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Modifiable Risk Factors and Complications of Enteric Fever in a Tertiary Care Hospital in Bangladesh

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Abstract: ***Background:*** Enteric fever, primarily caused by Salmonella Typhi and Paratyphi, remains a significant public health issue in Bangladesh. ***Objective:*** The study's objective was to identify modifiable risk factors for enteric fever and assess related complications in patients admitted to a tertiary hospital in Bangladesh. ***Methods:*** A cross-sectional study was conducted between January 2022 and January 2023, involving 200 patients diagnosed with enteric fever. Data on demographics, symptoms, diagnostic results, and complications were collected. Clinical investigations, including the Widal test and blood cultures, were used to assess risk factors and complications. ***Results:*** The majority of patients (52%) were aged 18-22, and 57% were female. Fever was observed in all cases, with common symptoms such as headache (94%), myalgia (84%), and constipation (57%). The Widal test was positive in 65% of cases, while blood cultures were positive in 18%. Key risk factors included contaminated food and water (72.5%), malnutrition (54.5%), and poor sanitation (42.5%). Complications were present in 39.5% of cases, with febrile seizures (20.25%) and enteric encephalopathy (12.66%) being the most frequent. ***Conclusion:*** Contaminated food and water, malnutrition, and poor sanitation are modifiable risk factors for enteric fever in Bangladesh.

Keywords: Salmonella Typhi Salmonella Paratyphi, Rose spots, Enteric hepatitis, Hematemesis and melena.

Original Research Article

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Article at a glance:

Study Purpose: *The aim of this study was to examine modifiable risk factors and evaluate complications associated with enteric fever in patients admitted to a tertiary care hospital in Bangladesh.*

Key findings: *The most significant risk factors for enteric fever were contaminated food and water (72.5%), malnutrition (54.5%), and poor sanitation (42.5%). Common complications included febrile fits (20.25%), enteric encephalopathy (12.66%), and pneumonia (11.39%).*

Newer findings: *The study emphasizes the urgent need for public health measures aimed at enhancing hygiene practices, providing access to clean water, and encouraging safe food handling to lower the occurrence of enteric fever and its associated complications.*

Abbreviations: *Widal Test: A serological test for enteric fever, C/S: Culture and Sensitivity, UTI: Urinary Tract Infection.*

INTRODUCTION

Enteric fever encompasses both typhoid and paratyphoid fevers, which are systemic infections caused by bacteria from the *Salmonella* genus. While these diseases have some similarities, they also exhibit notable differences. Typhoid fever is mainly caused by *Salmonella enterica* serotype Typhi, whereas paratyphoid fever is triggered by *Salmonella enterica* serotypes Paratyphi A, B, and C. Typhoid fever is a systemic illness characterized by fever and caused by *Salmonella enterica* serovar Typhi. It leads to countless infections and a

substantial number of deaths worldwide each year. In regions of Asia and sub-Saharan Africa where typhoid is prevalent, there have been significant outbreaks of Typhi strains that are resistant to multiple antimicrobials.[1] A closely related, yet frequently less intense illness is caused by S paratyphi A, B, and occasionally C. S typhi, a pathogen specialized for humans that emerged approximately 50,000 years ago.[2]

The clinical features of paratyphoid fever closely resemble those of typhoid fever, although they tend to be less severe and have a shorter incubation period.[3] Although typhoid fever has been successfully eradicated in wealthier nations due to advanced sanitation and clean water, it remains a major public health concern in numerous low- and middle-income countries globally.[4,5] Transmission commonly occurs through the fecal-oral route, typically when a person consumes food or water that has been contaminated.[6] S. Typhi typically enters the gastrointestinal tract and then spreads to cause a systemic infection.[7] In low-income countries, disease transmission often occurs through contaminated food and water systems, resulting in a significant burden of illness.[8]

S. Typhi typically infiltrates the gastrointestinal tract and then advances to a systemic infection. Three Past studies have associated the risk of infection with various factors, including exposure to contaminated water, insufficient waste management, unsanitary conditions, and living in urban slums.[9] A bone marrow culture is considered the most reliable method for diagnosing typhoid fever. This modality is extremely sensitive, but it is invasive and technically unfeasible in most settings.[10] Therefore, the diagnosis of this disease is commonly made using the blood culture method, which is considered more practical. However, it should be noted that this method has a limited sensitivity of 40-60% and faces difficulties in achieving contamination-free blood culturing in low- and middle-income countries (LMIC) settings.[11,12]

OBJECTIVE

To identify modifiable risk factors for Enteric fever in Bangladesh.

