

ORIGINAL ARTICLE

High frequency, diversity and severity of skin diseases in a paediatric emergency department

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Abstract

Background Skin disorders are a major concern in the Paediatric Emergency Department (PED). We provide an accurate evaluation of the incidence, characteristics and severity of skin disorders seen in our PED over a 1-year period.

Methods A total of 20 652 children's medical notes were reviewed in a single centre, retrospective study in the PED of a University Hospital over a 1-year period. The dermatological disorders were analysed on the basis of different criteria including their incidence, patient age, sex ratio, diagnosis, seasonal variations and hospitalization rates.

Results A total of 1897 (9.2%, F/M: 1.2; mean age: 4.1 ± 3.6 years) children presented with 1999 skin diseases and 69 different diagnoses. This frequency increased in the summer months (more than 14% of all patients). A total of 46.5% of diseases were infectious in nature (27.6% viral and 14.4% bacterial), inflammatory diseases accounted for 26.2% (urticaria and angio-oedema 15.9%, atopic dermatitis 3.5%, Henoch-Schönlein purpura: 2.1%), non-specific focal disease (balanitis, vulvitis, etc.) and insect bites, burns, transient diseases of the newborn and drug reactions for 9.2%, 7.8%, 6.4%, 3.7% and 1.2% respectively. More than 90% of children presented at the hospital for an acute condition and 155 (8.2% of children with skin disorders; F/M: 0.9; age: 4.0 ± 4.0 years) were hospitalized. More than 90% of hospitalizations were for infectious and inflammatory diseases.

Conclusion Our data reveal the extremely high frequency, diversity and potential severity of paediatric emergency skin disorders. Specific educational measures and closer co-operation between Dermatologists and Paediatricians are essential if the skin care dispensed to children and teenagers is to be improved.

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Keywords

dermatology, emergency service, hospital, paediatrics, skin diseases

Conflict of interest

The authors declare no conflict of interest in this article.

Introduction

Skin disorders are very common in children. More than 10% of children suffer from atopic dermatitis, angiomas or warts. Indeed, some skin disorders, including viral exanthema in the youngest patients or acne vulgaris in teenagers, can be considered to be unavoidable. While few paediatric skin disorders are acute, some (including varicella, urticaria, herpetic gingivostomatitis or bullous impetigo) can be severe, but not many are potentially life-threatening. The life-threatening skin diseases include some rare infectious diseases such as staphylococcal scaled skin syndrome, Kaposi's varicelliform eruption, varicella with complications and cellulitis, and inflammatory diseases such as angio-oedema, erythema multiform or Kawasaki disease.

Only a few studies evaluating skin disorders in the Paediatric Emergency Department (PED) have been published. The frequency of dermatological diseases was found to vary from 4% to 40% in these studies.¹⁻⁴ These frequencies depend on how the dermatological disorder is defined, the period of the study and exhaustiveness of the evaluation.

The aim of this study was to provide an accurate evaluation of the incidence, characteristics and severity of skin disorders in our PED over a 1-year period.

Methods

We analysed the medical notes of 20 652 children (< 18 years) who attended the PED of Ambroise Paré University Hospital

(Boulogne-Billancourt, France) between 1 January and 31 December 2006. Our hospital has a Medical Paediatric Department with a PED, but has neither Maternity Department, Paediatric Surgery Department nor a Paediatric Intensive Care Unit. The PED sees 20 000 to 21 000 outpatient children per year. All the children were first examined by a paediatrician. In the cases of dermatological disease, there was not always a confirmation of diagnosis by a dermatologist. When the paediatrician doubted for diagnosis or when a child suffered from a severe dermatological disease, an advice was asked. Five full-time dermatologists from our Department of Dermatology gave advice in PED; most of time, dermatologist physicians came to PED and dermatological advices were given during the day.

We analysed 'Dermatological diseases' only and excluded the following skin conditions: cutaneous trauma, intestinal parasitosis including oxyuriasis, neonatal jaundice, anaphylactic shock and animal bites except insect and tick bites. Skin complications of animal bites, such as cellulitis, were included. The primary skin complaints were counted as skin disorders, as well as all dermatological lesions discovered on examination and directly related to the main emergency diagnosis. For example, if the diagnosis was Henoch-Schönlein purpura with predominant arthralgias, the diagnosis was included in 'Dermatological disease' only if it was associated with cutaneous purpura.

