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Original article

Prevalence and pattern of dermatological disorders in the pediatric emergency service

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Abstract

Background: Dermatological disorders are common in children. This study sought to describe the prevalence and pattern of dermatological emergencies encountered in the pediatric emergency room (ER).

Methods: This was a retrospective study of patients with dermatological complaints visiting the pediatric ER at a teaching hospital in Saudi Arabia during the year 2014.

Results: A total of 44,162 ER visits were recorded among children aged ⩽13 years, of which 2070 (4.7%) involved dermatological complaints. Over 80 dermatological conditions were encountered, the most common of which was atopic dermatitis (10.8%), followed by urticaria (9.7%). Categorization of diseases according to etiology revealed that the largest proportion of patients had infectious diseases (25.2%). Rare genetic disorders and life-threatening dermatological conditions were also encountered. A total of 10.5% of patients did not receive a diagnosis.

Conclusions: Our study revealed a high frequency and wide spectrum of dermatological disorders in the pediatric ER. Considering the high rate of undiagnosed cases, this study highlights the need to objectively measure physicians' abilities to diagnose dermatological disorders. Identification of common and potentially dangerous disorders can aid in the development of educational resources for trainees and in the allocation of future resources for the treatment of common conditions.

Keywords: Curriculum development; Dermatology; Emergency care; Pediatrics; Primary care education; Rash

1. Introduction

Disorders of the skin and its appendages, including the hair and nails, are frequently encountered in children. From a pediatrician's perspective, few studies have evaluated dermatological disorders encountered in the emergency room (ER).

Studies have shown that the frequency of ER visits for skin complaints is unexpectedly high, accounting for up to 17.4% of all ER visits (Kramkimel et al., 2010; Landolt et al., 2013). In addition, the observed cases cover

Abbreviations: CMCC, chronic mucocutaneous candidiasis; DOCK8, dedicator of cytokinesis 8; ER, emergency room; VZV, varicella zoster virus.

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a wide spectrum of disorders (Kramkimel et al., 2010; Wang et al., 2009). Most cases encountered are not true emergencies; nevertheless, evaluation of the skin can reveal serious underlying systemic diseases (Auvin et al., 2004; Hunter and Alsharqi, 2013).

This study sought to estimate the frequency and describe the spectrum of dermatological disorders observed in the pediatric ER of a tertiary center over a one-year period.

2. Materials and methods

A retrospective review was conducted of all consecutive pediatric patients aged 13 years or younger visiting the pediatric ER at King Fahad University Hospital, Al-Khobar, Saudi Arabia. Our hospital is the single tertiary center in the city, and it serves a large multi-ethnic and mixed social class population. The age range of selected patients was based on the legal age of pediatric care in Saudi hospitals. Patients included were those with either a dermatological complaint or a final diagnosis of a dermatological condition. Patients with a trauma-induced skin disorder or burn are typically managed by the trauma team and therefore are not generally seen in the pediatric ER. However, trauma or burn patients treated in the pediatric ER and recorded in the emergency database were included. This study was conducted between January and December 2014. The pediatric ER is part of the pediatric department and is staffed by on-site pediatric ER specialists and trainees. Patients with dermatological complaints are evaluated by pediatric ER staff because no dermatology ER service coverage is available. Patients may be referred to the on-call dermatologist in severe cases or when the diagnosis is in doubt. The information assessed in this study was obtained from the emergency database using the description of the final diagnosis documented in emergency logbooks and recorded by the ER physician. Patient information that was collected included the identification number, age, gender, complaint, final diagnosis, time and date of ER visit, medical conclusion, and admission or discharge history, including referrals to the dermatology outpatient services. A chart review was performed for cases with a nonspecific diagnosis, such as those labeled "rash" or "lesion" by the attending physician, or when any doubts existed with respect to the diagnosis. Revision of charts was performed by a pediatric consultant. Referral to senior staff and review of consultation notes, including visits to dermatology and specialized outpatient clinics, were performed to confirm the diagnosis in all ambiguous cases. Furthermore, the need for a dermatologic advice was determined from the chart reviews, including whether the advice was urgent or not. An advice was defined as a consultation with the on-call dermatologist, with the advice considered urgent if the dermatologist had been requested to see the patient within 24 h of the ER visit. In addition, we recorded whether the advice was obtained for the purpose of diagnosis or treatment and whether the dermatologist made any changes to either one. Conditions excluded were jaundice and anaphylactic shock. This study received ethical approval from the Institutional Review Board. The extracted clinical data were incorporated into a Microsoft Excel® spreadsheet. Qualitative data are expressed as frequencies and percentages. The mean and percentages were calculated as appropriate.