To evaluate the spectrum of complications associated with Enteric fever in Bangladesh

METHODOLOGY

Study Design

This cross-sectional study was conducted in a medicine ward at a tertiary medical college hospital. The study was conducted from January 2022 to January 2023. During this period, a total of 200 cases were admitted to the medicine ward with Enteric fever and met the eligibility criteria.

Sample size

The total sample size was 200**.**

Sampling technique

Purposive sampling.

Inclusion Criteria

18 years or older with probable enteric fever.

Exclusion criteria

Individuals with concurrent infections or medical conditions that may confound the analysis of modifiable risk factors and complications specifically related to enteric fever.
Patients lacking complete medical documentation.

Data collection and analysis

To confirm the presence of typhoid or paratyphoid fever, it is necessary to isolate the bacteria S typhi or S paratyphi from samples such as blood, bone marrow, stool, or duodenal fluid. Various cultures have been treated with streptokinase, including those derived from the skin above rose spots, buffy coats, and blood clots.[13-16] The checklist consists of four distinct components. The first section consisted of demographic data, encompassing age, gender, educational history, and occupation. The second section focuses on the common presenting features and includes information about diagnostic investigations. Within our study cases, the third segment comprises the modifiable risk factors associated with enteric fever. The fourth segment of the discussion highlights the frequencies of complications observed in the research cases, specifically focusing on the consequences of Enteric fever. The data was inputted into SPSS 23. The significance criterion was established at a threshold of 0.05.

RESULTS

Table 1 shows that the majority of the 104 cases (52%) fell within the 18-22 age range. There were 33 cases (16.5%) in the 28-32 age range, 27 cases (13.5%) in the 23-27 age range, 21 cases (10.5%) over the age of 37, and only 15 cases (7.5%) in the 33-37 age range. 114 cases (57%) were female, while the remaining 86 cases (43%) were male. The majority of the cases, 86 in total, crossed the secondary level, accounting for 43% of the total. Following that, 72 cases, or 36%, crossed the primary level. There were 25 cases, or 12.5%, that were graduate level, and the remaining 17 cases, or 8.5%, were postgraduate. 147 cases (73.5%) were students by profession. There were 25 cases of service providers (12.5%), 15 cases of businessmen (7.5%), and 13 cases of people in other sectors (6.5%).

Table 1: Baseline profiles of the study cases (n=200)

Socio-demographic factors	Frequency	Percentage (%)
Age		
18-22	104	52
23-27	27	13.5
28-32	33	16.5
33-37	15	7.5
>37	21	10.5
Sex		
Male	86	43
Female	114	57
Educational background		
Primary	72	36
Secondary	86	43
Graduate	25	12.5
Post Graduate	17	8.5
Occupation		
Student	147	73.5
Service holder	25	12.5
Businessmen	15	7.5
Others	13	6.5

Table 2 provides an overview of the common presenting features. In all 200 cases, fever was present in every single one. Headache was reported in 188 cases (94%), myalgia in 168 cases (84%), constipation in 114 cases (57%), abdominal pain in 47 cases (23.5%), abdominal distension in 43 cases (21.5%), rose spots on the trunks in 32 cases (16%), cough in 29 cases (14.5%), and disorientation in only 13 cases (6.5%).

Table 2: Common presenting features of our study cases(n=200)

Presenting features	Frequency	Percentage
Fever	200	100
Constipation	114	57
Abdominal Pain	47	23.5
Abdominal distension	43	21.5
Cough	29	14.5
Myalgia	168	84
Headache	188	94
Disorientation	13	6.5
Rose Spots	32	16

Figure 1 shows that the majority of the 130 cases (65%) tested positive in their Widal test. Out of the total cases, 36 (18%) tested positive for Blood for C/S. Additionally, in 34 cases (17%), both Blood for C/S and Widal test were positive.

