Original Article

Dermatological Manifestations in Children Admitted to Paediatric Intensive Care Unit – A Prospective Observational Study

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Abstract

Background: Dermatological manifestations in critically ill children may reflect underlying systemic diseases, adverse drug reactions, or complications associated with intensive care. Early recognition may assist clinical management. The aim is to assess the prevalence, clinical spectrum, and association of dermatological manifestations with mortality and length of PICU stay. **Material and Methods:** This prospective observational study was conducted at Indira Gandhi Institute of Child Health, Bengaluru, over 18 months (April 2024–September 2025). Among 4,799 PICU admissions, 160 children aged 1 month to 18 years with dermatological manifestations were evaluated. Clinical characteristics, lesion morphology, etiological categories, PICU stay, and mortality were recorded and analyzed. **Results:** Dermatological manifestations were observed in 3.33% of PICU admissions. Males constituted 56.9% of cases, while infants accounted for 33.1%. Maculopapular lesions (36.3%) and purpuric lesions (26.3%) were the predominant presentations. Systemic disease-associated manifestations were most frequent (53.8%), followed by life-threatening dermatological conditions (25.6%), consequences of critical illness (13.8%), and drug-induced reactions (6.9%). Median PICU stay was 5 days, without significant differences across categories (P=0.164). Overall mortality was 8.8%, highest among children with consequences of critical illness (13.6%) and life-threatening dermatological conditions (12.2%). The association between dermatological category and mortality was not statistically significant (P=0.229). **Conclusion:** Dermatological manifestations in critically ill children predominantly reflected systemic diseases. Systematic skin examination may facilitate early identification of clinically important conditions and intensive care-related complications.

Keywords: Dermatological manifestations, Paediatric intensive care unit, Skin lesions, Systemic diseases, Mortality, Critical illness.

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Introduction

Dermatological manifestations are frequently encountered in critically ill children and may reflect underlying systemic diseases, adverse drug reactions, infections, or complications associated with intensive care management. The skin serves as an important indicator of physiological disturbances, including impaired perfusion, inflammation, and immune dysfunction. Children admitted to paediatric intensive care units (PICUs) are particularly vulnerable to skin injuries because of prolonged immobilization, medical devices, and underlying critical illness. Youn and Kim,[1] investigated the incidence and patterns of device-related pressure injuries in paediatric intensive care, highlighting the importance of regular skin assessment.

Skin complications in hospitalized children may contribute to discomfort, secondary infections, and prolonged hospitalization. Mosa et al,[2] reviewed paediatric pressure injuries and emphasized preventive measures and early recognition. Similarly, Seval et al,[3] evaluated the prevalence and risk factors associated with medical device-related pressure injuries in PICUs, demonstrating the importance of identifying vulnerable patients. Wakabayashi et al,[4] investigated pressure injuries associated with nasotracheal intubation, while Nie and Delmore,[5] examined risk factors for immobility-related and device-associated pressure injuries in hospitalized children.

Apart from treatment-related complications, dermatological manifestations may provide diagnostic clues to systemic inflammatory and infectious conditions. Penna et al,[6] described cutaneous manifestations associated with multisystem inflammatory syndrome in children, demonstrating the relationship between skin findings and systemic disease. Altammami et al,[7] evaluated dermatological conditions among intensive care patients, further emphasizing the clinical relevance of skin abnormalities in critically ill populations.

Despite their clinical importance, dermatological manifestations in PICUs remain inadequately characterized, particularly in Indian tertiary care settings. Their relationship with clinical

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outcomes, including mortality and duration of intensive care stay, requires further evaluation. Therefore, the present study aimed to assess the occurrence and clinical spectrum of dermatological manifestations among children admitted to the PICU and examine their association with mortality and length of PICU stay.

Materials and Methods

Study Design and Setting: This hospital-based prospective observational study was conducted in the Paediatric Intensive Care Unit of Indira Gandhi Institute of Child Health, Bengaluru, Karnataka, a tertiary care paediatric referral hospital. The study was carried out over 18 months, from April 2024 to September 2025.

Study Population and Sample Size: Children aged between 1 month and 18 years who were admitted to the PICU during the study period were screened for dermatological manifestations. Of 4,799 PICU admissions, 160 children with dermatological manifestations were included in the analysis.

Inclusion Criteria

Children aged 1 month to 18 years admitted to the PICU during the study period were eligible for inclusion. Written informed consent was obtained from parents or legally authorized representatives, and assent was obtained from children aged 12–18 years, wherever applicable.

Exclusion Criteria

Children presenting with traumatic skin lesions unrelated to dermatological disease, systemic illness, or intensive care management were excluded.

Data Collection: Demographic characteristics, including age, sex, presenting complaints, underlying diagnosis, and relevant medical history, were recorded using a structured proforma. Clinical examination included assessment of vital parameters, systemic findings, and dermatological abnormalities.

