

RESEARCH ARTICLE

Cholera outbreak in tea garden of Sivasagar district of Assam

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Abstract

Investigation of cholera outbreak in tea garden of Sivasagar district of Assam was evaluated in this study. In late May 2012, Bagjan division of Borbam tea estate, of Sivasagar district of Assam was affected by an outbreak of acute watery diarrhea, subsequently confirmed as *Vibrio cholerae* O1. To investigate and control the acute diarrhoeal disease outbreak in Sivasagar district of Assam, a physician-epidemiologist-led team did rapid investigation to confirm the outbreak and instituted treatment and control measures. Quantitative data collection was done using standard schedule and qualitative data by using key informant interview schedule. Spot mapping of cases was done along the garden residential lines. Suspected cases (120) were line listed with 1:1.23 male: female ratio. Ages ranged from 3 to 70 years. Attack rate was 4.79% with one death; case fatality rate was 0.83%. Open air defecation was practiced as 94.6%. Rectal swabs were positive for *Vibrio cholerae* O1 (Ogawa). All the piped water samples were class IV which was unsatisfactory for domestic use. There is a need to improve water and sanitation facility in the tea garden lines along with implementation of a strengthened disease surveillance system through integrated disease surveillance project (IDSP) covering all tea estates.

Keywords: Cholera, diarrhea, *Vibrio cholera*, spot mapping, open air defecation, rectal swabs.

Introduction

Cholera has reemerged as a major infectious disease caused by the bacterium *Vibrio cholerae*. Two epidemic strains have been isolated from different outbreaks *V. cholerae* O1 biotype El tor or *V. cholerae* O139 (NICIS, 2000; WHO, 2002; Sinha *et al.*, 2002). During 2010, 877 cases and 22 deaths due to cholera outbreak are reported from tea gardens in Sonitpur district of Assam (WHO, 2004). In May 2012, Bagjan division of Borbam tea estate of Sivasagar district of Assam was affected by an outbreak of acute watery diarrhea subsequently confirmed to be caused by *V. cholerae* O1. The investigation was conducted to determine the potential causes and to establish control measures as per standard protocol and implement an efficient surveillance system.

Materials and methods

Study population: A descriptive study was conducted in the Bagjan tea estate of Sivasagar district of Assam, which had a population of 2503. The residential areas were mostly in lines for garden labourer with only few staff quarter and one administrator. Institutional review board (IRB/IEC) was informed about the investigation and the study tool and all necessary documents were submitted and permission for publication was obtained afterwards.

Case definition utilised for cholera: The cases of diarrheal diseases fulfilling the WHO Standard case definition of cholera were taken into consideration for this study.

A case of cholera should be suspected when: in an area where the disease is not known to be present, a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhea; in an area where there is a cholera epidemic, a patient aged 5 years or more develops acute watery diarrhea, with or without vomiting. A case of cholera is confirmed when Vibrio cholerae O1 or O139 is isolated from any patient with diarrhea (WHO, 2004).

Instruments: A rapid epidemiological survey was conducted in the Borbam tea estate of Sivasagar district of Assam by a team led by a physician from department of medicine, paediatrics, consisting of faculty and other doctors, postgraduate medical student, and one laboratory technician from department of microbiology. A house to house survey was done in the residential areas of the tea estates including the index case covering a population of 2503, by using a pretested schedule containing demographic, socio-economic and environmental information.

Clinical investigation of all cases was conducted along with sample collection for laboratory investigation. Qualitative epidemiological data was collected by observation of water sources, visiting eating places, hospitals, examining the prescription pattern of health care providers. Key informant interview was also conducted for data triangulation. The cholera cases were mapped along the garden residential lines by line listing.

Sample collection: In the first week of the outbreak, three stool samples were collected from initial diarrhea cases in the transport media and examined in the department of microbiology, AMC for confirmation of the causative agent. Water samples using aseptic measures were collected from piped water supply and sent for bacteriological testing at AMC, Dibrugarh. In the second week, ten rectal swabs were taken in transport media from hospitalized patients, for examination and all water sources for drinking and other household purposes in the garden were collected using aseptic measures for bacteriological testing at AMC, Dibrugarh.

Containment measures undertaken:

1. Health education to the affected public was given about cholera, diarrhea and its prevention like washing hands with soap and water after defecation and before taking meals, use of boiled water for drinking purpose and demonstration of chemical treatment of water before consumption using stock solution prepared from bleaching powder, demonstration of oral rehydration solution (ORS) preparation also was provided.
2. Mobilization of resources like medications, oral rehydration solutions and Intravenous fluids.
3. Mobilization and capacity building of health care workers for early intervention.
4. Provision of information education and communication (IEC) material for supply to raise awareness in the affected population.
5. Existing drinking water supply is closed. Supply of potable drinking water is done from nearby tea garden using special water carrying tankers.
6. Provisions of prompt referral services for the patients to the nearby government hospitals.
7. Awareness camp with involvement of local community members like mothers club and adolescent girls groups for safe water and sanitation measures in the affected area.
8. Antibiotics based on sensitivity pattern (Ciprofloxacin) were started for symptomatic patients requiring hospitalization.

Results

One hundred and twenty suspected cases of cholera were line listed (Fig. 1). Male female ratio was 1:1.23. Ages ranged from 3 to 70 years (Table 1). Among affected population, majority was in the age group of 21 to 30 years followed by less than 10 years age group. The overall attack rate was 4.79% with one death. There was a trend of higher affection of woman. The overall case fatality rate was 0.83%. Three rectal swabs taken from initial untreated patients were positive for *Vibrio cholerae* 01(Ogawa). Piped water samples demonstrated contamination with *V. cholerae*. There is unsafe water supply and inadequate sanitation. About 94.6% of the total population practiced open field defecation. Everyone was using piped water, which was found contaminated.

