

The prevalence of paediatric skin conditions at a dermatology clinic in KwaZulu-Natal Province over a 3-month period

O S Katibi,^{1,2} MBBS, FMCPaed, MMedSci; N C Dlova,² MB ChB, FCDerm, PhD;
A V Chateau,² BSc, MB ChB, DCH, FCDerm, MMedSci; A Mosam,² MB ChB, FCDerm, MMed, PhD

¹ Dermatology Unit, Department of Paediatrics and Child Health, University of Ilorin, Kwara State, Nigeria

² Department of Dermatology, Nelson R Mandela School of Medicine, University of KwaZulu-Natal, Durban, South Africa

Corresponding author: O S Katibi (oskatibi@gmail.com)

Background. Skin conditions are common in children, and studying their spectrum in a tertiary dermatology clinic will assist in quantifying skin diseases associated with greatest burden.

Objective. To investigate the spectrum and characteristics of paediatric skin disorders referred to a tertiary dermatology clinic in Durban, KwaZulu-Natal (KZN) Province, South Africa.

Methods. A cross-sectional study of children attending the dermatology clinic at King Edward VIII Hospital, KZN, was carried out over 3 months. Relevant demographic information and clinical history pertaining to the skin conditions were recorded and diagnoses were made by specialist dermatologists. Data were analysed with EPI Info 2007 (USA).

Results. There were 419 children included in the study; 222 (53%) were males and 197 (47%) were females. A total of 64 diagnosed skin conditions were classified into 16 categories. The most prevalent conditions by category were dermatitis (67.8%), infections (16.7%) and pigmentary disorders (5.5%). For the specific skin diseases, 60.1% were atopic dermatitis (AD), 7.2% were viral warts, 6% seborrhoeic dermatitis and 4.1% vitiligo. Dermatitis was significantly more common in males ($p < 0.05$). AD was the most common condition below 12 years of age, while the presence of viral warts was the most prevalent disorder among HIV-infected children. Approximately one-third (37.5%) of the disorders referred by other medical practitioners were misdiagnosed.

Conclusions. AD constituted the highest burden both numerically and economically. Viral infections were a major contribution from HIV infection. The diverse spectrum and characteristics of skin diseases referred will assist in modifying the dermatology educational curriculum and bridge knowledge gaps among healthcare providers treating children.

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The spectrum of skin disorders seen in a population may reflect the level of hygiene, social development and health status of that community.^[1] A higher number of infectious skin disorders have been found in developing countries compared with allergic disorders, which are more prominent in developed countries.^[2,3] Paediatric dermatological problems are common, with some conditions requiring specialist consultation. Often appropriate diagnosis and therapy are delayed because specialist dermatology services are only available in the larger cities and patients cannot access these readily. Conditions such as atopic dermatitis (AD) may be associated with negative psychosocial impact and impaired quality of life for both the patients and affected family.^[4] Vitiligo and viral warts are also common diseases that lead to loss of self-esteem and psychological problems.^[5]

At the time of the study, there was no recent documentation of the prevalence of skin disorders in children. The previous study of childhood-associated dermatoses was conducted 41 years ago by Findlay *et al.*^[6] in Pretoria, with a focus mainly on white children. As such, it is imperative to study the current spectrum of skin diseases seen in children in a tertiary dermatology clinic, to assist in identifying diseases of greatest burden. This is paramount for public health intervention and future health planning. Therefore, this study aims to document the spectrum of paediatric skin diseases, investigating their relationship with age and gender, compare referring doctors' diagnoses with those of dermatologists, describe management modalities and estimate treatment costs.

Methods

This was a cross-sectional study involving all children (regardless of HIV status) aged 0 - 18 years and attending the dermatology outpatient

department of King Edward VIII Hospital, a regional hospital and the main teaching hospital for the Nelson R Mandela School of Medicine, University of KwaZulu-Natal (KZN), Durban. Children were recruited consecutively between May and August (autumn/winter) after ethical approval was granted by the Biomedical Research Ethical Committee (BREC) of the University of KZN in 2014 (BE026/14). A clear explanation of the study was given to each child's parent or caregiver, and signed informed consent was then obtained. Patients were reviewed by specialist dermatologists, and diagnoses were clinical and corroborated by appropriate investigations where necessary. Data collection sheets recorded relevant clinical history, demographics and therapeutic management of the skin disorder. Data were entered into a Microsoft (USA) Excel spreadsheet 2007 and analysed with EPI Info 2007 (USA). Direct costs of major skin conditions were calculated based on average cost of consultation (ZAR40) and the commercial cost of the standard medications for each condition. This was calculated in South African Rands (ZAR) and converted to US dollars (USD) using the average prevailing exchange rate at the time of the study (1 USD to 10 ZAR).

