



Original Article

Patterns of infant dermatoses: An observational study from the dermatology outpatient clinic of a tertiary referral center

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ABSTRACT

Objectives: To study the pattern of dermatoses among infants who attended the dermatology outpatient clinic of a tertiary referral center.

Materials and Methods: We included 270 consecutive infants (children aged 1 year and below) with dermatoses who attended the outpatient clinic of the department of dermatology of our tertiary referral center. Using a pre-set proforma, we collected information on patient profile, evolution of dermatosis, and clinical features. The dermatoses observed were classified as transient and non-infective conditions, nevi and other developmental defects, genodermatoses, infections and infestations, inflammatory dermatoses, reactive dermatoses, and other miscellaneous conditions.

Results: The study participants included 162 males (60%) and 108 females (40%). Fifty-three infants (53/270, 19.6%) were neonates. The most common dermatoses observed among the study participants were infections and infestations (86, 31.9%) followed by inflammatory dermatoses (83, 30.7%). Among the neonates, the common dermatoses observed were napkin dermatitis (14/53, 26.4%), transient neonatal pustular melanosis (6/53, 11.3%), and congenital melanocytic nevus (6/53, 11.3%). The common dermatoses observed among infants above 28 days were fungal infections (32/217, 14.7%), atopic dermatitis (23/217, 10.6%), miliaria (22/217, 10.1%) and infantile seborrheic dermatitis (21/217, 9.7%).

Limitations: The study carried out in the outpatient clinic of the dermatology department of a tertiary referral center and the cross-sectional design were the major limitations.

Conclusion: Fungal infection was the most frequently observed infection. Whether, this indicates an epidemiological shift in the prevalence of dermatophytosis in pediatric age group needs analysis in future multicenter studies. Napkin dermatitis and atopic dermatitis were the most common non-infective dermatoses in the neonatal and post-neonatal age groups, respectively.

Keywords: Infants, Dermatoses, Infections, Inflammatory dermatosis, Tertiary care center

INTRODUCTION

Dermatoses in infants (children below the age of 1 year) are a serious concern to parents and are common causes for consultations in pediatric age group.^[1] Many of the nevi make their appearance in the first year of life. At times a cutaneous finding could be the marker of a more serious

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congenital disorder such as tuberous sclerosis or a primary immunodeficiency disease or an underlying neoplastic process.^[2-4] Differentiating the physiological cutaneous changes of the newborn and the benign dermatoses of infancy from the dermatoses that require further evaluation and management is often a challenge to the clinician. An in-depth knowledge regarding the various dermatoses of infancy is of great importance in offering quality care to the baby.

We carried out a cross-sectional study to describe the clinical pattern of dermatoses observed in children aged 1 year and below.

MATERIALS AND METHODS

Inclusion criteria

We included 270 consecutive infants (children aged 1 year and below) with dermatoses who attended the outpatient clinic of department of dermatology of our tertiary referral center from January 2019 to December 2019.^[1] The sample size was calculated according to the formula $n = Z\alpha^2pq/d^2$. The sample size calculated was 262 based on the frequency of infections (43%) noted in infants with dermatoses in a previous study ($p = 43\%$, $d = 6\%$).^[5]

Exclusion criteria

We excluded patients whose parents/guardians were not willing to give consent for the study and infants who manifested only physiological cutaneous changes (neonatal erythema, lanugo, physiological desquamation, genital hyperpigmentation, vernix caseosa, axillary pigmentation, suckling pads, and vaginal bleeding).

Institutional ethics committee approved the study. We obtained written informed consent from the parents/the guardians of the infants.

Study participants were categorized as neonates (first 4 weeks of life) and those above 28 days.^[6] Infants born at a gestational age of less than 37 weeks were considered pre-term babies, while those delivered at a gestational age of 37–42 weeks were categorized as term babies.^[7] All the questions in a pre-set proforma were read to the parents of the study participants and the responses were recorded. We collected data on demography, history of the dermatoses, and associated family history. Investigation reports and previous medical reports were used for filling relevant parts of the proforma. A general examination followed by a detailed dermatological examination was carried out in individual study participant. Microscopic examination of skin scrapings in potassium hydroxide (KOH) solution, Gram stain, pus culture and sensitivity, and skin biopsy were performed when indicated. Dermatitis was diagnosed in individual patient by the first author (dermatology resident) with guidance from a qualified dermatologist (2nd author) and

a pediatrician (3rd author), both having more than 10 years' experience in respective specialities.

