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Original Research Article

Demographic Study on Enteric Fever: A Single Centre Experiences

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Abstract

Background: Typhoid fever, caused by *Salmonella typhi* and *Salmonella paratyphi*, infects various organs after entering the bloodstream. It typically presents with headache, fever, splenomegaly, abdominal pain, and leucopenia, among other symptoms. Globally, it affects 11-21 million people annually, causing 120,000-160,000 deaths, with Southeast Asia being the most impacted region. Improved water, sanitation, and hygiene (WASH) practices are crucial for prevention, alongside targeted public health strategies in endemic regions like Bangladesh. ***Aim of the study:*** The study aims to identify demographic risk factors associated with typhoid fever in Bangladesh. ***Methods:*** This cross-sectional observational study was conducted at the Department of Medicine, North Bengal Medical College Hospital, Sirajganj, Bangladesh, over 12 months. We included 72 patients presenting with fever, headache, and abdominal pain, with positive blood culture reports for Salmonella typhi and Salmonella paratyphi, aged 18 years and above, who provided informed consent. Excluded were patients on antibiotics and those with multiple blood culture samples. A short questionnaire, validated through a pilot study, captured demographic and clinical data. ***Result:*** Mostly 76.39% of participants were aged 18-45. Males comprised 58.33% of participants, and females 41.67%. Occupationally, 48.61% were civil servants, 16.67% housewives, 13.89% students, 12.50% businessmen, and 8.33% farmers. Socio-economically, 16.67% were upper class, 37.50% middle class, and 45.83% lower class. Urban residents made up 40.28% and rural residents 59.72%. All participants had a fever, with other symptoms including headache (69.44%), abdominal pain (48.61%), vomiting (20.83%), coated tongue (27.78%), and constipation (61.11%). ***Conclusion:*** This study examines factors influencing enteric fever in Bangladesh, noting higher prevalence among males aged 18-45 due to occupational risks. Lower socio-economic status and rural living also increase risk, highlighting healthcare disparities. Common symptoms included fever, headache, and abdominal pain. Improving sanitation and targeting high-risk groups can reduce incidence.

Keywords: *Salmonella typhi*, *Salmonella paratyphi*, demography, enteric fever.

INTRODUCTION

Enteric or typhoid fever is caused by the bacteria Salmonella typhi (S. typhi) and Salmonella paratyphi [1]. This bacterium invades various organs and causes symptoms once it enters the bloodstream. It travels to the intestinal tract and is expelled in the feces of an infected person, making stool cultures useful for diagnosis. Symptoms typically appear one to two weeks after infection and can persist for four to six weeks. These symptoms include headache, fever, splenomegaly, abdominal pain, relative bradycardia, and leucopenia. Patients may also experience generalized body aches, constipation, diarrhea, and poor appetite, and, if untreated, the condition can lead to intestinal perforation or bleeding. The reasons for the variability in disease severity are unclear but might be linked to differences in healthcare facilities, host immune responses, and genetic factors in the strains of Salmonella species [2,3]. It is estimated that between 11 and 21 million cases of typhoid fever occur globally each year, resulting in 120,000 to 160,000 deaths [4]. In the past, the fatality rate was higher, with approximately 16 million cases of typhoid fever and 600,000 deaths [5]. Southeast Asia accounts for more than 93% of all typhoid fever cases globally, particularly in regions with high population density and limited access to clean water, including certain areas of South and Central America, India, and

Africa [6,7]. Bangladesh is significantly affected by typhoid, with an incidence rate of 252 cases per 100,000 people each year. Children, particularly those under five and those with compromised immune systems, are especially vulnerable [8]. Typhoid fever, a longstanding disease, was a major cause of death before the advent of antibiotics. While not perfect, vaccines for typhoid fever have been available since 1896 [9]. However, advancements in these vaccines were hindered by the availability of antibiotics. Meanwhile, multidrug-resistant strains of S. Typhi and S. Paratyphi are becoming more prevalent, making antibiotics less reliable for treating enteric fever [10]. In general, the disease presents a pressing threat of widespread infections that could be as devastating as those experienced in the pre-antibiotic era. Given the fecal-oral transmission of S. Typhi and S. Paratyphi, enhancing water, sanitation, and hygiene (WASH) practices can help prevent the spread of these pathogens. Alongside WASH improvements, factors such as socioeconomic status, environmental conditions, and the consumption of contaminated foods are also recognized as risk factors for contracting typhoid fever [11]. Various climate factors, including elevated rainfall, river levels, and temperature, have been observed to contribute to the increased distribution of typhoid fever, particularly in regions like Bangladesh [12]. This exerts significant pressure on water, sanitation, and hygiene infrastructures, as issues like drain blockage and inadequate wastewater drainage result in the contamination of shallow water sources. These sources are often relied upon during droughts, especially by individuals residing in rural areas or slums [8]. In highly endemic regions like Bangladesh, documenting specific risk factors for typhoid fever enables scientists and public health professionals to devise evidence-based prevention strategies. To complement our investigation into the burden of illness, we conducted a case-control study aimed at identifying demographic risk factors associated with typhoid fever in Bangladesh.