3. Results

A total of 44,162 visits to the pediatric ER occurred during 2014, of which 2070 (4.7%) were related to a dermatological disease or complaint. The cohort included 1113 males (53.8%) and 957 females (46.2%). The patient ages ranged from 4 days to 13 years, with a mean of 7 $\pm$ 2.3 years. With respect to race, 87.5% of the patients were Saudi, and the remaining 12.5% were non-Saudi. The hospitalization rate was 2% ($n = 42$). A total of 1825 patients (88.2%) were discharged with no referral, while 245 (11.8%) were referred to a dermatology clinic. Furthermore, 448 patient charts were revised, and pediatricians obtained advice from a dermatologist in 92 (20.5%) cases, either for diagnostic ($n = 72$) or therapeutic ($n = 20$) purposes. Among these cases, the need to be evaluated by a dermatologist was requested on an urgent basis for 15 (1.1%) patients. Moreover, the dermatologist changed the diagnosis or treatment provided by the pediatrician in 60 (83.3%) and 17 (85%) cases, respectively.

The presenting diseases included in 81 different dermatological disorders (Table 1). The identified skin-related conditions were classified into groups of associated conditions. Among the diagnostic groups, the most commonly observed was skin infections (25.2%), followed by dermatitis (23.5%), mucosal disorders (10.3%), and urticaria and angioedema (10.2%). Among the infections, viral infections were the most commonly encountered (13.6%), followed by bacterial (10.6%) and fungal infections (0.6%). Varicella zoster virus (VZV) infection was the most commonly observed viral infection, accounting for 5.2% of the total visits (chicken pox = 103 and herpes zoster = 4), followed by hand, foot and mouth disease (4.5%) and nonspecific viral exanthema (2.75%). Conversely, cutaneous abscesses, including boils, carbuncles and furuncles, were the most commonly encountered bacterial infections, accounting for 4.5% of the total visits. Atopic dermatitis/eczema was the most commonly observed single disease entity (10.8%), followed by urticaria (9.7%). In addition, visits related to insect bites were common (8.45%), followed by non-fungal diaper dermatitis, mainly caused by irritation (6.1%). Nonspecific dermatitis and gingivostomatitis were also commonly observed (5.7% and 5.65%, respectively). The 10 most common diseases encountered, accounting for approximately two-thirds of the entire cohort (63.35%), are listed in Table 2.

Table 1
Skin lesions encountered in the pediatric ER.