Case report form for analysis

We extracted clinical data for all the children from computerized prospective case report forms in an Urqual database (Mckesson France, Bordeaux, France) and incorporated them in an Excel spreadsheet (Microsoft Corporation, Seattle, WA, USA). The data extracted were date of birth, gender, day of the visit, clinical examination, medical conclusion and International Statistical Classification of Diseases and Related Health Problems (ICD) code.⁵ ICD code was given by qualified paediatricians who mentioned the main final diagnosis, even if it was different from the initial reason of consultation. Finally, after the confirmation that skin diseases was the main problem, we analysed, among these children, those who were hospitalized (defined as hospital stay in excess of 24 h) for the skin condition. Only the children hospitalized in our hospital were analysed. Those hospitalized in other institutions (e.g. hospitalization in a Reanimation or a Burns Unit) were not studied because they were not considered as hospitalized in our computerized database. Moreover, it was not possible to check out this information from the Urqual database. We did not analyse laboratory or radiological data. Dermatological advices given in the PED rate could not be analysed in our computerized database.

The cases were evaluated in three steps: (1) we used the Excel search tool to identify dermatological diagnoses on the basis of ICD codes. One hundred and fifteen codes included in the following groups were used: 'Diseases of the skin and subcutaneous

tissue' (L00-L99), 'Viral infections characterized by skin and mucous membrane lesions' (B00-B09), 'Burns and corrosions' (T20-T32); and also dermatological codes from other groups (e.g. erysipelas/A46 is included in the sub-group 'Other bacterial diseases'/A30-A49); (2) we then scanned the Excel database using 72 dermatological keywords (e.g. 'purpur' for 'purpura' or 'purpuric'); and (3) all the observations were finally evaluated to confirm the dermatological diagnosis. If any doubts subsisted about a given case, the decision ('Dermatological disease' or 'Not') was taken by two of the authors (VS and EM). Diagnoses and treatments were not challenged.

Seasonal variations

We evaluated seasonal variations (month/month) in consultations for skin diseases, first for all the skin diseases and then for the most frequently diagnosed conditions. Only diseases for which more than 120 cases (10 cases/month) had been identified were taken into account. These included varicella, non-specific viral exanthema, impetigo, urticaria, insect bites and burns.

Statistical analysis

Quantitative data were expressed as the mean $\pm$ standard deviation and qualitative data as frequency and percentage. Mean values were compared via a Student's *t*-test. Incidences were compared by means of the chi-squared test. A *P*-value < 0.05 was considered to be statistically significant. Statistical analyses were performed using SAS software v 8.2 (SAS Institute Inc, Cary, NC, USA).

Results

Children with skin diseases

Of the 20 652 (56.6/day) attendances at the PED recorded during the 1-year study period, 1897 children (5.2/day, 9.2% of the consultations) presented with skin disorders. These children were younger ($P < 0.0001$) than those without skin disorders (Table 1).

Table 1 Characteristics of the 20 652 children attending the PED and of the 2726 children hospitalized at the Ambroise Paré University Hospital during 2006

	Skin diseases	Other diseases	<i>P</i>
Consultation			
No. of patients, <i>n</i> (%)	1897 (9.2)	18 755 (90.8)	
Age, years (mean $\pm$ SD)	4.1 $\pm$ 3.7	4.6 $\pm$ 4.2	<0.0001
Sex ratio (F/M)	1.2	1.2	ns
Hospitalization			
No. of patients, <i>n</i> (%)	155 (5.7)	2571 (94.3)	
Age, years (mean $\pm$ SD)	4.0 $\pm$ 4.0	3.2 $\pm$ 4.1	<0.0001
Sex ratio (F/M)	0.9	1.2	ns

SD, standard deviation; ns, not significant.

