OUTBREAK INVESTIGATION OF TYPHOID FEVER IN VILLAGE KUWARDU, DISTRICT SKARDU, GILGIT-BLATISTAN (G-B), PAKISTAN

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Abstract

Background: On 8th may, 2012, civil dispensary Kuwardu village (5000 population) of district Skardu reported an unusual increase in number of cases with high grade fever, abdominal discomfort and anorexia. A team from health department was deputed to investigate the outbreak with the objectives to identify the associated risk factors and provide recommendations for control.

Methods: A Case was defined as a person living in village Kuwardu with fever $>38^{\circ}\text{C}$ and with one of these symptoms: abdominal discomfort, vomiting, diarrhea and positive Typhidot test (IgM) between 30 April - 27 May, 2012. Cases were enrolled through active case finding. Equal numbers of age and sex matched controls were enrolled from the neighborhood. Descriptive statistics, univariate and multivariate analysis was done. Qualitative assessment of the environment was also done.

Results: A total of 98 cases were identified in which 66% (n= 65) were female. Mean age was 32 years (12-65 years). Age group 21-30 years (n= 32, 32.7%) were the most affected group. Drinking water from the storage tanks (OR=16.6), living in the same house (OR=20.28) were associated with illness. Six water samples were tested and found unfit for human consumption. Multiple logistic regression shows association of household size (>5 person in room of house) (OR 7.46), typhoid patients handling and cooking food (OR=13.43) and drinking water from storage tank (OR 12.62) with disease.

Conclusion: Contamination of drinking water sources with human fecal matter was the most probable cause of this outbreak. Awareness campaign was initiated. The importance of hand-washing practices before cooking and after attending the toilet was highlighted. Developing toilets away from drinking water sources were advocated. Based on our recommendation Public Health Engineering Department has prioritized setting up treated water system and have sent request for funds allocation.

Keywords: High grade fever, waterborne, contamination, case control, typhidot, Gilgit-Baltistan

Introduction

Typhoid fever is a systematic infection effecting human populations around the world especially in developing countries caused by *Salmonella enteric* serotype typhi which remains a significant cause of morbidity and mortality. The most frequent sign/symptoms are malaise, fever, headache, abdominal discomfort (constipation or diarrhoea), transient rash, splenomegaly, hepatomegaly, slow heart rate, cough, vomiting, hypotension and leucopenia, the most common major complications are intestinal hemorrhage, and perforation (1)

Typhoid fever remains a major public health problem in the third world countries, especially in developing countries of Asia causing gastrointestinal tract infections and has significant effect in mortality and morbidity and is a major concern for human health concern. World Health Organization (WHO) in 2016, estimated incidence of 16-33 million typhoid fever cases with million deaths, the case fatality rate is 1.5 and 3.8% In Pakistan typhoid fever cases were reported from urban areas and there is very little information available about cases in a rural setting. Early surveillance, diagnosis and timely response on safe methods could greatly reduce the number of typhoid fever cases and its complications (2).

Many studies conducted in Pakistan all described a high incidence rate of typhoid fever among children as most of these studies were hospital based which does not accurately reflect the true status of typhoid fever in communities especially among low socioeconomic status where lack of basic facilities like safe drinking water and food is lacking and frequent small disease outbreaks are reported (3)

In the rural areas of Pakistan people consume drinking water mainly from ground wells and these water sources are not usually protected from contamination by human and animal excreta from outside and drinking water from these unsafe sources added with poor sanitary conditions largely contribute in increasing number of typhoid fever cases which claims more than 250,000 lives due to waterborne diseases each year and typhoid fever is the one of the leading cause of mortality due to contaminated drinking water (4)

Methodology

The study was carried out in village Kuwardu (with a population of 5000), district Skardu in Gilgit-Baltistan Pakistan. It is geographically located in Mountainous terrain and health care services to the residents of village Kuwardu are delivered through civil dispensary by the Government Health department.

Having an alert about increases number of patients with fever with abdominal pain, anorexia, vomiting and diarrhea or constipation with the suspicion of enteric fever in village Kuwardu on May 08, 2012 by the Medical officer in charge of civil dispensary, team headed by the principal investigator reached the place and started collecting data by active case finding in village. Information of cases was collected on age, gender, date of onset of illness, sign/symptoms, residence, and possible risk factors. Laboratory results of and rapid screening Typhidot test were reviewed at the dispensary and blood samples of other identified new suspected patients were collected for laboratory confirmation.

A Case was defined as any resident of village Kuwardu presented with fever $>38^{\circ}\text{C}$ with one of the following sign/symptoms; abdominal discomfort, vomiting, diarrhea and positive Typhidot test (IgM) between 30 April - 27 May, 2012.

This analytical case control study was undertaken on a sample ($n=98$) of village residents to test the significance of etiological hypotheses. One healthy individual free of sign/symptoms of typhoid fever was taken as control for each case was taken from same neighborhood. Data entry, cleaning and analysis was done using EpiInfo (version 7). Descriptive statistics, univariate and multivariate analysis was done. Six water samples were collected from different sites for laboratory analysis. Qualitative assessment of the environment was also done

Results

A total of 98 cases were identified, the first case was reported on 30 March, 2012 and the second cases linked with this outbreak was reported on 03 April and number cases started increasing gradually and maximum number of cases ($n=15$) on 15th April, cases started declining from 16th April and outbreak subsided gradually with the last case reported on 27th May, 2012 (Figure 1).

