Original Article

Dermatological conditions in the intensive care unit at a tertiary care hospital in Riyadh, Saudi Arabia

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ABSTRACT

الأهداف: تقييم حالات الجلد المختلفة التي تم تشخيصها لدى المرضى الذين تم إدخالهم إلى وحدة العناية المركزة.

المنهجية: هذه دراسة وصفية بأثر رجعي لجميع المرضى البالغين والأطفال وحديثي الولادة الذين تم قبولهم في وحدة العناية المركزة وكان لديهم مظاهر جلدية. تم تصنيف وتحليل جميع حالات الجلد.

النتائج: شملت الدراسة 344 مريضاً في وحدة العناية المركزة يعانون من 365 حالة جلدية مختلفة. تتراوح الأعمار من أقل من سنة واحدة إلى 96 سنة بمتوسط عمر 43.6±30.1 سنة. كانت نسبة الذكور 189 (54.9%). كانت أعلى ثلاث فئات مرضية عامة هي الالتهابات الجلدية، وأمراض الالتهابات والمناعة الذاتية، والتفاعلات الدوائية. كانت الاضطرابات الجلدية الأكثر شيوعًا هي الاندفاع الدوائي الحصبي الشكل (6.8%)، يليه التهاب الجلد التماسي (6.3%)، والتهاب الأوعية الدموية (5.5%)، والهربس النطاقي (4.6%)، الفرفرية بسبب قلة الصفيحات (3.8%)، التهاب الجلد / الأكزيما (3.8%)، داء المبيضات (3.8%)، ورم وعائي طفولي (2.7%)، تفاعل دوائي غير مصنف (2.5%)، داء الثنيات (2.5%)، وفيروس الهربس البسيط (2.5%).

الخلاصة: يمكن أن تحدث الاضطرابات الجلدية في وحدة العناية المركزة على مستويات مختلفة من الشدة. كانت الالتهابات الجلدية، وأمراض الالتهابات والمناعة الذاتية، والتفاعلات الدوائية هي الأكثر انتشارًا.

Objectives: To evaluate the various skin conditions diagnosed in intensive care unit (ICU) patients.

Methods: This is a descriptive retrospective study of all adults, pediatric, and neonatal patients who were admitted to the ICU and had a dermatological manifestation during hospital stay or patients who had dermatological condition that requires ICU admission. All skin conditions were categorized and analyzed.

Results: A total of 344 ICU patients with 365 different dermatological conditions were included in the study. The age of patients ranged from less than 1-96 years, with a mean age of 43.6±30.1 years. Of the patients, 189 (54.9%) were males. The top 3 general disease categories observed were skin infections, inflammatory and autoimmune diseases, and drug reactions. The most commonly reported dermatological disorders included morbilliform drug eruption (6.8%), contact dermatitis (6.3%), vasculitis (5.5%), herpes zoster (4.6%), purpura due to thrombocytopenia (3.8%), dermatitis/eczema (3.8%), candidiasis (3.8%), infantile hemangioma (2.7%), unclassified drug reaction (2.5%), intertrigo (2.5%), and herpes simplex virus (2.5%).

Conclusion: Dermatological disorders can occur at various levels of severity in the ICU. Skin infections, inflammatory and autoimmune diseases, and drug reactions were found to be the most prevalent conditions.

Keywords: intensive care unit, skin diseases, dermatological conditions, critically ill patients

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Although dermatology has a low mortality rate and is often seen in outpatient clinics, some skin problems can be very serious, and patients may require extensive care due to the ailment itself, complications related to the condition, or side effects from treatment.[1,2] This means that certain cases necessitate consultation

and admission to the intensive care unit (ICU) due to the severity of the skin disease.[3] Examples of such conditions include toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome (SJS), necrotizing fasciitis, and exfoliative dermatitis.[3] In the ICU, patients may be at risk of secondary skin infections from nosocomial organisms, as they spend an extended time in bed, connected to life-support machines.[2,3] A prior study indicated that fungal infections accounted for 59% of overall dermatological infections in the ICU.[4] Given the use of various instruments and invasive procedures in ICU care and monitoring, patients may experience a range of dermatological manifestations, including contact dermatitis.[5] Furthermore, pressure ulcers are more prevalent in the ICU, particularly among elderly, chronically bedridden, and malnourished patients.[6,7] Data revealed that 42.2% of severely ill patients exhibited dermatological manifestations requiring medical attention.[4] Early recognition of dermatological manifestations is crucial, and consultation with dermatologists is recommended due to the complexity of certain critical skin conditions.[3] Studies on skin conditions in the ICU remain limited in Saudi Arabia, thus prompting this study's aim to evaluate all patients admitted to the ICU with various dermatological conditions.