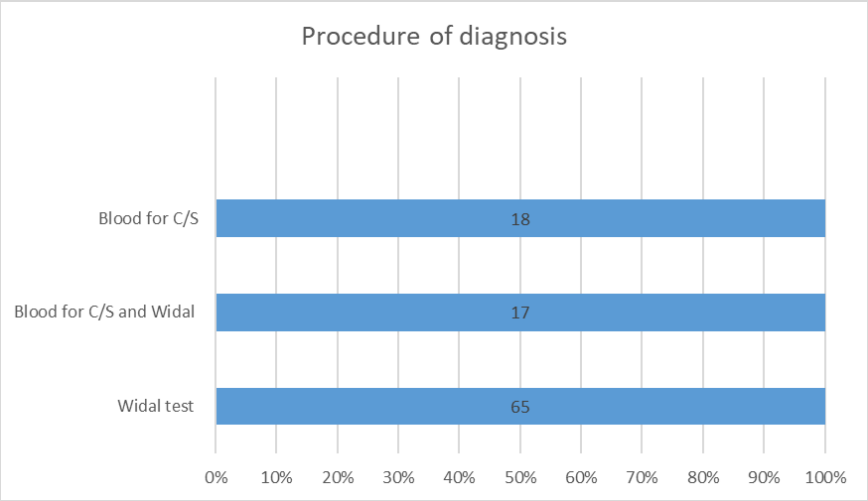

Figure 1: Diagnostic investigations of our study cases (n=200)

Table 3 includes enrolled modifiable risk factors. Among all the cases, 145 (72.5%) showed proof of eating food and water that was contaminated. Furthermore, a substantial proportion of cases, precisely 109, accounting for 54.5% of the overall total, were diagnosed with malnutrition. Furthermore, out of the total number of cases, 85 instances, making up 42.5%, were discovered in densely crowded living conditions, while 43 cases (21.5%) were attributed to insufficient sanitation and hygiene measures.

Table 3: Modifiable risk factors of our study cases (n=200)

Modifiable Risk factors	Frequency	Percentage
Contaminated Food and Water	145	72.5
Poor Sanitation and Hygiene	43	21.5
Crowded Living Conditions	85	42.5
Malnutrition	109	54.5

Figure 2 provides information on the frequencies of complications. The majority of cases, 121 (60.5%), were uncomplicated, while the remaining 79 cases (39.5%) experienced complications.

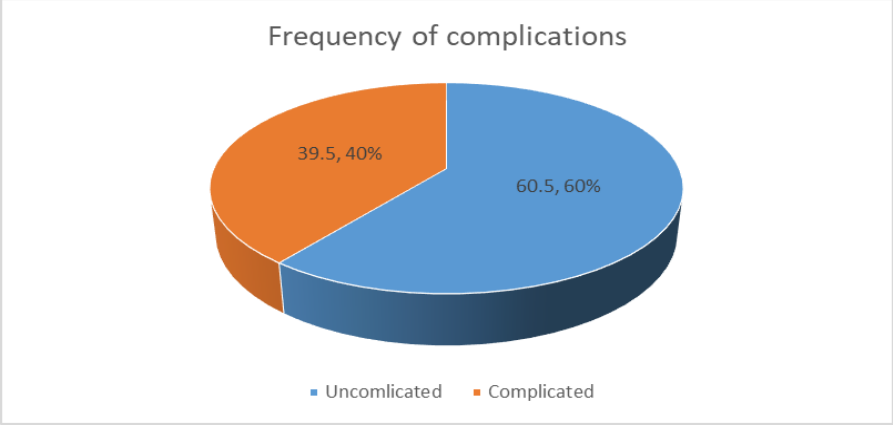

Figure 2: Frequencies of complications of the study cases (n=200)

Table 4 provides a comprehensive list of the typical complications associated with Enteric fever. A range of symptoms were observed in the majority of cases, with febrile fits being the most common (20.25%). Other symptoms included hematemesis and melena in 12 cases (15.19%), enteric encephalopathy in 10 cases (12.66%), enteric hepatitis in another 10 cases (12.66%), pneumonia in 9 cases (11.39%), UTI in 8 cases (10.13%), peritonitis and Cholecystitis in 5 cases (6.33%), acute cerebellar ataxia in 2 cases (2.53%), and ascites in 2 cases (2.53%). There were no instances of dysphasia or intestinal perforation.

