Original Research Article

A massive Cholera Outbreak in Shaheed Benazir Abad, Sindh, Pakistan

Abstract

Background; On June 14, 2016, District Health Management Benazir Abad, notified 56 diarrhea cases to the Directorate General Health Office at Hyderabad. As a response, FELTP team was deputed to investigate the reports, evaluate the risk factors and recommend control measures.

Methods; Investigation was carried out from 15-19 June 2016. A case was any person presenting with 3 or more episodes of watery stools or vomiting in past 24 hours, with or without; fever, nausea, abdominal cramps, blood or mucous in stool from 11-19 June 2016. ~~Active case finding was conducted.~~ Descriptive followed by matched case control study was carried out. Pretested questionnaire was used to collect data. Environmental assessment was done. Stool samples were sent to National Institute of Health, Islamabad.

Results; Diarrhea cases identified were 132 and CFR 3%. Mean age was 18 years (range 1-60 years). Males were more affected n=73 (56%). Population of village was 3308 therefore overall attack rate was calculated to be 4%. Most affected group was 30-34 years with attack rate of 11% (22/206). Diarrhea n=132 (100%) and vomiting n=47 (45%) were commonest symptoms. Water source near the toilets ~~< less than 10 feet>~~ were seen in n=107 (81%) of cases and n=30 (22%) of controls (OR: 11, 95% CI: 6-20, p: <0.001). Eating from common plate was seen in n=92 (69%) of cases and n=32 (23%) of control (OR=7.3, 95% CI: 4.2-12.6, p<0.001). Vibrio Cholera was detected in 3 stool samples and 4 water samples revealed coliforms.

Conclusion; Diarrhea outbreak was likely due to contamination of drinking water by sewage waste due to close proximity of water and sewage sources. It is recommended that hand pump should be installed away from toilets.

Comment [91]: More than 6 years old report! !

Comment [92]: Abbreviation when used for first time should be spelled out!

Comment [93]: See previous comments regarding using Abbreviation!

Comment [94]: This can be explained in the methods

Comment [95]: Since this is a Case Control study you can said the following risk factors were identified ….

Comment [96]: Out of what?

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Introduction

Cholera is an infectious disease characterized by acute watery diarrhea, caused by Vibrio cholera serogroup O1 and O139 [1, 2]. The incubation period of cholera is short ranging 5 hours to 5 days. [3] Patient with cholera may develop watery diarrhea usually rice water stools, dehydration, abdominal pain and vomiting. The disease is very virulent

and can ~~kill patients within hours due~~ to renal failure, electrolyte imbalance, ~~and~~ coma and in severe cases deaths. The mode of transmission of cholera is fecal oral ~~route~~. The disease cannot spread by simple touch with the infected person, however the person who is infected can transmit the disease if he would prepare the food. Risk factors of cholera transmission are widely studied include the poor sanitation, open defecation, poor hygiene, seasonal variation with most common in dry seasons, natural disaster like floods, drought, cyclone, earthquakes and displacement of population causing overcrowding. [4]

World has seen six pandemic of cholera so far and seventh is in progress, which began in 1961 in Asia. The cholera is endemic in certain countries of this advance world which also includes the Pakistan. Globally 3 to 5 million cases of cholera cases occur worldwide.~~.~~ ~~Of~~ of which 100,000 to 120,000 reported deaths are attributed to cholera. [5] There is embargo from international partners and losses from tourism, therefore often cholera cases remain underreported from most of countries of world.

Among continent of world Asia is regarded as home of origin of cholera (Bay of Bengal, India). The disease is reported from all major countries of South Asia but it is more prevalent in Bangladesh. It is estimated that about 450,000 cases of cholera are reported in hospitals each year in Bangladesh and there are three contact traced cases probably residing in community to each hospitalized case, so it totals to 120,0000 cases each year in the country. [6] Moreover the country is very prone to natural disaster like drought, flood and cyclone therefore the outbreak are always being reported.

Comment [98]: can lead to ...

