Section: Miscellaneous

Original Research Article

TO INVESTIGATE THE CLINICAL PROFILE AND LABORATORY FINDINGS OF PEDIATRIC PATIENTS DIAGNOSED WITH RICKETTSIAL FEVER AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Aim: To investigate the clinical profile and laboratory findings of pediatric patients diagnosed with Rickettsial fever at a tertiary care hospital.
Materials and Methods: This prospective, observational study included 100 children aged 1 to 12 years, presenting with clinical signs of Rickettsial fever over an 18-month period. Demographic data, clinical history, and physical examination findings were systematically recorded. Comprehensive laboratory investigations, including complete blood count, liver function tests, renal function tests, and serological testing (Weil-Felix test and immunofluorescence assay), were performed. Patients were managed with doxycycline or azithromycin, and outcomes were monitored. Statistical analysis was conducted using SPSS software.
Results: The mean age of the children was 7.2 ± 3.1 years, with a gender distribution of 55% males and 45% females. Fever (≥5 days) was observed in all cases, with rash present in 80% and eschar in 25%. Hepatomegaly and splenomegaly were noted in 30% and 25% of patients, respectively. Leukocytosis and thrombocytopenia were common laboratory findings, occurring in 45% and 50% of cases. Elevated liver enzymes were detected in 35-38% of patients. The Weil-Felix test was positive in 60% of cases, and the immunofluorescence assay was positive in 40%. The majority (80%) of patients were treated successfully with doxycycline, with a complete recovery rate of 85% and a mortality rate of 5%.
Conclusion: This study underscores the variability of clinical presentations and the importance of early diagnosis and treatment of Rickettsial fever in pediatric patients. Prompt antibiotic therapy is effective in most cases, but severe complications can occur, highlighting the need for vigilant monitoring and comprehensive management.
Keywords: Rickettsial fever, pediatric patients, clinical profile, laboratory investigations, doxycycline treatment.

INTRODUCTION

Rickettsial fever, a zoonotic disease caused by various obligate intracellular bacteria of the genus Rickettsia, is an emerging infectious disease that poses significant health concerns, particularly among pediatric populations. Children, due to their underdeveloped immune systems and outdoor activities, are highly susceptible to Rickettsial infections. These bacteria are transmitted to humans primarily through the bites of infected arthropods such as ticks, mites, fleas, and lice. Rickettsial infections are often neglected and underreported in many regions, leading to a lack of awareness among

healthcare professionals and delayed diagnoses. This is concerning, as Rickettsial fever can have a wide range of clinical manifestations, ranging from mild symptoms to life-threatening complications if not identified and treated promptly.[1] The clinical profile of Rickettsial fever in pediatric patients can be quite variable and often nonspecific in the early stages. The most common presentation includes high-grade fever, which may persist for several days, accompanied by symptoms such as headache, myalgia, malaise, and gastrointestinal disturbances. Rash is another hallmark feature, often appearing a few days after the onset of fever and varying in nature from maculopapular to petechial. In some cases, a characteristic eschar—a black, necrotic lesion at the site of the arthropod bite—can be observed, serving as a critical diagnostic clue. However, the absence of an eschar does not rule out Rickettsial fever, as it is not present in all cases. The clinical presentation can mimic other febrile illnesses such as dengue, malaria, or typhoid, making the diagnosis challenging without laboratory confirmation. Severe manifestations, although less common, may include multi-organ involvement, such as hepatosplenomegaly, respiratory distress, and cardiovascular complications, which can lead to significant morbidity and mortality in pediatric patients.[2] The pathogenesis of Rickettsial fever involves the invasion and proliferation of Rickettsial organisms within endothelial cells, causing widespread endothelial damage and vasculitis. This damage to the vascular endothelium results in increased vascular permeability, leading to edema, hemorrhage, and, in severe cases, multi-organ dysfunction. The immune response to the infection further exacerbates the inflammation and vascular damage, contributing to the systemic symptoms observed in affected individuals. Children, especially those under five years of age, are at a higher risk of developing severe disease due to their immature immune responses and limited physiological reserves to cope with the systemic effects of the infection. The delay in diagnosis and treatment is a major factor contributing to adverse outcomes, underscoring the importance of early recognition and intervention.[3] Diagnosis of Rickettsial fever in pediatric patients requires a high index of suspicion, especially in endemic areas or among children with a history of tick exposure. Laboratory investigations play a crucial role in confirming the diagnosis and guiding appropriate management. Hematological abnormalities such as leukocytosis, leukopenia, or thrombocytopenia are commonly observed and provide important clues to the underlying infection. Thrombocytopenia, in particular, is associated with disease severity and can serve as a marker for monitoring the clinical course. Liver function tests often reveal elevated transaminase levels, indicating hepatic involvement, which is common in Rickettsial infections. Renal function may also be compromised in severe cases, necessitating close monitoring of serum creatinine and blood urea nitrogen levels. Electrolyte imbalances are another concern, as they can exacerbate the clinical condition and complicate management.[4]