Table 4: Complications of Enteric fever in our study cases

Complications	Frequency	Percentage
Febrile fits	16	20.25
Melena & Hematemesis	12	15.19
Enteric Encephalopathy	10	12.66
Enteric hepatitis	10	12.66
Pneumonia	9	11.39
UTI	8	10.13
Peritonitis	5	6.33
Cholecystitis	5	6.33
Ascites	2	2.53
Dysphasia	0	0
Intestinal Perforation	0	0
Acute cerebellar ataxia	2	2.53

DISCUSSION

Our research findings indicate that a significant proportion of the 104 cases (52%) were observed among individuals aged 18-22. There were 33 cases (16.5%) in the age range of 28-32, 27 cases (13.5%) in the age range of 23-27, 21 cases (10.5%) in individuals over the age of 37, and only 15 cases (7.5%) in the age range of 33-37. Another study found that a majority of patients (55.8%) were under the age of 30, which is consistent with our findings.[17] Out of the total number of cases, 57% were female and 43% were male. Out of the total number of cases, 86 of them were at the secondary level, making up 43% of the total. Additionally, 72 cases, which account for 36% of the total, surpassed the primary level. Out of the total number of cases, 25 were at the graduate level, accounting for 12.5%, while the remaining 17 cases were classified as postgraduate, making up 8.5%. In our study,147 cases were students (73.5%). There were 25 cases were service holders, accounting for 12.5% of the total. Additionally, there were 15 cases of businessmen, making up 7.5% of the total. The remaining 13 cases were involved in various other occupations, representing 6.5% of the total. Fever was present in every single one of the 200 cases. Headache was reported in 188 cases, myalgia in 168 cases, constipation in 114 cases, abdominal pain in 47 cases, abdominal distension in 43 cases, rose spots on the trunks in 32 cases, cough in 29 cases, and disorientation in only 13 cases.

In a similar study, fever and headache were the common clinical presentations. [18] Our research findings indicate that a significant proportion of the 130 cases (65%) yielded positive results in their Widal test. Among all the cases, 36 individuals (18%) tested positive for Blood for C/S. In 34 cases (17%), both the Blood for C/S and the Widal test yielded positive results, which aligns with findings from a study conducted in Bangladesh.[19] Among all the cases, 145 (72.5%) showed proof of eating food and water that was contaminated. Furthermore, a substantial proportion of cases, precisely 109, accounting for 54.5% of the overall total, were diagnosed with malnutrition. Furthermore, out of the total number of cases, 85 instances, making up 42.5%, were discovered in densely crowded living conditions, while 43 cases (21.5%) were attributed to insufficient sanitation and hygiene measures. Another study conducted in Bangladesh found that using contaminated water was identified as a significant risk factor, which is consistent with our findings. [20]

Our study presents data on the occurrence of complications. Out of the total cases, 121 (60.5%) were categorized as uncomplicated, while the remaining 79 cases (39.5%) encountered complications. In a separate study, the complication rate is similar to our study. [21] A range of symptoms were observed in the majority of cases, with febrile fits being the most common (20.25%). Other symptoms included hematemesis and melena in 12 cases (15.19%), enteric encephalopathy in 10 cases (12.66%), enteric hepatitis in another 10 cases (12.66%), pneumonia in 9 cases (11.39%), UTI in 8 cases (10.13%), peritonitis and Cholecystitis in 5 cases (6.33%), acute cerebellar ataxia in 2 cases, and ascites in 2 cases (2.53%). There were no instances of dysphasia or intestinal perforation. In a different study conducted in India, the rate of encephalopathy was higher (18%) compared to our study. However, the rates of hematemesis, melena, and hepatitis align with our findings. [22-28]

CONCLUSION

This study aims to gather important data on the modifiable risk factors and complications associated with enteric fever in a tertiary care hospital in Bangladesh. The results can provide valuable insights for public health strategies and enhance clinical management practices to optimize patient outcomes. The identification of contaminated food and water, malnutrition, and poor sanitation as significant modifiable risk factors has been established. The findings highlight the importance of implementing public health interventions that prioritize enhancing hygiene practices, guaranteeing access to clean water, and advocating for proper food handling. The observed complications, such as febrile fits, enteric encephalopathy, hepatitis, and pneumonia, highlight the potential seriousness of enteric fever. Timely identification and intervention play a vital role in mitigating potential complications and enhancing patient outcomes.

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