Journal of Pakistan Association of Dermatologists. 2024;**34(4)**:821-828.

Original Article

Pattern of cutaneous manifestations in newborns at a tertiary referral hospital in Pakistan

Aamir Habib, Sohail Shaheen, Sohail Shahzad, Syed Gull Raiz Ali Nadir, Reham Binte Aamir*

Department of Dermatology, CMH Bahawalpur.
* Department of Dentistry, CMH Bahawalpur.

Abstract

Objective To determine the frequency and pattern of cutaneous manifestations among newborns and to evaluate their association with neonatal factors.

Methods This cross sectional study was conducted at Paediatric department of a Tertiary referral hospital in Bahawalpur from August 2023 to February 2024 for duration of six months. All the newborns up to 72 hours of age, admitted in neonatal intensive care unit of the hospital during the study period were examined by Consultant Dermatologist and Consultant Paediatrician for cutaneous manifestations. Data regarding gender of the newborn, gestational age, birth weight, mode of delivery and cutaneous manifestations were recorded.

Results At least one cutaneous manifestation was found in 949 (92.5%) out of 1026 newborns. One, two, three and four cutaneous manifestations were observed in 187 (18.2%), 335 (32.7%), 278 (27.2%) and 149 (14.4%) newborn babies. Transient benign cutaneous lesions were the most common cutaneous manifestations. Developmental abnormalities of the skin and oral mucosa were found in 87 newborns. Iatrogenic and traumatic Injuries were seen in 170 (16.57%) newborns. Transient benign cutaneous lesions and developmental abnormalities of the skin and oral mucosa were significantly more common in newborns with normal birth weight.

Conclusion Most of the Cutaneous manifestations in newborns are benign and self-limiting. Physicians caring for babies should be trained to differentiate the physiologic skin lesions from the more serious skin conditions.

Key words
Cutaneous manifestations; Epstein's pearls; Sebaceous hyperplasia; Milia; Toxic Erythema.

Introduction

Skin being the largest body organ, performs many critical functions including, barrier function, photo-protection, thermoregulation and immunologic protection.[1] At birth, the baby living in the protected environment of uterus is faced with the challenges of external environment.[1] The skin of newborn differs from that of adult in many aspects. It takes many weeks to adapt to the external environment.[2] The newborn skin lacks functional, biochemical and even structural maturity.[1-3] It is thinner and less elastic.[2] The skin is more permeable and the epidermis appears to be weakly attached to the dermis.[2] Sweat and sebaceous gland secretions are produced in lesser quantities as compared to adult skin.[1-3] These differences are more marked in premature babies.[2]

Because of all these properties, the newborn is likely to present with a variety of cutaneous lesions at birth.[2,3] The cutaneous manifestations

Manuscript: Received on: June 13, 2024
Accepted on: July 26, 2024
Address for correspondence
Dr. Aamir Habib Consultant Dermatologist,
CMH Bahawalpur.
Email: aamir1158@gmail.com

in newborns range from transient and self-limiting conditions to serious life threatening skin disorders.[2-3]

A variety of factors influence the frequency and pattern of cutaneous manifestations in newborns in a population. These factors include climate, awareness about hygiene, customs, socioeconomic status and maternal factors and therefore the frequency and pattern of skin lesions in newborns vary in different countries and ethnicities.[2-5]

A number of studies have documented cutaneous findings in newborns worldwide.[4,6-12] However few such studies have been conducted in Pakistan.[12-13]

We conducted a cross sectional prospective study to have an insight into cutaneous manifestations in newborns at a tertiary referral hospital. The aim of our study was to determine the frequency and pattern of cutaneous manifestations among newborns and to evaluate their association with neonatal factors.