Pakistan is among the countries of world where cholera is endemic, before 1988 cholera was not considered a significant cause of diarrhea in Pakistan. But after the preceding years it emerged as major problem due to proper reporting. Despite the fact of virulence and outbreak potential cholera is always under reported due to passive surveillance system of reporting, poor data quality and lack of motivation among staff within the country. [7]

Comment [99]: Better to state the years!

On June 14, 2016, unusual increase in diarrhea cases reported by medical officer at Taluka Hospital Dolat pur SBA, ~~upon taking history attending physician noticed that all unusual increased number of diarrhea cases were being reporting~~ especially from village Laiq Rahoo, District Benazir Abad.

District Health Management Team Benazir Abad, notified the situation to the Directorate General Health Office (DGHSS) Hyderabad. In this regard, Provincial Disease Surveillance and Response Unit (PDSRU) @ DGHSS Hyderabad responded and nominated team (FELTP Fellows) to investigate the problem and control the situation in the affected village.

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The Outbreak

The unusual increase in acute watery diarrheal cases were seen in the village Laiq Rahoo Taluka Daulat Pur District Shaheed Benazir Abad in mid-June 2016. The index case in this outbreak was a boy of 6 years age named Naseebullah s/o Abdullah. On

extensive interview with the parents of index case the mother and father told that their son was alright on the morning of 11th June. He was playing in the street on the morning of 11th June 2016. After eating the lunch at about 12 pm, he developed the diarrhea on 3 pm of 11 June 2016. By very short time interval of 1 hours his condition worsen and he became lethargic. They sent them to nearby government hospital where they infused him ringer lactate and referred him to PUMHS Nawabshah for further management. His father was attending him in hospital. ~~They brought him to PUMHS Nawabshah where he was admitted~~. ~~On next day his father went back to home.~~ At home his father, sister and 3 more peoples in his family developed same sort of complaints. They were all sent to Daulatpoor taluka hospital and admitted for further management. Slowly the cases started to appear in the very next house ~~of Abdullah~~ and so forth in the village. There was not any travelling history found in index case and other family members of Naseebullah. There was not ~~any~~ mass gathering in the village in past two weeks. However the latrine pits were found open in the streets of index case home.

The villagers are relative to each other and have strong intermingling culture. They take their meals together at lunch and dinner. They share the food with each other regularly. They have no proper system of sanitation. The sewerage lines were open and pits were dug for the human wastes. The pits were found open in many places in the village.

The water resources are hand pumps. In some houses the hand pumps are located very near to latrines and its open pit. Some houses have implanted the motor machine for obtaining the water for their daily use. The motors are connected to a bore hole and extracting the water which is flown to house through PVC pipes. Pipe line of index case house was leaking at the point where it was crossing the latrine pit hole. When the

Comment [911]: Where? What about others who take the same lunch?

father of index was asked about the leakage of pipe he said it was alright a week ago when a tanker of mud has crossed the street, however he had no idea about any leakage. There was a rain fall in the village on the morning of 8th June 2016 followed by very hot and humid week. Our study was aimed to know ~~The~~ the ~~Magnitude~~ magnitude of diarrhea cases, to identify the ~~Risk~~ risk ~~Factors~~ factors associated with diarrhea cases and to implement control measures and make recommendations.

Methodology:

After reviewing literature on diarrhea, the control team PDSRU along with District Health Management Team (DHMT) Benazir Abad, planned to visit the affected village on June 15, 2016. Meeting sessions were conducted with community stakeholders and District administration to know epidemiological link to diarrhea cases.

Water samples~~,~~ and stool for D/R~~,~~ and culture has been collected and sent for laboratory diagnosis through the DHMT Benazir Abad. Five samples of fresh stool taken and sent to National Institute of Health (NIH) for culture and sensitivity. The water sample were sent to People's University of Medical and Health Sciences (PUMH) Nawabshah.

The case definition used was a~~A~~ny person of any age having episodes of loose motions > 3 times or v~~V~~omiting in 24 hours, associated with any of the following signs/symptoms Nausea, abdominal cramps, blood in stool, fever, mucous in stool, residing in village Laik Rahoo during the last 15 days.