METHODOLOGY & MATERIALS

This cross-sectional observational study was carried out at the Department of Medicine, North Bengal Medical College Hospital in Sirajganj, Bangladesh, over 12 months from July 2022 to June 2023. During this time, 72 patients presenting with symptoms of fever, headache, and abdominal pain were admitted to both outpatient and inpatient units.

Inclusion criteria:

- Patients with positive blood culture reports (including both Salmonella typhi and Salmonella paratyphi).
- Patients aged 18 years and above.
- Patients who gave informed consent.

Exclusion criteria:

- Patients who are currently on antibiotics and those who have provided multiple blood culture samples.

A short questionnaire was developed and tested through a pilot study. The questionnaire included variables such as age, gender, marital status, occupation, seasonal variation, drinking water treatment, and clinical features. Participants' blood samples were collected for blood culture analysis. All typhoid isolates underwent antimicrobial susceptibility testing and were archived for future genomic characterization. Other significant culture isolates, including S. Paratyphi, were also documented.

Data analysis was performed using IBM SPSS Statistics for Windows, Version 26.0. Frequencies and percentages were reported for the variables, and Chi-square analyses were conducted to examine the association between blood culture positivity and the various variables.

RESULT

The majority of participants (76.39%) in this observation were between 18 and 45 years old. Those aged 46 to 75 years accounted for 20.83%, and the smallest group, those over 75 years old, represented 2.78% of the participants (Table 1). Among the participants, more than half were male (58.33%), while the remaining were female (41.67%) (Figure 1). Table 2 shows the occupational status of the study population. Civil servants constitute the largest group at 48.61%, followed by housewives at 16.67%. Students make up 13.89%, while 12.50% were businessman and 8.33% were farmers. Out of 72 patients, 12(16.67%) people belonged to the upper socio-economic level, 27(37.50%) were in the middle socio-economic level, and 33(45.83%) fell into the lower socio-economic level (Table 3). The living area distribution reveals that 40.28% (n=29) reside in urban areas, whereas 59.72% (n=43) live in rural areas (Table 4). According to our study, all the study people had fever. Other signs and symptoms experienced by participants included headache (69.44%), abdominal pain (48.61%), vomiting (20.83%), coated tongue (27.78%), and constipation (61.11%) (Figure 2).

Table 1: Age distribution of the study population (N=72)

Age (In years)	Frequency (n)	Percentage (%)
18-45	55	76.39
46-75	15	20.83
>75	2	2.78
Total	72	100.00

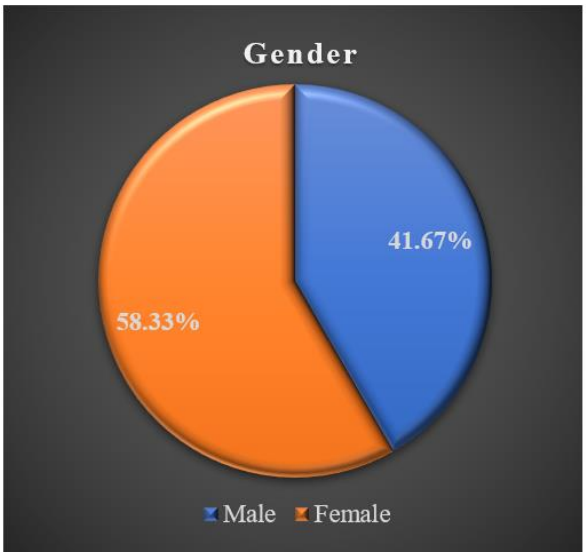

Figure 1: Gender distribution of the study population (N=72)

Table 2: Occupational status

Occupation	Frequency (n)	Percentage (%)
Civil Servants	35	48.61
Farmers	6	8.33
Businessman	9	12.50
Students	10	13.89
House wives	12	16.67
Total	72	100.00

Table 3: Socio-economic condition

Socio-economic level	Frequency (n)	Percentage (%)
Upper	12	16.67
Middle	27	37.50
Lower	33	45.83