Material & Methods

This cross sectional study was conducted at Paediatric department of a Tertiary Care Hospital in Bahawalpur from August 2023 to February 2024 for a duration of six months. The Ethical Committee of the Hospital approved the study (Ref No 13, 21 July 2023). Newborns up to 72 hours of age, admitted in Neonatal intensive care unit during the study period were included in the study after taking informed consent from the parents. The neonates in whom oral examination was not possible due to intubation were not included in the study.

Data regarding gender of the newborn, birth weight, mode of delivery, gestational age were recorded. A Consultant dermatologist visited Neonatal intensive care unit twice daily along with pediatrician and carried out detailed examination including cutaneous examination and examination of oral cavity in full light. Diagnosis was based on clinical examination. The cutaneous lesions were broadly classified into three groups. Group one comprised transient benign cutaneous lesions which included the conditions which are physiological, benign, and transient. Group two comprised Developmental abnormalities of the skin and oral mucosa which are a diverse group of anomalies that represent errors in morphogenesis. Group three comprised iatrogenic and traumatic Injuries

The data collected was analyzed using Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were used to analyze the data. Mean and standard deviation were calculated for quantitative variables and frequency and percentages were calculated for qualitative variables. A p-value of <0.05 was considered significant.

Results

At least one cutaneous manifestation was found in 949 (92.5%) out of 1026 newborns. 95.4% of the newborns were examined during first 24 hours after birth. 930 (90.6%) newborns were delivered by cesarean section (C- section) and 96 (9.4%) were born by spontaneous vaginal delivery (SVD). The mean birth weight was 2.68±0.552 kg with a range of 1.0 Kg to 4.3 kg **(Table 1)**. There was no significant difference in mean birth weight of male and female babies ($p>0.05$).

One, two, three and four cutaneous manifestations were observed in 187 (18.2%), 335 (32.7%), 278 (27.2%) and 149 (14.4%) newborn babies. Transient benign cutaneous lesions were the most common cutaneous manifestations **(Table 1)**. Out of these 494 (48.25%) were male and 406 (39.57%) were female. Out of 187 newborns with single lesions,

Table 1 Number of newborns with cutaneous manifestations.

		Total (%)	*Gestational age*		*Birth weight*	
			Preterm N (%age of Total)	*Full term N (%age of Total)*	*Weight<2.5kg N (%age of Total)*	*Weight>2.49kg N (%age of Total)*
Total		1026 (100%)	380 (37.04%)	646 (62.96%)	295 (28.75%)	731 (71.25%)
Gender	Male	557 (54.3%)	214 (56.32%)	343 (53.10%)	159 (53.90%)	398 (53.17%)
	Female	469 (47.3%)	166 (43.68%)	303 (46.90%)	136 (46.10%)	333 (32.46%)
Newborns with Cutaneous Manifestations	Transient benign cutaneous lesions	900 (87.72%)	329 (86.58%)	571 (88.39%)	249 (84.41%)	651 (89.06%)
	Developmental abnormalities	87(8.48%)	27 (7.11%)	60 (9.29%)	16 (5.41%)	71 (9.71%)
	Iatrogenic and traumatic Injuries	170 (16.57%)	66 (17.37%)	104 (16.10%)	46 (15.59%)	124 (16.96%)
	Total	949 (92.5%)	354 (93.16%)	595 (92.11%)	269 (91.19%)	680 (93.02%)

141 (75.4 %) newborns had transient benign cutaneous lesions.

Epstien pearls, Mongolion spots **(Figure 1)**, Sebaceous hyperplasia (**Figure 2)**, Hypertrichosis, Salmon patch and Milia, were six most common transient benign cutaneous manifestations (**Table 2**). Sebaceous hyperplasia, Hyperpigmentation and Cutis Marmorata were significantly more common in male newborns ($p<0.05$). Epstien pearls, Salmon patch, Suckling Blister and Mongolion spots were significantly more common in female babies **(Table 2)**. There was no significant gender difference in the frequency of other manifestations.