Results

Characteristics of study participants

A total of 419 children were studied. There were 367 (87.6%) black children, 40 (9.5%) Indians, 11 (2.6%) mixed race and 1 white child (0.2%). There were slightly more male patients 222 (53%) than female patients 197 (47%). Ages ranged from 1 week to 18 years with a mean (standard deviation) age of 56.04 (49.14) months. Infants (<2 years) accounted for 30.3%, preschool (2 - 5 years) 33.7%, school age (6 - 11 years) 28.2% and adolescents (12 - 18 years) 7.8%.

Spectrum of skin disorders found

A total of 64 skin diseases were diagnosed and classified into 16 categories. The most prevalent disorders by category were dermatitis (67.8%), infections (16.7%), pigmentary (5.5%), papulosquamous (4.5%), appendageal (3.1%), vascular (2.4%) and genodermatoses (1.2%) (Table 1 and Fig. 1). Multiple diagnoses were made in 9.8% of the patients.

Skin disorders in relation to gender and age groups

A higher preponderance of males with dermatitis was seen (odds ratio 1.57, 95% confidence interval 1.13 - 2.19; $p=0.007$). Table 1 shows the gender distribution of skin lesions. AD was the most common disorder below 12 years of age while viral warts and acne vulgaris were most common above this age. Seborrhoeic dermatitis, impetigo, nappy dermatitis and infantile haemangioma were most common in infancy (Table 2).

Comparison of diagnoses of referring doctors to those of dermatologists

Among children referred with a skin diagnosis, 65 (62.5%) had a correct diagnosis while 39 (37.5%) had an incorrect diagnosis. Three cases each of chronic bullous disease of childhood, pityriasis rosea, verruca plana and scabies were newly referred and they were all misdiagnosed by referring doctors. AD was appropriately diagnosed in 90.2% of cases.

Dermatoses in HIV-infected children

Infections were seen in 23 (82.1%) of the 28 HIV-infected children. Viral warts (60.7%) were the most common conditions and accounted for 56.7% of the warts seen in the whole study population. AD (28.6%) was the most common non-infectious disease (Table 3).

Management modalities and treatment costs

Skin biopsy was carried out in 16 (3.8%) patients while 35 (8.4%) had blood assays done. Management modalities included topical therapy (92.8%), systemic therapy (14.3%), wet wrap therapy (2.1%), cryotherapy (1.9%) and counselling alone (1.9%). Some of these treatment modalities were used in combination. The estimated costs of consultation of the common diseases based on costs of prescription medications are highlighted in Table 4.

Discussion

The spectrum of paediatric skin diseases in a tertiary dermatology centre gives an insight into the diseases that are associated with diagnostic difficulty, chronicity and/or severity and greater financial implication.

Spectrum of skin disorders

A variety of skin disorders were seen, including inflammatory, infections and pigmentary disorders. Multiple diagnoses were made in 9.8% of the studied population and this is similar to the 11% reported by Hon *et al.*^[7] in China. Some of the co-existent conditions in this study, viz. alopecia areata and impetigo were totally unrelated, while other conditions like AD and molluscum contagiosum were closely linked. This should prompt medical practitioners to look out for other lesions on the skin apart from the presenting skin complaint. The prevalent disease categories were dermatitis (67.8%), infections (16.7%) and pigmentary problems (5.5%). This pattern was also reported by Shibeshi^[8] in Ethiopia, where allergic skin diseases accounted for 55.1%, followed by the infections (32.8%) and photodermatoses (8%). Hon *et al.*^[7] in China also found allergic skin diseases and eczema to be the most common. However, infections were the highest in studies from Egypt and Nigeria, where poor hygiene, low socioeconomic levels and poor health awareness are prevalent.^[1,2]

