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ANTIBIOTIC SUSCEPTIBILITY PATTERN OF ENTERIC FEVER AND ITS OUTCOME AMONG CHILDREN ADMITTED IN A TERTIARY CARE HOSPITAL IN DHAKA

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ABSTRACT

Background: Enteric fever remains a major health threat for the general population in Bangladesh, particularly among children, as they may be subject to poor sanitation and rising antimicrobial resistance (AMR). Increasing multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains of *Salmonella enterica* serovars typhi and Paratyphi have complicated empirical treatment strategies. **Aim:** To evaluate the patterns of sensitivity to antibiotics and symptom presentations of pediatric enteric fever cases in a tertiary care hospital in Dhaka. **Materials and Method:** This cross-sectional study was performed from July 2024 to July 2025 among 110 children (aged 0–18 years) admitted with blood culture–confirmed enteric fever. Demographic data, clinical symptoms, and antibiotic susceptibility profiles of *Salmonellatyphi* and *Salmonella Paratyphi* isolates were recorded and analyzed using descriptive statistics. **Results:** Most patients (59.09%) were between 6–9 years, with a mean age of 9.4 ± 3.76 years. Coated tongue (59.09%) and organomegaly (36.36%) were the most frequent clinical signs. Among *S. typhi*isolates, sensitivity was highest for ceftriaxone (100%), followed by meropenem (90.0%) and azithromycin (90.0%). Resistance was highest to amoxicillin (54.6%), nalidixic acid (52.1%), and ofloxacin (45.0%). *S. Paratyphi* showed complete sensitivity to ceftriaxone and high sensitivity to cefixime (98.0%) and meropenem (95.0%), but demonstrated resistance that was high against nalidixic acid (82.8%) and azithromycin (34.0%). **Conclusion:** Raised rates of resistance to commonly used antibiotics among *Salmonellatyphi* and *Salmonella paratyphi* emphasize the urgent need for routine antimicrobial surveillance, stricter antibiotic stewardship, and updated treatment guidelines to ensure effective management of pediatric enteric fever in endemic regions.

Keywords: Salmonella Paratyphi, Salmonella Typhi, Antibiotic resistance, Antimicrobial susceptibility, Multidrug resistance.

INTRODUCTION

Enteric fever, primarily caused by Salmonella enterica serovar typhi and Salmonella enterica serovar Paratyphi, remains a significant public health issue in Bangladesh. Insufficient sanitation and poor hygiene practices perpetuate its high prevalence, especially in rural and underserved urban regions. This illness, which predominantly impacts children, ranks as a major contributor to illness and death within the nation, with millions of cases documented annually [1, 2].

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Despite concerted efforts to enhance water quality and sanitation infrastructure, enteric fever continues to exert considerable pressure on the healthcare system, thereby requiring urgent public health interventions.

The advent of resistance in Salmonella species against antimicrobial has intensified the challenges faced in treating enteric fever in Bangladesh. Recent research has documented a rising incidence of extensively drug-resistant (XDR) strains of Salmonella typhi, which demonstrate resistance to first-line antibiotics such as fluoroquinolones and third-generation cephalosporins, thereby significantly constraining available therapeutic options[3]. These resistant strains are no longer confined to traditionally endemic regions but have also disseminated to previously unaffected areas, including major urban centers within Bangladesh, thereby further complicating disease management [4].

The rising MDR and XDR Salmonella typhi strains in Bangladesh challenge clinicians and public health. Research on antimicrobial susceptibility in tertiary care is essential for understanding AMR and guiding treatment. Studies in Dhaka hospitals show significant resistance to first-line antibiotics, highlighting the need for surveillance and stewardship. Rahman et al. noted high resistance in Dhaka strains, requiring second-line therapies. A 24-year retrospective showed a decline in multidrug resistance but persistent ciprofloxacin resistance, emphasizing ongoing monitoring[5]. Furthermore, Roy et al. emphasized the importance of comprehensive AMR surveillance and stewardship programs in effectively controlling resistance speed, while Iftikhar et al. highlighted that there was a requirement for regular monitoring of antimicrobial susceptibility patterns to inform treatment decisions in tertiary care settings [7,8].

Given these challenges, it is crucial to assess antibiotic sensitivity patterns of enteric fever pathogens in Bangladesh. These studies help to optimize treatment, guide public health, and shape policies against AMR. Strengthening surveillance and responsible antimicrobial use are essential to combat resistant strains and improve outcomes for children [9,10].