Table 2 The 1999 dermatological diagnoses of the 1897 children with skin disorders seen at the PED

Diagnosis	N (%)	Mean age $\pm$ SD	Male/female
Viral infections	551 (27.6)		
Varicella	150	2.7 $\pm$ 2.1	86/64
Herpetic gingivostomatitis	45	3.3 $\pm$ 3.3	23/22
Enterovirus stomatitis	43	3.0 $\pm$ 2.5	28/15
Roseola	31	1.4 $\pm$ 0.8	13/18
Fifth disease	16	2.9 $\pm$ 2.1	11/5
Molluscum contagiosum	12	6.3 $\pm$ 3.8	4/8
Wart	10	8.8 $\pm$ 2.2	6/4
Herpetic recurrence	9	4.0 $\pm$ 3.5	6/3
Infectious mononucleosis	6	5.6 $\pm$ 5.3	2/4
Zoster	5	9.0 $\pm$ 3.1	3/2
Ocular herpes	2	9.9 $\pm$ 2.5	0/2
Non-specific viral exanthema	222	2.4 $\pm$ 2.6	118/104
Bacterial infections	287 (14.4)		
Impetigo	133	5.1 $\pm$ 3.7	79/54
Whitlow	52	6.1 $\pm$ 4.2	26/26
Erysipelas/cellulitis	40	5.0 $\pm$ 3.9	16/24
Abscess/furuncle	32	5.3 $\pm$ 4.6	15/17
Scarlet fever	27	4.5 $\pm$ 1.9	16/11
Staphylococcal scalded skin syndrome	3	1.2 $\pm$ 0.1	3/0
Mycosis	23 (1.2)		
Oral candidiasis	15	0.7 $\pm$ 0.8	
Dermatomycosis, tinea pedis	5	4.1 $\pm$ 2.6	3/2
Tinea capitis	2	6.1 $\pm$ 7.8	0/2
Onychomycosis	1	15.1	0/1
Parasitosis	12 (0.6)		
Scabies	11	5.8 $\pm$ 4.5	9/2
Pediculosis	1	7.6	0/1
Inflammatory diseases	464 (23.2)		
Urticaria	260	4.7 $\pm$ 3.6	150/110
Atopic dermatitis	70	3.5 $\pm$ 3.8	33/37
Angio-oedema	58	6.0 $\pm$ 3.9	35/23
Henoch-Schönlein purpura	41	7.2 $\pm$ 2.9	24/17
Contact dermatitis	9	6.6 $\pm$ 3.3	5/4
Erythema multiform	6	4.1 $\pm$ 4.1	3/3
Kawasaki disease	5	2.5 $\pm$ 1.5	3/2
Dyshidrotic eczema	3	8.0 $\pm$ 6.6	3/0
Gianotti-Crosti's syndrome	3	1.1 $\pm$ 0.5	2/1
Erythema nodosum	2	13.7 $\pm$ 1.1	0/2
Acne vulgaris	1	15.1	0/1
Pityriasis rosea	1	2.3	0/1
Reiter's syndrome	1	13.3	0/1
Lichen planus	1	3.6	1/0
Acute haemorrhagic oedema	1	1.3	0/1
Alopecia areata	1	14.4	1/0
Psoriasis	1	9.9	1/0
Disorders with an external cause	281 (14.1)		
Insect bites	148	5.4 $\pm$ 3.7	75/73
Burns	122	3.7 $\pm$ 3.7	67/55
Traumatic blister	6	7.4 $\pm$ 2.4	4/9
Cutaneous foreign body	2	6.1 $\pm$ 4.3	1/1

Table 2 *Continued*

Diagnosis	N (%)	Mean age $\pm$ SD	Male/female
Chilblain	2	12.3 $\pm$ 0.0	0/2
Actinic erythema	1	1.1	1/0
Non-specific focal diseases	175 (8.8)		
Balanitis	94	4.3 $\pm$ 3.3	94/0
Vulvitis	52	4.0 $\pm$ 2.9	0/52
Anusitis	15	4.8 $\pm$ 3.7	8/7
Aphthosis	14	5.3 $\pm$ 3.5	7/7
Transient diseases of the newborn	70 (3.5)		
Napkin dermatitis	43	0.8 $\pm$ 0.5	19/4
Newborn acne	13	0.1 $\pm$ 0.3	4/9
Seborrheic dermatitis	11	0.1 $\pm$ 0.2	8/3
Erythema toxicum neonatorum	3	0.1 $\pm$ 0.1	2/1
Drug/vaccine reactions	23 (1.2)		
BCG infection	12	1.9 $\pm$ 3.0	4/8
Vaccine-induced skin reaction	6	2.4 $\pm$ 2.4	3/3
Drug-induced skin reactions	5	3.9 $\pm$ 5.6	2/3
Tumours	11 (0.6)		
Haemangioma	5	1.1 $\pm$ 1.6	2/3
Benign cutaneous tumour	4	2.9 $\pm$ 3.6	1/3
Lymphangioma	1	2.3	0/1
Branchial cyst	1	4.2	0/1
Deficiency	2 (0.1)		
Zinc deficiency	2	0.1 $\pm$ 0	2/0
Non-specific eruption	100 (5.0)		
Non-specific eruption	45	4.3 $\pm$ 3.9	23/22
Non-specific purpura	29	5.1 $\pm$ 5.0	17/12
Pruritus, prurigo	14	3.7 $\pm$ 3.7	7/7
Xerosis	7	5.7 $\pm$ 6.0	3/4
Non-specific oedema	4	4.5 $\pm$ 3.0	0/4
Non-specific achromic lesion	1	7.4	0/1