Methods. This retrospective chart review study was carried out at King Abdulaziz Medical City in Riyadh, Saudi Arabia, encompassing adult, pediatric, and neonatal ICUs. The study received approval from the ethics committee at King Abdullah International Medical Research Center, Riyadh, Saudi Arabia. Given the retrospective design, obtaining informed consent from patients was not necessary.

All adult, pediatric, and neonatal patients who were admitted to the ICU between January 2016 and December 2020 and had a dermatological condition or required a dermatology consultation were included in the study. Data were extracted from electronic medical records and included demographic characteristics (such as age and gender) as well as the type of skin condition. Dermatologic diseases were further categorized. The data collection period for this study was from January 2022 to March 2022.

Statistical analysis. Data analysis was carried out using the Statistical Package for the Social Sciences, version 22 (IBM Corp. Armonk, NY, USA). Categorical variables were described using frequency and percent distribution. Dermatological diagnoses, disease categories, and related subcategories were tabulated and presented graphically. The mean age of patients was calculated with standard deviation.

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Results. The total number of patients enrolled in our study was 344 with 365 dermatological conditions. The patients' ages ranged from less than 1-96 years (43.6±30.1 years). Males comprised 189 (54.9%) of the patients. There were 98 (28.5%, age: 0-17 years) children, 133 (38.7%, age: 18-65 years) adults, and 113 (32.8%, age: >65 years) elderly patients. The most commonly reported dermatological disorders were morbilliform drug eruption, followed by contact dermatitis, vasculitis, and herpes zoster (Figure 1).

Infections, inflammatory and autoimmune diseases, and drug reactions were the most prevalent general categories of skin diseases (Table 1). Table 2 outlines the details of all dermatologic conditions documented in this study. Eczema was the predominant inflammatory disease while bullous pemphigoid was the most common immunobullous condition. Congenital and neonatal skin disorders constituted 10.4% of the study population.

When it came to dermatoses due to exogenous factors, we found that almost half of cases were attributed to contact dermatitis (Table 2). Of all drug reactions, 22.6% were severe cutaneous adverse drug reactions. Among infectious cases, viral infections were the most common, accounting for 43.7% of the cases. In terms of age-specific findings, among children, the top dermatological disorders were contact dermatitis, followed by infantile hemangioma and port wine stain

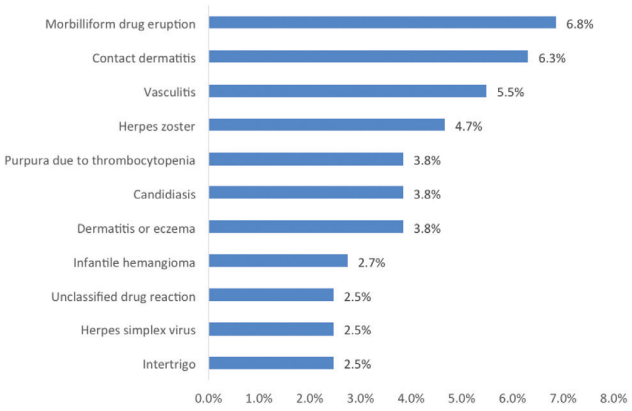

Figure 1 - Top dermatological conditions among intensive care unit patients.

Table 1 - Categories of dermatological conditions among intensive care unit patients (N=365).

Categories	n (%)
Infections	71 (19.5)
Inflammatory and autoimmune diseases	66 (18.1)
Drug reactions	62 (17.0)
Dermatoses due to exogenous factors	50 (13.7)
Vascular and coagulopathies	43 (11.8)
Congenital and neonatal skin disorders	38 (10.4)
Miscellaneous	28 (7.7)
Neoplasms	4 (1.1)
Unclear diagnosis	3 (0.8)

Vlaues are presented as numbers and percentages (%).

(Figure 2). On the other hand, among adults and elderly patients, the most prevalent diagnoses were morbilliform drug eruption, vasculitis, and herpes zoster (Figure 3).