Serological testing remains a cornerstone of diagnosing Rickettsial fever, with the Weil-Felix test being a widely used but nonspecific method. A significant titer in the Weil-Felix test can provide a preliminary indication of Rickettsial infection, although it lacks the sensitivity and specificity required for definitive diagnosis. The immunofluorescence assay (IFA) is considered the gold standard for confirming Rickettsial infections, offering higher accuracy in detecting Rickettsial antibodies. However, the availability of IFA is often limited to specialized laboratories, making it less accessible in resource-limited settings. Polymerase chain reaction (PCR) and other molecular techniques have emerged as valuable diagnostic tools, enabling the direct detection of Rickettsial DNA, but their use is still restricted to research or well-equipped centers. Blood cultures are typically performed to rule out other bacterial infections that may present with similar clinical features, ensuring a comprehensive evaluation of febrile children.[5]

Management of Rickettsial fever in pediatric patients involves the prompt administration of appropriate antibiotics, with doxycycline being the drug of choice for all age groups. Azithromycin is an alternative for younger children or those with contraindications to doxycycline. Early initiation of antibiotic therapy is crucial, as it significantly reduces the risk of complications and accelerates recovery. Supportive care, including antipyretics, fluid management, and monitoring for complications, is equally important to ensure optimal outcomes. The clinical response to treatment is usually rapid, with most children showing significant improvement within 48 to 72 hours of starting antibiotics. However, a delayed or inadequate response may indicate the presence of complications or co-infections, necessitating further investigation and intervention.[6]

MATERIALS AND METHODS

This prospective, observational study was conducted to investigate the clinical profile and laboratory findings of pediatric patients diagnosed with Rickettsial fever at a tertiary care hospital. A total of 100 children, aged 1 to 12 years, who presented with clinical features suggestive of Rickettsial fever were enrolled over a period of 18 months. The study was approved by the Institutional Ethics Committee, and informed written consent was obtained from the parents or legal guardians of all participating children.

Inclusion and Exclusion Criteria

The inclusion criteria consisted of pediatric patients aged 1 to 12 years presenting with clinical signs and symptoms consistent with Rickettsial fever,

including fever, rash, headache, myalgia, and a history of tick exposure or travel to endemic areas. Diagnosis was confirmed through serological testing using an immunofluorescence assay (IFA) or a Weil-Felix test with a significant titer. Children with known autoimmune diseases, chronic illnesses, or those receiving long-term immunosuppressive therapy were excluded. Patients who had received antibiotics prior to hospital admission that might interfere with the study's results were also excluded.

Methodology

Detailed demographic data, including age, gender, residence, and history of tick exposure or travel, were collected from each participant. A comprehensive clinical history was obtained, documenting the duration of fever, presence of characteristic rash, eschar, headache, myalgia, conjunctival congestion, abdominal pain, and other systemic symptoms. Physical examination findings, such as fever pattern, hepatosplenomegaly, lymphadenopathy, and respiratory or cardiovascular involvement, were systematically recorded.

Laboratory investigations were conducted on all participants to gain a comprehensive understanding of the clinical manifestations and potential complications of Rickettsial fever. Blood samples were obtained and analyzed to evaluate various hematological and biochemical parameters. A complete blood count (CBC) was performed to assess leukocytosis, leukopenia, thrombocytopenia, and hemoglobin levels, which provided crucial information about the presence of infection and any associated hematological abnormalities. Liver function tests (LFTs) were also carried out to detect hepatic involvement, with a focus on measuring alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels; elevations in these enzymes indicated liver dysfunction.

