Gujarat for investigating suspected typhoid outbreak. This involved gathering information from local authorities, hospital admissions and home visits; collection of blood samples and water samples. **Result:** Of 30 suspected cases, 19 (63.3%) tested Widal positive. Common presenting symptoms were fever, vomiting followed by diarrhea and abdominal pain. Chlorine levels at source and end users were inadequate. 5 leakage points in water supply were identified in areas around the clustered cases. **Conclusion and Recommendations:** Leakage in piped water supply coupled with inadequate chlorination lead to contaminated drinking water and subsequent Typhoid epidemic. Corrective steps in form of rapid surveys to identify cases, household chlorination and appropriate engineering measures were recommended and implemented.

Keywords

Typhoid; Investigation of Epidemic; Rapid Response Team; Gastroenteritis; Chlorination

Introduction

Enteric Fever or Typhoid fever occurs in those parts of the world which have substandard water supply and poor sanitation. While *Enterica serovar Typhi* (*S. Typhi*) is the most common etiologic agent, cases due to *S. Paratyphoid A* (SPA) are on the rise.(1) In low-income countries it sickens millions of people each year.(2) India, with an incidence rate of 493.5 cases per 100,000 person-years, is endemic for the disease and shows higher incidence in regions where water supply is contaminated with faeces.(3,4) In Gujarat, reported cases increased between 2010 and 2017 from approximately 10,000 to 46,000.(5) During the 7-year period (2005-11), for every 100,000 people in the state, approximately 186 reportedly

suffered from enteric fever, with an average case rate of 26.7/100,000 population/year.(6) Morbidity and mortality due to Typhoid have increased since poor sanitation, lack of a safe drinking water supply and low socio-economic conditions in resource-poor countries are amplified by the evolution of multidrug resistant salmonellae leading to treatment failure and relapse. The ability to quickly recognize and respond to a disease outbreaks is a particular public health management challenge due to a variety of new pathogens, different risk factors (travel, food imports, technological innovation etc.), variable spread, increased public and media attention, economic and political consequences. (7)

Brief Demographic description of the affected district

Borsad is Municipality town in the Anand district of Gujarat. It is located 17 km from district headquarters and has a population of 63,377 and sex ratio of 923. Its average literacy rate (68%) is higher than the national average (59.5%).(8)

Aims & Objectives

To investigate the sudden surge in gastroenteritis cases to confirm the outbreak, describe it in terms of time place and person, identify source of infection, modes of transmission and suggest remedial measures.

Material & Methods

Following an intimation regarding increased reporting of acute gastroenteritis (AGE) cases from Borsad in Feb 2018, a Rapid Response Team (RRT) comprising of faculty from Community Medicine, Medicine, Microbiology from a Medical College of Ahmedabad city was deployed to investigate the epidemic. Background information and necessary data were provided by the health authorities. 30 odd cases were reported over a period of 10 days and were plotted on a spot map. Widal test was done for all 30 cases. Blood samples (4) were collected from newly admitted cases (yet not put on antibiotics) for culture and serum samples (7) for Anti HEV anti bodies. Two areas namely Fatepura and Saiyad tekra, where clustering of cases was seen were visited by the team for on the spot assessment. (Table2). 4 Water samples, 1 from bore well (supply end) and 3 from different localities with clustering of cases (user end) for were collected and analyzed for residual chlorine and faecal contamination. Structured questionnaire was used to collect information for admitted cases to interview and clinically assess for management and treatment. Other cases were contacted at their residences.

Results

Community Health Centre (CHC) and Urban Health Centre (UHC) Borsad were located in the same premises and facilities were inadequate. No data of previous years was available for comparison. Following the Index case on 19/02/2018, within 9 days cases increased to 30 (on 01/03/2018). (Figure 1). The outbreak being in a Muslim locality, all 30 cases were among Muslims. Mean age of affected cases was 24.2 ± 14.3 years. Age and sex distribution of the cases is as shown in (Table 1). 19 (63.3%) tested positive on Widal. Average time lag between appearance of symptoms and admission to the health facility was 4.2 ± 1.3 days. However, all patients were admitted to health facilities on the same day they tested positive. Common presenting symptoms were fever, vomiting followed by diarrhea, abdominal pain, chills, cough, muscular/ body/ joint pain or headache. No complications or deaths were reported. All cases were treated or being treated (at the time of investigation) either as indoor cases or on OPD basis. Distribution of

cases and leakages in different localities is as shown in (Table 2) and (Figure 2). Clustering of cases was observed around points of leakages. Of the 7 sera samples examined later at tertiary care center, all were negative for Anti HEV antibodies and 2 were positive for Widal. All water samples, except 1, taken in the community tested negative for chlorine. In one sample taken at user end, residual chlorine was 0.2 ppm. Community was not using any water purification methods and was unaware of role or correct method of use of these tablets. Personal hygiene was assessed in these patients by inquiring about hand washing with soap water before eating or after defecation and was found to be poor. Pumping station in the locality was visited for inspection. Chlorination was supposedly being done using liquid chlorine solution but the pump used for the same was not functioning properly. There was a log book to record the residual chlorine levels but it was never filled. Water sample collected from the bore well (supply end) was negative for residual chlorine. Out of 4 water samples collected from different localities, fecal contamination was found in 2. The public health response by the local health department, supplemented by technical inputs from RRT, included:

1. OPD based management as per Standard Treatment guidelines,
2. Case confirmation by Widal test,
3. Identification of leakage (5 sewage broken oints)
4. Fever surveillance in "at risk neighborhood" for additional cases
5. Distribution of Chlorine tablets to all households in the area
6. Reporting of suspect cases by private practitioners (3 - 4 suspected cases were reported by a private practitioner from a nearby area).