General category	*N* (%)	Subcategory		*N* (%)
Infections	521 (25.2)	Viral		282 (13.6)
			Herpes zoster	4
			Herpes simplex	9
			Nonspecific viral exanthema	57
			Chicken pox	103
			Fifth disease	2
			Hand, foot and mouth disease	94
			Warts	3
			Molluscum contagiosum	2
			Roseola infantum	8
		Bacterial		219 (10.6)
			Cellulitis	34
			Impetigo	39
			Abscess	93
			Paronychia	37
			Scarlet fever	16
		Fungal		13 (0.6)
			Tinea capitis	1
			Tinea corporis	2
			Onychomycosis	2
			Fungal intertrigo	1
			Fungal diaper dermatitis	7
		Infestations		7 (0.3)
			Scabies	6
			Head lice	1
Bites and stings	195 (9.4)			
			Insect bites	175
			Bed bug bites	2
			Rat bites	6
			Cat bites	4
			Dog bites	3
			Jelly fish stings	3
			Human bites	2
External injury	29 (1.4)			
			Infected wounds	9
			Burns	6
			Foreign bodies	4
			Scars	9
			Pressure sores	1
Urticaria/angioedema	211 (10.2)			
			Urticaria	201
			Angioedema	10
Dermatitis	486 (23.5)			
			Atopic dermatitis	224
			Contact dermatitis	8
			Diaper dermatitis	127
			Seborrheic dermatitis	8
			Nonspecific dermatitis	119
Reactions	20 (1)			
			BCG infection	3
			Vaccine eruptions	6
			Drug eruptions	11
Connective tissue disorders	4 (0.2)			
			Ehlers-Danlos	1
			Epidermolysis bullosa	2
			Neurofibromatosis	1
Inflammatory disorders	14 (0.7)			
			Acne vulgaris	1
			Kawasaki disease	2
			HSP	3
			SLE	2
			Pityriasis rosea	1
			SJS	1

(*continued on next page*)

Table 1 (*continued*)

General category	*N* (%)	Subcategory	*N* (%)
		Psoriasis	3
		Vitiligo	1
Tumors/swelling	54 (2.6)		
		Hemangioma	1
		Port-wine stain	1
		Hematoma	2
		Cysts	5
		Nonspecific swelling	45
Transient newborn	71 (3.4)		
		Acne	2
		Erythema toxicum	6
		Benign pustular melanosis	1
		Nonspecific dermatitis	12
		Umbilical granuloma	50
Mucous membrane disease	213 (10.3)		
		Aphthosis	49
		Gingivostomatitis	117
		Chelitis	4
		Oral thrush	43
Anogenital dermatitis	29 (1.4)		
		Proctitis	4
		Balanitis	6
		Anal fissure	19
Purpura	5 (0.2)		
		ITP	2
		Mechanical (post-vomiting)	1
		Nonspecific	2
Others	218 (10.5)		
		Nonspecific rashes	135
		Descriptive rashes	43
		Nonspecific pruritus	22
		Nonspecific xerosis	14
		Onycholysis	1
		Dandruff	2
		Hair loss	1

Abbreviations: BCG, Bacillus Calmette–Guérin; HSP, Henoch–Schönlein purpura; ITP, idiopathic thrombocytopenic purpura; SJS, Stevens–Johnson syndrome; SLE, systemic lupus erythematosus.

Table 2
The 10 most common skin diseases diagnosed in the pediatric ER.

Diagnosis	*N*	%
Atopic dermatitis/eczema	224	10.8
Urticaria	201	9.7%
Insect bite	175	8.45
Diaper dermatitis	127	6.1
Nonspecific dermatitis	119	5.7
Gingivostomatitis	117	5.65
VZV infection	107	5.2
Hand, foot and mouth disease	94	4.5
Cutaneous abscesses	93	4.5
Nonspecific viral exanthema	57	2.75

Abbreviations: VZV, varicella zoster virus.

Table 3
Primary dermatological complaints requiring hospitalization of patients.

Disease requiring admission	*N*
Cutaneous abscess	11
Gingivostomatitis	7
Cellulitis	4
Acute urticaria	3
Idiopathic thrombocytopenic purpura	2
Kawasaki syndrome	2
Infected wound	3
Henoch–Schönlein purpura	3
Epidermolysis bullosa	2
Ehlers–Danlos syndrome	1
Hemangioma	1
Herpes zoster	1
Balanitis	1
Stevens–Johnson syndrome	1