Few children had two skin diseases identified, e.g. varicella and staphylococcal superinfection (included in impetigo).

SD, standard deviation.

Diagnosis

The 1897 children presented with a total of 1999 skin diseases and 69 different diagnoses (Table 2). Infectious diseases were observed in 46.5% of cases. These were mainly viral (27.6%) and bacterial infections (14.4%). The most frequent viral skin diseases were viral exanthema (roseola, fifth disease, infectious mononucleosis and non-specific viral exanthema, $n = 275$; 13.8%), VZV infection (varicella and zoster, $n = 155$; 7.8%) and herpes infection (herpes gingivostomatitis, recurrence and ocular herpes, $n = 56$; 2.8%). All the bacterial infections were suggestive of a staphylococcal or streptococcal aetiology.

Inflammatory disease was observed in 23.2% of cases. These were mainly anaphylactic reactions (urticaria and angio-oedema, $n = 318$; 15.9%), atopic dermatitis ($n = 70$; 3.5%) and Henoch-Schönlein purpura ($n = 41$; 2.1%). Half of the children with the two diagnoses presented with bacterial complications such as superinfection, abscess or cellulitis ($n = 47$).

Insect bites were observed in 7.4% of cases and burns in 6.1%. Non-specific focal pathologies (balanitis, vulvitis, etc.), transient diseases of the newborn (acne, napkin dermatitis, etc.), drug reactions, tumours and zinc deficiency accounted for 9.2%, 3.7%, 1.2%, 0.6% and 0.1% of all cases respectively. There were one hundred cases (5.0%) of non-specific disease.

Seasonal aspects

Skin disorders were more frequent during the summer months, with 14% or more of the consultations taking place in July and August vs. 10.1% or less during the other 10 months (Fig. 1). Non-specific viral exanthema, impetigo and insect bites were more frequent during the summer (Figs 2b–e), whereas varicella (Fig. 2a) was more frequent during the winter months. No seasonal variations were observed for burns and urticaria (Fig 2d,f).

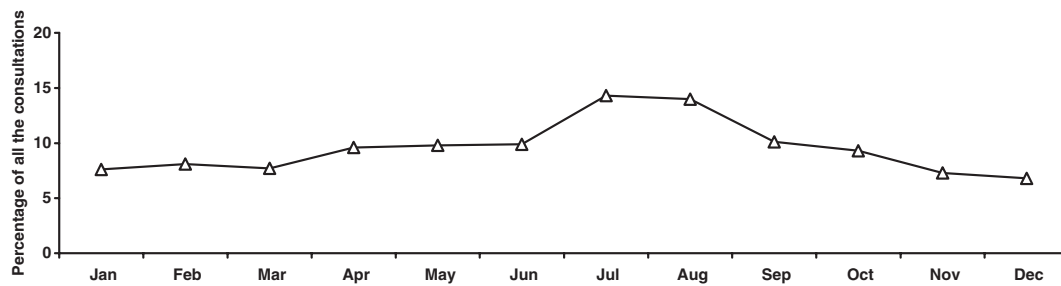


Figure 1 Seasonal variations in attendances (% of all the attendances/month) for skin diseases at the Ambroise Paré Hospital Paediatric Emergency Department (PED).

