

Pattern of Neonatal Dermatoses in Newborns of Intensive Care Unit in a Tertiary Care Hospital

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Abstract

Background: Neonates are presenting with various skin manifestations at birth or immediately after birth. Skin lesions in neonates can be physiological or pathological. Identification of physiological and pathological skin conditions with underlying associations helps in reassuring the parents or in the initiation of earlier interventions.

Aim of the Study: To find out the prevalence of various neonatal dermatoses in newborns of neonatal intensive care unit (NICU).

Materials and Methods: All the neonates (≤ 28 days after birth) with skin manifestations admitted in NICU were registered serially for the period of 1 year. The newborns were examined and the cutaneous signs and other associated manifestations were noted. Routine blood tests and other relevant investigations were done wherever necessary.

Results: During the study period of 1 year, 55 neonates were registered. Infections were the most common dermatosis observed in 14 (25.45%) cases, followed by transient neonatal dermatosis 13 (23.63%) cases and nevus and developmental disorders 9 (16.36%) cases. Skin rashes due to sepsis were the fourth common dermatosis observed in 8 (14.54%) cases. Genodermatoses were the fifth common skin disorder noted in 6 (10.90%) neonates. Keratinization disorders were seen in 5 (9.09%).

Conclusion: Skin infections were the most common dermatoses observed in this study and the risk of acquiring infectious dermatoses was more with prolonged hospitalization. Miliaria crystallina was the most common transient dermatosis observed in this study. The prevalence of transient neonatal pustular eruptions were less in newborns with comorbid conditions. Neonatal rashes were commonly associated with sepsis. Epidermolysis bullosa was the most common genodermatosis noted in this study. Piebaldism with natal teeth observed in our study have not been reported in the literature so far. Study on neonatal skin lesions and the associated pathological conditions will help in the management of newborn in NICUs.

Key words: Genodermatoses, Nevus, Neonatal rashes, Neonate, Transient dermatoses

INTRODUCTION

Neonates present with various skin manifestations at birth or immediately after birth. Skin lesions in neonates can be physiological or pathological. Neonatal dermatoses may occur as an isolated phenomenon or they may be associated with systemic manifestations. Identification of physiological and pathological skin conditions with

underlying associations helps in reassuring the parents or in the initiation of earlier interventions.

Aim of the Study

The aim of the study is to find out the prevalence of various neonatal dermatoses and the associated conditions and its clinical significance in neonates of neonatal intensive care unit (NICU).

MATERIALS AND METHODS

All the neonates (≤ 28 days after birth) with skin manifestations admitted in NICU were registered serially for the period of 1 year. The newborns were examined and the cutaneous signs and other associated manifestations

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were noted. The other relevant data such as age in terms of days, maturity, gender, birth weight, mode of delivery, and indication for admission in NICU were recorded. Routine blood tests and other relevant investigations were done wherever necessary. This study was approved by our Institutional Ethical Committee.

Statistical Analysis

The prevalence of various skin manifestations were calculated. The clinical significance of the prevalence of dermatoses and the association between some variables were analyzed. The data were entered in the Statistical Package for the Social Sciences (Version 20). Chi-square test was used for the analysis of relevant data. The $P < 0.05$ was considered as statistically significant.

RESULTS

During the study period of 1 year, 55 neonates were registered. Among them, 31 (56.36%) were male and 24 (43.63%) were female. Of the 55 neonates studied, 29 (52.72%) were in the early neonatal period (<7 days) and 26 (47.27%) were in late neonatal period (≥ 7 days). Among the study population, 4 (7.27%) were preterm and 51 (92.72%) were term neonates and their birth weights were appropriate for gestational age in 45 (81.81%) neonates and small for gestational age in 10 (18.18%) neonates. Single dermatological diagnosis was made in 46 (83.63%) neonates and multiple skin conditions were noted in 9 (16.36%) neonates (Table 1).

