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ORIGINAL RESEARCH OPEN ACCESS

Clinical profile and etiological patterns of pediatric tropical fever: Experience from a tertiary care center from eastern India

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Abstract

Background: Pediatric tropical fevers represent a significant public health problem in our country. Multiple viral, parasitic and bacterial pathogens are responsible for tropical diseases in endemic regions. The study aimed to assess the clinical and etiological profile of tropical fever cases presenting to our tertiary care hospital in the northern part of West Bengal.

Materials and methods: This observational, cross-sectional study was done in hospitalized children after obtaining approval from the Institutional Ethics Committee. Duration was 1 year from December 2022 to November 2023. Participants satisfied the inclusion criteria and confirmed positive on laboratory investigations were enrolled. Written informed consent from parents was obtained.

Results: A total of 100 patients were finally enrolled for analysis. Mono infections were present in 78% patients, and 22% patients had more than one concurrent infections. The causes of tropical fever included dengue (59%), scrub typhus (50%), enteric fever (7%), malaria (4%), and other infections. Clinical features included vomiting (92%), abdominal pain (82%) pallor (76%), and rash (58%) and others manifestations. Children aged 5-12 years comprised 62% and males were 60% in our study. Survival rate was (97%) and mortality rate was 3%.

Conclusion: Dengue and scrub typhus emerged as the major contributors to pediatric tropical fever in this study. Early identification and targeted management based on regional epidemiological pattern can reduce adverse outcome. Further research on a large scale is essential to validate and generalize our findings.

***Keywords**:* tropical fever; clinical and etiological profile; children; eastern India

Introduction

Febrile infections commonly prevalent in tropical and subtropical regions are collectively termed tropical fevers [1]. The Indian Society of Critical Care Medicine (ISCCM) described them as infections prevalent in or unique to tropical and subtropical regions [2]. These are the febrile illnesses encompass a wide range of infections such as dengue, scrub typhus, typhoid, malaria and infections, and also the mixed infections. Many water borne, food-borne, vector-borne illnesses are included in this group of fevers [3].

Tropical fever represent a major public health challenge in our country. These infections are highly prevalent and the symptoms of many infections may overlap with one another [2, 4]. These infections can rapidly progress to severe and life threatening complications. It may be difficult to identify a particular infection at the time they first present to a health care facility. It is essential to know the clinical profile of these infections, High

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index of suspicion is needed for their for their timely diagnosis and management.

The prevalence of these infections is heavily influenced by the geographical and climatic conditions present in different tropical regions [1, 5]**.** The aim of this study was to evaluate the pattern of tropical infections and their clinical manifestations in hospitalized children in our tertiary care teaching hospital, in the northern part of West Bengal, Eastern India.

Material and Methods

This was an observational, cross-sectional, study in hospitalized children, after obtaining approval from the Institutional Ethics Committee. The study was conducted over a period of 12 months, from December 2022 to November 2023, in the Pediatric Medicine Ward of Malda Medical College and Hospital, West Bengal. All children aged 1 month – 12 years of age, admitted to pediatric medicine ward, and suspected to have a tropical fever, depending on the clinical criteria, were subjected to the confirmatory laboratory test. Data Collection: Relevant demographic and clinical details (e.g., age, sex, geographic origin, seasonality, presenting symptoms, comorbidities) were recorded on a predesigned proforma.

Case definition [1] : Clinical criteria for tropical fever were defined as follows : Acute onset (within the last 14 days), fever of at least 48 hours duration with one or more of the following clinical findings; Rash/ thrombocytopenia, respiratory distress, abdominal pain, encephalopathy, jaundice, renal failure, or multi organ dysfunction syndrome (MODS).

Laboratory investigations included: (1) Complete Blood Counts (hemoglobin, total leukocyte count, platelets). (2) Serology: Scrub typhus IgM ELISA, Leptospira IgM ELISA, Dengue rapid NS1 antigen, IgM ELISA, Chikungunya IgM ELISA. (3) Blood Smears (both thick and thin smear) and Rapid Diagnostic Tests (RDT) for malaria. (4) Blood Cultures: Automated (BATEC) or conventional methods, with subsequent pathogen identification and sensitivity testing. (5) Other Tests: Liver function tests, renal function tests, chest X-ray, ultrasound abdomen, cerebrospinal fluid (CSF) analysis, and relevant biochemical parameters (e.g., LDH, ferritin, PT, INR) as clinically warranted. (6) Co-Infection: Simultaneous laboratory confirmation of ≥2 pathogens.

Inclusion criteria: The participants satisfied the case definition criteria with laboratory tests confirmed the infection, were enrolled in the study. More than 1 positive confirmatory test was labelled as 'Mixed infection'. The written informed consent from their parents was obtained.