Table 4: Living area

Are	Frequency (n)	Percentage (%)
Urban	29	40.28
Rural	43	59.72

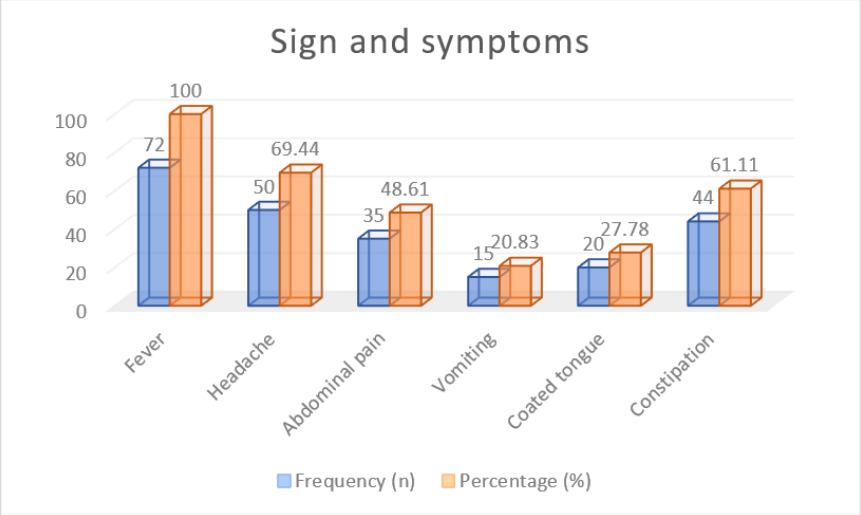

Figure-2: Signs and symptoms of the study population

DISCUSSION

The demographic study on enteric fever provided valuable insights into various aspects of the population affected by this infectious disease. By examining demographic characteristics involving occupational status, socio-economic condition, living area, and signs and symptoms, the study aimed to enhance our understanding of the profile of individuals affected by enteric fever and demographic risk factors. Age distribution analysis revealed a predominant representation of adult individuals, particularly those between 18 and 45 years old, while the least positive result was found in the age group of 75 and above. This observation may be attributed to the lax attitudes towards hygiene and dietary habits often seen in young adults of this age range. This corresponds with the results of a study by Esohe *et al.,* which found that 66 out of 173 patients diagnosed with typhoid fever fell within the age of 26 to 35 years [13]. Older adults are likely more responsive to maintaining sanitary conditions in their food preparation and consumption practices and may have a relatively stronger immune response due to regular immune system stimulation [14]. In terms of gender, males were observed to be more significantly affected than females, possibly attributed to their role as the primary earners in the family, often spending considerable time outside the home and thus more likely to consume food from sources outside the home environment. A study conducted in an Asian country reported that approximately 9.1% of food handlers tested positive for Salmonella [15]. The findings of several studies is comparable with our results [2,3,16]. According to our study, the impact of occupation on the prevalence of typhoid fever, revealing that civil servants have the highest rate of enteric fever positivity at 48.61%. This high occurrence among civil servants can be linked to their lifestyle habits, as many frequently eat lunch at nearby eateries or purchase food from street vendors, which often lack proper hygiene standards. While individuals in other occupations also engage in these practices, the prevalence appears particularly high among students as well. Similarly, a study conducted by Ajayi *et al.,* identified civil servants as having the second-highest rate of positive blood cultures for typhoid fever. This finding was also linked to their lifestyle habits, with civil servants identified as the most susceptible occupation, experiencing a 41.2% occurrence rate [17]. Another study conducted by Ozougwu (2018) found a similar result [18]. Socio-economic status analysis indicated a significant portion of the population falling into the lower socio-economic level, reflecting the socio-economic disparities that may influence access to healthcare and sanitation facilities, thereby impacting the prevalence of enteric fever. Additionally, a higher proportion of participants of our study reside in rural areas compared to urban areas. Our findings are consistent with the results of another related study [19]. Clinical presentations of enteric fever are nonspecific classical step ladder pattern of fever is not commonly found in all patient groups. Different clinical manifestations among the patients were seen in this present observation. Fever was the most constant symptom representing 72 (100%), headache was present in 50 (69.44%), abdominal pain in 35 (48.61%), vomiting in 15 (20.83%), coated tongue in 20 (27.78%), and constipation was seen in 44 (61.11%) cases. Our findings were comparable with the observation of Bienvenido *et al.,* in which fever was the most constant symptom, headaches and chills were present in 63%, abdominal pain in 48%, anorexia in 44%, malaise in 33%, vomiting in 31% and diarrhoea in 49%. Constipation and nausea were seen in 12% and disorientation in 3% of patients [20]. By this study, population at-risk cases were identified. The number of typhoid fever cases can be reduced by targeting vulnerable populations.

Limitations of the study: Every hospital-based study has its limitations, and this one is no different. This study has several limitations. The small sample size of 72 patients limits the generalizability of the findings. Additionally, the cross-sectional design only provides a snapshot in time, hindering the ability to infer causality between demographic factors and enteric fever incidence.

CONCLUSION AND RECOMMENDATIONS

This study highlights the demographic factors influencing the prevalence of enteric fever in Bangladesh. Adults aged 18-45, particularly males, were predominantly affected, likely due to occupational and lifestyle habits that exposed them to contaminated food sources. Lower socio-economic status and rural residency were significant risk factors, reflecting disparities in healthcare access and sanitation. Fever was the most consistent symptom, with headache and abdominal pain also common. Enhancing sanitation, promoting hygiene, and focusing on high-risk groups can effectively reduce the incidence of enteric fever.

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Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

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