Discussion

Investigation of any epidemic is always a challenge as much is to be achieved in a short time with limited resources. Though broad guidelines for epidemic investigations are available but disease specific guidelines are missing, hence such investigations are always a learning experience and such reports also act as reference points for future. An outbreak of acute diarrhoeal disease (57 cases) was recorded in a nearby village in June-July which was linked to food consumed at a festive gathering. Here too there was no residual chlorine in the water supply.(9) The current outbreak occurred due to contamination of drinking water due to leakage in sewer lines. Poor water quality and faecal contamination of drinking water resulting in outbreaks of typhoid fever have been reported previously in different parts of India as well.(10,11,12,13,14) In Bholakpur, India, bacteriological pollution of drinking water due to infiltration of contaminated water through cross connection/ leaking points and back siphoning cause diarrheal illness.(15) In the current outbreak, very few

children were affected, probably due to limited exposure. Also, higher female cases may be due to more time spent at home leading to increased exposure. Similar investigation in Jorhat, Assam; reported 78.5% children and young adults being affected.(10) Majority of the cases reported suffering from fever and diarrhea. Investigation by Misra et al also reported presence of fever as universal finding of all cases.(12) Due to changing modes of presentation and development of multidrug resistance (MDR), typhoid fever is becoming increasingly difficult to diagnose and treat. Laboratory confirmation and epidemiological linkage therefore become crucial. Knowledge and awareness regarding hygiene was poor as evident from non-usage of any household method of water purification except for using cloth to strain in a few households or heating the water (not rolling boil) and lack of hand hygiene among patients. The infrastructure and staffing at the CHC/UHC were far from ideal and upgradation was required to efficiently deal with future challenges

Conclusion

Sudden surge in AGE was due to Typhoid outbreak due to contamination of community bore well water with leaked sewage. Chlorine levels at supply and user's end as well as knowledge and awareness regarding purification methods and hand hygiene were far from satisfactory.

Recommendation

Borsad, being an urban town needs a properly functioning Urban Health Centre. Authorities need to regularly ensure chlorination in the water distribution system. Behaviour change communication regarding personal hygiene and sanitation along with safe drinking water and waste disposal is required. Continued surveillance is required for the current outbreak since some cases might still be incubating. Regular maintenance and monitoring of the bore well, water and sewage lines should be undertaken, especially before monsoon, to prevent such outbreaks.

Limitation of the study

In the limited time and resources, population exposed could not be identified. Follow up of cases and their outcomes could not be done. Hence several epidemiological parameters could not be documented.

Relevance of the study

This article is intended to be a ready reckoner for a quick outbreak investigation. In absence of situation specific protocol and guidelines, this highlights some of the steps to be followed while investigating an outbreak.

Authors Contribution

RS: RRT Member, Epidemiological Investigation of Outbreak and Public health Recommendations, Manuscript writing. HB: RRT Member, Epidemiological Investigation of Outbreak and Public health Recommendations, Manuscript writing. SP: RRT Member,

Microbiological Investigation of Outbreak, Processing water and blood samples. MP: RRT Member, Clinical Investigation of Outbreak and Clinical Recommendations. GS: Data compilation, Manuscript writing

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Tables

TABLE 1 AGE & SEX WISE DISTRIBUTION OF LINE LISTED TYPHOID CASES (N=30)

Age (Years)	Male	Female	Total
00 - 05	0	2	2
05 - 15	3	5	8
15 - 25	3	4	7
25 - 45	2	7	9
45 - 60	0	3	3
>60	0	1	1
Total	8	22	30

TABLE 2 DISTRIBUTION OF CASES (N = 30) AS PER THE LOCALITY AND THE LEAKAGE OBSERVED

Area	No (%)	Leakage reported
Jhupadpatti	1(3.3)	No
Saiyad Tekra	8 (26.7)	Yes (2)
Rabari Chakla	4(13.4)	Yes
Rajofaliya	3(10)	No
Kantannagar	1(3.3)	No
Malekwada	4(13.4)	Yes
Bhoivas	1(3.3)	No
Madinanagar	2(6.7)	No
Fatehpura	5(1.7)	Yes
Vankarwas	1(3.3)	No

Figures

FIGURE 1 MAP OF STUDY AREA REPORTING LEAKAGES IN WATER SUPPLY AND NUMBER OF CASES

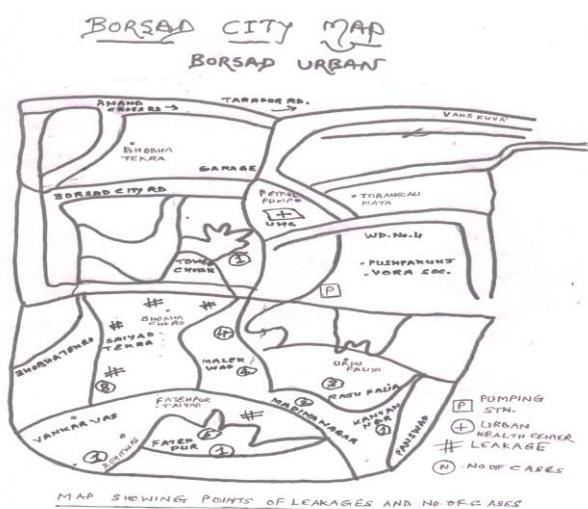


FIGURE 2 EPIDEMIC CURVE OF TYPHOID CASES FEBRUARY 2018

