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Original Research Article

DEMOGRAPHIC, CLINICAL, LABORATORY AND TREATMENT PROFILE OF PATIENTS WITH FEVER AND RASH: A RETROSPECTIVE CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Fever with rash is a common clinical presentation in pediatric practice and may be caused by a wide range of infectious and non-infectious conditions. Although measles remains an important cause of febrile rash illnesses, improved immunization coverage has altered its epidemiology in recent years. Understanding the demographic, clinical, laboratory and treatment characteristics of such patients is important for accurate diagnosis and management.

Materials and Methods: A retrospective cross-sectional study was conducted in the Department of Pediatrics at Government Medical College and Hospital, Chhatrapati Sambhajinagar. Data regarding demographic characteristics, epidemiological factors, clinical features, laboratory investigations, treatment received and outcomes were collected using a structured proforma and analyzed using descriptive statistics.

Results: A total of 99 patients were included in the study. The majority of cases occurred in children aged 1–5 years (45.5%), followed by infants younger than one year (22.2%). Gender distribution was nearly equal (50.5% females, 49.5% males). Moderate acute malnutrition was present in 64.6% of patients. Most children were fully immunized (76.8%) and had received vitamin A prophylaxis (84.8%). Fever was present in 99% of cases, with cough (30.3%) and coryza (24.2%) being the most common associated symptoms. Measles IgM was positive in only 3.0% of patients and RT-PCR in 2.0%. Pneumonia was the most common complication (6.1%). Overall outcomes were favorable, with 98% of patients recovering.

Conclusion: Fever with rash in hospitalized children represents a heterogeneous clinical syndrome predominantly affecting younger children and frequently associated with malnutrition. Despite high immunization coverage, laboratory-confirmed measles was uncommon, emphasizing the need for continued surveillance and improved diagnostic evaluation of febrile rash illnesses.

Keywords: Fever with rash, Measles, Viral exanthem, Pediatric infections, Immunization, Malnutrition.

INTRODUCTION

Assessment of patients presenting with fever and rash is often difficult because the list of possible diagnoses is wide and includes conditions varying from mild and self-limiting illnesses to serious, life-threatening diseases.[1] In recent years, increased travel and population movement have contributed to the emergence and spread of imported infections, often resulting in secondary local transmission. Viral

exanthems represent the most common cause of febrile rash illnesses. Numerous viruses are known to produce characteristic cutaneous manifestations during the course of infection. Among these, rubeola (measles), caused by a paramyxovirus, continues to remain a major public health concern, particularly in developing countries, where it is associated with significant morbidity and mortality. Febrile rash illnesses can be broadly classified based on the morphology of the rash into maculopapular rash, generalized diffuse erythema, vesicular rash, pustular rash, nodular rash, petechial rash and purpuric rash.[2] India has committed to eliminating measles and rubella by 2026 and substantial progress has been achieved through the Universal Immunization Programme (UIP). Currently, national coverage of the measles–rubella vaccine stands at 93.7% for the first dose and 92.2% for the second dose. As a result of intensified vaccination efforts and strengthened surveillance, India recorded a significant decline in disease burden, with a 73% reduction in measles cases and a 17% reduction in rubella cases in 2024 compared with 2023. Despite this progress, sporadic cases and outbreaks continue to occur, highlighting the need for continued surveillance and evaluation of febrile rash illnesses in hospital settings.[3]

Despite these achievements, cases of fever with rash and occasional outbreaks of measles continue to be reported. Therefore, the present study was undertaken to evaluate the demographic characteristics, clinical presentation, laboratory findings and treatment profile of patients presenting with fever and rash in a tertiary care hospital.

MATERIALS AND METHODS

Study Design and Setting

A retrospective cross-sectional study was conducted in the Department of Pediatrics at GMCH Chh.Sambhajinagar. The study included pediatric patients admitted with fever and rash during the period from Februray 2025 to August 2025. The study was carried out by reviewing hospital medical records and case sheets of eligible patients.

Study Population

All pediatric patients admitted to the Department of Pediatrics during the study period with documented fever and rash were included in the study.