Hospitalizations

One hundred and fifty-five (155; 8.2%) of the 1897 children with skin disorders were hospitalized in our hospital. For all these cases, the skin disease was the main reason for hospitalization. This represents about three cases a week, or 5.7% of all the hospitalizations in our Paediatric Department. These children were older than those hospitalized who did not present with skin diseases (Table 1). The most frequent skin diseases requiring hospitalization were severe infectious (52.6%) and inflammatory diseases (33.1%) (Table 3). Children with staphylococcal scaled skin syndrome ($n = 3$) and Kawasaki disease ($n = 5$) were systematically hospitalized. The three most frequent diagnoses leading to hospitalization were urticaria or angio-oedema ($n = 30$, 17.1%), impetigo ($n = 22$, 12.6%) and varicella ($n = 16$, 9.1%). Of the 22 cases of impetigo, five were hospitalized owing to the severity of the condition ($n = 4$) or because the patient was a neonate ($n = 1$), and 17 were superinfections of another form of dermatitis (atopic dermatitis $n = 8$, varicella or zoster $n = 5$, scabies $n = 2$, or insect bites $n = 2$). Of the 16 cases of varicella, eight had digestive complications (diarrhoea or vomiting), six, bacterial superinfections (impetigo $n = 3$, cellulitis $n = 3$) and two, neurological complications (cerebellitis and febrile convulsions).

Discussion

This study demonstrates the very high frequency of skin diseases (9.2% of all cases seen), their heterogeneous nature (69 different diagnoses) and the high hospitalization rate (8.2%) among the 20 652 cases seen in our PED over a 1-year period.

In previous studies, the incidence of skin diseases in the PED was found to vary from 4% to 40%.¹⁻⁴ Auvin reported that skin disorders represented 4% of all paediatric emergencies and 7% of non-surgical consultations, whereas Shivaram reported a 40% rate of skin disorders. Shivaram's study also included skin traumas (including abrasions, contusions and lacerations) as skin disorders, unlike our study. Skin disorders were found to be more frequent in the summer (incidence of 14%). This can be explained by the increase in the number of consultations for insect bites, non-specific viral exanthema and impetigo in the summer months.

These data may also reflect seasonal variations. Previous studies reporting information on seasonality suggest that skin disorders were also more frequent in spring and summer as a result of bacterial skin infections and insect bites.^{6,7}

The spectrum of paediatric emergency skin conditions is very large: we were able to identify 69 different disorders. The main diagnoses were urticaria, non-specific viral exanthema, varicella, insect bites, impetigo, burns and balanitis. This pattern is quite different from that observed in scheduled paediatric dermatological appointments. The most common diagnosis reached, in the literature, was atopic dermatitis,^{8,9} although this accounted for only 3.7% of emergency consultations and in most cases, the children presented for skin complications of the superinfection type.¹⁰ These skin disorders also differed from the dermatological conditions seen in adult emergency consultations. Three French studies evaluated diagnoses established at open-access adult outpatient clinics in university hospitals,¹¹⁻¹³ and the principal diagnoses were bacterial infection, contact eczema, ulcers and drug reactions. This shows the major distinctive characteristics of paediatric emergency dermatology.

This report also highlights the potential severity of paediatric emergency skin disorders. The rate of hospitalization for dermatological disease, considered as the main problem for hospitalization, was 8.2%, equivalent to three hospitalizations per week for skin diseases in our paediatric department. In most cases (> 90%), these diseases were infectious or inflammatory in nature. We point out hospitalizations' criteria of usually outpatient treatment disease: young patients, length of skin lesions, comorbidities (for example, associated haematological disease) and complications (exacerbations, febrile convulsions, superinfections, inability to eat because of extensive oral mucosa lesions). For example, the hospitalization rate for varicella, which is a common and benign childhood disease, was 10.6% in our study because of digestive or neurological complications and bacterial superinfections. These data are consistent with the study by Liese *et al.*¹⁴ These authors analysed all the cases of varicella hospitalized over a 2-year period in Germany: 77% of these children were previously healthy and 80% of these hospitalizations were because of complications

