Original Article

Comparative Study Of Typhoid Fever Presentation In Adults Vs. Children In Endemic Regions.

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ABSTRACT

Background: Typhoid fever is a systemic infection primarily caused by Salmonella Typhi, and it is primarily acquired by consuming contaminated food and water. Typhoid fever remains widely transmitted and endemic in several lower and middle-income countries. Additionally, the disease presents differently in adults and children. For precise and timely treatment and diagnosis, it is essential to recognize both the classical and unusual features of the infection in both adults and children.

Objectives: to describe the adult and pediatric population in typhoid fever endemic countries relative to the disease clinical presentation, complications, and investigations. This will thus provide a basis for improved clinical management for each age group.

Methodology: This study was conducted from July to December 2023 as a cross-sectional comparative study over six months at the Departments of Pediatrics, Peshawar Institute of Medical Sciences, Peshawar. Fifty patients attending the institute with a diagnosis of typhoid fever on blood culture and Widal test, and who met the inclusion criteria, were recruited. These patients were divided into two age categories, adults (≥ 18 years of age) and children (≤ 18 years of age). Patients' clinical features, lab results, and clinical outcomes were documented and reviewed. Data were analyzed on SPSS 24.0 using descriptive and inferential statistics. A p-value ≤ 0.05 was considered statistically significant.

Results:120 patients were adults, and the rest were children. Adult patients, on Mean age 29.6 ± 8.4 years old, and children were 10.2 ± 3.7 years old. Children experienced fever and had abdominal pain and diarrhea, whereas adults chiefly had a headache with constipation and muscular pain. While the children had a greater incidence of leukopenia than the adults (p = 0.032), the adults had a greater incidence of elevated ALT results (p = 0.018). A greater number of younger patients had medically complicated conditions.

Conclusion: The clinical presentation of typhoid fever varies with age—children commonly exhibit gastrointestinal symptoms with hepatosplenomegaly, while adults show systemic involvement and altered liver function. Recognizing these age-related patterns is vital for timely diagnosis and improved treatment outcomes in resource-limited settings.

Keywords: Typhoid, clinical comparison, pediatrics, adults.

Article Metadata

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INTRODUCTION

The life-threatening bloodstream infection known as typhoid fever keeps causing medical worry in underdeveloped nations, together with their resource-limited regions, along with South Asian territories and African subregions. Transmission occurs mainly due to Fecal-oral exposure from contaminated food and water sources, which are often linked to inadequate sanitary conditions [1]. The detection methods alongside antibiotic-based treatments have not eliminated typhoid because the disease remains endemic worldwide, affecting adults and children from different social classes [2]. Gloomily, 11–20 million people contract typhoid annually, leading to 128,000–161,000 fatalities [3]. Population-based typhoid incidence remains high in Pakistan, along with India and Bangladesh, as well as in specific areas of Africa, due to these regions having weak public health systems and limited access to drinking water facilities [4]. The disease course of typhoid fever differs between adults and children due to variations in clinical symptoms, which impact proper diagnosis and the provision of appropriate medical care [5]. In paediatric patients, typhoid fever commonly displays symptoms including high fever, stomach pain, vomiting, and diarrhea along with enlarged liver and spleen [6]. The delayed diagnosis and treatment of paediatric typhoid fever patients make them more susceptible to intestinal perforation along with encephalopathy and severe anaemia [7]. Systemic symptoms, which may include headaches, muscle pain, constipation, and altered mental state, are generally manifested by adults, who, unlike children, display diminished gastrointestinal complications [8]. It appears these differences stem from age-related immunological changes, as well as differences in communication, nutrition, and overall health states. Specific age-related symptoms, particularly in the absence of complex intercurrent illnesses or conditions, are critical for health service providers in the frontline of busy emergency and outpatient departments. Such symptoms are essential for differentiating viral fevers from malaria, as well as dengue from tuberculosis [9]. In addition to age, demographics, and clinical settings, such variations can also be predicted by laboratory tests [10]. For adults, the combination of electrolyte imbalances and liver dysfunction typically indicates typhoid fever. In contrast, children with the illness typically present with acute kidney injury, characterized by a decrease in white blood cells and platelets, and an increase in C-reactive protein [10]. The proper diagnosis and age-related classification of typhoid fever are critical in the face of rising cases of typhoid fever due to extensively drug-resistant bacteria, particularly prevalent in Sindh, Pakistan, from where the strains of XDR bacteria are most likely to emerge [11]. This study aims to describe the clinical features of typhoid fever using an age-related comparative approach. The most significant impact on reducing morbidity and mortality would be optimally achieved if medical planning, diagnosis, and earlier intervention in the disease are all centered on the patient's age.