A detailed dermatological examination was performed within 48 hours of PICU admission. Skin lesions were assessed according to morphology, number, anatomical distribution, colour, size, and associated symptoms. Relevant laboratory investigations and clinical records were reviewed to determine the underlying cause of dermatological manifestations.

Classification of Dermatological Manifestations: Dermatological manifestations were classified into four categories:

1. Life-threatening dermatological diseases: Conditions requiring intensive care, including Stevens–Johnson syndrome, toxic epidermal necrolysis, staphylococcal scalded skin syndrome, and severe cutaneous infections.
2. Drug-induced dermatological manifestations: Cutaneous adverse drug reactions, including maculopapular eruptions, urticaria, and other medication-related skin abnormalities.
3. Manifestations of systemic diseases: Skin findings associated with infections, hematological disorders, inflammatory conditions, nutritional deficiencies, and other systemic illnesses.
4. Consequences of critical illness: Pressure injuries, device-related skin damage, and other dermatological complications developing during intensive care.

Outcome Assessment: The primary outcome was the occurrence and distribution of dermatological manifestations among children admitted to the PICU. Secondary outcomes included mortality and length of PICU stay. Clinical outcomes were compared across the four dermatological categories to assess their association with disease severity and prognosis.

Statistical Analysis: Data were analyzed using descriptive and inferential statistical methods. Continuous variables were summarized using means and standard deviations or medians and interquartile ranges, as appropriate. Categorical variables were expressed as frequencies and percentages. Associations between dermatological categories and clinical outcomes were assessed using the Chi-square test or Fisher's exact test, as appropriate. A P-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted following approval from the Institutional Ethics Committee of Indira Gandhi Institute of Child Health, Bengaluru. Written informed consent was obtained from parents or legally authorized representatives, and age-appropriate assent was obtained wherever applicable. Patient confidentiality was maintained throughout the study.

Results

A total of 4,799 children were admitted to the Paediatric Intensive Care Unit (PICU) during the 18-month study period. Among them, 160 children (3.33%) were identified with dermatological manifestations and included in the analysis. The demographic characteristics, morphological patterns, etiological distribution, length of PICU stay, and mortality outcomes were evaluated.

Table 1: Demographic Characteristics of the Study Population (N=160)

Characteristics	Frequency (n)	Percentage (%)
Age group		
1 month–1 year	53	33.1
1–5 years	27	16.9
6–12 years	46	28.7
13–18 years	34	21.3
Gender		
Male	91	56.9
Female	69	43.1
Age characteristics	Value	
Mean age ± SD (years)	6.42 ± 5.18	
Median age (years)	5.50	
Interquartile range (years)	0.98–12.00	

Male-to-female ratio	1.32:1	

Infants aged 1 month to 1 year constituted the largest proportion of patients (33.1%), followed by children aged 6–12 years (28.7%). Males accounted for 56.9% of the study population, with a male-to-female ratio of 1.32:1. The median age was 5.5 years. The difference in gender distribution was not statistically significant (P=0.082).

Table 2: Morphological Characteristics and Distribution of Dermatological Manifestations (N=160)

Parameters	Frequency (n)	Percentage (%)
Primary morphology		
Macule/patch/maculopapular rash	58	36.3
Purpura/petechiae/ecchymosis	42	26.3
Vesicle/bulla/pustule	26	16.2
Ulcer/erosion/necrotic lesion	12	7.5
Scale/crust/excoriation	13	8.1
Mixed/other morphologies	9	5.6
Number of lesions		
Solitary	14	8.8
Few (2–5)	18	11.2
Multiple (6–20)	47	29.4
Innumerable (>20 or confluent)	81	50.6
Anatomical distribution		
Generalized	104	65.0
Regional	33	20.6
Localized	23	14.4

Maculopapular lesions were the most frequent morphological presentation (36.3%), followed by purpuric lesions (26.3%). Multiple or innumerable lesions were observed in 80.0% of patients. Generalized cutaneous involvement was recorded in 65.0% of children, indicating that widespread skin manifestations were common among critically ill patients.

Table 3: Etiological Classification of Dermatological Manifestations (N=160)

Etiological category	Frequency (n)	Percentage (%)	95% CI
Life-threatening dermatological conditions	41	25.6	19.0–33.2
Drug-induced dermatological manifestations	11	6.9	3.5–11.9
Dermatological manifestations of systemic diseases	86	53.8	45.8–61.6
Consequences of critical illness	22	13.8	8.9–20.0
Total	160	100.0	—

Dermatological manifestations associated with systemic diseases constituted the largest category (53.8%), followed by life-threatening dermatological conditions (25.6%). Skin manifestations arising as consequences of critical illness accounted for 13.8%, while drug-induced reactions represented 6.9% of cases.

Among the 86 children with systemic disease-associated dermatological manifestations, hematological disorders were the most frequent (27.9%), followed by autoimmune or rheumatological conditions (24.4%) and infectious diseases (20.9%).