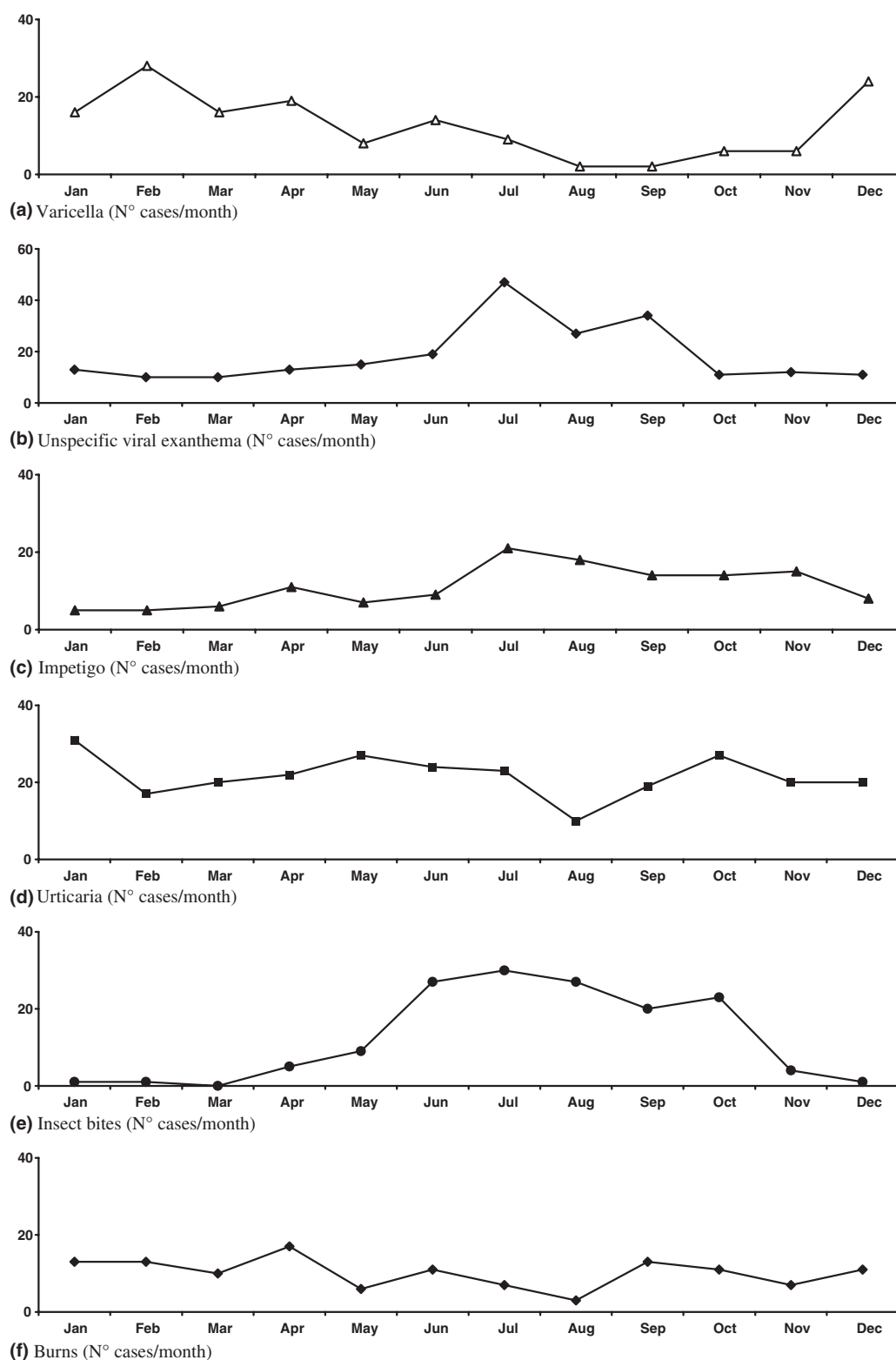


Figure 2 Seasonal distribution of the most frequent (> 120 cases in 2006) skin diseases at the Ambroise Paré Hospital Paediatric Emergency Department (PED).

Table 3 The 175 dermatological conditions diagnosed in 155 children seen at the PED for skin disorders and hospitalized for this skin disorders