Dermatitis/eczema

AD (60.1%) occurred in every second child seen in the clinic. This prevalence rate, which is one of the highest reported in literature,

is three times more than the 18.7% documented 40 years ago in Pretoria.^[6] This high rate may be attributed to higher standards of

Table 1. Prevalence of cutaneous disorders and gender distribution

Cutaneous lesion	Male	Female	n (%)
Dermatitis	158	126	284 (67.8)
AD	140	112	252 (60.1)
Seborrhoeic dermatitis	16	9	25 (6.0)
Nappy dermatitis	2	2	4 (1.0)
Papular urticaria	1	3	4 (1.0)
Contact eczema	0	2	2 (0.5)
Lip-licking dermatitis	1	0	1 (0.2)
Perioral dermatitis	0	1	1 (0.2)
Foot dermatitis	1	0	1 (0.2)
Erythroderma	0	1	1 (0.2)
Infections	38	32	70 (16.7)
Viral	23	23	46 (11)
Viral warts	14	16	30 (7.2)
Molluscum contagiosum	9	7	16 (3.8)
Chicken pox	1	1	2 (0.5)
Fungal	9	5	14 (3.3)
Dermatophytosis	8	4	12 (2.9)
Oral candidiasis	1	0	1 (0.2)
Nappy candidiasis	0	1	1 (0.2)
Pityriasis versicolor	1	0	1 (0.2)
Bacterial	4	6	10 (2.4)
Impetigo	2	5	7 (1.7)
Folliculitis	2	1	3 (0.7)
Furuncles	0	1	1 (0.2)
Parasitic	3	0	3 (0.7)
Scabies	3	0	3 (0.7)
Mycobacterial	1	0	1 (0.2)
Lupus vulgaris	1	0	1 (0.2)
Pigmentary	12	11	23 (5.5)
Vitiligo	10	7	17 (4.1)
Albinism	1	4	5 (1.2)
Mongolian spots	1	0	1 (0.2)
Papulosquamous	7	12	19 (4.5)
Psoriasis	1	2	3 (0.7)
Pityriasis rosea	2	2	4 (1)
Pityriasis alba	0	2	2 (0.5)
Pityriasis lichenoides chronica	1	2	3 (0.7)
Lichen planus	1	1	2 (0.5)
Lichen nitidus	0	1	1 (0.2)
Lichen spinulosus	0	1	1 (0.2)
Gianotti crosti syndrome	1	1	2 (0.5)
LP/LE overlap	1	0	1 (0.2)

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living in the new cohort, industrialisation, migration from rural to urban and suburban areas, and a westernised lifestyle compared

Table 1. (continued) Prevalence of cutaneous disorders and gender distribution

Appendages	7	6	13 (3.1)
Acne vulgaris	5	3	8 (1.9)
Alopecia areata	2	1	3 (0.7)
Onycholysis	0	1	1 (0.2)
Miliaria crystalline	0	1	1 (0.2)
Vascular	3	7	10 (2.4)
Infantile haemangioma	2	4	6 (1.4)
Phakomatosis pigmentovascularis	0	1	1 (0.2)
Nevus flammeus	1	1	2 (0.5)
Klippel treunaunay	0	1	1 (0.2)
Genodermatoses	4	1	5 (1.2)
Giant congenital melanocytic naevus	1	0	1 (0.2)
Epidermal naevus	0	1	1 (0.2)
Naevus sebaceous	1	0	1 (0.2)
ILVEN	1	0	1 (0.2)
Xeroderma pigmentosum	1	0	1 (0.2)
Disorders of cornification	1	3	4 (1.0)
Ichthyosis	1	3	4 (1.0)
Sclerosing disorders	0	4	4 (1.0)
Morphea	0	4	4 (1.0)
Vesicobullous	2	2	4 (1.0)
Acropustulosis of infancy	0	1	1 (0.2)
CBDC	2	1	3 (0.7)
Urticaria	3	1	4 (1.0)
Angioneurotic oedema	1	0	1 (0.2)
Chronic urticaria	2	1	3 (0.7)
Dermis & subcutaneous nodules	1	2	3 (0.7)
Mastocytosis	1	1	2 (0.5)
Erythema nodosum	0	1	1 (0.2)
Connective tissue diagnosis	0	2	2 (0.5)
Discoid lupus erythematosus	0	1	1 (0.2)
Mixed connective tissue diagnosis	0	1	1 (0.2)
Malignancy	1	1	2 (0.5)
Actinic keratosis	0	1	1 (0.2)
Squamous cell cancer	1	0	1 (0.2)
Drug reaction	1	0	1 (0.2)
Fixed drug reaction	1	0	1 (0.2)
Miscellaneous	4	0	4 (1.0)
Primary immune deficiency	1	0	1 (0.2)
Leukaemoid reaction	1	0	1 (0.2)
Skin necrosis (IV fluid)	1	0	1 (0.2)
Arthropod bite	1	0	1 (0.2)