Exclusion criteria: Children with immunodeficiency, on immunosuppressive therapy, children with pre-existing cardiac or renal or hematologic disorders.

A prevalence of tropical fever of 50%, with $\alpha = 0.05$ and a margin of error of 10%, yielded a sample size of 96; we enrolled 100 patients to enhance robustness.

Statistical analysis

Patients enrolled in the study were managed as per standard treatment guidelines. Descriptive and inferential statistics were performed using SPSS version 26.0. Categorical variables are reported as frequencies/percentages, whereas continuous variables are presented as mean ± standard deviation or median (range) as appropriate. Associations were tested using the chi-square test for categorical variables and the Z-test or t-test for continuous variables. A p-value of <0.05 was considered as statistically significant.

Results

A total of 100 patients were enrolled in our study. Out of them, 97% (n=97) were managed in children ward and successfully discharged with intact survival. Three (n=3, 3 %) patients had serious complication with multi organ involvement, needed intensive care support, but unfortunately succumbed to the illness. Male were 60% in our cohort (significant, p value <0.05). Mean age of presentation of children in our study is 5.8 years. Median age was 6.3 years, 95% CI for the median age being 4.8 to 7.0 years. The most commonly affected age group was children between 5 to 12years, comprised 62% of the study population (Table 1).

Table 1: Association between age and gender of study subject (n=100).

Age grading	*Females*	*Males*	*Total*
<1year	0	6 (100%)	6 (6%)
1-5 years	8 (25%)	24 (75%)	32 (32%)
>5-12 years	32 (51.6%)	30 (48.4%)	62 (62%)
Total	40 (40%)	60 (60%)	100 (100%)

Note: Chi-square test 10.48; P value 0.005 (Significant).

The mean duration of fever was 8.2 days and fever with a range of varied from 03-16 days in our study.

Etiological distribution (Table 2): Mono infections were present in 78% patients and 22% patients were infected with more than one concurrent infections.

Dengue fever was the most common infection detected in 59% patients. Dengue as a monoinfection were present in 41%. Dengue with coinfections were detected: with scrub typhus infection in 14%, enteric fever in 2%, vivax malaria in 1%, and with hepatitis A in 1% patients respectively.

Scrub typhus infection were diagnosed in 50% children: 30% of them had monoinfection. Coinfections were associated with dengue in 14%, with enteric in 2%, with vivax malaria in 2%,with leptospira in 1% and rest 1% with hepatitis A respectively.

Table 2: Etiological Distribution of Tropical Fever (n=100).

Diagnosis	*Percentage (%)*
Dengue monoinfection	41
Scrub typhus monoinfection	30
Scrub typhus and dengue coinfection	14
Enretic fever monoinfection	3
Dengue and enteric fever coinfection	2
Scrub typhus and enteric fever coinfection	2
Malaria and dengue coinfection	1
Malaria and scrub typhus coinfection	2
Malaria monoinfection	1
Leptospira monoinfection	1
Leptospira and scrub typhus coinfection	1
Hepatitis A and dengue coinfection	1
Hepatitis A and scrub typhus coinfection	1
Total	100

Enteric fever was present in 7 % children: with 3% as mono infection and 2% as coinfecton with scrub typhus, and 2% as confection with dengue. Malaria vivax were detected in 1% as mono infection, in 2% patients as coinfections with scrub typhus and in 1% patient as coinfection with dengue. Leptospira was seen in 2 % children: in 1% patient as mono infection, and in 1% as coinfection with scrub typhus. Children with hepatitis A (2%) were presented as co infections: 1% was co infected with dengue and the rest 1% with scrub typhus.

Clinical presentations (Figure 1 and Table 3)

The clinical features among patient at admission included vomiting (92%), pain abdomen (82 %), chill and rigor (70 %), pallor (76 %), rash (58%) edema (54%), altered sensorium (30%) seizure (10%), bleeding (14%) and meningeal sign (14%). Eschar was present only in 02% patient of scrub typhus fever.

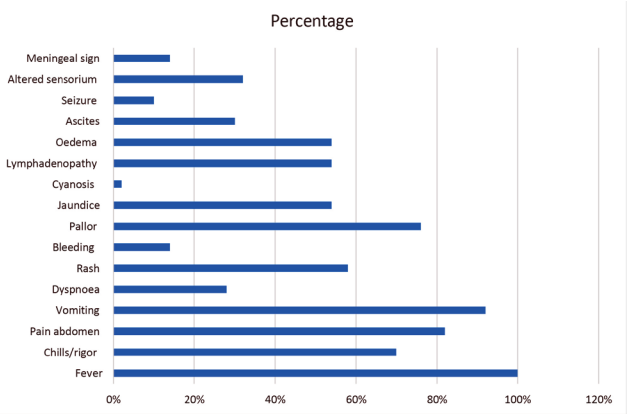

Figure 1: Clinical features of different tropical fever at presentation.

