ORIGINAL ARTICLE

Diarrhoeal disease outbreak in a rural area of Karnataka

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Abstract

Background: Acute diarrhoea is the passage of 3 or more loose or watery stools in the past 24 hours with or without dehydration. Owing to WASH strategy (Water, Sanitation and Hygiene) the burden of diarrheal diseases has seen a tremendous decline over the past 2 decades. Cholera is an acute diarrhoeal infection caused by ingestion of food or water contaminated with the bacterium Vibrio Cholerae. **Objectives:** 1. To document the factors responsible for the outbreak. 2. To provide recommendations for prevention and control of such outbreaks in future. **Methods:** After receiving verbal information from district office regarding outbreak of diarrhoeal disease (cholera) in a town of Bijapur district, we independently conducted a cross sectional study in the affected area and collected information regarding no. of people affected since the outbreak, their age and sex distribution. A total of 3802 people were interviewed using a predesigned questionnaire on 28th and 29th July, 2012. We also conducted environmental investigation regarding the source of contamination and collected 2 water samples from drinking water source. **Results:** All the cases were clustered in the five streets, which were consuming water from contaminated two water tanks. A total of 121 cases of diarrhoea were identified affecting 3.18% of the population. Attack rate of cholera was highest (4.5%) in 25-34 years age group followed by 4.22% in 15-24 years age group. Attack rates was higher among females (3.4%) compared to males (2.9%). Laboratory report stated that water samples were unfit for drinking purpose. V. Cholera (Ogawa serotype) was isolated from water sample. **Conclusion:** Consumption of contaminated water from a newly dug bore-well had led to the diarrhea outbreak. Lack of sanitation and hygiene had worsened the situation.

Key Words

Diarrhoea; Cholera; Outbreak; Ogawa; Sanitation

Introduction

Diarrhoea is defined by the World Health Organization as having three or more loose or liquid stools per day, or as having more stools than is normal for that person. (1) Inadequate water, sanitation and hygiene (WASH) is linked to transmission of various diseases like cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio. Epidemiologic studies have estimated that it is responsible for about 5-10% of all acute diarrhoea cases. Lack of clean drinking water, poor ecological conditions, poor hygiene practices and bad peridomestic sanitation are usual causes of cholera. The burden of diarrhoeal deaths has decreased over the past two decades from as high as 2.48 million deaths in 1990 to 1.44 million in 2010 i.e. 41.9% decrease in deaths. (2) This can be attributed to improvements in WASH. Today, 91% of the world's population have access to an improved drinking-water source, compared to just 76% in 1990. (3)

About 68% of the world's population have access to improved sanitation facilities including flush toilets and covered latrines, compared with 54% in 1990. The proportion of people practising open defecation is 13%. (4) Such improper faecal disposal leads to contamination of groundwater which can cause diarrhoeal outbreaks, especially in the absence of water filtration or purification. Diarrhoeal outbreaks are a key indicator of lack of socio-economic development like poverty, illiteracy, ignorance and poor personal hygiene. The problem is further confounded by improper, inadequate, irrational environmental management in providing safe drinking water and sanitary facilities, more so during disasters (drought and flood situation).

Aims & Objectives

1. To document the factors responsible for the outbreak
2. To provide recommendations for prevention and control of such outbreaks in future.

Material and Methods

Study design: A cross sectional study was conducted. ***Study area:*** A town in Bijapur district, Karnataka. ***Study duration:*** July 28th and July 29th 2012. ***Study population:*** 3802 people were interviewed using a Semistructured open ended epidemiological case sheet which we designed based on the preliminary enquiry with local health officials. After receiving verbal information from District office regarding outbreak of diarrhoeal disease in a town of Bijapur District, we constituted a rapid epidemiological investigation team in the department of Community Medicine. ***Data collection:*** After taking the required permissions we met the Medical officer in the Community Health Centre of the affected town. We collected information regarding:

Verification of diagnosis (both history of cases and lab investigations) from PHC.

Collected information regarding number of cases during the month of July of the preceding 3 years.

We collected area map of town Talikoti.

As per the signs and symptoms of the cases we suspected it to be diarrhoeal disease (cholera/gastroenteritis) as per Integrated Disease Surveillance Project case definition i.e. Acute watery diarrhoea, with or without vomiting in a patient aged 5 years or more. (5) We confirmed it to be an outbreak after comparing with the no. of cases in the last 3 years during the same period. We independently conducted house to house survey in the affected area and collected information regarding the number of people affected since the outbreak, their symptoms, treatment taken and demographic data. We also conducted environmental investigation regarding the source of contamination and collected 2 water samples, 1 each from a tank and a bore well. Samples were sent to the Microbiology department laboratory in our institution.