The dermatoses observed were classified as transient and non-infective conditions, nevi, and other developmental defects, genodermatoses, infections and infestations, inflammatory dermatoses, reactive dermatoses, and other miscellaneous conditions. A diagnosis of candidal intertrigo was made when hyphae/pseudohyphae were observed in KOH smear of skin scrapings. When infants presented with intertrigo and hyphae/pseudohyphae were not observed in KOH smear, then the diagnosis was kept as intertrigo and included under miscellaneous dermatoses.

Data were entered in Excel sheets and analyzed. The proportion of various dermatoses was reported as percentages.

RESULTS

Out of the 270 participants, 162 were males (60%) and 108 were females (40%). Fifty-three babies (19.6%) out of the total 270 infants were neonates (0–28 days) and 217 (80.4%) had completed the neonatal period.

Twenty-three infants (23/270, 8.5%) were pre-term and 247 infants (91.5%) were term babies.

The majority (261) of the infants had adequate birth weight (96.7%) and 3.3% (9/270) had a low birth weight of 2.5 kg or less. Two hundred and eight (77%) and 62 (23%) infants were born by normal vaginal delivery and caesarean section, respectively.

Mothers of 147 study participants (54.4%) had a history of illness during pregnancy. The common maternal conditions documented in the study were gestational diabetes (34/270, 12.6%), hypothyroidism (31/270, 11.5%), pregnancy induced hypertension (16/270, 5.9%), and atopy (14/270, 5.2%).

The most common dermatoses [Table 1] observed in the study participants were infections and infestations (86, 31.9%) [Table 2], followed by inflammatory dermatoses (83, 30.7%).

None of the neonates manifested any fungal or parasitic infestation, while fungal infections (32/217, 14.7%) contributed to majority of the infections in the post-neonatal period [Figure 1]. Bacterial infection was the predominant infection in the neonatal age group (5/53, 9.4%).

The fungal infections observed in the study participants were pityriasis versicolor (18/270, 6.7%), candidal intertrigo (2/270, 0.7%), and dermatophytosis (12/270, 4.4%).

The viral infections noted included exanthematous rash (9/270, 3.3%), varicella (4/270, 1.5%), molluscum contagiosum (3/270, 1.1%), and hand, foot, and mouth disease (6/270, 2.2%). The two patients who manifested viral infections in the neonatal period had varicella (1/53, 1.9%) and molluscum contagiosum (1/53, 1.9%), respectively.

The bacterial infections noted were impetigo (5/270, 1.9%), perioritis (5/270, 1.9%), and staphylococcal scalded skin syndrome [6/270, 2.2%, Figure 2]. All the five bacterial infections seen in the neonatal period were staphylococcal scalded skin syndrome.

The lone parasitic infestation noted in the study was scabies (16/270, 5.9%).

The inflammatory dermatoses observed were atopic dermatitis [23/270, 8.5%, Figure 3], infantile seborrheic dermatitis (21/270, 7.8%), napkin dermatitis (21/270, 7.8%), pityriasis alba (10/270, 3.7%), keratosis pilaris (3/270, 1.1%), nummular eczema, (2/270, 0.7%), urticaria (2/270, 0.7%), and allergic contact dermatitis (1/270, 0.4%). The only inflammatory dermatosis observed in the neonatal period was napkin dermatitis (14/53, 26.4%).

The various nevi [Figure 4] observed in the study are shown in Table 3.

The transient, non-infective dermatoses noted were transient neonatal pustular melanosis (6/270, 2.2%), erythema toxicum neonatorum (3/270, 1.1%), and Bohn's nodule (2/270, 0.7%). Both patients who had Bohn's nodule belonged to the post

neonatal age group. The remaining nine patients (9/11, 81.8%) who manifested transient, non-infective dermatoses were neonates.

The only reactive dermatosis observed among study participants was papular urticaria which was observed in nine infants (9/270, 3.3%), all of whom were older than 28 days (9/217, 4.1%).

The genodermatoses were seen in seven infants (7/270, 2.6%) and included collodion baby [3/270, 1.1%, Figure 5], hypomelanosis of Ito [3/270, 1.1%, Figure 6], and linear and whorled nevoid hypermelanosis (1/270, 0.4%). All three neonates (3/53, 5.7%) who had genodermatoses were collodion babies.