Infections were the most common dermatosis observed in 14 (25.45%) neonates in this study, followed by transient neonatal dermatosis in 13 (23.63%) and nevus and developmental disorders 9 (16.36%) neonates (Tables 2-4). Skin rashes due to underlying systemic pathology were the fourth common dermatosis observed in 8 (14.54%) neonates in this study. Genodermatoses were the fifth common skin disorder noted in 6 (10.90%) and Keratinization disorders were seen in 5 (9.09%) neonates (Table 3). The other dermatoses observed were ecchymoses 2 (3.63%), birth injuries 2 (3.63%), iatrogenic skin conditions 3 (5.45%), cyanosis of skin 1 (1.81%), diaper dermatitis 1 (1.81%), and subcutaneous fat necrosis of newborn in 1 (1.81%) (Tables 2 and 4).

The most common indications for NICU admission in newborns were birth asphyxia in 14 (25.45%) and sepsis in 13 (23.63%). The other indications were meconium aspiration in 4 (7.27%) newborns, respiratory distress due to causes other than birth asphyxia in 3 (5.45%), neonatal convulsion in 3 (5.45%), congenital heart disease in 2 (3.63%), preterm births in 2 (3.63%), low birth weight in 2 (3.63%), and excessive skin peeling in 2 (3.63%)

newborns (Table 5). The other less common indications were illustrated in Table 5.

DISCUSSION

Neonatal skin conditions are commonly physiological and these physiological skin changes have to be differentiated from pathological dermatoses. Some of the physiological skin changes in neonates which need to be identified are “erythema neonatorum” due to generalized hyperemia, “acrocyanosis” due to hypothermia, reticulated bluish vascular pattern called “cutis marmorata”, “physiological scaling of newborn” with superficial cutaneous desquamation, “sucking blisters” or erosions, “neonatal

Table 1: Maturity, age, sex, birth weight, mode of delivery, and number of diagnostic conditions-wise distribution of study population

Distribution	Number of cases (%)
Maturity	
Preterm	4 (7.27)
Term	51 (92.72)
Age (days)	
<7	29 (52.72)
≥ 7	26 (47.27)
Gender	
Male	31 (56.36)
Female	24 (43.63)
Birth weight	
AGA	45 (81.81)
SGA	10 (18.18)
Mode of delivery	
Normal vaginal delivery	38 (69.09)
LSCS	17 (30.90)
Number of skin conditions	
Single dermatosis	46 (83.63)
Multiple dermatoses	9 (16.36)

AGA: Appropriate for gestational age, SGA: Small for gestational age, LSCS: Lower segment caesarean section

Table 2: Infections and skin rashes

Dermatoses	Number of cases (%)
Infections	
Neonatal herpes	1 (1.81)
Pyoderma	8 (14.54)
Umbilical sepsis	2 (3.63)
Ophthalmia neonatorum	2 (3.63)
Oral thrush	1 (1.81)
Total	14 (25.45)
Pathological neonatal rashes	
Diffuse macular rash	5 (9.09)
Purpuric rash	2 (3.63)
Papulopustular rash	1 (1.81)
Total	8 (14.54)
Ecchymoses	
Ecchymoses over eyelids	1 (1.81)
Hematoma right elbow	1 (1.81)
Total	2 (3.63)

occipital alopecia” due to telogen hair shedding in occipital region, diffuse alopecia of the scalp called “telogen effluvium of newborn” because of synchronous hair shedding in neonatal period, “milia”, “sebaceous gland hyperplasia” due to maternal androgens, “miniature puberty” with enlarged genitalia and withdrawal bleeding

Table 3: Nevi, developmental disorders and genodermatoses

Dermatoses	Number of case (%)
Nevus and developmental disorders	
Nevoid hypermelanosis	2 (3.63)
Congenital melanocytic nevus	2 (3.63)
Nevus sebaceous	2 (3.63)
Port-wine stain	1 (1.81)
Cystic hygroma	1 (1.81)
Café au lait macules	1 (1.81)
Total	9 (16.36)
Keratinization disorders	
Collodion membrane	1 (1.81)
Congenital ichthyosis	2 (3.63)
Keratinization disorder	2 (3.63)
Total	5 (9.09)
Genodermatoses	
Down's syndrome	1 (1.81)
Epidermolysis bullosa	3 (5.45)
Piebaldism, natal teeth	1 (1.81)
Aplasia cutis	1 (1.81)
Total	6 (10.90)

Table 4: Transient neonatal dermatoses/physiological, iatrogenic, and miscellaneous skin conditions