LP/LE = lichen planus/lupus erythematosus; ILVEN = inflammatory linear verrucous epidermal naevus; CBDC = chronic bullous dermatosis of childhood.

with other parts of sub-Saharan Africa. Further research is needed to determine environmental or genetic predispositions to this disorder. Since the diagnostic accuracy for physicians referring AD patients was good, the treatment of this disorder may have been a challenge to first-line healthcare providers, hence the high numbers referred to the clinic for possible second-line treatment. Further attention therefore needs to be given to the appropriate management of these children at the primary care level. This will improve outcome and decrease referral to tertiary centres.

Seborrhoeic dermatitis (6%) has been strongly associated with HIV infection. Despite the endemic nature and high prevalence of HIV in KZN, only one of the 25 children with seborrhoeic dermatitis was HIV-infected. Human T-cell lymphotropic virus 1 (HTLV-1) infective dermatitis presents in a similar pattern to seborrhoeic dermatitis but none of the patients seen had this disorder. The reduction in prevalence of seborrhoeic dermatitis after infancy is presumably due to reduced stimulation of maternal androgens transferred to the infant in utero.^[9] In this cohort, the success of the widespread roll-out of antiretroviral medications to HIV-infected pregnant women has most likely caused the reduction in HIV prevalence in children.

Infections

Viral infections (11%) were the most prevalent infections. In studies where AD is most prevalent, viral infections tend to be the most commonly associated infections.^[3,7,10] These are reports from tertiary dermatology centres and may indicate that among the infections, viral dermatoses pose the greatest management challenge for primary care doctors. Orogenital warts accounted for 20 of the 30 cases of warts encountered. HIV infection may be responsible for this because over half of the viral warts in this study were found in HIV-infected children. High rates of sexual abuse could account for the increased frequency of these type of warts.^[11] This trend should alert managing doctors to take an in-depth history into child abuse and notify the relevant health authorities. Heck's disease, a variant of oral warts (Fig. 2) seen in some patients, has been found to be more common in some regions of the world, including South Africa.^[12] About 40% of the patients with molluscum contagiosum were HIV-infected, and this could also be a contribution of HIV to paediatric dermatoses. Tinea capitis was the predominant type of superficial dermatophytosis seen (2.9%), with a male preponderance. Its occurrence in a specialty clinic may be due to inadequate treatment, as oral antifungal medication is indicated for at least 6 weeks. The prevalence rate of impetigo (1.7%) was relatively low compared with the findings in Egypt (19.1%), where overcrowding, lack of hygiene and antibiotic resistance from indiscriminate use have been implicated.^[1]

Pigmentary

There were more male patients with vitiligo (4.1%), with ages ranging between 2 and 11 years. Management included potent topical steroids, vitamin D analogues and topical calcineurin inhibitors. Albinism was more common in females (80%), with one patient presenting with actinic keratosis at the age of 6 years. Education about the dangers of ultraviolet exposure in this group is paramount.

Others

Acne vulgaris was seen only in adolescents and supports the role of higher production of sebum and androgens in the pathogenesis of the disorder in this age group. Most of the papulosquamous dermatoses were seen in children 6 years and above. A variety of vascular problems (2.4%) and genodermatoses (1.2%) were seen. Infantile haemangiomas involved areas like the lips, scalp, labia and cheek. Xeroderma pigmentosum was seen in an 11-year-old black boy who developed squamous cell carcinoma (SCC) on the scalp (Fig. 3). This rare autosomal recessive condition is characterised by severe photosensitivity and defective DNA repair. Solar keratosis and SCC