Other dermatoses [Figure 7] observed in the study were classified as miscellaneous dermatoses (43/270, 15.9%) and are shown in Table 4.

Among the neonates, the common dermatoses were napkin dermatitis (14/53, 26.4%), transient neonatal pustular melanosis (6/53, 11.3%), and congenital melanocytic nevus (6/53, 11.3%).

The common dermatoses observed among infants aged above 28 days were fungal infections (32/217, 14.7%), atopic dermatitis (23/217, 10.6%), miliaria (22/217, 10.1%), and infantile seborrheic dermatitis (21/217, 9.7%).

Table 1: Dermatoses observed in children aged 1 year and below attending a tertiary referral center.

Diagnosis	Number of patients (% of total) <i>n</i> =270 (100)
Infections and infestations	86 (31.9)
Inflammatory dermatoses	83 (30.7)
Nevi and developmental defects	31 (11.5)
Transient, non-infective dermatoses	11 (4.1)
Reactive dermatoses	9 (3.3)
Genodermatoses	7 (2.6)
Miscellaneous dermatoses	43 (15.9)

DISCUSSION

The first year of life is significant as far as the structural and functional maturation of skin is considered. The process of this maturation starts soon after birth and completes in the first year of life. The new born skin has a higher growth rate, immature sweat glands and hence a limited ability to sweat (particularly that of pre-term infants), reduced water holding capacity, a lower concentration of natural moisturizing factor and a higher skin pH compared to adult skin. The resident

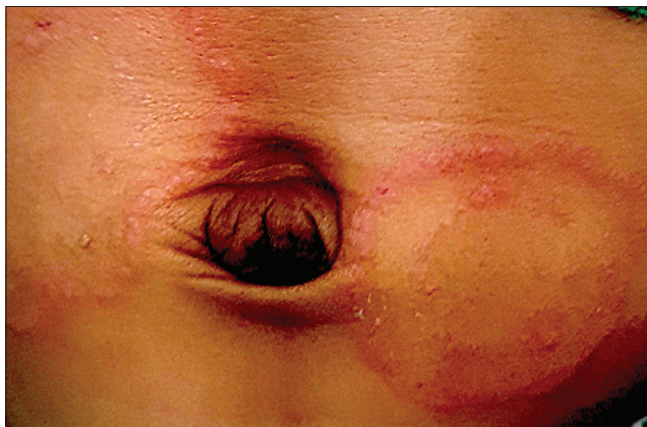


Figure 1: Annular plaque with central clearing and peripheral activity — Tinea corporis.



Figure 2: Epidermal peeling and perioral lesions-staphylococcal scalded skin syndrome.

microbial community of new born skin differs from that of adults and evolves during the first year of life.^[8] There are conflicting reports on the comparability of the new born and adult skin with respect to transepidermal water loss. Some studies say the transepidermal water loss in full-term newborn skin is comparable to that of adults; but others have reported a lower or higher value in infants.^[8-10]

Information on dermatoses of clinical significance in infants is essential for distinguishing the pathological changes from the physiological changes.



Figure 3: Facial dermatitis in an infant with atopic dermatitis.



Figure 4: Velvety, pigmented lesion of congenital melanocytic nevus.

Physiological conditions (65.3%) and infections (54.8%) predominated in the neonatal and post-neonatal period, respectively, in another study from a tertiary care center in Eastern India.^[5] Current study was not designed to assess physiological skin changes of newborn since it was carried out in the outpatient clinic of the dermatology department. An accurate description of physiological skin changes in newborn would only be possible in studies that recruit participants from the newborn nursery. Hence, we used physiological skin changes as an exclusion criterion.