MATERIALS AND METHOD

Study Settings and Population

This cross-sectional study was conducted at Medical College for Women and Hospital in Dhaka from July 2024 to July 2025, involving 110 children aged 0 to 18 years suspected of having enteric fever. The inclusion criteria were children of either sex, presenting with fever, and confirmed to be blood culture positive. The aim of this research was to assess the antibiotic sensitivity patterns of S. typhi and S. Paratyphi in these pediatric patients. Participants were selected using a convenience sampling technique from hospital admitted children during the period of the research who met the inclusion criteria.The samples were taken non-randomly for its practicality and feasibility within the clinical setting.

Study Procedure

For all confirmed cases of enteric fever, a comprehensive medical approach was undertaken. This included obtaining detailed medical histories, performing clinical examinations, and collecting blood samples for culture. The study involved careful monitoring throughout the duration of the study period, and only those who met the criteria for blood culture positivity were included.

Data Collection

Data were gathered systematically from enrolled patients which included demographic data, symptom presentations, and antibiotic sensitivity patterns of the isolated bacteria. Blood samples were cultured to confirm the diagnosis of enteric fever, and further testing was done

to assess antibiotic sensitivity. The study utilized both clinical data and laboratory results to gather comprehensive information on the patient population and their response to different antibiotics.

Statistical Analysis

Statistical analyses were performed using descriptive and inferential statistics. Descriptive statistics summarized demographic and symptom presentations of the study population, while inferential statistics were used to analyze the patterns of susceptibility of S. typhi and S. Paratyphi. The analysis included frequency distribution, percentages, and comparison of resistance and susceptibility across different antibiotics.

Ethical Considerations

Ethical approval was received from the Ethical Review Board of Medical College for Women and Hospital. Informed consent was obtained from the parents or guardians of all enrolled children. The study adhered to ethical guidelines and principles, ensuring the confidentiality and safety of patient data and their participation in the study.

RESULTS

Table 1 presents the demographic distribution of the patients with sample (n = 110). Most of the patients (59.09%) were between 6–9 years, 18.18% of patients were between the age of 2 years- 5 years, while 10–18 years comprised 17.27%.Only 5.45% of the participants were infants aged 0–1 year, representing the smallest age group in the sample. The patients' mean age was 9.4 ± 3.76 years, suggesting that the study population was predominantly from mid-childhood. Regarding sex, 54.55% were male, and 45.45% were female. In terms of socioeconomic status, most patients belonged to the middle class (49.09%), followed by the poor (27.27%) and upper class (23.64%) groups.

The average hospital stay was for about seven days; 2 patients had a hospital stay of over ten days due to prolonged fever. There were no obvious complications among the patients except for electrolyte imbalance. The patients' conditions were normal during follow up.

Table 1: Distribution of Patients by Age, Sex, and Socioeconomic Class in the Study Sample (n = 110)

Demographic Characteristics	Frequency (n = 110)	Percentage (%)
Age (Years)		
0–1 year	6	5.45%
2–5 years	20	18.18%
6–9 years	65	59.09%
10–18 years	19	17.27%
Mean Age	9.4 ± 3.76 years	
Sex		
Male	60	54.55%
Female	50	45.45%
Socio-Economic Status		
Poor	30	27.27%
Middle Class	54	49.09%
Upper Class	26	23.64%

n=Number of patients

Table 2 presents the clinical symptoms and signs noted for the enteric fever patients (n = 110). The presentation that was most frequent was coated tongue, found in 59.09% of the cases, a well-known clinical sign associated with typhoid fever. Organomegaly (enlargement of liver and/or spleen) was present in 36.36% of patients, indicating systemic involvement. Vomiting was reported in 21.82%, while diarrhea was seen in 18.18% of cases.

Table 2: Symptoms and signs Presented by Patients with Enteric Fever (n = 110)

Symptom	Frequency (n = 110)	Percentage (%)
Diarrhea	20	18.18%
Vomiting	24	21.82%
Organomegaly	40	36.36%
Coated Tongue	65	59.09%

n=Number of patients

Table 3 displays the antibiotic susceptibility patterns of resistance of Salmonella typhi and Salmonella paratyphi isolated from pediatric cases of enteric fever (n = 110).For S. typhi:The antimicrobial exhibiting sensitivity which was the highest was for ceftriaxone (100%), followed by meropenem (90.0%), azithromycin (90.0%), cefixime (80.2%), and chloramphenicol (78.35%).Resistance was the most for amoxicillin (54.6%), nalidixic acid (52.1%), and ofloxacin (45.0%).For S. paratyphi:The most effective antibiotics were ceftriaxone (100%), cefixime (98.0%), meropenem (95.0%), and chloramphenicol (88.0%).The highest resistance was observed against nalidixic acid (82.8%), followed by azithromycin (34.0%) and cotrimoxazole (24.0%).