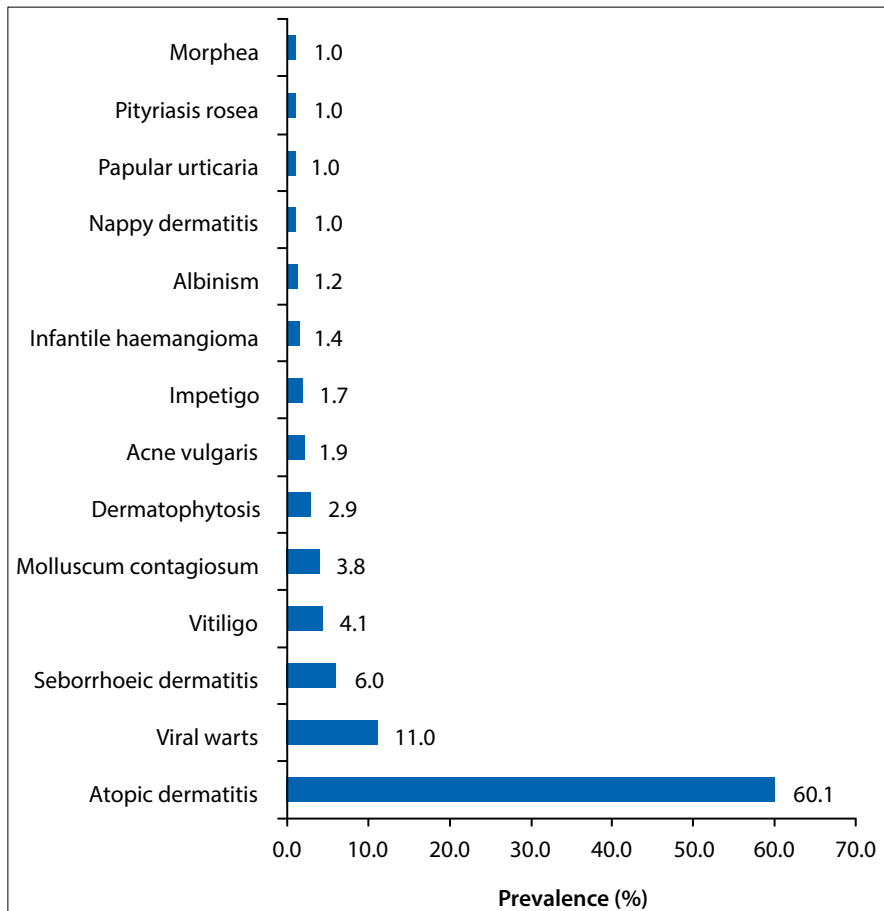


Fig. 1. Most prevalent skin disorders seen among the study population.



Fig. 2. Heck's disease, a variant of oral warts.



Fig. 3. Xeroderma pigmentosum in an 11-year-old child who developed SCC on the scalp.

Table 2. Distribution of most common skin diseases by age group

0 - <2 years (n=127)	2 - 5 years (n=141)	6 - 11 years (n=118)	12 - 18 years (n=33)
AD (63.8%)	AD (68.8%)	AD (59.3%)	Acne vulgaris (24.2%)
Seborrhoeic dermatitis (11.8%)	Viral warts (7.8%)	Viral warts (9.3%)	Viral warts (24.2%)
Infantile haemangioma (3.1%)	Vitiligo (5.7%)	Molluscum contagiosum (6.8%)	AD (12.1%)
Impetigo (3.1%)	Dermatophytosis (5.0%)	Vitiligo (5.1%)	Vitiligo (7%)
Nappy dermatitis (3.1%)	Seborrhoeic dermatitis (5.0%)		

are complications that arise early in life and are characterised by a rapid and devastating course.

Relationship between age, sex and skin disorders

A higher male preponderance was found in children under the age of 5 years compared with older children. This was noted by Findlay *et al.*,^[6] and attributed to increasing concern and awareness of the skin among females as they approach puberty. Marrone *et al.*^[13] noted more fungal and parasitic infections in males and this is corroborated

in this study. The more adventurous nature of boys leading to more play outside in the sand may account for this picture. The trend of AD peaking in the preschool age and reducing significantly in adolescence is consistent with previous observations that this condition improves with age.

Referring to the dermatologist's diagnosis

Skin diseases are usually referred to the dermatologist because of treatment difficulty or diagnostic dilemma. Diseases such as AD that were well recognised in this study fall into

the former, while others like verruca plana and scabies which were misdiagnosed fall into the latter category. This information will be useful in educating general practitioners and paediatricians.