A total of 92 Developmental abnormalities of the skin and oral mucosa were found in 87 newborns (**Table 2**). Four newborns had two developmental abnormalities. Port wine stain, Congenital Melanocytic Nevi, Sacral dimple and Faun tail were the most common Developmental abnormalities found in 64 newborns (**Table 2**). There was no significant difference in the frequency of Developmental abnormalities in male and female babies except for haemangiomas which were significantly more common in male babies ($p<0.05$). Transient benign cutaneous lesions and developmental abnormalities of the skin and oral mucosa were significantly more common in newborns with normal birth weight ($p<0.05$).

Iatrogenic and traumatic Injuries were seen in 170 (16.57%) newborns with no significant difference in gender prevalence and no correlation was found with birth weight or maturity of the newborn **(Table 2)**. In most of cases it took the form of forceps marks in cases with assisted vaginal delivery.

Other iatrogenic injuries included needle marks, erosions, lacerations, petechiae or ecchymoses.

Figure 1 Large Mongolion spot in a newborn.

Figure 2 Sebaceous hyperplasia and hypertrichosis in a newborn.

Table 2 Correlation of gender, birth weight and maturity of newborn with cutaneous manifestations.

Sr. No.	*Diagnosis of lesion Newborns with Cutaneous manifestations*	*Total*	*Frequency by gender (%age)*			*Frequency by birth weight (%age)*			*Frequency by maturity (%age)*		
			Male	*Female*	*p-value*	*>2.49 kg*	*<2.5kg*	*p-value*	*Preterm*	*Full Term*	*p-value*
		949 (92.5)	515 (50.2)	434 (42.3)	0.963	680 (71.7)	269 (28.3)	0.313	354 (37.3)	595 (62.7)	
Group one -Transient and benign cutaneous lesions.											
1	Epstien Pearls	428 (41.7)	208 (20.3)	220 (21.4)	**0.001**	337 (49.6)	91 (33.8)	**0.000**	143 (40.4)	285 (47.9)	**0.025**
2	Mongolion Spot	399 (38.9)	194 (18.9)	205 (20)	**0.003**	320 (47.1)	79 (29.4)	**0.000**	123 (34.7)	276 (46.4)	**0.000**
3	Sebaceous Hyperplasia	407 (39.7)	242(23.6)	165 (16.1)	**0.005**	285 (41.9)	122 (45.4)	0.335	168 (47.5)	239 (40.2)	**0.028**
4	Hypertrichosis	190 (18.5)	115 (11.2)	75 (7.3)	0.053	104 (15.3)	86 (32.0)	**0.000**	89 (9.4)	101 (17.0)	**0.002**
5	Salmon Patch	145 (14)	67 (6.3)	78 (7.6)	**0.034**	108 (15.9)	37 (13.8)	0.412	52 (14.7)	93 (15.6)	0.697
6	Milia	138 (13.5)	73 (7.1)	65 (6.3)	0.727	104 (15.3)	34 (12.6)	0.296	50 (14.1)	88 (14.8)	0.779