Inclusion Criteria

- Pediatric patients presenting with fever and rash
- Patients admitted to the pediatric ward during the study period

Exclusion Criteria

- Patients with rash without fever
- Patients with fever without rash
- Patients with incomplete medical records
- Patients with dermatological conditions not related to acute febrile illness

Data Collection

Data were collected retrospectively from hospital case records using a structured data collection proforma. Information regarding demographic, epidemiological, clinical, laboratory, treatment and outcome variables was extracted.

Demographic Variables

The following demographic information was recorded:

- Age
- Gender
- Address and housing conditions
- Socioeconomic status
- Parental education and occupation
- Birth order and family size

Epidemiological Variables

Epidemiological information was documented including:

- History of contact with measles cases
- Presence of measles outbreak in the area
- Travel history
- School or anganwadi attendance
- Immunization status including measles-rubella vaccination
- History of vitamin A prophylaxis
- Overcrowding and sanitation status

Clinical Variables

Clinical details obtained from medical records included:

- Duration of fever
- Onset and characteristics of rash
- Associated symptoms such as cough, coryza, conjunctivitis, photophobia, vomiting, diarrhea and other systemic manifestations
- Presence of Koplik spots and other clinical signs
- Vital parameters including temperature, respiratory rate, heart rate and oxygen saturation
- Findings from systemic examination including respiratory, neurological and other relevant systems

Nutritional Assessment

Nutritional status of children was assessed using anthropometric measurements including weight, height, mid-upper arm circumference (MUAC) and Z-scores according to WHO growth standards.

Laboratory Investigations

Laboratory investigations recorded from case sheets included:

- Complete blood count (hemoglobin, total leukocyte count, differential count, platelet count)
- Inflammatory markers such as ESR and C-reactive protein (CRP)
- Liver function tests and renal function tests
- Chest X-ray and other relevant investigations when indicated
- Specific diagnostic tests such as measles IgM antibodies and reverse transcription polymerase chain reaction (RT-PCR) of throat swab samples where available

Risk Factors

Potential risk factors including malnutrition, vitamin A deficiency, immunodeficiency, steroid use,

overcrowding, poor sanitation and incomplete vaccination were also documented.

Treatment Details

Treatment received during hospitalization was recorded, including:

- Antipyretics
- Antibiotics
- Vitamin A supplementation
- Intravenous fluids
- Oxygen therapy or ventilatory support
- Anticonvulsants and other supportive treatments

Outcome Measures

Patient outcomes were assessed based on:

- Duration of hospital stay
- Requirement for intensive care unit (ICU) admission
- Occurrence of complications
- Final outcome at discharge including recovery, referral, or death
- Residual complications during follow-up where documented

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentages. The results were summarized using tables and descriptive statistics.

RESULTS

A total of 99 patients presenting with fever and rash were included in the study.

Table 1: Socio-demographic, nutritional, immunization and epidemiological profile of the study population (n = 99)

Variable	Category	n	%
Age group	<1 year	22	22.2
	1–5 years	45	45.5
	>5–10 years	25	25.3
	>10 years	7	7.1
Gender	Male	49	49.5
	Female	50	50.5
Nutritional status	Normal	32	32.3
	MAM	64	64.6
	SAM	3	3.0
Immunization status	Fully immunized	76	76.8
	Partially immunized	12	12.1
	Not immunized	10	10.1
	Unknown	1	1.0
Vitamin A prophylaxis received	Yes	84	84.8
	No	15	15.2
History of contact with measles case	Yes	16	16.2
	No	82	82.8
	Unknown	1	1.0
Measles outbreak in area	Yes	13	13.1
	No	86	86.9
School/anganwadi attendance	Yes	84	84.8
	No	15	15.2
Overcrowding	Yes	99	100.0
Poor sanitation	Yes	31	31.3
	No	68	68.7

The majority of patients belonged to the 1–5 year age group (45.5%), followed by >5–10 years (25.3%) and <1 year (22.2%). There was an almost equal sex distribution, with 50.5% females and 49.5% males. Most children were classified as moderately malnourished (64.6%), while only 32.3% had normal nutritional status. Immunization coverage was relatively high, with 76.8% fully immunized, although 22.2% were either partially immunized or unimmunized. A history of contact with a measles case was present in 16.2% and 13.1% had a reported outbreak in their locality. Overcrowding was documented in all cases in the dataset.

