

Investigation of a Cholera Outbreak in a Tea Garden of Sivasagar District of Assam

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ABSTRACT

Background: 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. **Objectives:** Our objective is to investigate and control the acute diarrheal disease outbreak in Sivasagar district of Assam. **Materials and Methods:** A physician-epidemiologist-led team did rapid outbreak 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. **Results:** Spot mapping of cases was done along the garden residential lines. About 120 suspected cases were line listed; with 1:1.23 male: female ratio. Ages ranged from 3 to 70 years (median - 40.5 years). Attack rate was 4.79% with one death; case fatality rate was 0.83%. Open air defecation was practiced by 94.6%. Rectal swabs were positive for *V. cholerae* O1 (Ogawa). All the piped water samples were class IV unsatisfactory for domestic use. **Conclusions:** 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 covering all tea estates.

Keywords: Assam, cholera, outbreak, Sivasagar, tea garden

Introduction

Cholera has re-emerged as a major infectious disease, caused by the bacterium *Vibrio cholerae*. Two epidemic strains has been isolated from different outbreaks *V. cholerae* O1 biotype El Tor or *V. cholerae* O139.⁽¹⁻³⁾ During 2010, around 877 cases and 22 deaths due to cholera outbreak are reported from tea gardens in Sonitpur district of Assam.⁽⁴⁾ 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, establish control measures as per standard protocol and implement an efficient surveillance system.

Materials and Methods

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 laborer with only few staff quarter and one administrator. Institutional review board/institutional ethical committee/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

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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 *V. cholerae* O1 or O139 is isolated from any patient with diarrhea.⁽⁴⁾

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, Pediatrics, 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, socioeconomic and environmental information. Clinical investigation of all cases was conducted along with sample collection for laboratory investigation. Qualitative epidemiological data collection was conducted 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.

In the 1st week of the outbreak, three stool samples were collected from initial diarrhea cases in the transport media and examined in the Department of Microbiology, Assam Medical College 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 2nd 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 like health education to the affected public with the involvement of community members like mothers club member and adolescent girls groups was done for 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 was also done. Mobilization of resources such as medications, oral rehydration solutions, intravenous fluids was done along with capacity building of health care workers for early intervention. Provision of IEC material for supply to raise awareness in the affected population was done through

National Rural Health Mission. Existing drinking water supply was closed. Supply of potable drinking water was done from nearby tea garden using special water carrying tankers. Antibiotics based on sensitivity pattern (ciprofloxacin) were started for symptomatic patients requiring hospitalization and quick referral transfer was done for those in need.

Results

About 120 suspected cases of cholera were line listed [Figure 1]. Male: female ratio was 1:1.23. Ages ranged from 3 years to 70 years (median - 40.5 years) [Table 1]. Amongst affected population, majority was in the age group of 21-30 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 *V. cholerae* O1 (Ogawa). Piped water samples demonstrated contamination with *V. cholerae*.

There is unsafe water supply and inadequate sanitation. 94.6% of the total population, practicing open field defecation. Everyone was using piped water, which was

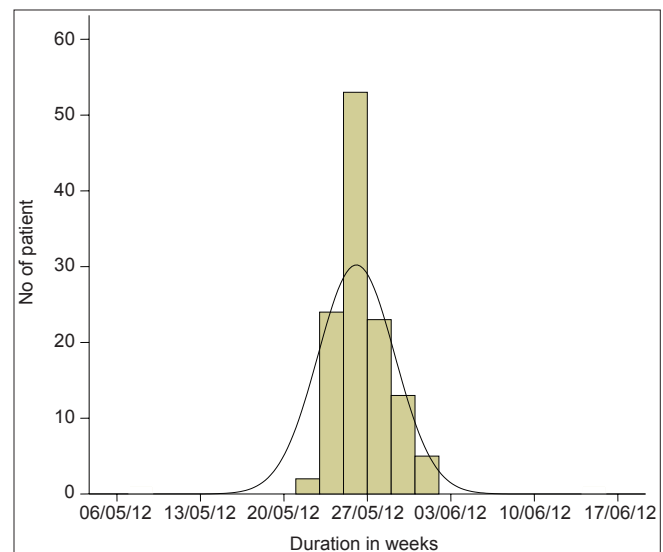


Figure 1: Epidemic curve

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

Age (years)	Sex		Total (no.=120) (%)
	Male total no.=53 (44.17%)	Females total no.=67 (55.83%)	
≤10	10 (18.86)	14 (20.89)	24 (20)
11-20	8 (15.09)	8 (11.94)	16 (13.33)
21-30	19 (35.84)	20 (29.85)	39 (32.5)
31-40	8 (15.09)	10 (14.93)	18 (15)
41-50	4 (7.54)	8 (11.94)	12 (10)
>50	4 (7.54)	7 (10.45)	11 (9.17)

found contaminated. There was leakage in the pipes carrying water and contamination with ground water and surface contaminant such as wastewater, sewage, kitchen waste and animal dung were evident.

Three more water samples were collected in the 2nd week of the outbreak, from hospital premises in the garden (two samples, Photo 1 and water used by the public for domestic use from the pond (one sample, Photo 2) 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 1st week of the outbreak was found to be positive for *V. cholerae* O1 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 Government of Assam was successful and contributed to control of the outbreak.

Discussion

The cause of the outbreak was confirmed as cholera in Bagjan tea estate of Assam. 120 suspected cases were identified. Females were affected more. Median affected age is 40.5 years (ranges from 3 to 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 *V. 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^(5,6) also revealed the same strain as causative organism of gastroenteritis outbreaks in recent past.

In our study, investigations revealed the attack rate of 4.79% and higher number of females with

1:1.23 male: female ratio were also similar to the observations made by Singh, *et al.*⁽⁷⁾

Results of water sampling 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% 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.*⁽⁸⁾ where he 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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