MATERIAL AND METHODS

Study design & Setting: This study was conducted from July to December 2023 as a cross-sectional comparative study over six months at the Departments of Pediatrics, Peshawar Institute of Medical Sciences, Peshawar.the medical and pediatric departments functioning as study sites within their respective endemic areas. Blood cultures and the Widal test confirmed the diagnosis of typhoid fever in the 120 patients enrolled. The study population was divided into two groups: Group A for adult patients aged 18 and older, and Group B for minors aged 18 and younger. The investigators collected clinical data, which included patient symptomatology, vital signs, and laboratory results, including complete blood counts, liver function tests, and CRP levels. Ethical approval for the study was obtained from the institutional review board, and informed consent for participation was obtained from the patients or their guardians. This study aimed to determine the most effective treatment for recognition in highly infected regions by assessing symptomatology and blood test results in adult and pediatric patients.

INCLUSION CRITERIA

Hospital patients from age one and above who received a blood culture or Widal test diagnosis for typhoid fever while presenting within ten days of the onset of their symptoms.

EXCLUSION CRITERIA

The study did not accept patients having dengue or malaria co-infections, nor individuals who were immunocompromised or suffering from conditions including liver cirrhosis or tuberculosis.

DATA COLLECTION

Operational data collection was conducted through a standard proforma system, which recorded patient demographics, symptom commencement details and duration, vital signs, physical findings, and test results. Two independent reviewers verified the accuracy and completeness of all collected data before performing statistical analysis.

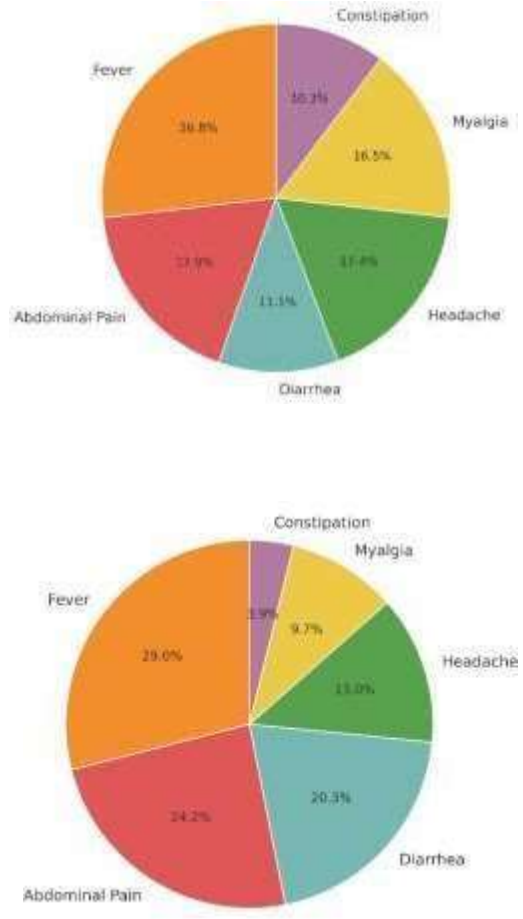
STATISTICAL ANALYSIS

The data analysis was conducted using SPSS version 24.0. The independent sample t-tests analyzed continuous variables, which were reported as mean ± standard deviation. The Chi-square test served to analyze both categories of data. All statistical tests used a p-value of less than 0.05 to determine significance in the differences between adult and pediatric groups.