During the active case search, House-~~-~~to-~~-~~House search have been carried out in the village to find out unreported diarrhea cases and information gathered on risk factors

Comment [912]: Outbreak investigation

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associated with diarrhea cases from head of the household by introducing the semi structured questionnaire. The adjoining villages were screened to find any unreported case. The index case was identified by the recall of the villager. The index case was a male baby of 6 years age. The questionnaire catered data on Socio-Demographic ~~information~~, ~~Clinical~~ clinical ~~Features~~ features ~~Information~~, ~~Risk~~ risk ~~Factors~~ factors~~information~~, ~~Personal~~ personal ~~Hygiene~~hygiene/~~Sanitation~~ sanitation status, ~~/~~ water resources, ~~with~~ storage, and water treatment practices. The risk factors evaluated were source of water, storage of drinking water, any treatment of drinking water prior to use, any travel history, any mass gathering within past one two weeks, habits of hand washing with presence of soap in the latrine.

Descriptive statistics were computed at end of each day of active case search. Time, place and person distribution, clinical spectrum, risk factors information and deaths were figured out in the form of percentages and numbers.

On dated 16 June 2016 a case control study was undertaken in the village. The 132 cases screened were taken as cases for study. The 134 controls were selected from the village Laiq Rahoo and adjoining villages. The control were taken in the ratio of 1; 1.

The inclusion criteria for control were having same sex, same age, not living in the same house as cases and having no diarrhea in past two weeks. The controls were interviewed using a pretested semi structured questionnaire. The data was taken on the risk factors like hand washing, boiling of water, source of water, distance between source of water and latrines etc. The hand washing habits were asked before eating and after using latrines. The responses were recorded as yes or no. The distance

between latrine and water sources were assessed using a feet meters. The distance ~~were~~was recorded numerically in feet. Source of water were found and boiling habits were recorded. ~~The odds ratio were calculated for distance between source of water and latrine, hand washing and eating from common plate. All the quantitative variable were reported on significance level of 95% and with p value less than 0.05.~~

~~All obtained data~~ Data was entered and analyzed by using the Epi-Info software, initial frequency measures have been calculated and reported on significance level of 95% and with p value less than 0.05. ~~at CI of 95%.~~ The odds ratio was calculated. All the quantitative variable were reported

Results

Total 132 diarrhea cases identified, of them initially 43% (n-=56) cases and 2% (n-=3) deaths were reported by DHMT Benazir Abad. During active case search 57% (n-=76) cases were recorded from the village.

Of them total 132 diarrhea cases 56% (n-=73) were ~~Males~~ males and 44% (n-=59) were ~~Females~~females. The age ranges from 3 Months to 60 Years with ~~mean age of 18 years and~~ median age of 11 years. The most common affected group was 6-15 years of age 32% (n-34).

Comment [916]: Abnormally distributed you can not use the mean

All the identified diarrhea cases have developed signs and symptoms like ~~Diarrhea~~ diarrhea 100% (n-=132), abdominal pain 35% (n-47), ~~Dehydration~~ dehydration 29% (n-

=39), ~~Vomiting~~ vomiting 13% (n-18), ~~Mucus~~ mucus in Stool 2% (n-=2) and ~~Blood~~ blood in Stool 2% (n-=3).

The hand washing habit was observed in 14% of cases (n=19), while all the households were throwing the house hold waste on daily basis 100% (n=132).

Most of the cases were farmers and daily wagers. The education level of cases or their caregiver were found to be very low. ~~The distance between the water source and latrine was recorded using a feet meter.~~ Among 132 households visited the distance between water source and latrine was less than 10 feet in 35% (n=47) and 45% (n=60) were houses in which the water source was equal to or more than 10 feet away from the latrine or its pit holes.

Overall attack rate was calculated to be 4%. ~~Total deaths observed during the outbreak were 3 out of 132 cases so case fatality rate was 3%.~~ The age specific attack rate showed that the most affected age group was 30 to 34 years with attack rate of 11%.