Inflammatory and systemic disorders presenting with skin complaints were also observed, including Henoch–Schönlein purpura (3 cases, all admitted), Kawasaki syndrome ($n = 2$, both admitted), psoriasis ($n = 3$), systemic lupus erythematosus ($n = 2$), vitiligo ($n = 1$), Ehlers–Danlos syndrome ($n = 1$, admitted), and epidermolysis bullosa ($n = 2$, both admitted). In addition, life-threatening disorders were observed, including Stevens–Johnson syndrome ($n = 1$, admitted), as well as rare disorders, such as

hypomelanosis of Ito and neurofibromatosis type 1. Interestingly, we identified a large family affected with keratitis, ichthyosis, and deafness (KID) syndrome. This family was identified through chart reviews of 2 siblings diagnosed with scalp cysts and chronic mucocutaneous candidiasis (CMCC). Multiple family members were found to be affected, including several children who had frequently visited the ER for recalcitrant thrush. The following conditions were rarely observed: inflicted skin injury suggestive of child abuse (2), juvenile plantar dermatosis, hereditary angioedema, and cysts, including dermoid (1), ganglionic (1), and infected thyroglossal cysts (1). Furthermore, the physician reported the presence of a rash but did not provide a final diagnosis for 43 patients (2%). The terms used to describe the rashes included papular, macular, maculopapular, peeling, hypopigmented, hyperpigmented, and crusted lesions. The overall proportion of patients who had either no specific diagnosis or who were described as having a nonspecific disease or complaint totaled 10.5% of the entire cohort ($n = 218$).

The overall admission rate for pediatric patients presenting with a dermatological complaint or disorder was 2%. The most common disease resulting in admission was cutaneous abscess (26.2%), followed by gingivostomatitis (16.7%) (Table 3). Patients with Kawasaki syndrome, idiopathic thrombocytopenic purpura, and Stevens–Johnson syndrome were systematically admitted, whereas those with stomatitis were admitted because of persistent vomiting or for intravenous rehydration. Hospitalization of all remaining patients was directly related to their skin diseases; these patients included one with herpes zoster associated with primary immunodeficiency, caused by deletion of the dedicator of cytokinesis 8 (*DOCK8*) gene, who was hospitalized because of the severity of the skin condition.

4. Discussion

Few international reports have described the frequencies and patterns of dermatological diseases encountered in pediatric ERs (Kim et al., 2013; Mathias et al., 2013; Shivaram et al., 1993; Wenk and Itin, 2003). This study is the first such report among Arabic countries and the Middle East.

Our study revealed that dermatological diseases were frequently encountered in the ER, as 4.7% of the total ER visits were related to a skin condition or complaint. A similar proportion has been observed in a previous study (Auvin et al., 2004). Furthermore, the conditions encountered were mainly non-urgent and mild, as indicated by the low rate of urgent dermatology consultations. Interestingly, several rare hereditary disorders were encountered, reflecting the unique geographical and genetic composition of our population. In addition, atopic dermatitis was the most common disease encountered. This finding is in agreement with a recent report from Switzerland showing a predominance of atopic dermatitis among all dermatoses (Wenk and Itin, 2003). In a previous study of the pattern of dermatological diseases observed at dermatological clinics at our center, atopic dermatitis was found to be the most frequent (Alakloby, 2005). Although the setting is different in this study, these results suggest that allergic disorders are among the most prevalent diseases encountered in this region. This high prevalence of allergic disorders is likely the result of genetic-environment interactions, which play key roles in the development of atopic diseases (Vercelli, 2010). Furthermore, in our study, insect bites, diaper dermatitis, nonspecific dermatitis and gingivostomatitis were frequently encountered. These particular conditions, along with atopic dermatitis and angioedema, accounted for 46.5% of the total dermatological visits. Comparably, in a study conducted in France, the six most common pediatric dermatological diseases observed in the ER were viral exanthema (17%), urticaria (15%), atopic dermatitis (8%), varicella (9%), diaper dermatitis and herpetic gingivostomatitis (4% each) (Auvin et al., 2004).