Discussion. Our study enrolled 344 ICU patients with 365 dermatological disorders. Infectious dermatological diseases were the most prevalent, accounting for 19.5% of the cases, which is consistent with findings from a previous report.[8] Among infectious conditions, viral infections were the most commonly reported (43.7%), with herpes zoster representing the majority (54.8%) of viral infections. Fungal and bacterial infections were less frequent causes of skin infections. It is important to mention that the prevalence of different organisms causing ICU-related skin infections can vary in the literature. For example, a recent study indicated that fungal infections were the most common among ICU patients, followed by viral infections.[9] Conversely, another study reported that bacterial infections, particularly *Staphylococcus aureus*, were the primary pathogens, followed by fungal infections.[10] It is likely that the higher infection rates observed in ICU patients can be attributed to their extended hospital stays, severe medical conditions, and immunosuppressive treatments.[11] Furthermore, another study demonstrated a correlation between infectious dermatological conditions and longer hospital stays.[1]

Adverse drug reactions (ADRs) were among the top 3 general categories of skin diseases in our study. The unique characteristics of ICU patients, such as their underlying illnesses, complex medication regimens, and co-existing multi-organ failure, can affect the pharmacokinetics of drugs and increase the risk of developing ADRs.[12] A previous study reported a prevalence of 11.6% for ADRs among ICU patients, which aligns with our findings.[13] In our study, we observed that morbilliform drug eruption (6.8%) was

Table 2 - All dermatological conditions among intensive care unit patients (N=365).

Categories	n (%)	% all dermatological conditions
Inflammatory and autoimmune diseases		
Dermatitis or eczema	14 (28.0)	3.8%
Intertrigo	9 (18.0)	2.5%
Prurigo	7 (14.0)	1.9%
Urticaria	4 (8.0)	1.1%
Folliculitis	3 (6.0)	0.8%
Alopecia areata	2 (4.0)	0.5%
Panniculitis	2 (4.0)	0.5%
Acne vulgaris	2 (4.0)	0.5%
Erythema multiforme	1 (2.0)	0.3%
Pyoderma gangrenosum	1 (2.0)	0.3%
Erythroderma	1 (2.0)	0.3%
Id reaction	1 (2.0)	0.3%
Lichen planus	1 (2.0)	0.3%
Psoriasis	1 (2.0)	0.3%
GVHD	1 (2.0)	0.3%
Connective tissue diseases		
Lupus erythematosus	4 (66.7)	1.1%
Dermatomyositis	1 (16.7)	0.3%
Mixed connective tissue disease	1 (16.7)	0.3%
Immunobullous		
Bullous pemphigoid	7 (70.0)	1.9%
Epidermolysis bullosa acquisita	3 (30.0)	0.8%
Infections		
Bacterial		
Cellulitis	4 (22.2)	1.1%
Ecthyma or ecthyma gangrenosum	3 (16.7)	0.8%
Bullous impetigo	2 (11.1)	0.5%
Skin abscesses	2 (11.1)	0.5%
Staphylococcal scalded skin syndrome	2 (11.1)	0.5%
Necrotizing fasciitis	1 (5.6)	0.3%
Toxic shock syndrome	1 (5.6)	0.3%
Unclassified bacterial infection	3 (16.7)	0.8%
Fungal		
Candidiasis	14 (66.7)	3.8%
Dermatophytosis	5 (23.8)	1.4%
Unclassified fungal infection	2 (9.5)	0.5%
Viral		
Herpes zoster	17 (54.8)	4.7%
Herpes simplex virus	9 (29.0)	2.5%
Warts	2 (6.5)	0.5%
Viral exanthem	2 (6.5)	0.5%
Cutaneous CMV	1 (3.2)	0.3%
Parasitic		
Scabies	1 (100)	0.3%
Drug reactions		
Severe cutaneous drug adverse reactions		
SJS/TEN	7 (50.0)	1.9%
Acute generalized exanthematous pustulosis	5 (35.7)	1.4%
DRESS syndrome	2 (14.3)	0.5%
Other drug reactions		
Morbilliform drug eruption	25 (52.1)	6.8%
Drug induced acne	6 (12.5)	1.6%
Bullous drug eruption	3 (6.3)	0.8%
SDRIFE	2 (4.2)	0.5%
Fixed drug eruption	1 (2.1)	0.3%
Toxic erythema of chemotherapy	1 (2.1)	0.3%
Warfarin necrosis	1 (2.1)	0.3%
Unclassified drug reaction	9 (18.8)	2.5%

Values are presented as numbers and percentages (%). CMV: cytomegalovirus, DIC: disseminated intravascular coagulation, DRESS: drug reaction with eosinophilia and systemic symptoms, GVHD: graft-versus-host disease, SDRIFE: symmetrical drug-related intertriginous and flexural exanthema, SJS/TEN: Stevens-Johnson syndrome/toxic epidermal necrolysis

Table 2 - All dermatological conditions among intensive care unit patients (N=365) (continuation).