The odds of getting diarrhea in those peoples whose water sources were < 10 feet away from the latrine were 11 with confidence interval of 6-20 and p value < 0.0001 ~~as compared to those whose water sources were > 12 feet away from the latrines~~. Eating from common plate was seen in 69% (n=92) of cases and 23% (n-=32) of control (*OR=7.3, 95% CI: 4.2-12.6, p<0.001*). The odds of getting diarrhea in those peoples who were washing their hands after using latrine were 0.2 with confidence interval of 0.11-0.37 and p value < 0.0001 as compared to those who did not wash their hands. Five samples of fresh stool were taken from the cases, who had yet not taken antibiotics, for culture and sensitivity. The sample were sent to National Institute of

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Health at Islamabad. Two samples of water taken from the hand pumps where there was clustering of cases and sent to Peoples Medical University Hospital Laboratory for analysis. Three out of five stool sample confirmed the presence of Vibrio Cholera poly O1 Serotype inaba biotype E1 Tor. The water samples showed the high turbidity and presence of coliform colonies more than 5 miu/ml.

Comment [920]: All this, is a method not a result?!

Impact of the study;

The findings of the study were shared with the District Management Authority and Provincial official. District Management Authority supported in the repair of the leaking pipe lines of the water supply and installed new hand pumps away from the latrines. Provincial government approved a drainage system for the village Laiq Rahoo.

Discussion;

Our study was an outbreak response which had helped to contain the outbreak timely and effectively. The time lapse between reporting of the outbreak to Provincial Unit and response was less than 18 hours. Nevertheless previous studied had shown that the delays in an outbreak situation could generally happen especially in countries with weak system of the surveillance, notification and remoteness [8, 9].

The risk factor which were indulged to cause this outbreak and analyzed were globally accepted, however the factors were identified by screening the initial cases reported to district health facilities. Our study showed that the water contamination and poor hygienic practices were the cause of the cholera outbreak, the findings are consistent with other studies done in the country [10]. However, person to

person transmission had not been evident in our study as compared with the study done in the same setting outside Karachi by Siddiqui, Fahad J., et al in 2003 [11]. Social as well cultural practices are well studies as important cause of the cholera outbreaks. Most of the outbreak were reported in the setting of the emergencies like displacement and camps, as is shown in a study done in the country by Shah MA et al in 2010 [12] , but this outbreak was reported from the settled population. There was no any heavy raining and displacement observed prior to current cholera outbreak in the country. However, a previous study ~~published American Journal of Tropical Medicine and Hygiene in 2013~~ showed that the warm weather and human activities are also among the plausible risk factor for Cholera outbreak [13~~],]. this~~ This finding is consistent with our results.

With contrast to widely studied risk factor of cholera outbreak and transmission, such as raw food items, dried fish and un boiled water [14], our study showed that having the food form common plate and family type serving were also significantly associated with the cholera transmission. ~~Whereas our~~ Our finding of close proximity of water sources with the latrine as a risk factor for cholera outbreak ~~are~~ is consistent with the study done in Bangladesh in 2002[15]. One possible answer to this finding is that the water contamination is more vigorous inside the home as compared to the point from where it has been fetched [16].

As we have gathered data retrospectively and the index case was a child of six years age, the possibility of recall biases could never be ruled out. Due to cultural taboos of the village we had not been allowed to watch the food handling and preparation activities. As there was not any RDT/ Screening test available with us in

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the field for the proper identification of cases, so the selection bias especially for the diarrhea of Rota virus origin could also not be ruled out. The leakage of conduit of drinking water are common phenomenon in Pakistan. We have also noticed that the pipelines of the drinking water were leaking in most of houses, but it was beyond the capacity to check all the pipelines of the hand pumps in the village.

We have concluded that advocacy of communities on Health education and good food hygiene, basic hygienic behaviors, including the necessity of systematic hand-washing with soap after defecation and before handling food or eating, as well as safe preparation and conservation of food is needed. Water contamination risk need to be lowered and the health education system be strengthened.

Conclusions

The existing diarrhea outbreak occurred likely due to personal as well as environmental unhygienic conditions. Culprit Causative agent in this outbreak were identified to be Vibrio Cholera poly O1 Serotype inaba biotype E1 Tor.

Reference;

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