The most frequently encountered disease category in our study was of an infectious etiology, accounting for one-fourth of the total cases (25.2%). Cutaneous infections have been reported to be the most prevalent in several previous reports (Auvin et al., 2004; Gupta et al., 2003; Kramkimel et al., 2010; Mathias et al., 2013; Wang et al., 2009). Our results are similar to those of Grillo et al. (2013), who found that dermatological cases related to infections represented 29.5% of the total ER visits. Furthermore, the most common infectious diseases encountered, in the order of decreasing frequency, included VZV infection, hand, foot and mouth disease, cutaneous abscess, and nonspecific viral exanthema. A high rate of VZV infections was observed despite introduction of the varicella vaccine into the routine vaccination schedule for children in 2008. Kramkimel et al. (2010) reported a 5% rate of VZV infections in their cohort, comparable to the frequency found in our study. However, this frequency is significantly different from that reported in other studies. For example, in a study conducted in Singapore, over 20% of dermatological disorders treated at the ER were caused by VZV infections (Wang et al., 2009). These important differences likely signify the geographical epidemiology of different diseases, especially those of an infectious etiology (Auvin et al., 2004). Considering such differences, the pattern and frequencies of common disorders should be evaluated in each region, and this knowledge should be utilized to plan learning modules aimed at improving the training provided to pediatric residents. In fact, providing non-dermatology residents with training in pediatric dermatology has been a focus of recent reports (Drucker et al., 2013; McCarthy et al., 1991; Pariser and Pariser, 1987). The wide spectrum of dermatological diseases observed in the ER makes the diagnostic process a daunting task for pediatricians and primary care physicians, as many of them received little or no formal dermatology training during their residency (Chamlin and Stein, 2013; Landolt et al., 2013). The dermatology core curriculum for medical students is well established and can be utilized by primary care providers

to master the diagnosis and management of common conditions while recognizing, but not necessarily managing, the potentially dangerous conditions to initiate appropriate referrals (American Academy of Dermatology, 2015; Feigenbaum et al., 2014; McCleskey et al., 2009; McCleskey, 2013). Nevertheless, global differences in disease epidemiology and the available knowledge regarding common and life threatening conditions in each region must be recognized to implement similar modules in international training programs. Furthermore, the fact that one-tenth of the patients did not receive a specific diagnosis and that the rates of misdiagnosis and therapeutic modifications were high indicate deficiencies in knowledge; this highlights the need to objectively measure physicians' abilities to diagnose dermatological disorders. The importance of this knowledge extends beyond identification of specific skin disorders *per se*, as dermatological conditions may indicate the presence of other internal diseases. For example, the CMCC cases recognized in our cohort were managed as simple oral thrush, while the underlying cause was overlooked. Furthermore, recognizing the underlying mechanisms is crucial for determining the appropriate management strategy; this was illustrated in a patient with a *DOCK8* gene deletion who presented with herpes zoster infection and was immediately hospitalized and started on systemic anti-viral therapy. DOCK8 deficiency is a rare primary immune deficiency disorder characterized by an elevated IgE antibody level, eczema, recurrent skin abscesses and persistent viral skin infections (Su et al., 2011). The skin is often affected in children with immunodeficiency disorders, and recognizing symptom complexes can narrow the differential diagnosis and guide physicians toward the appropriate management of acutely ill patients (AlKhater, 2009; Relan and Lehman, 2014).

Importantly, despite the low frequency of systemic and life threatening conditions observed in our study, the hospital admission rate for such ailments was 100%. Although these conditions were rarely observed, they are considered a threat to health and are potentially fatal. Prompt recognition of such dermatological emergencies and provision of immediate medical attention are crucial and can save lives.

In summary, our study has revealed a diverse range of dermatological diseases observed in the pediatric ER, including rare genetic disorders. Thus, it is important for physicians dealing with the pediatric age group to become familiar with the dermatological aspects of diseases related to their field, as this will help to ensure initiation of proper treatment at the point of primary care prior to referral to a specialized dermatology service.

Conflicts of interest

The author has no conflicts of interest to declare. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sector. This paper has not been considered for publication elsewhere.

IRB statement

The study was approved by the institutional review board of the University of Dammam (IRB-2015-01-055).

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