We noted napkin dermatitis (26.4%) to be the most common neonatal dermatosis, while infections (36.4%) predominated in the post-neonatal period. Diaper dermatitis is reported as the most common skin disorder of infancy in United States. Wetness of diaper area leads to disruption of skin barrier function and easier penetration of irritants. It is reported that *Candida albicans* was isolated from majority of infants with irritation of perineal area. A less frequent use of synthetic diapers could be the reason for the observed lower frequency (7/217, 3.2%) of dermatitis of the diaper area in the post-neonatal period in our study in comparison to Western literature.^[11]

We noted a higher frequency of fungal infections (11.9%) among the study participants, followed by viral (8.1%) and bacterial infections (5.9%). This was contradictory to certain previous studies that observed a higher frequency of parasitic infestations and bacterial infections.^[5,12,13] Samanta and Achar in their study conducted at a tertiary referral center noted parasitic infestations in 3.3% of neonates and 25.3%



Figure 5: Collodion baby during a follow up visit.

of infants older than 28 days.^[5] All infants belonging to the post-neonatal age group who manifested parasitic infestation in their study had scabies.^[5] We also found scabies as the only parasitic infestation among study participants. We found scabies in 7.4% of infants older than 28 days, while none of the neonates had parasitic infestation. Children living in poor, overcrowded areas are more likely to develop scabies.^[14] The lower frequency for the same noted by us could be attributed to the better infant care in the state, which in turn, could be a reflection of the high female literacy rate.^[15]

Table 2: Infections and infestations in children aged 1 year and below attending a tertiary referral center.

Diagnosis	Number of study participants		Total n=270 (100%)
	0-28 days n=53 (100%)	29 days-1 year n=217 (100%)	
Fungal infections	0 (0)	32 (14.7)	32 (11.9)
Viral infections	2 (3.8)	20 (9.2)	22 (8.1)
Bacterial infections	5 (9.4)	11 (5.1)	16 (5.9)
Parasitic infestations	0 (0)	16 (7.4)	16 (5.9)

Table 3: Nevi observed in children aged 1 year and below attending a tertiary referral center.

Clinical type	Number of study participants		Total n=270 (100%)
	0-28 days n=53 (100%)	28 days-1 year n=217 (100%)	
Congenital melanocytic nevi	6 (11.3)	3 (1.4)	9 (3.3)
Mongolian spots	1 (1.9)	5 (2.3)	6 (2.2)
Infantile hemangioma	0 (0)	5 (2.3)	5 (1.9)
Nevus flammeus	0 (0)	3 (1.4)	3 (1.1)
Nevus Simplex	2 (3.8)	1 (0.5)	3 (1.1)
Nevus depigmentosus	1 (1.9)	1 (0.5)	2 (0.7)
Nevus sebaceous	1 (1.9)	1 (0.5)	2 (0.7)
Verrucous epidermal nevi	1 (1.9)	0 (0)	1 (0.4)

Table 4: Miscellaneous dermatoses observed among children aged 1 year and below attending a tertiary referral center.

Diagnosis	Number of study participants		Total number of study participants n=270 (100%)
	0-28 days n=53 (100%)	29 days-1 year n=217 (100%)	
Miliaria	0 (0)	22 (10.1)	22 (8.1)
Intertrigo	1 (1.9)	13 (6)	14 (5.2)
Psoriasis	0 (0)	2 (0.9)	2 (0.7)
Neonatal lupus erythematosus	0 (0)	1 (0.5)	1 (0.4)
Keloid	0 (0)	1 (0.5)	1 (0.4)
Stevens-Johnson's syndrome — Toxic epidermal necrolysis	0 (0)	1 (0.5)	1 (0.4)
Vitiligo	0 (0)	1 (0.5)	1 (0.4)
Cutaneous mastocytosis	0 (0)	1 (0.5)	1 (0.4)

Viral infections predominated in a study (18.2%) from Kuwait by Nanda *et al.*, while an Egyptian study documented a higher frequency of bacterial infections (23.4%).^[16,17]

The frequency of fungal infection (11.9%) in the current study was slightly higher than the same documented in previous Indian studies (4.6–9.1%).^[5,12,18] This could be attributed to the hot and humid climate of the region which provides a favorable environment for fungal infections. It could also be a reflection of the rising trend of fungal infections reported in adults.^[19,20] The children may be affected by transmission of infection from their adult care takers. To validate such an epidemiological shift in the incidence of fungal infections in the pediatric community, further studies are needed. Pityriasis versicolor (6.7%) and dermatophytosis (4.4%) as the most common fungal infections noted by us was somewhat comparable to the observations of Samanta and Achar, who noted dermatophytosis, candidiasis, and pityriasis versicolor as the predominant infections of fungal etiology.^[5] We made a diagnosis of candidal intertrigo only when hyphae/pseudohyphae were observed in KOH smear. This could be the reason for the low frequency (0.7%) of the same noted among study participants as KOH smear does not show 100% sensitivity to diagnose candidiasis.^[21]