Categories	n (%)	% all dermatological conditions
Dermatoses due to exogenous factors		
Contact dermatitis	23 (46.0)	6.3%
Bed sores	8 (16.0)	2.2%
Trauma induced ulcer or blister	7 (14.0)	1.9%
Pressure induced alopecia	4 (8.0)	1.1%
Hematoma	2 (4.0)	0.5%
Burn	2 (4.0)	0.5%
Extravasation	2 (4.0)	0.5%
Pressure induced erythema	1 (2.0)	0.3%
Trauma induced nail dystrophy	1 (2.0)	0.3%
Vascular and coagulopathies		
Vasculitis	20 (46.5)	5.5%
Purpura due to thrombocytopenia	14 (32.6)	3.8%
DIC, purpura fulminans	4 (9.3)	1.1%
Ischemic skin changes or necrosis	3 (7.0)	0.8%
Superficial thrombophlebitis	1 (2.3)	0.3%
Lymphedema	1 (2.3)	0.3%
Congenital and neonatal skin disorders		
Infantile hemangioma	10 (26.3)	2.7%
Port wine stain	8 (21.1)	2.2%
Aplasia cutis congenita	4 (10.5)	1.1%
Nevus sebaceous	4 (10.5)	1.1%
Ichthyosis	3 (7.9)	0.8%
Collodion baby	2 (5.3)	0.5%
Mongolian spots	2 (5.3)	0.5%
Acrodermatitis enteropathica -like eruption	1 (2.6)	0.3%
Klippel-Trenaunay syndrome	1 (2.6)	0.3%
Neonatal cephalic pustulosis	1 (2.6)	0.3%
Stiff skin syndrome	1 (2.6)	0.3%
Subcutaneous fat necrosis of the newborn	1 (2.6)	0.3%
Neoplasms		
Kaposi sarcoma	1 (25.0)	0.3%
Lymphoma	1 (25.0)	0.3%
Seborrheic keratosis	1 (25.0)	0.3%
Squamous cell carcinoma	1 (25.0)	0.3%
Miscellaneous		
Miliaria	7 (25.0)	1.9%
Edema bullae	6 (21.4)	1.6%
Xerosis	5 (17.9)	1.4%
Calcinosis cutis	3 (10.7)	0.8%
Hyperkeratosis	3 (10.7)	0.8%
Acquired perforating dermatosis	2 (7.1)	0.5%
Bullosis diabeticorum	1 (3.6)	0.3%
Post inflammatory pigmentary changes	1 (3.6)	0.3%
Unclear diagnosis	3 (100)	0.8%

Values are presented as numbers and percentages (%). CMV: cytomegalovirus, DIC: disseminated intravascular coagulation, DRESS: drug reaction with eosinophilia and systemic symptoms, GVHD: graft-versus-host disease, SDRIFE: symmetrical drug-related intertriginous and flexural exanthema, SJS/TEN: Stevens-Johnson syndrome/toxic epidermal necrolysis

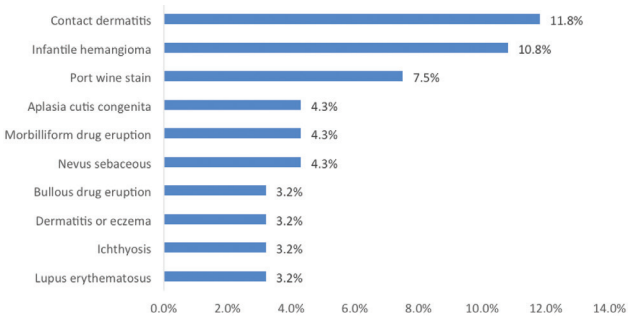

Figure 2 - Top dermatological conditions among patients aged 0-17 years.