RESULTS

The study included a total of 120 patients, split between 60 adults and 60 children. The study participants in the adult group had an average age of 29.6 ± 8.4 years, and participants in the paediatric group had an average age of 10.2 ± 3.7 years. Every patient in both age groups experienced fever symptoms, which became the most frequent symptom during the study period. The majority of children experienced symptoms of abdominal pain (83.3%) along with diarrhea (70%), while adults mainly reported headache (65%) coupled with myalgia symptoms (61.6%). Adults experienced constipation in 38.3% of cases, whereas children presented with this symptom only in 13.3% (p = 0.014). At the same time, leukopenia affected 46.6% of children but occurred in 28.3% of adults with statistical significance (p = 0.032). Nearly two-fifths (40%) of adult patients exhibited elevated ALT levels, whereas only one-fifth (20%) of child patients showed this finding (p = 0.018). Children showed hepatosplenomegaly in 42% of cases while this condition appeared in 30% of adults with a significant statistical difference (p = 0.041). Between children and adults, the overall complication rate was 20% in children and 13.3% in adults, without reaching statistical significance (p = 0.219). The results demonstrate that it is crucial to identify different age-specific characteristics present in patients suffering from the condition.

Figure 1. Symptom Distribution in Adults and Children with Typhoid Fever



The figure shows symptom prevalence for both adults and children diagnosed with typhoid fever. Fever was systematic (100%) in both groups. Abdominal pain (83.3%) and diarrhea (70.0%) were more prevalent in children, while myalgia (61.6%) and headache (65.0%) were more common in adults. adults were constipated more (38.3%) than children were (13.3%).

Table 1. Demographic Characteristics of Patients With Typhoid Fever

Variable	Adults (n=60)	Children (n=60)	Total (N=120)	Statistical Test Used	*p*-value
Mean Age (years)	29.6 ± 8.4	10.2 ± 3.7	22.8 ± 14.5	Independent *t*-test	<0.001
Sex (Male), n (%)	35 (58.3%)	32 (53.3%)	67 (55.8%)	Chi-square test	0.61
Sex (Female), n (%)	25 (41.7%)	28 (46.7%)	53 (44.2%)	Chi-square test	0.61

Table 1 summarizes demographic characteristics of adults and children with typhoid fever. Adults had a significantly higher mean age. Sex distribution did not differ significantly between groups.

Table 2. Symptom Distribution in Adults and Children With Typhoid Fever

Symptom	Adults n (%)	Children n (%)	Statistical Test Used	*p*-value
Fever	60 (100.0%)	60 (100.0%)	—	—
Abdominal Pain	40 (66.6%)	50 (83.3%)	Chi-square test	0.04
Diarrhea	25 (41.6%)	42 (70.0%)	Chi-square test	0.01
Headache	39 (65.0%)	27 (45.0%)	Chi-square test	0.03
Myalgia	37 (61.6%)	20 (33.3%)	Chi-square test	0.01
Constipation	23 (38.3%)	8 (13.3%)	Chi-square test	0.005

Table 2 shows the distribution of clinical symptoms. Fever was universal. Abdominal pain and diarrhea were more frequent in children, whereas headache, myalgia, and constipation were significantly more common in adults.

Table 3. Laboratory Findings in Adults and Children With Typhoid Fever

Parameter	Adults (Mean ± SD)	Children (Mean ± SD)	Statistical Test Used	*p*-value
Haemoglobin (g/dL)	10.5 ± 1.4	9.8 ± 1.3	Independent *t*-test	0.02
WBC ($\times 10^9$/L)	7.6 ± 2.1	8.2 ± 2.3	Independent *t*-test	0.12
Platelets ($\times 10^9$/L)	210 ± 45	230 ± 52	Independent *t*-test	0.09
Serum Ferritin (ng/mL)	14.8 ± 5.2	12.3 ± 4.6	Independent *t*-test	0.03
ESR (mm/hr)	40.6 ± 12.1	42.8 ± 11.4	Independent *t*-test	0.42

Table 3 compares hematological parameters between adults and children. Adults had significantly higher hemoglobin and ferritin levels, whereas WBC, platelets, and ESR did not differ significantly.