Serological testing was a key component of the diagnostic process. The Weil-Felix test was used to detect significant titers, with a cutoff value of 1:320 or higher considered indicative of Rickettsial infection. For cases requiring further confirmation, an immunofluorescence assay (IFA) was employed to identify Rickettsial antibodies with higher specificity. Renal function tests were conducted to monitor serum creatinine and blood urea nitrogen (BUN) levels, assessing for any renal impairment associated with the infection. Electrolyte levels, including sodium, potassium, and calcium, were measured to identify and address any imbalances that could complicate the disease course. Blood cultures were also performed to rule out other bacterial infections that could present with similar symptoms, ensuring an accurate diagnosis.

Management and treatment of the children adhered to established hospital protocols. The primary treatment involved administering appropriate antibiotics, such as doxycycline or azithromycin, tailored to the clinical severity and age of each patient. Supportive therapy was provided as needed, including the use of antipyretics for fever management, fluid administration to maintain hydration, and vigilant monitoring for any signs of complications. Daily follow-ups were conducted throughout the hospital stay to track clinical progress and monitor for potential adverse reactions to the treatment regimen. This comprehensive approach facilitated effective management and optimized patient outcomes.

Statistical Analysis

Data were analyzed using SPSS software version 25.0. Continuous variables, such as age and duration of fever, were presented as mean ± standard deviation (SD), while categorical variables, such as the presence of rash or eschar, were expressed as frequencies and percentages. The chi-square test was used to assess associations between clinical features and laboratory findings, and a p-value of <0.05 was considered statistically significant. Logistic regression analysis was conducted to identify factors associated with severe outcomes, such as multi-organ involvement or the need for intensive care support.

RESULTS

Demographic Characteristics

The demographic profile of the study population, as shown in Table 1, highlights the mean age of the children, which was 7.2 ± 3.1 years. The gender distribution was relatively balanced, with 55% males (55 children) and 45% females (45 children), and the difference was not statistically significant ($p = 0.68$). The majority of the children resided in urban areas (60%), while 40% lived in rural areas, with a p-value of 0.59, indicating no significant difference between urban and rural populations. A history of tick exposure was reported in 30% of the children, and 25% had traveled to endemic areas, with p-values of 0.45 and 0.52, respectively. These findings indicate that a significant proportion of patients had risk factors associated with tick exposure or travel to areas where Rickettsial fever is common.

Clinical Profile and Symptomatology

Table 2 presents the clinical profile of the patients. All 100 children (100%) experienced fever lasting five or more days, which was a universal finding. Rash was present in 80% of the patients, while headache was reported by 65% and myalgia by 55%, with p-values ranging from 0.29 to 0.41, indicating no statistically significant differences in the distribution of these symptoms. Conjunctival congestion was observed in 40% of cases, abdominal pain in 30%, eschar in 25%, and lymphadenopathy in 22%, with p-values from 0.34 to 0.55. The high prevalence of fever and rash is characteristic of Rickettsial fever, and the presence of eschar in 25% of cases is a key diagnostic feature, though not observed in all patients.

Physical Examination Findings

Physical examination findings, detailed in Table 3, reveal that hepatomegaly was detected in 30% of the children, while splenomegaly was present in 25%, with p-values of 0.38 and 0.42, respectively. Respiratory involvement was observed in 20% of patients, cardiovascular involvement in 15%, and multi-organ involvement in 10%, with no statistically significant associations (p-values ranging from 0.49 to 0.60). Severe complications were seen in only 8% of the cases, with a p-value of 0.66. These results suggest that while hepatic and splenic involvement were relatively common, severe multi-organ complications were less frequent.

Laboratory Findings

Table 4 outlines the laboratory abnormalities observed in the study population. Leukocytosis was present in 45% of the children, and thrombocytopenia was found in 50%, with p-values of 0.39 and 0.41, respectively. Elevated liver enzymes were also common, with 35% of patients showing increased ALT and 38% showing increased AST levels (p-values of 0.36 and 0.35). The Weil-Felix test was positive in 60% of the cases, and the immunofluorescence assay (IFA) was positive in 40%, with p-values of 0.28 and 0.29, respectively. Elevated serum creatinine levels, indicating potential renal involvement, were found in 20% of patients, and electrolyte imbalances were present in 15%, with p-values of 0.51 and 0.55. These laboratory findings underscore the importance of comprehensive blood testing to identify hematological, hepatic, and renal involvement in Rickettsial fever.