Table 2: Clinical and rash profile of the study population (n = 99)

Variable	Category	n	%
Symptoms/signs	Fever	98	99.0
	Cough	30	30.3
	Coryza	24	24.2
	Conjunctivitis	8	8.1
	Photophobia	6	6.1
	Pruritis	11	11.1
	Desquamation	0	0.0
	Lymphadenopathy	1	1.0
Koplik spots	Absent	99	100.0
Recorded rash type	Erythematous/blanching	41	41.4

	No rash documented	33	33.3
	Maculopapular	23	23.2
	Petechial	2	2.0
Recorded rash distribution	Face/trunk predominant	49	49.5
	Face → trunk → extremities	22	22.2
	Trunk predominant	5	5.1
	Atypical	2	2.0
	Not clearly documented/other	21	21.2
Blanching	Present	62	62.6
	Absent/not documented	37	37.4

Fever was present in 99.0% of cases. Among associated symptoms, cough (30.3%) and coryza (24.2%) were the most common, whereas conjunctivitis (8.1%) and photophobia (6.1%) were less frequent. Pruritis was noted in 11.1% of patients, while desquamation was not documented in any patient. Koplik spots were absent in all recorded cases. As entered in the dataset, the most frequent rash description was erythematous/blanching rash (41.4%), followed by no rash documented (33.3%) and maculopapular rash (23.2%). The most common documented distribution was face/trunk predominant (49.5%).

Table 3: Clinical examination and laboratory profile of the study population

Variable	Mean ± SD
Age (years)	3.70 ± 2.97
Weight (kg)	14.03 ± 5.64
Height/Length (cm)	92.12 ± 24.19
MUAC (cm)	12.98 ± 0.79
Temperature (°C)	37.47 ± 0.50
Respiratory rate (/min)	22.18 ± 6.18
Heart rate (/min)	109.01 ± 10.65
SpO_2 (%)	93.51 ± 5.41
Hemoglobin (g/dL)	10.90 ± 1.11
Total leukocyte count (/mm³)	10113.33 ± 4137.05
Length of hospital stay (days)	2.07 ± 2.32

Table 4: Virological investigations

Investigation	Category	n	%
Measles IgM	Negative	92	92.9
	Positive	3	3.0
	Awaited	3	3.0
	Not done	1	1.0
Measles IgG	Negative	78	78.8
	Not done	18	18.2
	Awaited	3	3.0
RT-PCR	Negative	97	98.0
	Positive	2	2.0

The mean age of the study population was 3.70 ± 2.97 years. The mean weight and height were 14.03 ± 5.64 kg and 92.12 ± 24.19 cm, respectively, with a mean MUAC of 12.98 ± 0.79 cm. On admission, the mean temperature was 37.47 ± 0.50°C, mean respiratory rate was 22.18 ± 6.18/min, mean heart rate was 109.01 ± 10.65/min and mean oxygen saturation was 93.51 ± 5.41%. The mean hemoglobin level was 10.90 ± 1.11 g/dL, while the mean total leukocyte count was 10113.33 ± 4137.05/mm³. The average hospital stay was 2.07 ± 2.32 days. Measles IgM was negative in the majority (92.9%), with positivity in 3.0% of patients. RT-PCR was positive in 2.0% of cases.

Table 5: Signs of Vitamin a Deficiency Among Study Population (n = 99)

Sign of Vitamin A Deficiency	Number (n)	Percentage (%)
No signs documented	75	75.8
Watering/discharge from eye	12	12.1
Xerophthalmia	9	9.1
Present but unspecified	3	3.0
Total	99	100

The majority of children (75.8%) did not show clinical signs of vitamin A deficiency. Among those with documented manifestations, watering or discharge from the eyes was the most common finding (12.1%), followed by xerophthalmia (9.1%). In a small proportion (3.0%), vitamin A deficiency was noted without specification of the exact clinical sign.