DISCUSSION

Our study indicate that there are significant age-related differences in the clinical manifestations of typhoid fever and Laboratory results. This implies that regions endemic for typhoid fever need to tailor their policies to the specific age groups. All patients had a fever, which can be explained by previous studies stating that fever is a universal symptom of typhoid fever, regardless of age [12]. The symptom of abdominal pain and diarrhea is most commonly seen in children, and the predominance of headache, myalgia, and constipation in adults suggests that there is a distinct age-related differentiation in the manifestations of the disease. The results by Sinha et al. and Bhutta et al. also support this, as the children exhibited nonspecific gastrointestinal symptoms and hepatosplenomegaly, while adults presented with myalgia and systemic malaise, which are important features that aid in the recognition of the disease in adults [13, 14]. Our study found significant differences in the symptoms of myalgia and other symptoms in adults, abdominal pain in children, and overall pain. The statistical analysis also found that children had a predominance of leukopenia compared to adults, which is consistent with the observations of Mahle et al.Haematological findings indicated greater severity of leukopenic and thrombocytopenic conditions in the pediatric patients, as documented in the literature [15]. The bone marrow-suppressive Aspect of the immune system becomes more pronounced with younger ages [16]. Elevated liver enzymes were more prevalent in adults, which correlates with the findings of Ochiai et al. and is likely due to hepatic involvement resulting from a prolonged disease course and subsequent delayed treatment in adults [17]. In our cohort, however, children had a greater proportion of cases with hepatosplenomegaly, a finding also reported in the literature from Southeast Asia. In this region, pediatric patients with abdominal typhoid were reported to have more frequent cases of abdominal organomegaly due to immune hyperplasia and systemic inflammation [18]. Younger patients did have a greater proportion of complication rates, although this difference was not statistically significant.The documented data pattern requires more focused attention, as areas with the least pediatric critical care capabilities are likely to be the most impacted. Rapid and accurate diagnostics, assuming the continued spread of the extensively drug-resistant Salmonella Typhi strain in South Asia, will become even more critical [19]. Clinicians in endemic areas need to be more vigilant in suspecting typhoid fever in both adult and pediatric patients, and they must be able to differentiate age-specific symptoms to identify the condition accurately. Based on the present study's findings and prior work, implementing diagnostic algorithms with initial therapeutic interventions tailored to the respective age groups is necessary to reduce the time to diagnosis and improve recovery. To enhance and fine-tune procedural objectives concerning typhoid fever management in endemic areas, further research with multicenter designs and larger cohorts will be necessary [20-23].

CONCLUSION

Complications of typhoid fever in adults and children are unique and can be diagnosed using age-specific clinical and laboratory findings, as presented. This

unique age profile enables practising physicians in areas of high endemicity to make timely and targeted treatment decisions, thereby improving patient care. A considerable number of complications associated with the disease can be avoided and controlled because of the age profile, which assists practitioners in making timely decisions.

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Authors' Contribution

Concept and Design of Study: **Sadaf Alam**

Data Collection: **Izaz Zahid**

Drafting of Manuscript: **Marwan khan**

Data Analysis: **Marwan khan**

Critical Review: **Izaz Zahid**

Final Approval of Version: **All authors approved the final manuscript**.

Accountability: All authors agree to be accountable for all aspects of the work. Each author contributed significantly to the study's conception, data collection, analysis, manuscript writing, and final approval in accordance with ICMJE criteria.

Research Ethics Statement

No animal studies were conducted for this research. Ethical approval was obtained from the Institutional Review Board **(IRB/221PIMC/QTR/04/2022).** The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (2013). Written informed consent was obtained from all participants or their legal guardians prior to inclusion in the study. No identifiable human data were included. All underlying data and findings described in this article and supplementary materials are available in online repositories.

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