	N (%)	Mean age $\pm$ SD	Male/female
Viral infections	51 (29.1)		
Varicella	16	1.8 $\pm$ 1.2	8/8
Herpetic gingivostomatitis	9	1.8 $\pm$ 0.8	4/5
Enterovirus stomatitis	4	3.2 $\pm$ 1.1	0/4
Roseola	1	1.5	0/1
Fifth disease	1	1.4	1/0
Herpetic recurrence	1	1.7	1/0
Zoster	2	9.6 $\pm$ 1.0	1/1
Non-specific viral exanthema	17	2.7 $\pm$ 4.1	9/8
Bacterial infections	36 (20.6)		
Impetigo	22	4.3 $\pm$ 4.4	12/10
Erysipelas/cellulitis	7	3.5 $\pm$ 4.9	3/4
Abscess/furuncle	2	0.7 $\pm$ 0.4	1/1
Scarlet fever	2	6.8 $\pm$ 5.1	0/2
Staphylococcal scalded skin syndrome	3	1.2 $\pm$ 0.1	3/0
Parasitosis	5 (2.9)		
Scabies	5	5.3 $\pm$ 8.3	2/3
Inflammatory diseases	58 (33.1)		
Urticaria	11	5.3 $\pm$ 4.8	4/7
Atopic dermatitis	9	3.5 $\pm$ 4.5	4/5
Angio-oedema	19	6.0 $\pm$ 4.3	12/7
Henoch-Schönlein purpura	11	6.2 $\pm$ 1.7	6/5
Erythema multiform	2	3.9 $\pm$ 5.4	1/1
Kawasaki disease	5	2.5 $\pm$ 1.5	3/2
Rieter's syndrome	1	13.3	0/1
Disorders with an external cause	9 (5.1)		
Insect bites	4	7.3 $\pm$ 4.8	2/2
Burns	4	2.7 $\pm$ 2.2	3/1
Chilblains	1	12.3	0/1
Non-specific focal diseases	2 (1.1)		
Aphthosis	2	3.4 $\pm$ 3.1	1/1
Transient diseases of the newborn	1 (0.6)		
Seborrheic dermatitis	1	0.1	1/0
Drug/vaccine reactions	1 (0.6)		
BCG infection	1	0.3	0/1
Non-specific eruption	12 (6.9)		
Non-specific eruption	2	8.1 $\pm$ 3.5	1/1
Non-specific purpura	10	5.1 $\pm$ 4.7	2/8

Few children had two skin diseases identified, e.g. varicella and staphylococcal superinfection (included in impetigo).

SD, standard deviation.

(25.4% neurological complications, 23.2% skin infections and 15% gastrointestinal tract complications).

There are limits in our study. This study is based on the ICD code; however, it is possible that there were mistakes in the encoding. It could be a bias, with under-estimation of skin disease, in the purpose of frequency and hospitalizations of dermatological disease. Moreover, use of dermatological advice obtained in the emergency department was not evaluated. Yet, in an earlier French

study,² the authors showed that the paediatricians requested specialist dermatologist advice in 31% of skin disorder cases and that the dermatologist considered that advice was necessary in 57% of cases and urgent in 19%. Finally, diagnoses and treatments were not discussed. However, the diagnostic concordance rate between paediatricians and dermatologists fluctuated from 58% to 66%.^{1,2} This important discordance shows the importance of ameliorate and the collaboration between these two specialities in the

PED to improve the children cares: high availability of dermatologists, good feeling between practitioners from the two departments, common training about diagnosis and treatment of skin disorders. Creation of an open-access child outpatient in department of dermatology could also be considered; this kind of consultation would not only help emergency paediatric practitioners, but also general practitioners.

Otherwise, we did not have the number of patients who were hospitalized in others hospitals, because these data were not available in our computerized database; in these cases, children were mainly transferred to Burns, Dermatological Surgery, or Paediatric Intensive Care Unit. This lack of information probably underestimates the rate of hospitalization for dermatological diseases.

It would have also been interesting to analyse the rate of children addressed in the PED by their general practitioner. Moreover, access to a general practitioner in summer is often more difficult than in the other periods of the year; it could be another bias with overestimation of dermatological disease in summer.

The Assistance Publique-Hôpitaux de Paris is a group of 43 hospitals located in Paris and its Suburbs, including nine University Hospitals with a PED. In 2006, a combined total of 292 400 children attended these PED (data not published). If we extrapolate our results to Paris and its Suburbs (population: 11.5 million in 2006, 18.8% of the French Metropolitan Population, data available at: http://www.insee.fr/fr/themes/tableau.asp?reg_id=99&ref_id=CMRSOS02137), more than 26 000 children attend a PED for Dermatological disorders per year, and more than 2200 are hospitalized for dermatological disorders country-wide.

To conclude, this study shows the very high frequency, diversity and potential severity of paediatric emergency skin disorders. It underlines the need to train paediatricians and dermatologists in the recognition, diagnosis and treatment of these conditions in children and the importance of close collaboration between these two medical specialties for the benefit of our younger patients. This high rate of dermatological outpatients in the PED could also make us to consider the utility of creating an open-access child outpatient in the department of dermatology.

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