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Identification of Risk Factors for Typhoid Fever in Children Admitted in a Tertiary Care Hospital

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Abstract

Enteric fever remains a major public health problem in developing countries like Bangladesh. Improvement in the health facility, vaccination, and health-related awareness program the incidence of enteric fever among children is not decreased. The study aimed to find out the risk factors for enteric fever in hospitalized children in a tertiary care hospital. Methodology: We conducted a hospital-based case-control study to identify the risk factors in children residing in Dhaka city. We enrolled 50 enteric fever cases as a case group and 50 age-matched febrile patients as a control group. Result: Out of 50 cases, 2 patients were below one year and most of them were pre-school aged 26(52%). Univariate analysis showed that enteric fever is more who take food with the help of the mother and caregiver (OR=7.1; 95% CI= 26.7 -61.3) and never or rarely wash hands before preparing food and before feeding (OR= 5.7; 95% CI= 23.2 -52.8). Cases were eating outdoors at the mobile food vendors and consuming ice-cream regularly (OR=2.28; 95% CI=1- 39) whereas the control group also took street food but less frequently. Conclusion: Enteric fever is an exclusive food and water-borne systemic disease and one of the major public health problems in Bangladesh. Not only overcrowding, unsafe drinking water are the common risk factors but also hand washing both children and caregiver, poor food habit is the important risk factors. So, health education to children and food handlers may reduce the incidence of enteric fever in children.

Keywords: Enteric Fever, Risk Factors, Children

Introduction

Enteric fever is an acute, life-threatening, febrile infection caused by *Salmonella enterica* serovar Typhi (Typhoid fever) and less commonly *Salmonella Paratyphi* A B & C (Paratyphoid fever). Enteric fever is a common health problem in many developing countries like Bangladesh. Globally it is estimated that 21.7 million typhoid cases and 5.4 million para-typhoid cases and more than 200000 deaths occur each year (Kliegman RM et.al., (2011). The age incidence of typhoid fever varies in different countries. The children and the adolescents' group in south East and central Asia and Sub-saharan Africa face the greatest burden of illness (Crump JA et.al.,2010; Mogasale V et.al.,2014; Laishram N et.al.,2016).Several studies from different parts of the endemic zone showed that a very high incidence of typhoid fever in the child group especially pre-school children (Ahmad KA et.al.,2000; Sinha A et.al.,1999).

In developing countries like Bangladesh, typhoid fever is around a year's problem and there are no seasonal variations (Rahman AKMM et.al. (2011). Some hospital-based studies showed that the rate of typhoid fever was 9-10% in Dhaka city (Afroz H et.al.,2014; Saha SK et.al.,2001). A community-based data on typhoid disease conducted by ICDDR,B, Dhaka indicates that for children less than 5 years the attack rate was 18.7 per 1000 per year which was 8.9 –fold increased rate in comparison to others (ICDDR,B : Publication. Incidence of Typhoid fever, Dhaka 2001, 2003).

Typhoid vaccination does not eliminate the risk of infection because it can prevent about 40-80% of diseases for the first two years (Milligan R et.al., 2018).

S. typhi or *Paratyphi* , a Gram-negative bacterium is human host-adapted and transmitted by the feco-oral route. It enters the body through ingestion of the organism. So, the risk is highest in overcrowded areas like semi-urban or slum areas due to unsafe water supply, defective sewerage system, and unhygienic food handling practice (Dewan A.M., et al.,2013; Rahman M et.al., 2007). On the other hand, in urban life the health-related behaviors, hygienic conditions, and other social trends are changing. But the incidence of typhoid fever is not significantly decreased rather increasing evidence of the emergence of multi-drug resistant typhoid fever (Akbar MS et.al., 1994; Ochai RLet.al., 2008). As typhoid fever is a food and water-borne disease, in pediatric cases, the food handlers play an important source of transmission (Usera MA et.al., 1993). A very important feature of enteric fever is the carrier state and asymptotically infected individuals who continue to shed *Salmonella* and thereby sustaining transmission (Parry CM et.al.,2002).

Taking all this into consideration the aim of our study to detect any change in risk factors or identify new modifiable risk factors for enteric fever in pediatric patients.

Methodology

It was a hospital-based case-control study done in the dept. of pediatrics in a tertiary care hospital in Dhaka city. Cases were the patients registered with typhoid fever and controls were the patients admitted with fever but diagnosed other than typhoid fever during the one year from May 2018 to April 2019. Both case and controls were age-matched, came from the same area, and belong to the middle socio-economic class.

Inclusion criteria

- Case: Febrile patients diagnosed as enteric fever either by positive blood culture for *Salmonella* or raising titer in serology.
- Control: Febrile patient with negative blood culture for *Salmonella*, normal serology, no evidence of raising titer and diagnosed other than typhoid fever.

Exclusion criteria

- Patients came outside Dhaka city.
- History of travel outside Dhaka within 4 weeks.

Data collection and analysis

Data were collected by a structured questionnaire describing demographics, socioeconomic conditions, individual personal and food hygiene practices. Both cases and controls were informed about their interviews.