Dermatoses	Number of cases (%)
Transient neonatal dermatoses/physiological skin conditions	
Transient neonatal pustular melanosis	2 (3.63)
Erythema toxicum neonatorum	2 (3.63)
Miliaria crystallina	5 (9.09)
Milia	1 (1.81)
Cutis marmorata	1 (1.81)
Sebaceous hyperplasia	1 (1.81)
Neonatal acne	1 (1.81)
Total	13 (23.63)
Birth injuries	
Subgaleal hemorrhage	1 (1.81)
Caput succedaneum	1 (1.81)
Total	2 (3.63)
Iatrogenic skin conditions	
Irritant contact dermatitis to antiseptic	1 (1.81)
Ecchymotic discoloration of toes due oxygen monitoring probe	1 (1.81)
Injuries due to adhesive tape application	1 (1.81)
Total	3 (5.45)
Miscellaneous skin conditions	
Extensive cyanosis of skin	1 (1.81)
Diaper dermatitis	1 (1.81)
Subcutaneous fat necrosis of newborn	1 (1.81)
Total	3 (5.45)

per vagina due to maternal and placental hormones and “Epstein’s pearls” which are 1-2 mm keratinous cysts in the alveolar ridges and at the junction of hard and soft palate.

Physiological skin changes and transient dermatoses usually disappear in the neonatal period whereas the nevus and developmental disorders may persist into adult life. Some of the nevus, developmental defects and genodermatoses have underlying systemic involvement which needs to be identified and early intervention can be initiated in relevant cases. The neonatal skin is delicate and is more prone to develop infections and iatrogenic dermatoses.

The frequency of occurrence of various neonatal dermatoses differs worldwide. There are very few studies which have been conducted among the NICU neonates.

Among the neonatal dermatoses, benign transient neonatal dermatoses were the most common skin condition noted in various studies whereas infections were the common skin condition observed in this study.¹ Pyodermas were the common infectious skin condition in 8 (14.54%) neonates. Of these 8 neonates, 7 were in late neonatal period with hospital stay more than 1 week and this association was found to be statistically significant ($P = 0.13$). It indicates that the risk of hospital acquired skin infection is more with prolonged hospital stay. Infection of scalp skin and pressure sores in occiput with secondary bacterial infection were the commonly noted pyodermas in this study. The risk of pressure sores has to be considered in newborns with prolonged hospitalization. Pyoderma was commonly seen over the scalp skin in 4 out of 8 newborns in our study. This could be due to increased moisture in the hair-covered skin which would have facilitated the bacterial invasion. The other infectious dermatoses observed were umbilical sepsis 2, ophthalmia neonatorum 2, oral thrush 1, and neonatal herpes 1 (Figure 1).

Transient neonatal pustular eruptions were the most common transient dermatosis in most of the studies.¹ However, miliaria crystallina was the most common transient neonatal dermatosis observed in this study in 5 (9.09%) neonates. This could be because of the reason that our study was conducted in a tropical country where the temperature and humidity is more in the atmosphere. Transient pustular eruptions such as erythema toxicum neonatorum and transient neonatal pustular melanosis were seen in 2 (3.63%) cases each. The prevalence of erythema toxicum neonatorum and transient neonatal pustular melanosis were very less in our study when compared to the other studies where it was up to 50% and 4.4%, respectively.²⁻⁴

In these studies, the data were collected from healthy neonates whereas this study was conducted in hospitalized newborns. The other physiological and transient skin conditions noted were milia 1 (1.81%), sebaceous hyperplasia 1 (1.81%), cutis marmorata 1 (1.81%), and neonatal acne 1 (1.81%) (Figure 2).

The common nevus and nevoid dermatosis noted were nevoid hypermelanosis 2 (3.63%), congenital melanocytic nevus 2 (3.63%), and nevus sebaceous 2 (3.63%). The other nevoid conditions observed were extensive port wine stain with multiple segmental distribution 1 (1.81%), cystic hygroma 1 (1.81%) and café au lait macules 1 (1.81%) in this study. The neonates with extensive port wine stain and multiple café au lait macules need further follow-up to identify the associated syndromes (Figure 3).