Statistical analysis: The distribution of cases was analysed using time, place and person characteristics. Analysis was done using SPSS version 16.

Results

A total of 121 cases were identified which were clustered around a newly dug borewell and unprotected tanks supplied by this borewell (Figure 1a & 1b). Index case was reported on 3rd July, 2012 Cases were clustered around five areas in the town namely, Kailashpet, Vodaraoni, Halegode, Kembavi oni, Jhede galli. Total population at risk in these five areas exposed to borewell water was 3802. A total of 3.18% of population were affected. Epidemic curve shows multiple peaks at various time intervals indicating multiple exposures (Graph 1). Majority cases (83%) had only diarrhea as the symptom while remaining 17% had diarrhea with vomiting

It was seen from Table 1 that of 121 cases, 49.5% were males and 50.5% were females. Most affected age group was between 15-34 years with 50 cases (41.32%). Thus the economically productive age group was more affected. In regards to socioeconomic status, 27% belonged to Class III (Modified B.G. Prasad classification), 62% Class IV, 11% Class V. None of the cases had any travel history outside the affected town.

It is observed from Table 2 that attack rate of cholera outbreak was 3.18%. Attack rate was highest (4.5%) in 25-34 years age group followed by 4.22% in 15-24 years age group. Attack rates was higher among females (3.4%) compared to males (2.9%).

Environmental assessment

Investigation regarding source of drinking water revealed that all the houses in these 5 lanes collected water from 2 recently constructed water tanks. These tanks received water from a recently dug bore well in the area which was less than 50 m from an open sewage drain. The height of the tank walls were about 3 feet. The tanks were neither covered nor had a tap connection. People collected water by dipping

their utensils in these tanks. Women washed clothes beside these tanks and water clogging was observed. No method of water filtration was used in any of these households.

Laboratory investigation

We collected only water samples from borewell as well as tank. These samples were sent to the Microbiology Department for examination. Report: Presumptive coliform count was 15 and 21 for the 2 samples. V. Cholera (Ogawa strain) was isolated from 1 sample (Tank water sample). Both water samples were not safe for consumption. The District administration had also conducted Laboratory investigation on water and stool samples. Vibrio cholera (Ogawa strain) was isolated from both samples.

Discussion

Cholera is an acute diarrhoeal infection caused by ingestion of food or water contaminated with the bacteria Vibrio cholera. The short incubation period of two hours to five days, enhances the potentially explosive pattern of outbreaks. The burden of cholera deaths has seen a significant decrease from 120.9 thousand deaths to 58 thousand deaths in 2010. (2) In 2011 alone, a total of 589,854 cases were notified from 58 countries, including 7816 deaths. (6) In India, epidemics of cholera are quite frequent. Epidemiologic studies have estimated that it is responsible for about 5-10% of all acute diarrheal cases. (7) The outbreak in Bijapur district reported an attack rate of 3.18%. Attack rate was highest in the 25-34 years age group at 4.5%. Attack rates was higher among females (3.4%) compared to males (2.9%). No fatalities occurred during this outbreak. This can be attributed to the prompt action taken by the local and district administration. The borewell was closed, halogen tablets were supplied to every household and drinking water was supplied from an outside source through water tankers. Cholera outbreaks are frequent in India owing to poor sanitation and hygiene. The outbreak investigated here had a very low attack rate compared to that in Punjab and Haryana states of northern India, during July–September 2007. 6 clusters of cholera outbreak were identified with an attack rate of 18.3% and case-fatality rate was 0.5%. V. CHOLERAE O1 Ogawa was confirmed from stool cultures. (8) In a village in Ambala district in August 2007, 488 cases were reported with an attack rate of 53%. Attack rate was higher among males (57.5%) compared to females (48%). (9)

According to WHO 2009 report from 42 countries, cholera was responsible for 2,21,226 cases, 4948 deaths with case fatality rate of 2.24%.(10) In India, in 2009 reported 3482 cases, 12 deaths with a case-fatality rate of 0.34%.(11) Globally in 2010, the number of deaths from cholera was 7543, an increase of 52% from 2009 figures. Overall CFR was 2.38%. Of the 32 countries that reported deaths from cholera, 20 were on the African continent: these countries accounted for 3397 deaths and 45% of the global total. An overall CFR of >1% was reported by 22/48 countries (46%) worldwide; 10 countries had a CFR <1%. (12)