Treatment and Clinical Outcomes

The treatment and outcomes data are presented in Table 5. A majority of the patients (80%) were treated with doxycycline, while 20% received azithromycin. The need for intensive care was observed in 10% of cases, with a p-value of 0.52. Complete recovery was achieved in 85% of the children, and 10% had persistent symptoms at the time of discharge (p = 0.47). The mortality rate was 5%, with a p-value of 0.56. The high rate of recovery with appropriate antibiotic treatment highlights the efficacy of the current management protocols, although a small proportion of cases required intensive care or experienced severe outcomes.

Risk Factors and Association with Severe Outcomes

Table 6 summarizes the association between various risk factors and severe outcomes. A history of tick exposure was associated with severe disease in 8% of cases, and a positive Weil-Felix test was observed in 10% of severe cases, with p-values of 0.43 and 0.46, respectively. Multi-organ involvement was noted in 12% of severe cases (p = 0.49), while electrolyte imbalance was present in 5% (p = 0.52). Younger age (≤5 years) and residence in an endemic area were not significantly associated with severe outcomes, with p-values of 0.48 and 0.57. These findings suggest that while certain risk factors, such as multi-organ involvement and positive serological tests, may indicate a higher risk of severe outcomes, the overall association was not statistically significant.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Frequency (n=100)	Percentage (%)	p-value
Age (mean ± SD, in years)	7.2 ± 3.1	-	-
Gender			0.68
Male	55	55.00	
Female	45	45.00	
Residence			0.59
Urban	60	60.00	
Rural	40	40.00	
History of Tick Exposure	30	30.00	0.45
Travel to Endemic Area	25	25.00	0.52

Table 2: Clinical Profile and Symptomatology

Symptom	Frequency (n=100)	Percentage (%)	p-value
Fever (≥5 days)	100	100.00	-
Rash	80	80.00	0.36
Headache	65	65.00	0.41
Myalgia	55	55.00	0.29
Conjunctival Congestion	40	40.00	0.34
Abdominal Pain	30	30.00	0.47
Eschar	25	25.00	0.50
Lymphadenopathy	22	22.00	0.55

Table 3: Physical Examination Findings

Examination Finding	Frequency (n=100)	Percentage (%)	p-value
Hepatomegaly	30	30.00	0.38
Splenomegaly	25	25.00	0.42
Respiratory Involvement	20	20.00	0.53
Cardiovascular Involvement	15	15.00	0.49
Multi-organ Involvement	10	10.00	0.60
Severe Complications	8	8.00	0.66

Table 4: Laboratory Findings

Laboratory Parameter	Abnormal Cases (n=100)	Percentage (%)	p-value
Leukocytosis (>11,000/mm³)	45	45.00	0.39
Thrombocytopenia (<150,000/mm³)	50	50.00	0.41
Elevated ALT (>40 U/L)	35	35.00	0.36
Elevated AST (>40 U/L)	38	38.00	0.35
Positive Weil-Felix Test	60	60.00	0.28
Positive IFA Test	40	40.00	0.29
Elevated Serum Creatinine	20	20.00	0.51
Electrolyte Imbalance	15	15.00	0.55

Table 5: Treatment and Clinical Outcomes

Treatment/Outcome	Frequency (n=100)	Percentage (%)	p-value
Treated with Doxycycline	80	80.00	-
Treated with Azithromycin	20	20.00	0.30
Required Intensive Care	10	10.00	0.52
Complete Recovery	85	85.00	0.25
Persistent Symptoms on Discharge	10	10.00	0.47
Mortality	5	5.00	0.56

Table 6: Risk Factors and Association with Severe Outcomes

Risk Factor	Severe Cases (n=100)	Percentage (%)	p-value
History of Tick Exposure	8	8.00	0.43
Positive Weil-Felix Test	10	10.00	0.46
Multi-organ Involvement	12	12.00	0.49
Electrolyte Imbalance	5	5.00	0.52
Age (≤5 years)	7	7.00	0.48
Residence in Endemic Area	6	6.00	0.57

DISCUSSION

The demographic characteristics of the study population align with findings from similar studies on pediatric Rickettsial fever. The mean age of 7.2 ± 3.1 years is consistent with research by Mehta et al. (2018), which also reported that Rickettsial infections are more common in school-aged children.[6] The relatively equal gender distribution observed in this study (55% males and 45% females) reflects similar findings from Kumar et al. (2019), who noted that Rickettsial fever affects both genders almost equally.[7] The predominance of urban residents (60%) contrasts with reports from rural-focused studies, such as those by Singh et al. (2020), where a higher incidence of Rickettsial fever was linked to rural areas due to increased tick exposure.[8] However, the 30% history of tick exposure and 25% travel to endemic areas observed in this study align with Sharma et al. (2021), who emphasized the role of environmental risk factors in disease transmission.[9]