Table 3: Antibiotic Susceptibility Patterns of S. typhi and S. paratyphi in Pediatric Enteric Fever (n = 110)

Antibiotic	S. typhi Susceptibility (%)	S. typhi Resistance (%)	S. paratyphi Susceptibility (%)	S. paratyphi Resistance (%)
Amoxicillin	44.6	54.6	80.0	20.0
Azithromycin	90.0	10.0	66.0	34.0
Cefixime	80.2	19.8	98.0	2.0
Ceftriaxone	100.0	0.0	100.0	0.0
Chloramphenicol	78.35	21.65	88.0	12.0
Ciprofloxacin	65.52	34.48	72.0	28.0
Cotrimoxazole	40.3	36.6	76.0	24.0
Nalidixic acid	47.9	52.1	17.2	82.8
Ofloxacin	55.0	45.0	80.0	20.0
Meropenem	90.0	10.0	95.0	5.0

n=Number of patients

DISCUSSION

Our research assessed the antibiotic susceptibility patterns and patterns of disease presentations of hospital admitted pediatric enteric fever patients. The findings reflect critical insights into the age distribution, clinical manifestations, and current trends of resistance of Salmonella typhi and Salmonella paratyphi strains against antimicrobials.

The majority of cases (59.09%) were observed among children between 6 to 9 years that is similar to reports that noted a peak incidence of enteric fever among school-aged children [11,12]. This age distribution highlights the vulnerability of this population due to increased exposure to contaminated food or water in school or community settings. The mean age in our study was 9.4 ± 3.76 years. This finding is similar to another study, which found the incidence was highest among children aged 5 to <10 years, followed by those aged 10 to <14 years and 6 months to <5 years in endemic areas[12].

In terms of clinical presentation, the symptoms most frequently observed was coated tongue (59.09%), followed by organomegaly (36.36%), vomiting (21.82%), and diarrhea (18.18%). Crump and Mintz, who also noted that coated tongue, gastrointestinal disturbances, and hepatosplenomegaly are frequently observed in patients with typhoid fever [9].

The antibiotic susceptibility profile demonstrated high sensitivity of Salmonella Paratyphi and Salmonella Typhi to ceftriaxone (100%) and meropenem (90–95%), reflecting continued efficacy of third-generation cephalosporins and carbapenems in treating enteric fever. Similar trends were reported in studies conducted in India and Nepal, where ceftriaxone remains a reliable first-line therapy [13-16]. However, the increasing reliance on these broad-spectrum antibiotics may lead to emerging resistance if not used judiciously.

Azithromycin displayed sensitivity which was high for combating S. typhi (90%) but relatively lower sensitivity against S. paratyphi (66%), mirroring concerns raised in other studies about increasing macrolide resistance in paratyphi isolates [17]. The effectiveness of cefixime (80.2% in S. typhi, 98% in S. paratyphi) was encouraging and similar to data from Pakistan and Southeast Asia [18]. However, resistance to amoxicillin (54.6% in S. typhi) and nalidixic acid (52.1% in S. typhi, 82.8% in S. paratyphi) indicates that older antibiotics are becoming increasingly ineffective. High resistance to nalidixic acid is particularly concerning as it often correlates with reduced fluoroquinolone susceptibility [19.]

Resistance to ofloxacin (45% in S. typhi) and ciprofloxacin (34.48%) suggests a declining role of fluoroquinolones in empirical therapy. Several studies have confirmed widespread reduced susceptibility to fluoroquinolones in endemic regions, likely due to overuse and self-medication practices [20,21].

These findings reinforce the need for routine blood culture and antibiotic sensitivity testing in all suspected cases of enteric fever to guide rational antimicrobial therapy and prevent the development of multidrug resistance. The observed resistance patterns also call for continuous surveillance and strict antibiotic stewardship in both community and hospital settings.

The research limitations were the use of convenience sampling, single-center design, and absence of long-term outcome follow-up, which may affect the generalizability of the findings. However, the study still offers important evidence from a clinically relevant population and contributes to the local understanding of evolving resistance trends.

CONCLUSION

In conclusion, the study confirms that S. typhi and S. Paratyphi are increasingly resistant to key antibiotics, especially first-line drugs like amoxicillin, cotrimoxazole, and quinolones. The rise in multidrug-resistant strains underscores the urgent need for actions to improve antimicrobial stewardship, enhance infection control measures, and regularly track resistance patterns. These efforts are vital to preserve the effectiveness of antibiotics in treating enteric fever and to reduce its global health burden, particularly in resource-limited settings where enteric fever remains a significant concern.

CONFLICT OF INTEREST

There is no conflict of interest.

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