Complications

Patients with dengue fever were most commonly complicated by hepatic dysfunction, pneumonia and empyma thoracis. One patient with dengue was complicated with Hemophagocytic lymphohistiocytosis (HLH).

Scrub typhus infections were complicated with encephalitis (11.6%), hepatic dysfunction. Jaundice (54%), lymphadenopathy(54%) and hepatosplenomegaly were presenting features in concurrent infection of dengue and scrub typhus in our study.

Concurrent infections presented with overlapping clinical features, attributed major challenges in their diagnosis and management. Atypical symptomatology, together with the clinical response with empiric therapy provided important clues to the presence of coinfections.

Laboratory findings: Pallor was noted in 76%, with mean hemoglobin level significantly lower in nonsurviors (7.43 gm/dl) compared to survivors (10.06gm/dl) (p value 0.032). Thrombocytopenia has been observed in dengue, scrub typhus and malaria patients. There was significant association (p value is 0.0001) between duration of fever and staying hospital. There was also significant association (p value 0.033) between age at presentation and duration of fever of study subject.

Outcome: Ninety seven (97%) patients were successfully discharged and mortality rate was 3% (n=3). Death occurred in patients with dengue complicated with HLH (n=1, 1%), scrub typhus with leptospira coinfection

Table 3: Clinical presentations and complications in association with age and etiologies (n=100).

Diagnosis	*<1 year*	*1-5 years*	*5-12 years*	*Total*
Dengue mono-infection with febrile illness, skin rash and vomiting	2	10	25	37
Dengue fever with empyema thoracis	0	3	0	3
Hepatitis A and dengue with fever and hepatic dysfunction	0	0	1	1
Enteric fever and dengue with pain abdomen and vomiting	0	0	2	2
Dengue with HLH with multi organ dysfunction	1	0	0	1
Dengue with Malaria with fever	0	0	1	1
Dengue with scrub typhus with pneumonia and hepatic dysfunction	2	7	5	14
Enteric fever with febrile illness	0	0	3	3
Malaria with febrile illness	0	0	1	1
Malaria with scrub typhus with febrile illness	0	0	2	2
Scrub typhus with fever, pallor, vomiting	0	9	8	17
Scrub typhus fever and acute cholecystitis	0	0	2	2
Scrub typhus and hepatitis A with liver dysfunction	0	1	0	1
Scrub typhus with fever and skin rash	1	0	3	4
Scrub typhus with encephalitis	0	2	5	7
Scrub typhus and enteric fever with pain abdomen	0	0	2	2
Scrub typhus and leptospira with hepatic dysfunction	0	0	1	1
Leptospira monoinfection with fever and hepatic dysfunction	0	0	1	1
Total	6	32	62	100

(n=1, 1%) and scrub typhus complicated with acute hepatitis and encephalitis (n=1, 1%). Maximum number of cases were detected in our study that was monsoon and post monsoon (June to October).

Discussion

Tropical fever denotes several communicable diseases endemic to tropical areas, which may cause significant morbidity and/ or mortality [3]. The prevalence of these infections is largely influenced by the season and geographical characteristics of these regions [1]. The diseases are less prevalent in temperate climates, due in part to the occurrence of a cold season, which controls the insect population by forcing hibernation [2] Infectious illnesses commonly included in tropical fever category are Dengue, malaria, enteric fever, scrub typhus, leptospirosis, Hepatitis A, Japanese encephalitis and mixed infections. Many water borne, food-borne, and vector-borne illnesses are also included in this group of fevers [3]. Indian Society of Critical Care Medicine (ISCCM) constituted an expert committee who emphasized a systematic approach for the diagnosis and providing prompt and empirical or specific management as and when applicable [2].

In our study, mono infections were present in 78% patients and 22% patients were infected with more than one concurrent infections. Dengue fever was the most common infection (59%), followed by scrub typhus infection (50%) enteric fever (7 %), vivax malaria (4%), leptospira (2 %), hepatitis A (2%) respectively. We did not find children suffering from chikungunya and japanese enceplalitis during our study period. The clinical features among patient at admission included vomiting (92%), pain abdomen (82 %), chill and rigor (70 %), pallor (76 %).Majority were male (60%). Ninety-seven (n=97,97%) patients survived and recovered completely.