Management modalities of skin diseases and estimated costs

Documentations in referral dermatology clinics have shown skin biopsy rates between 0.8 and 12%, which is consistent with our finding of 3.8%.^[3,7] Biopsies were performed for less-common diseases such as actinic keratosis, SCC, chronic bullous disease of childhood, psoriasis and connective tissue diseases. Afsar *et al.*,^[14] in Turkey, reported Henoch-Schönlein purpura and various papulosquamous diseases as the most common reason for biopsy in children. Skin-prick test was the most common investigation in Switzerland, and this is most likely due to incorporation of allergology with paediatric dermatology.^[3] About 80% of patients in this study had topical treatments in the form of steroids, antibiotics, calcineurin inhibitors and keratolytics. Topical steroids were part of

Table 3. Comparison of skin disorders between HIV-positive and other children in the population

Skin disorders	HIV-positive, n (%) (n=28)	Other, n (%) (n=391)	Total, n (%) (N=419)
Infections	23 (82.1)	47 (12.0)	70 (16.7)
Viral warts	17 (60.7)	13 (3.3)	30 (11.0)
Anogenital warts	4 (14.3)	7 (1.8)	11 (2.6)
Oral papillomas	4 (14.3)	5 (1.3)	9 (2.1)
Plane warts	7 (25.0)	2 (0.5)	9 (2.1)
Verruca vulgaris	3 (10.7)	0 (0.0)	3 (0.7)
Molluscum contagiosum	7 (25.0)	9 (2.3)	16 (3.8)
Dermatophytosis	4 (14.3)	8 (2.0)	12 (2.9)
Tinea capitis	3 (10.7)	7 (1.8)	10 (2.4)
Tinea cruris	1 (3.6)	0 (0.0)	1 (0.2)
Dermatitis	8 (28.6)	276 (70.6)	284 (67.8)
AD	6 (21.4)	246 (62.9)	252 (60.1)
Seborrhoeic dermatitis	1 (3.6)	24 (6.1)	25 (6.0)
Perioral dermatitis	1 (3.6)	0 (0.0)	1 (0.2)
Pityriasis alba	1 (3.6)	1 (0.3)	2 (0.5)
Papulosquamous	1 (3.6)	18 (4.6)	19 (4.5)
Pityriasis lichenoides chronica	1 (3.6)	2 (0.5)	3 (0.7)
Appendages	1 (3.6)	12 (3.1)	13 (3.1)
Acne vulgaris	1 (3.6)	7 (1.8)	8 (1.9)

Table 4. Direct cost of consultation and medication of skin diseases per visit

Skin disorder	Cost per patient (USD)	Total cost for all patients (USD)
AD	86.97	21 916.4
Viral warts	46.81	2 340.5
Seborrhoeic dermatitis	86.97	2 174.3
Vitiligo	96.33	1 637.6
Molluscum contagiosum	46.81	749.0
Dermatophytoses	54.28	651.4
Acne vulgaris	142.93	1 143.4

management in 47% of the patients in China, while in Switzerland, 66% of the patients had local therapy.^[3,7] Cryotherapy was used for oral papillomas, some cutaneous warts and molluscum contagiosum. There are few reports in the literature that document the impact of costs on the management of paediatric skin diseases. In a study sponsored by the American Academy of Dermatology,^[15] the direct cost of treatment in the general population was highest with skin ulcers, acne vulgaris, cutaneous fungal infections and AD. This is reflected in this study, as AD is the most common of these diseases in the paediatric age group and has the highest economic burden that is about 20 times that of acne vulgaris. Most of these costs are largely owing to prescription medications.

Conclusion

The spectrum of paediatric skin diseases in KZN is diverse. AD constituted a high burden both numerically and financially. Viral infections were a major contribution from HIV infection. Diseases such as scabies, chronic bullous dermatosis of childhood and verruca planar that were misdiagnosed by referring primary care doctors will help inform modification of dermatology educational curriculum.

The knowledge of spectrum of diseases will assist in prioritising drugs that can be included in the 'essential drug lists' of clinics and hospital in the province and help improve medical drug supplies. Age- and gender-related dermatoses as well as the financial implications of common paediatric

skin diseases would be useful for future health planning in order to reduce disease burden.

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