Table 4: Association of Dermatological Categories With PICU Stay and Mortality (N=160)

Dermatological category	Total (n)	Median PICU stay (days)	Survived n (%)	Died n (%)
Life-threatening conditions	41	6.0	36 (87.8)	5 (12.2)
Drug-induced manifestations	11	5.0	10 (90.9)	1 (9.1)
Systemic disease manifestations	86	5.0	81 (94.2)	5 (5.8)
Consequences of critical illness	22	4.0	19 (86.4)	3 (13.6)
Total	160	5.0	146 (91.2)	14 (8.8)

Statistical findings:

- Difference in PICU stay across dermatological categories: Kruskal–Wallis H=5.112, P=0.164.
- Association between dermatological category and mortality: χ^2=4.318, P=0.229.
- Comparison of mortality between higher-risk categories (1 and 4) and other categories: relative risk=2.05 (95% CI: 0.76–5.53), two-sided Fisher's exact P=0.096.

The median PICU stay was 5 days (IQR: 3–8 days), with a mean duration of 6.4 ± 4.8 days. Children with life-threatening dermatological conditions had the longest median PICU stay (6 days), although differences across categories were not statistically significant (P=0.164).

Overall, 146 children (91.2%) survived, while 14 (8.8%) died. Mortality was highest among children with dermatological manifestations arising as consequences of critical illness (13.6%), followed by those with life-threatening dermatological conditions (12.2%). The lowest mortality was observed among children with systemic disease-associated manifestations (5.8%). However, the association between dermatological category and

mortality was not statistically significant (P=0.229).

The combined higher-risk categories demonstrated approximately twice the mortality risk compared with the remaining categories, but the two-sided comparison did not reach statistical significance (P=0.096).

Discussion

Dermatological manifestations in critically ill children may indicate underlying systemic diseases, adverse drug reactions, or complications associated with intensive care management. In the present study, dermatological manifestations were identified in 160 of 4,799 PICU admissions, giving a prevalence of 3.33%. The majority of affected children were males (56.9%), and infants constituted the largest age group (33.1%).

Macules, patches, and maculopapular rashes were the most common morphological presentations (36.3%), followed by purpuric lesions (26.3%). Generalized skin involvement was observed in 65.0% of patients. Méndez-Flores et al,[8] examined dermatological manifestations among intensive care patients and emphasized the diverse clinical presentations encountered in critically ill populations. These observations support the importance of systematic skin examination during intensive care.

Dermatological manifestations associated with systemic diseases constituted the largest category (53.8%), followed by life-threatening dermatological conditions (25.6%). Manifestations arising as consequences of critical illness accounted for 13.8% of cases. Takashima et al,[9] in a systematic review and meta-analysis, evaluated invasive device-associated skin complications in paediatric healthcare settings. Similarly, Başbakkal et al,[10] investigated medical device-related pressure injuries among hospitalized children, highlighting the importance of preventive skin care.

Drug-induced dermatological manifestations accounted for 6.9% of cases. Mori et al,[11] discussed the interaction between medications and viral infections in childhood skin eruptions, emphasizing the diagnostic challenges associated with differentiating drug reactions from infection-related rashes. Hande et al,[12] in a prospective observational study from South India, investigated mucocutaneous findings among children admitted to the PICU, providing relevant evidence regarding the spectrum of dermatological manifestations in critically ill children.

The median PICU stay was 5 days, with no statistically significant difference across dermatological categories (P=0.164). Setchell et al,[13] evaluated preventive strategies for pressure injuries in critically ill children, demonstrating the importance of structured skin care practices. Mathieu et al,[14] reviewed paediatric fixed drug eruptions, highlighting the need for careful identification of medication-related skin manifestations.

Overall mortality was 8.8%, with the highest mortality observed among children with dermatological manifestations arising as consequences of critical illness (13.6%), followed by those with life-threatening dermatological conditions (12.2%). However, the association between dermatological category and mortality was not statistically significant (P=0.229). Sillevis Smitt et al,[15] investigated skin lesions among children admitted to the PICU, supporting the clinical relevance of dermatological assessment in paediatric critical care.

The study was limited by its single-centre design and the relatively small number of patients in certain dermatological categories. Although mortality rates varied across categories, these differences did not establish a statistically significant association. Nevertheless, the findings demonstrated the broad spectrum of dermatological manifestations encountered in critically ill children.

Conclusion

Dermatological manifestations were identified in 3.33% of PICU admissions, predominantly reflecting underlying systemic diseases. Maculopapular and purpuric lesions were the most common presentations. Mortality was numerically higher among children with life-threatening dermatological conditions and complications of critical illness, although the association was not statistically significant. Routine dermatological examination may support early recognition and management of skin-related complications in critically ill children.

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Conflicts of interest

There are no conflicts of interest.

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