Figure 1: (a) Neonatal herpes, (b) pressure sore in occiput, (c) umbilical sepsis, (d) ophthalmia neonatorum

Skin rashes with underlying sepsis were seen in 8 neonates (14.54%) in this study. Among the 8 neonates with rashes, 5 cases were diffuse erythematous macular rash, 2 cases were purpuric rashes, and 1 case was associated with papulopustular rash. Among these neonates with rashes, clinical or microbiological evidence for sepsis was present in 6 newborns and this association was found to be statistically significant ($P = 0.002$). Hence, the underlying sepsis could be suspected in the presence of skin rashes. Among the purpuric rashes, 1 newborn showed positive serology for cytomegalovirus infection and had hepatosplenomegaly and the other neonate with purpuric rash showed clinical features of sepsis and hemorrhagic disease of newborn.⁵ The newborn with papulopustular rash and purpuric necrosis of skin in a leg in the late neonatal period was associated with *Pseudomonas* septicemia. *Pseudomonas* septicemia could be a nosocomial infection in this neonate (Figure 4).

Blood culture showed *Staphylococcus epidermidis* growth in one case with macular rash. This could be a contaminant from the venipuncture site in some cases, as the most common bacteria colonizing the neonatal skin are *S. epidermidis*. However, our newborn had signs of sepsis and the rash had completely disappeared with intravenous vancomycin indicating that the invasive infection caused by *S. epidermidis* in the setting of poor immune status of newborn⁶ (Figure 4).

Epidermolysis bullosa was the common genodermatosis found in 5.45% cases in our study which was higher than study conducted by Shehab *et al.* where it was seen in 1.5% cases. 1 Natal teeth was noted with piebaldism in one neonate (Figure 5a). We were unable to find any previous



Figure 2: (a) Miliaria crystallina, (b) milia, (c) cutis marmorata, (d) acne neonatorum, (e) erythema toxicum neonatorum, (f) transient neonatal pustular melanosis

reports of piebaldism occurring with natal teeth in the literature. A case of Down's syndrome showed dry skin with excessive skin peeling at birth and the baby was not found to be postdated (Figure 5b). Aplasia cutis congenita in scalp was noted in one case.

Among the neonates with keratinization disorders, collodion membrane was seen in one newborn in our study (Figure 5c). Two cases of congenital ichthyosis showed excessive peeling of skin with fissures in flexures at birth (Figure 5d). Of these, one neonate presented with bilateral purulent conjunctivitis within 24 h of birth and the baby was treated as ophthalmic neonatorum. One of the newborn with keratinization disorder showed excessive hyperkeratosis all over the body along with excess vernix caseosa over the hyperkeratotic plaques. Hyperkeratosis was also noted in the palmo plantar skin, periorificial regions,

and lip mucosa suggestive of Olmsted syndrome (Figure 5e and f). Another preterm neonate had hyperkeratosis all over the body with excessive scaling, palm plantar hyperkeratosis with fissuring in both feet. These neonates have to be followed up to find out the type of keratinization disorder.

Ecchymoses was noted in 2 (3.63%) term neonates. One baby showed ecchymosis and bleeding over the upper eyelids and the other neonate showed ecchymoses in right elbow region (Figure 6a and b). Birth asphyxia was the indication for hospitalization in both neonates. The causes for bleeding tendency could be severe transient deficiency in Vitamin K-dependent clotting factors, congenital defects in blood coagulation such as thrombophilia's, fragility of superficial blood vessels, and disseminated intravascular coagulation due to asphyxia, hypoxia, acidosis, shock, or infection.⁷ Another two newborns with skin rash and sepsis showed erythema and purpuric rash over the eyelids. This could be due to fragility of blood vessels or the presence of thin skin and loose connective tissue over the eyelids which are clearly revealing the dilated dermal vessels in septicemia (Figure 6c and d).

Caput succedaneum and scalp swelling due to subgaleal hemorrhage were the two birth injuries (3.63%) observed in this study. In the case of caput succedaneum, the swelling was ecchymotic involving the occipital region near the vertex (Figure 7a).