Figure 1: Epidemic curve showing the onset of outbreak, peak and the last reported case in Village Kuwardu during April-May, 2012
Among the cases 34% ($n=33$) were male and 66% ($n=65$) were females. Mean age was 32 years (range 12-65 years). The most affected age group was 21-30 years (attack rate 28%, $n=32$) followed by the age group 11-20 years (attack rate 22%, $n=20$) and age group 41-50 years (attack rate 20.3%, $n=15$). Females were more affected (attack rate 26%, $n=65$) compared to males (attack rate 14%, $n=33$). The overall attack rate was 19% ($n=98$) (Table 1).

Table 1: Descriptive analysis of typhoid cases and environmental investigation findings

Characteristic	Results
No. of Cases	98
Male Female Ratio	1:2
Mean Age	32 years
Range	12 - 65 years
Most affected age-group	21 - 30 years. Attack rate 28% ($n=29$)
Gender-wise attack rate	females 26% ($n=65$) Males 14% ($n=33$)
Over all attack rate	19% ($n=98$)
Water Samples	Unfit due to presence of coliforms Sample color was slightly turbid Each 500ml sample coliform count was 55-147 cfu/100ml
Environmental Assessment	<ul style="list-style-type: none"> No sewage disposal facilities available Waste and excreta thrown in the fields

Spot map shows the clustering of cases around the main source of drinking water as these inhabitants used to consume drinking water from these nearby water sources (Spot map).

Spot Map: Spot map showing clustering of cases around suspected source of drinking water contamination in Village Kuwardu

The most frequently reported sign/symptoms were; fever and headache 100%, anorexia 71%, abdominal pain 64%, vomiting 60% and myalgia 54%. Drinking water from the storage tanks (OR=16.6 CI 4.4-41.1, $p<0.05$), living in the same house (OR=20.28, CI 05-39, $p<0.05$) were associated with illness.

Multivariate analysis of suspected risk factors shows association of household size >5 person in room of house (OR 7.46, CI 03-25, $p<0.05$), typhoid patients handling and cooking food (OR=13.43, CI 8.45-39, $p<0.05$) and drinking water from storage tank (OR 12.62, CI 04-40, $p<0.05$) with disease while hand washing practices showed a preventive effect (OR 0.09, CI 0.02-0.09, $p<0.005$) (Table 2). Water samples were tested in laboratory and were found heavily contaminated with fecal coliforms (55-147 cfu/100ml).

Table No.2: Multivariate risk factors analysis

Exposure	Cases (n=98)	Controls (n=98)	Odds ratio (95% CI)	Adjusted OR (95% CI)
History of contact with a case	32 (32.65%)	21 (21.43%)	20.30 (4.6-39)	13.43 (8.45-39)
Consumption of water from reservoir	98 (100%)	12 (12.24%)	16.61 (4.44-41.09)	12.62 (4.01-39.72)
Household size (>5 persons in a room)	63 (%)	35 (%)	13.07 (1.54-16.12)	7.46 (2.76-25.02)
Hand washing practices (After defecation)	10 (10.20%)	69 (70.41)	0.047 (0.02-0.65)	0.0855 (0.02-0.09)

No proper water supply or sewage disposal facilities available in this village and contamination of the drinking water from the storage tank was the most probable cause of this outbreak. Water source secured at the place of contamination and chlorine Tablets were distributed. Awareness campaign was initiated.

The importance of hand-washing practices before cooking and after attending the toilet was highlighted. Developing toilets away from drinking water sources were advocated. Based on our recommendations, the Public Health Engineering Department has prioritized setting up treated water system and have sent request for funds allocation.

Discussion

The aim of this study was to investigate an outbreak of typhoid and subsequently devise a strategy to contain it in a rural far-flung area of Skardu, Gilgit-Baltistan in 2012.

In this study, it was found that due to unsecured supply of drinking water and subsequent unsafe storage of drinking water led to an escalation of typhoid cases of 98 in Kuwardu Village of approximate 5000 dwellers. Lack of awareness and close proximity in the vicinity of house-hold led to the spread of disease. Due to confinement of women, female gender was more affected and also the prone age group was between second and third decade. These findings are in conformity with other studies in which poor sanitation and contaminated water supply was reported to led to the outbreak of typhoid (5). In another study in Hyderabad Sindh Pakistan (6), contamination from sewage to drinking water due to close proximity in the house-hold was also reported. These findings are also in conformity with similar studies from neighboring India (7) and in Nepal (8) where they also reported a surge in typhoid cases due to mixing with sewage in communities. In Nepal they also reported an increase in number of persons in household and storage of water for long-period, findings similar to our results. Sequelae of symptoms were very typical reported in other studies (9, 10,11) elsewhere i.e. of fever, headache, anorexia, vomiting and anorexia.

Conclusion

Contamination of drinking water sources with human fecal matter was the most probable cause of this outbreak. Awareness campaign was

initiated. The importance of hand-washing practices before cooking and after attending the toilet was highlighted. Developing toilets away from drinking water sources were advocated. Based on our recommendation Public Health Engineering Department has prioritized setting up treated water system and have sent request for funds allocation.

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