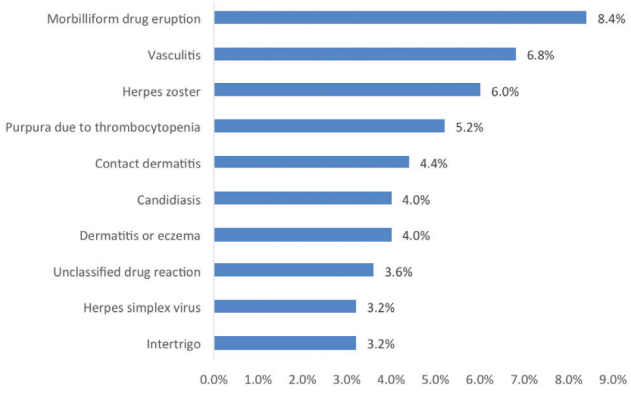

Figure 3 - Top dermatological conditions among patients aged 18 years or above.

the most frequently diagnosed ADR among all ICU patients. This contrasts with a previous study where ADRs accounted for only 3.7% of cases.[14] Among ADRs, antimicrobials were the primary culprits, followed by nonsteroidal anti-inflammatory drugs (NSAIDs), according to previous study.[13] Notably, severe cutaneous adverse drug reactions accounted for 22.6% of drug reactions in our population, with TEN and SJS being the most common diagnoses within this subgroup, representing 50% of cases. Phenytoin, allopurinol, valproate, and NSAIDs were identified as the main agents responsible for SJS/TEN cases.[10] Stevens-Johnson syndrome/toxic epidermal necrolysis are severe, life-threatening skin conditions that necessitate ICU admission as primary skin disorders.[15]

Inflammatory and autoimmune diseases were very common in our study. Dermatitis or eczema was the most common diagnosis in this category and one of the top 10 overall diagnoses. Similarly, contact dermatitis ranked as the second most reported diagnosis among all ICU patients (6.3%), and it was the most common diagnosis among patients aged 0-17 years (11%). In line with our findings, a retrospective study analyzing dermatological consultation requests in inpatient settings identified contact dermatitis as the most frequent diagnosis (8.9%).[16] The study also revealed that devices, wound dressings, and antiseptics were common causes of contact dermatitis, particularly in patients with sensitive skin.[8] After contact dermatitis, bed sores were the second most common diagnosis

within dermatoses due to exogenous factors. Another local study reported a hospital-acquired pressure ulcer incidence of 39.3% among ICU patients.[17] A systematic review emphasized several risk factors associated with the development of pressure sores in ICU patients, including advanced age, prolonged hypotension, mechanical ventilation, hemodialysis, vasopressor support, sedation, and postural changes.[18] Vascular diseases and coagulopathies represented 11.8% of dermatoses among ICU patients. Vasculitis (46.5%) and purpura due to thrombocytopenia (32.6%) were the most common diagnoses within this category. In contrast, a similar study identified purpura as the most frequent non-infectious cause, with trauma being the most commonly reported cause, followed by vasculitis.[9]

In our study, infantile hemangiomas and port wine stains were the most common skin conditions in neonates and infants. In a study carried out in Egypt, it was found that 74.6% of neonates admitted to the ICU had skin lesions out of a total of 177 neonates.[19] Birthmarks constituted 34% of skin lesions in neonates, with pigmentary birthmarks being the most commonly reported type, as indicated in a previous report.[19] Among all children in our study, contact dermatitis (11.8%) was the most frequently diagnosed condition, followed by infantile hemangiomas (10.8%) and port wine stains (7.5%). Another study carried out in a pediatric ICU found that iatrogenic factors were the leading cause of skin lesions in pediatric patients.[20] However, in contrast to our findings, another study reported that infections were the primary cause of most dermatological manifestations in pediatric patients.[21]

Study limitations. There are some limitations to consider when interpreting the findings of this study. The retrospective nature of the study and the use of medical records might have affected the accuracy of the results. Further concerns arise from the fact that the study was carried out in only one center which raises questions regarding its generalizability.

In conclusion, dermatological disorders are frequently observed among patients in the ICU, and they can vary widely in terms of severity. Among the various categories, skin infections, inflammatory and autoimmune diseases, and drug reactions are commonly encountered. Given the complexity of caring for critically ill patients, it is essential to foster interdisciplinary collaboration between dermatologists and intensivists. By working together, they can anticipate the occurrence of dermatological conditions and take preventive measures to mitigate their development. This collaborative approach is crucial in providing optimal care and improving outcomes for ICU patients.

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