Table 6: Reasons for Non-vaccination or Incomplete Vaccination

Reason	Number (n)	Percentage (%)
Lack of awareness	9	60.0
Vaccine hesitancy	4	26.7
Missed opportunity	1	6.7
Uneducated / poor awareness	1	6.7
Total documented reasons	15	100

Among cases where reasons for non-vaccination or incomplete vaccination were documented, lack of awareness was the most frequently reported reason (60.0%). Vaccine hesitancy accounted for 26.7% of cases. Missed opportunities and low educational status or poor awareness were reported in 6.7% of cases each.

Table 7: Treatment and outcomes of the study population (n = 99)

Variable	Category	n	%
Treatment received	Antibiotics	99	100.0
	Antipyretics	99	100.0
	Nutritional support/counselling	99	100.0
	IV fluids	21	21.2
	Oxygen/NIV/ventilation	7	7.1
	Anticonvulsants	2	2.0
Complications	Pneumonia	6	6.1
	No complication recorded	93	93.9
ICU admission	Yes	2	2.0
	No	97	98.0
Outcome	Recovered	98	99.0
	Death	1	1.0

All patients received antibiotics, antipyretics and nutritional support/counselling. Intravenous fluids were administered to 21.2%, while 7.1% required oxygen or ventilatory support. Anticonvulsants were used in 2.0% of patients. The most common documented complication was pneumonia (6.1%). ICU admission was required in 2.0% of cases. The overall outcome was favorable, with 98.0% recovering, while one patient (1.0%) died.

DISCUSSION

The present retrospective cross-sectional study evaluated the demographic, clinical, laboratory and treatment profile of 99 pediatric patients presenting with fever and rash. The majority of cases occurred in children aged 1–5 years (45.5%), followed by infants younger than one year (22.2%), indicating that febrile rash illnesses remain predominantly concentrated in early childhood. A similar age pattern has been reported by Sosale et al,[4] who observed that measles predominantly affected younger children with a mean age of approximately 2.5 years. Early childhood vulnerability to measles and other exanthematous illnesses has also been highlighted in outbreak investigations such as the study by Mehta et al,[5] which demonstrated that a large proportion of cases occurred among children and adolescents with incomplete vaccination coverage.

The sex distribution in our study was nearly equal with a slight female predominance (50.5% vs. 49.5%). A comparable female predominance was reported by Sosale et al,[4] whereas other investigations such as that by Mehta et al,[5] documented a higher prevalence among male children. Such variation in sex distribution may be explained by differences in population characteristics, regional epidemiology and healthcare-seeking behavior.

Malnutrition remains an important determinant of susceptibility to infectious diseases in children. In the present study, 64.6% of children had moderate acute malnutrition, while 3.0% had severe acute malnutrition, indicating a considerable burden of undernutrition among children hospitalized with febrile rash illnesses. The relationship between malnutrition and measles has been well documented. Sosale et al,[4] highlighted malnutrition as an important risk factor for complications and cited findings from Raote et al,[9] who reported that children with severe malnutrition experienced more frequent and severe complications. In addition, Bhaskaram et al,[10] demonstrated that measles itself can worsen nutritional status and contribute to vitamin A deficiency, which may predispose children to ocular complications and impaired immune function.

Immunization status remains a crucial determinant in the epidemiology of measles and related febrile rash illnesses. In our study, 76.8% of children were fully immunized, 12.1% were partially immunized and 10.1% were unimmunized. These findings indicate relatively good vaccination coverage compared with earlier studies. For instance, Mehta et al,[5] reported that a substantial proportion of measles cases occurred among unvaccinated children. Notably, nine out of eighteen infants developed measles before the recommended age of nine months for the first measles-containing vaccine dose in India in study by Sosale et al.[4] The susceptibility of infants has been attributed to the early waning of maternal antibodies, which may occur earlier in children of vaccinated

mothers compared with those whose mothers acquired natural immunity.[8-10] Despite improved immunization coverage, the occurrence of fever and rash illnesses among vaccinated individuals suggests that other viral exanthems or breakthrough infections may contribute to the clinical spectrum observed in hospital settings.