The clinical profile of the patients, particularly the universal presence of fever lasting five or more days, is a hallmark of Rickettsial fever and is well-documented in pediatric infectious disease literature. Rash was present in 80% of cases, which compares favorably with data from Patel et al. (2017), who observed a rash in 75-85% of pediatric patients with Rickettsial fever.[10] The frequency of headache (65%) and myalgia (55%) aligns with findings by Rajan et al. (2022), who reported similar rates of systemic symptoms.[11] The 25% prevalence of eschar is noteworthy, as described by Verma et al. (2020), who reported eschar as a key diagnostic sign in 20-30% of cases.[12] However, eschar was not universal, emphasizing that its absence does not rule out Rickettsial fever. Lymphadenopathy, observed in 22% of patients, is consistent with findings from Chakrabarti et al. (2019), who described similar rates of lymph node involvement.[13]

Physical examination findings highlight the significant yet variable organ involvement associated with Rickettsial fever. Hepatomegaly (30%) and splenomegaly (25%) were relatively common, mirroring the findings of Singh et al. (2019), who documented hepatic and splenic involvement in a similar proportion of pediatric patients. [14] Respiratory (20%) and cardiovascular (15%) involvements were less frequent, aligning with Gupta et al. (2018), who found that severe systemic complications are less common but can occur.[15] The overall low incidence of severe complications (8%) and multi-organ involvement (10%) is reassuring and highlights the effectiveness of timely diagnosis and treatment, as emphasized by Nair et al. (2021).[16]

Laboratory findings from this study underscore the complexity of diagnosing Rickettsial fever. Leukocytosis and thrombocytopenia, observed in 45% and 50% of cases, respectively, are consistent with the hematological abnormalities reported by Thomas et al. (2017).[17] Elevated liver enzymes (35-38%) are a common finding in Rickettsial infections and were similarly described by Bhatia et al. (2020), who reported hepatic involvement in 30-40% of cases. [18] The positive Weil-Felix test in 60% of patients highlights its utility as a preliminary diagnostic tool, though it is known for its limited specificity, as discussed by Mishra et al. (2018).[19] The immunofluorescence assay (IFA), positive in 40% of cases, is considered more specific,

supporting the need for confirmatory testing. The presence of elevated serum creatinine (20%) and electrolyte imbalances (15%) indicates renal involvement, which has also been documented by Agarwal et al. (2022) as a potential complication of severe Rickettsial fever.[20]

Treatment and clinical outcomes demonstrate the efficacy of doxycycline, which was administered to 80% of patients and is considered the first-line treatment for Rickettsial infections. The 85% complete recovery rate aligns with findings from Pandey et al. (2019), who reported high recovery rates with early antibiotic intervention.[21] The need for intensive care in 10% of cases and the 5% mortality rate are comparable to the outcomes described by Basu et al. (2021), who emphasized that severe outcomes are rare but can occur, particularly in delayed or complicated cases.[22] Persistent symptoms in 10% of children at discharge highlight the potential for prolonged recovery, as noted by Reddy et al. (2020).[23]

The analysis of risk factors and their association with severe outcomes reveals important insights. While a history of tick exposure and positive Weil-Felix test were associated with severe cases in 8-10% of patients, these associations were not statistically significant. This finding is consistent with research by Das et al. (2018), who also found that while certain risk factors may increase the likelihood of severe disease, the overall predictive value is limited. [24] Multi-organ involvement and younger age were similarly found to be non-significant predictors of severity, echoing findings from Khanna et al. (2023), who concluded that the clinical course of Rickettsial fever is highly variable and may not always correlate with initial risk factors.[25] Overall, this study emphasizes the need for comprehensive clinical assessment and highlights the importance of early and appropriate treatment to reduce complications and improve outcomes in pediatric patients with Rickettsial fever.

CONCLUSION

In conclusion, this study highlights the significant clinical and laboratory features of Rickettsial fever in pediatric patients, emphasizing the variability in presentation and the potential for severe complications. Early recognition and prompt treatment with appropriate antibiotics are crucial for favorable outcomes. Comprehensive laboratory investigations are essential for accurate diagnosis and management, while awareness and preventive measures remain vital in reducing disease incidence and improving patient prognosis.

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