Injury due to adhesive plaster application, irritant contact dermatitis to antiseptic applied over the venipuncture site, and purpuric discoloration of toes at the site of application of pulse oximeter probes were the 3 (5.45%) iatrogenic skin conditions noted in this study (Figure 7b-d). By repeatedly changing the position of pulse oximeter probes we can avoid pressure necrosis in the digits of newborn.

Central cyanosis was noted in one neonate admitted for birth asphyxia and convulsion without underlying cardiac

Table 5: Indications for NICU admission

Indication for NICU admission	Total cases (%)
Refusal of feed, fever and vesicular rash	1 (1.81)
Congenital heart disease	2 (3.63)
Birth asphyxia	14 (25.45)
Meconium aspiration	4 (7.27)
Preterm births	2 (3.63)
LSCS delivery with various skin lesions	8 (14.54)
SGA/LBW	2 (3.63)
Respiratory distress	3 (5.45)
Sepsis	10
Rash, hepatosplenomegaly, sepsis	1
Convulsion with sepsis	2
Total	13 (23.63)
Convulsion with asphyxia (hypoxic ischemic encephalopathy)	3
Convulsion with hemorrhagic disease of newborn	1
Total	4 (7.27)
Neonatal jaundice	1 (1.81)
Microcephaly, rigidity of limbs and skin erosions	1 (1.81)
Total	55

NICU: Neonatal intensive care unit, AGA: Appropriate for gestational age, SGA: Small for gestational age, LSCS: Lower segment caesarean section, LBW: Low-birth-weight



Figure 3: (a) Nevoid hypermelanosis, (b) congenital melanocytic nevus, (c) congenital melanocytic nevus, (d) nevus sebaceous, (e) cafe au lait macules, (f) port-wine stain in segmental distribution, (g) extensive port-wine stain, (h) cystic hygroma



Figure 4: (a) Rash in *Staphylococcus epidermidis* septicaemia, (b) purpuric rash is sepsis with hemorrhagic disease of newborn, (c) papulopustular rash in *Pseudomonas* septicemia, (d) macular erythematous rash in sepsis



Figure 6: (a) Ecchymosis and hemorrhage over the eyelids, (b) ecchymosis of upper limb, (c) purpura over the eyelids in sepsis, (d) erythema over the eyelids in sepsis



Figure 5: (a) Piebaldism with natal teeth, (b) skin peeling and sandal gap toes in Down's syndrome, (c) collodion baby, (d) congenital ichthyosis, (e) plantar keratoderma, (f) periorificial keratoderma in Olmsted syndrome



Figure 7: (a) Caput succedaneum, (b) skin erosion due to plaster application, (c) irritant contact dermatitis induced by antiseptic, (d) bluish-gray discoloration of toes due to pulse oximeter probes

diseases. Cyanosis in this case might be induced by hypoxic encephalopathy and its complications.⁸

Diaper dermatitis was observed in a neonate in the second week of neonatal period. The incidence of primary irritant diaper dermatitis increases after 1 week which had been reported by some studies.⁹ Subcutaneous fat necrosis of newborn was noted on the fourth day of life in a neonate with birth asphyxia and convulsion. The lesions were larger and seen over the upper back. Asphyxia¹⁰ and mechanical pressure in the back were the factors responsible for its occurrence over the back and shoulders.

CONCLUSION

The frequency of occurrence of skin lesions varies in different studies conducted in newborns. Skin infections

were the most common dermatoses observed in this study when compared to transient dermatoses and the risk of acquiring infectious dermatoses was more with prolonged hospitalization. Miliaria crystallina was the most common transient dermatosis observed in this study which could be due to the increased temperature and moisture in neonatal nursing care units. The prevalence of transient neonatal pustular eruptions was less in newborns with comorbid conditions when compared to the data from healthy neonates. Neonatal rashes were commonly associated with sepsis and the association was found to be statistically significant. Hence, rashes in newborn could serve as a marker of underlying sepsis. Epidermolysis bullosa was the most common genodermatosis noted in this study. Piebaldism with natal teeth observed in our study have not been reported in the literature so far. Whether the presence of natal teeth with piebaldism in our case is

an incidental finding or it has any clinical significance is not known. Neonatal skin lesions may serve as a marker of associated systemic problems in many newborns. Hence, study on neonatal skin lesions and the associated pathological conditions will help in the management of newborn in NICUs.

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