Fig. 1. Epidemic curve of cholera outbreak.

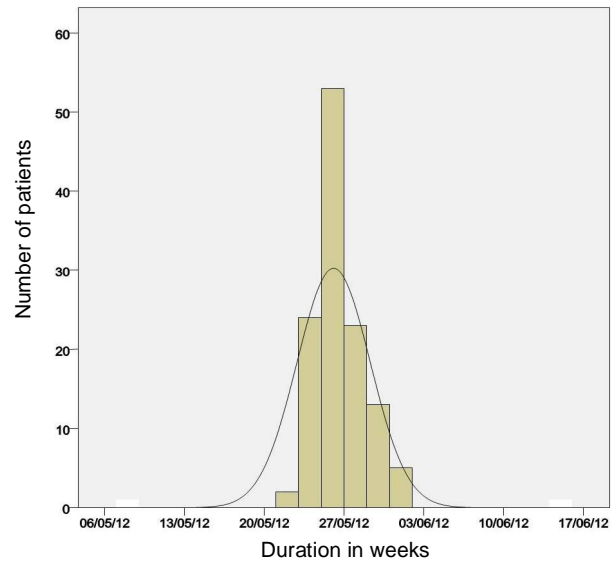


Table 1. Age and sex distribution of the cholera cases recorded in the outbreak at Bagjan tea estate.

| Age (Years) | Male (n=53) (44.17%) | Female (n=67) (55.83%) | Total (n=120) |
|-------------|----------------------|------------------------|---------------|
| <=10 | 10 (18.86%) | 14 (20.89%) | 24 (20%) |
| 11-20 | 08 (15.09%) | 08 (11.94%) | 16 (13.33%) |
| 21-30 | 19 (35.84%) | 20 (29.85%) | 39 (32.5%) |
| 31-40 | 08 (15.09%) | 10 (14.93%) | 18 (15%) |
| 41-50 | 04 (7.54%) | 08 (11.94%) | 12 (10%) |
| >50 | 04 (7.54%) | 07 (10.45%) | 11 (9.17%) |

There was leakage in the pipes carrying water and contamination with ground water and surface contaminant like wastewater, sewage, kitchen waste and animal dung were evident (Fig. 2a-d). Three more water samples were collected in the second week of the outbreak from hospital premises in the garden (2 samples, Fig. 2b) and water used by the public for domestic use from the pond (1 sample, Fig. 2a) of the index case (died) with aseptic measures for bacteriological testing and were sent to department of microbiology, Assam medical college hospital, Dibrugarh for analysis and found class IV unsatisfactory for domestic use, even after closure of the main piped water supply. Similarly ten rectal swabs taken from patients admitted in the hospitals were also sent to the same department. These samples were negative for *V. cholerae*, which was probably due to the use of sensitive antibacterial medications. The initial water samples from the garden piped water supply taken in the first week of the outbreak was found to be positive for *V. cholerae* 01 biotype El tor serotype Ogawa. Outbreak was managed in a coordinated manner with good garden administration and line headman at the community level. The use of community-based workers like from the local health authority of the health department of gov. of Assam was successful and contributed to control of the outbreak.

Fig. 2a-d. Water sampling location.



Discussion

The cause of the outbreak was confirmed as cholera in Bagjan tea estate of Assam. One hundred twenty suspected cases were identified. Females were affected more. Median affected age is 40.5 years (ranging from 3-70 years) and maximum affected population group was 21-30 years. The overall attack rate was 4.79%. The overall case fatality rate was 0.83%. Rectal swabs were positive for *Vibrio cholerae* O1(Ogawa). Piped water samples were contaminated with *V. cholerae*. There is inadequate sanitation (94.6% practicing open field defecation) and insufficient access to clean potable drinking water as everybody using piped water which was found contaminated. Bacteriological examination of stool and water sample revealed *V. cholerae* O1 El tor, Ogawa as the causative organism. Other studies in India also revealed the same strain as causative organism of gastroenteritis outbreaks in recent past (Khera *et al.*, 1996; Bara *et al.*, 1997).

In our study, investigations revealed the attack rate of 4.79% and higher number of females with 1:1.23 male: female ratio and children less than 5 years of age were also suffering from diarrhea. The observations are similar to the findings of Singh *et al.* (1998). Results of water sampling tests suggested that the cases had contracted the disease from the contaminated water of piped water supply and use of this water for drinking purpose by almost all the people of the garden lines without boiling it. Most residential lines of garden workers in tea gardens didn't utilize the deep tube wells provided to them, as they considered this water as harmful thinking it to be due to high iron content in it. Even though iron removal plants were installed along with the deep tube wells, this source of water supply was not been utilized, rather ponds having dirty water were used for all household uses including washing of utensils and taking bath. The hygienic condition and knowledge about healthy lifestyle of these people were found to be very poor (94.6% used open field defecation). The garden management and staff of this tea garden also used the same source of water supply but none of them or their family members suffered from this illness as they boil the water before drinking it and also adopt the hand washing and other hygienic practices. Cholera will continue to be a problem in this tea estate which was unable to meet health education, safe water and sanitation needs for population. This was also advocated by Thakur *et al.* (2001). WHO suggested that a system of surveillance of cases coupled with continuing health education measures will help in monitoring and early identification of cases for prompt control measures.

Conclusion

Cholera outbreak is continuing in tea garden areas of Assam. Provision of safe drinking water, improving sanitation and strengthening of disease surveillance is necessary to avoid recurrences of cholera and other diarrheal diseases in garden areas.

There is a need to implement different long term public health intervention strategies and to do action research for better evidence generation.

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