In their landmarked prospective multicenter study by Singh S et al on tropical fevers in Indian ICUs, male to female ratio observed in pediatric patients was 1.77:1. Dengue (23%) was the most common etiology, followed by scrub typhus (18%), encephalitis/meningitis (n = 9.6%), malaria (8%) [1]. Chandra S et al from north India in their study observed boys were 64.2%. Enteric fever was the most common etiology of Tropical Fever in this study [4].

Agarwal S et al from Maharashtra, in their retrospective study from observed dengue in 25%, malaria in 10.3% and scrub typhus in 7.5% patients and leptospirosis in 6.8% cases [6]. In dengue, 42% had hepatitis as a complication at the time of presentation. 28.8% had hepatitis in scrub typhus patients [6].

In another retrospective study by Matlani et al from north India, the etiologies of tropical fever were dengue (55.5%), malaria (19%), scrub typhus (19%), enteric fever (4.7%) and chikungunya (1.5%). The common presenting symptoms were pyrexia followed by myalgia, aches and pains in the body and vomiting. Commonly observed complications included thrombocytopenia, hepatitis and shock [7].

In a study on tropical fever in adults, by Haq Samsul et al from Jammu, north India, dengue (37.5%), was the most common etiology and malaria (2.5%) was the least common cause [8].

Shrestha et al in their studies on febrile illness in Asia including both children and adults revealed the etiological agents : the most frequently reported etiology was dengue (50%), followed by leptospirosis (27%), scrub typhus (23%) and Salmonella (20%) [9].

In their study on 126 patients, Meena SS et al observed, dengue fever in 55.5%, patients, Scrub typhus in 19% patients, P. vivax malaria in 19%, Enteric fever in 4.7%, and chikungunya in 1.5% patients. Coinfections were observed in malaria with scrub or enteric fever in their study [10].

Concurrent infections: Among tropical fevers, concurrent coinfections are recently being recognized as an emerging problems. Coinfections were suspected in this study if a patient's illness is unusually severe. Atypical symptomatology, together with the clinical response with empiric therapy provided important clues to the presence of coinfections. Molecular tests, antigen-based tests, targeted serology, using specific ELISA tests for IgM and IgG antibodies when available, were availed to minimize the chance getting false positive result from other infections. In our study, most common coinfections were associated with scrub typhus and dengue fever (4%, n=14).In a study done by Malaka et al in Himachal Pradesh for detecting coinfections as the underlying etiology, the most common coinfection were scrub typhus with leptospirosis (50%) and scrub typhus with dengue (29%) [11]. Meena SS et al observed concurrent coinfections in 26/126 pediatric patients. The common coinfections were enteric fever with malaria (in eight patients) and coinfection of malaria with scrub typhus (in six patients). Dengue with malaria and dengue with enteric fever were recorded as less frequent coinfections by them [10].

Clinical and laboratory findings: In our study, patients with dengue fever were most commonly complicated by hepatic dysfunction and pneumonia, while patients with scrub typhus infections had complications as encephalitis (11.6%), hepatic dysfunction, and jaundice (54%). Altered sensorium was present in 30% patients overall. Pallor was significantly linked to bad prognosis, and prolonged fever was linked with prolonged hospital staying in our study.

In the landmarked study by Singhi et al described thrombocytopenia and/or rash as the most common clinical syndrome (n = 275, 60%). respiratory distress and/or acute respiratory distress syndrome (ARDS) in 209 (46%) study participants and 29% (n = 130) presented with encephalopathy [1].

Agarwal S. in their study of tropical fever in adults, also observed hepatitis as a complication of dengue, while they noticed shock in patients with malaria and acute respiratory distress syndrome (ARDS) and pneumonia in patients with leptospira, at their complications [6]. Matlani et al noticed the most common presenting symptom was fever, followed by myalgia, generalised aches and pains in the body and vomiting, while commonly observed complications were thrombocytopenia and hepatitis [7]. Meena SS noticed thrombocytopenia, hepatitis and shock were the frequently associated complications in their study in concurrent infections[10].

Limitations: This is a single center study, based on the hospitalized children in a tertiary care setting. It may not reflect the true prevalence of tropical infection pattern in the community. Secondly, these infections also occur in outbreaks and their frequency may not be similar in every year. Periodic update with follow-up studies is required to identify the changing trends in epidemiology and antimicrobial susceptibility in this region.

Conclusion

Dengue, Scrub typhus and Enteric fever were the major etiologies of tropical infections in this study center in northern part of West Bengal. Strong suspicion and early detection of these diseases can help in instituting empirical and/or specific therapy in decreasing morbidity and mortality. These infections often co-exist and present with overlapping clinical features leading to increased severity and multiple complications. Seasonal trends of tropical infection should be kept in mind.

Conflicts of interest

Authors declare no conflicts of interest.

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