During October 2010, first cases of Vibrio Cholerae were detected in Haiti. As of 31 December 2010, a total of 179379 cases, including 3990 deaths, had been registered. The CFR exceeded 30% in some remote rural areas where access to health services is limited. As of 3 July 2011, the outbreak was still continuing, and a total of 381236 cases, including 5609 deaths, had been registered in Haiti. (12)

Conclusion

The diarrhoea outbreak was confined to the population consuming water from a newly dug borewell in the area. Lack of planning by the local panchayat has resulted in the bore well-being located less than 50m from an open sewage drain. Presence of Coliforms in the water sample suggests faecal contamination from this sewage drain. Absence of water filtration and poor sanitation and hygiene had worsened the situation causing vomiting and diarrhea among the cases. Prompt actions by the local authorities have helped in containment of the outbreak.

Recommendation

The public should be alerted about the occurrence of diarrhea cases, signs and symptoms of cases, source of contamination, proper use of chlorine tablets supplied, use of ORS packets.

The contaminated borewell should be closed permanently. Safe, wholesome water should be supplied from another source using water tankers.

In future, proper planning must be undertaken by the local authorities while digging a new borewell. Sanitary conditions must be maintained in and around the borewell by prohibiting washing of cattle and clothes in the vicinity so as to prevent ground water contamination. Measures should be taken to

protect the tanks like keeping it covered, installation of taps and avoiding water stagnation around tank. Frequent water quality testing can be carried out.

Limitation of the study

Stool samples should have been tested to confirm V. Cholera cases but due to certain technical difficulties we were unable to do the same.

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Tables

TABLE 1 AGE WISE & SEX WISE DISTRIBUTION OF CASES (PERSON DISTRIBUTION)

Age	Male	Female	Total
0-4yrs	2	3	5
5-14 yrs	15	9	24
15-24 yrs	11	14	25
25-34 yrs	12	13	25
35-44 yrs	10	6	16
45-54 yrs	5	6	11
55-64 yrs	3	5	8
>65 yrs	2	5	7
Total	60	61	121

TABLE 2 ATTACK RATES OF CHOLERA BY AGE AND SEX

	Number of cases	Population	Incidence
Age (in yrs)			
0-4	05	407	1.22%
5-14	24	814	2.94%
15-24	25	592	4.22%
25-34	25	555	4.5%
35-44	16	518	3.08%
45-54	11	398	2.7%
55-64	08	296	2.7%
>65	07	222	3.1%
Sex			
Male	60	2020	2.9%
Female	61	1782	3.4%
Total	121	3802	3.18%

Figures

GRAPH 1 EPIDEMIC CURVE

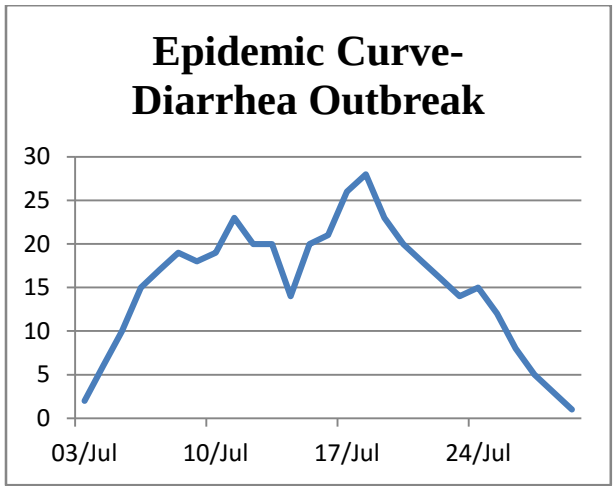

FIGURE 1(A) AREA MAP OF AFFECTED TOWN

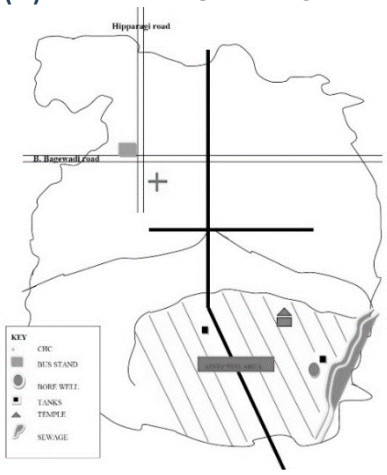

FIGURE 1(B) SPOT MAP SHOWING CHOLERA CASES (PLACE DISTRIBUTION)