Table 1: Example of the questionnaire

1. What kind of water is used for drinking? a. Supply water b. boiled water c. Filtered water
2. What kind of water use during bathing? a. Supply water b. Boiled water
3. What kind of water use during brushing? a. Supply water b. Boiled water
4. Do you take food by your hand or caregiver? a. Own hand b. caregiver
5. Do the food makers wash hands before preparing food? a. Always b. sometimes c. Never
6. Do you take street food (Fushka, ice-cream) 2 weeks before this illness? a. Yes b. no

Statistical analysis was done by using SPSS version 16. For univariate analysis, we evaluated the differences in risk factors between cases and controls by matched odds ratio (OR) and confidence limits.

Results

During this one-year study period, 50 typhoid fever patients and 50 age-matched control subjects were enrolled. Both cases and controls admitted in this hospital were living in Dhaka city and belong to the same (middle) socioeconomic background and they did not travel outside Dhaka within the last one month. Table 2 describes some characteristics of cases and controls showing the similarities between the two groups.

Table 2: describes the demographic characteristics of cases and controls

Variable	Cases (n=50)	Controls (n=50)
Age		
Infant	2(4%)	3(6%)
Pre-school	26(52%)	21(42%)
School going	22(44%)	26(52%)
Sex		
Male/Female	29/21	31/19

Out of 50 cases, 18 (36%) had positive blood culture for S typhi and 1 (2%) had Paratyphi A while 31 (62%) had a positive widal test.

In Table 3 univariate 1:1 matched analysis showed that there was no significant difference in water supply for drinking and brushing between cases and controls but most of the cases took their bath with supply water (OR=2.7); 95% CI= 5.4 to 42%. Most of the cases were took food with the help of caregivers (OR=7.1); 95% CI= 26.7 -61.3). Hand washing practice before preparing food of cases was worse than controls (OR= 5.7; 95% CI= 23.2 -52.8). Cases had consumed ice-cream and fuchka more often in the 2 weeks before they got ill (OR=2.28; 95% CI=1- 39).

Table 3: Univariate 1:1 matched analysis of risk factors of cases and controls

Variables	cases (%)	controls (%)	OR*	95% CI	Ape**
Drinking water					
Supply water	00(00)	00(00)			
Boiled water/Filtered water	50(100)	50(100)			
Water use during bathing					
Supply water	35	23	2.7	5.4 to 42%	63%
Boiled water	15	27	0.36		

Water use during brushing					
Supply water	16	15	1.09	-16.1 to 20.1%	8%
Boiled water	34	35	0.9		
Feeding practice					
By own hands	10	32	0.14		
Caregiver fed them	40	18	7.1	26.7 to 61.3%	85%
Hand washing before preparing food					
Always	9	28	0.17		
Sometimes/never	41	22	5.7	23.2 to 52.8%	82%
Eating fuchka/ice-cream					
No/Occasionally	23	33	0.43		
>1times/week	27	17	2.28	1 to 39%	56%

*ODDs ratio and 95% confidence interval

**Attributable Proportion in Exposed

Discussion

In our study 50 enteric fever were selected as a case group and 50 age-matched febrile patients were selected as the control group. Table 2 showed the demographic characteristics of both case and control groups. In the case group, the maximum number of patients was (52%) pre-school-aged. Sinha A et al(1999),Saha SK et al (2001) and ICDDR(2003) also found that children between 2-4 years of age are the most susceptible group. Out of 50 cases, 18(36%) patients were culture positive for Salmonella Typhi and 1 patient was positive S. Paratyphi.

Enteric fever is a food and water-borne disease and transmitted through the oro-fecal cycle. Some common risk factors like overcrowding, drinking water, sewerage system (Dewan A.M., et al.,2013; Rahman M et.al., 2007) were not significantly associated in this study.

Compared with the control's cases were more often taken food from outsides like fuchka, ice-cream, etc. Cases were consumed street food 2 weeks before the onset of enteric fever. We did not know the source of water used in ice factories or street foods. Possibly this was a potential risk factor for enteric fever. Our data were supported by other studies like in Pakistan (Luby SP et.al.,1998), Philippines (Tinaya-Superable JF et.al.,1995) and Indonesia. In this study, we found that the personal hygiene of cases was not good. Here both case and control groups used boiled water for drinking but for bathing and brushing with supply water. In the case of the group, the feeding practice was poor than the control group. In the case, group majority of children were taken food from the caregiver's hand. Here hands play an important role in transmission. Proper handwashing before preparing food or during feeding was very poor among this group. So inadequate hand hygiene practice of convalescent carriers may be a great problem (Rahman AKMM et.al., 2011; Usera MA et.al., 1993; Parry CM et.al.,2002) Due to ethical reasons we could not evaluate the carrier state of food handlers.

It is our observation that risk factors for enteric fever are similar to other studies done in some developing countries. But we found that the child who ate by his or herself were washed their hands properly with soap, but mother or caregiver were not washed hands properly even didn't wash hands because they were busy in multiple activities during food handling.

Conclusion

Enteric fever remains a major public health problem. A significant number of children need hospital admission and sometimes it is life-threatening. To improve awareness about healthy food practice and proper handwashing with soap and water both children and caregivers may reduce the incidence of Enteric fever among children.

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