Our observation of inflammatory dermatoses (30.7%) as the second most common category after infections and infestations was consistent with previous Indian studies.^[5,12,18] Atopic dermatitis being the most common inflammatory dermatosis as observed by us was consistent with foreign literature, while Indian studies have reported inflammatory seborrheic dermatitis as the predominant inflammatory dermatosis.^[5,12,18,22,23] Increasing urbanization is cited as the reason for the rising trend of atopic dermatitis observed in developing countries.^[24] The frequency of atopic dermatitis (8.5%) noted by us was higher than the same in other Indian studies (4–5%).^[5,12] Urbanization, that is taking place at a rapid pace in Kerala could be the reason for the higher frequency of atopic dermatitis in our study.^[25]



Figure 6: Streaks and patches of hypopigmentation — hypomelanosis of Ito.

The frequency of infantile seborrheic dermatitis noted by us was slightly lower than the 10-15% noted in previous Indian studies.^[5,12,18] All those manifesting infantile seborrheic dermatitis belonging to the post-neonatal age group as observed by us was discordant to the findings of another study that noted an equal distribution of the disease in neonatal and post-neonatal period.^[5]

The prevalence of contact dermatitis (0.4%) documented by us was consistent with literature.^[12,26] The offender identified was turmeric in our patient. Previous authors have noted turmeric as an agent causing contact dermatitis.^[26] Smearing turmeric on baby skin before giving them a bath is a common cultural practice in the state.

We found a higher frequency of transient neonatal pustular melanosis in comparison to existing literature.^[27-32] The frequency of erythema toxicum neonatorum (1.1%) noted by us was lower than the 19–38% reported earlier.^[28-30] A greater familiarity among clinicians regarding the condition could be the reason for the low frequency of the same noted in a study conducted in the outpatient clinic of a tertiary referral center, since only referred patients are seen in our outpatient clinics.

The frequency of 2.2% noted for Mongolian spot was lower than the same reported in previous Indian studies (65–90%).^[5,29,30,32] Different studies have documented considerable inter-racial difference in the prevalence of Mongolian spot (80–



Figure 7: Erythematous, scaly papules and plaques of psoriasis.

90% in Asians, and 3–10% in Caucasians).^[32-35] The low frequency of Mongolian spot documented by us could be attributed to the patient profile seeking treatment in the dermatology outpatient clinic of a referral hospital. Mongolian spot is a very common condition. Most of the parents (being aware of this birthmark) are less likely to visit a referral hospital solely for the same. Most of the infants with Mongolian spots had come to the institution for other complaints.

Around 2.5% of the sample population had genodermatoses, which was comparable to one previous study (2.1%).^[13] However, many other studies reported a lower frequency of patients with genodermatoses.^[17] Three neonates were collodion babies (1.1%), which was concordant to the observation of Behera *et al.*, (0.9%).^[27] Certain other Indian studies did not report any collodion baby.^[5,12,29] Consanguinity, which was noted in all three cases, could be one reason for the higher frequency in our study; moreover, most of the peripheral and rural hospitals refer such babies to a referral center like ours, for better neonatal care.

Papular urticaria reported in 3.3% of infants was comparable to other Indian studies.^[5,13,18]

In the sole case (0.4%) of Stevens-Johnson syndrome-Toxic epidermal necrolysis (SJS-TEN), the implicated drug was carbamazepine, prescribed for seizure disorder. Techasatian *et al.*, had reported carbamazepine (prescribed for seizure disorder) as the most common drug causing (SJS-TEN) in children.^[36]

Limitations

The study carried out in the outpatient clinic of the dermatology department of a tertiary referral center and the cross-sectional design were the major limitations.

CONCLUSION

Infections and infestations were the most common dermatoses in infants (who attended the outpatient clinic of the dermatology department of a tertiary referral center) followed by inflammatory conditions. Fungal infections were the most frequently observed infection. Whether, this indicates an epidemiological shift in the prevalence of dermatophytosis in pediatric age group needs analysis in future studies. Atopic dermatitis was the most common non-infective dermatosis observed in the overall study population as well as in the 1–12 month age group, whereas napkin dermatitis predominated in neonates.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

Dr. Koyakutty Abdul Samad and Dr. Anuja Elizabeth George are on the editorial board of the Journal.

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