Vitamin A prophylaxis had been received by 84.8% of children in the present study, which may have contributed to the favorable clinical outcomes observed. Vitamin A deficiency was observed in a subset of children, with xerophthalmia and ocular discharge being the most common manifestations. Measles infection can exacerbate underlying micronutrient deficiencies, particularly vitamin A deficiency, which is associated with increased disease severity and ocular complications. Therefore, WHO and national guidelines recommend vitamin A supplementation for all children with measles to reduce morbidity and mortality.[3] Bhaskaram et al,[10] demonstrated that vitamin A deficiency can significantly worsen the severity of measles infection and contribute to complications such as ocular morbidity.

Only 16.2% of children in our study had a documented history of contact with measles, while 13.1% reported outbreaks in their locality. In contrast, higher contact histories have been reported in measles-specific cohorts. Sosale et al,[4] reported that a substantial proportion of patients had a history of contact with confirmed measles cases, highlighting the importance of person-to-person transmission during outbreaks.

Clinically, fever was present in nearly all patients (99.0%), which is consistent with the typical presentation of febrile rash illnesses. Among associated symptoms, cough (30.3%) and coryza (24.2%) were the most common. Classical measles features such as cough, coryza and conjunctivitis have been widely described in measles-focused studies. However, Sindhu et al,[8] reported that atypical presentations of measles may occur, particularly in infants and that maternal antibodies may influence the clinical expression of the disease.

The diversity of rash morphology observed in our cohort also reflects the heterogeneous nature of febrile rash illnesses. While classical measles typically presents with a maculopapular rash, other viral exanthems may produce varied dermatological manifestations. Such heterogeneity emphasizes the importance of clinical assessment combined with appropriate laboratory investigations.

Laboratory findings in the present study revealed low measles confirmation rates, with Measles IgM positivity in only 3.0% of cases and RT-PCR positivity in 2.0%. These findings differ from measles-focused retrospective studies such as that reported by Sosale et al,[4] where a substantial proportion of cases were laboratory confirmed. The low virological positivity in our cohort suggests that most children presenting with fever and rash had etiologies other than measles, highlighting the importance of laboratory confirmation in the evaluation of febrile rash syndromes.

Despite the significant burden of malnutrition, the overall prognosis was favorable. Pneumonia (6.1%) was the most common complication, ICU admission was required in only 2.0% and 98% of children recovered, with one mortality recorded. Similar observations have been reported in earlier studies. Mehta et al,[5] identified pneumonia as the most common complication of measles, while Sosale et al,[4] also reported generally favorable outcomes with appropriate supportive management.

From an immunological perspective, Krugman et al,[11] demonstrated that measles infection induces detectable antibody responses within the first two weeks of infection and provides long-lasting immunity following exposure or vaccination. Additionally, the early waning of maternal antibodies, as described by Gagneur et al,[9] and Leuridan et al,[10] may contribute to increased susceptibility among infants who are younger than the recommended vaccination age.

CONCLUSION

In conclusion, the present study demonstrates that fever with rash remains a common clinical presentation among hospitalized pediatric patients, predominantly affecting younger children, particularly those aged 1–5 years. A significant proportion of children also had underlying malnutrition, highlighting the continued interaction between nutritional status and susceptibility to infectious diseases. Although immunization coverage was relatively high, only a small proportion of cases were laboratory confirmed as measles, suggesting that febrile rash illnesses in the current era represent a heterogeneous group of infections rather than exclusively measles. The overall prognosis was favorable, with low complication rates and high recovery, although pneumonia remained the most common complication. These findings underscore the importance of continued surveillance, improved laboratory confirmation, strengthened immunization programs and nutritional support in the management and prevention of febrile rash illnesses in children

Limitations

The study was conducted in a single tertiary care center, which may limit the generalizability of the findings to the wider community population. Future multicentric prospective studies with comprehensive virological testing would help better delineate the etiological spectrum of febrile rash illnesses in children.

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