7	Hyperpigmentation	105 (10.2)	70 (6.8)	35 (3.1)	**0.007**	90 (13.2)	15 (5.6)	**0.001**	29 (8.2)	76 (12.8)	**0.030**
8	Desquamation	47 (4.6)	24 (2.3)	23 (2.2)	0.652	43 (6.3)	4 (1.5)	**0.002**	8 (2.3)	39 (6.6)	**0.003**
9	Petechie/purpura	39 (3.8)	24 (2.3)	15 (1.5)	0.352	28 (4.1)	11 (4.1)	0.984	14 (3.9)	25 (4.2)	0.853
10	Cutis Marmorata	34 (3.3)	27 (2.6)	7 (0.7)	**0.003**	7 (1.0)	27 (10.0)	**0.000**	26 (7.3)	8 (1.3%)	**0.000**
11	Erythema Toxicum Neonatorum	27 (2.6)	14 (1.4)	13 (1.3)	0.798	24 (3.5)	3 (1.1)	**0.044**	8 (2.3)	19 (3.2)	0.403
12	Acrocyanosis	23 (2.2)	13 (1.3)	10 (1.0)	0.826	20 (2.9)	3 (1.1)	0.099	9 (2.5)	14 (2.4)	0.855
13	Neonatal Acne	11 (1.1)	7 (0.7)	4 (0.4)	0.531	10 (1.5)	1 (0.4)	0.154	4 (1.1)	7 (1.2)	0.948
14	Suckling Blister	10 (1.0)	2 (0.2)	8 (0.8)	**0.029**	4 (0.6)	6 (2.2)	**0.026**	5 (1.4)	5 (0.8)	0.404
15	Harlequin Colour Change	6 (0.6)	3 (0.3)	3 (0.3)	0.833	5 (0.7)	1 (0.4)	0.525	3 (0.8)	3 (0.5)	0.519
16	Transient Neonatal Pustular Melanosis	5 (0.5)	2 (0.2)	3 (0.3)	0.52	4 (0.6)	1 (0.4)	0.678	3 (0.8)	2 (0.3)	0.293
17	Bohn's Nodule	5 (0.5)	3 (0.3)	2 (0.2)	0.797	3 (0.4)	2 (0.7)	0.583	3 (0.8)	2 (0.3)	0.293
18	Nail Changes	2 (0.2)	2 (0.2)	0	0.194	1 (0.1)	1 (0.4)	0.497	2 (0.6)	0	0.067
19	Miliara	1 (0.1)	0	1 (0.1)	0.276	1 (0.1)	0	0.530	0	1 (0.2)	0.441
Group two- Developmental abnormalities of the skin and oral mucosa.											
1	Port wine stain	25 (2.4)	11 (1.1)	14 (1.4)	0.297	21 (3.1)	4 (1.5)	0.165	9 (2.5)	16 (2.7)	0.892
2	Congenital Melanocytic Nevus	16 (1.6)	11 (1.1)	5 (0.5)	0.241	13 (1.9)	3 (1.1)	0.391	5 (1.4)	11(1.8)	0.614
3	Sacral dimple	13 (1.3)	7 (0.7)	6 (0.6)	0.555	11 (1.6)	2 (0.7)	0.297	2 (0.6)	11(1.8)	0.100
4	Faun Tail	10 (1.0)	3 (0.3)	7 (0.7)	0.122	10 (1.5)	0	**0.046**	1 (0.3)	9 (1.5)	0.073
5	Spinal dysraphism	4 (0.4)	1 (0.1)	3 (0.3)	0.239	3 (0.4)	1 (0.4)	0.882	1 (0.3)	3 (0.5)	0.611
6	Supernumery Mammary Tissue	4 (0.4)	1 (0.1)	3 (0.3)	0.239	4 (0.6)	0	0.882	1 (0.3)	3 (0.5)	0.611
7	Cleft lip	4 (0.4)	2 (0.2)	2 (0.2)	0.864	4 (0.6)	0	0.208	1 (0.3)	3 (0.5)	0.611
8	Cleft palate	3 (0.3)	3 (0.3)	0	0.111	3 (0.4)	0	0.848	1 (0.3)	2 (0.3)	0.887
9	Cafe-au-Lait Macule	3 (0.3	2 (0.2)	1 (0.1)	0.666	1 (0.1)	2 (0.7)	0.276	3 (0.8)	0	**0.025**
10	Hemangioma	3 (0.3)	1 (0.1)	2 (0.2)	**0.000**	1 (0.1)	2 (0.7)	0.158	1 (0.3)	2 (0.3)	0.907
11	Aplasia cutis	1 (0.1)	0	1 (0.1)	0.278	1 (0.1)	0	0.531	0	1 (0.2)	0.441
12	Collodion Baby	1 (0.1)	1 (0.1)	0	0.359	1 (0.1)	0	0.530	1 (0.3)	0	0.195
13	Epidermolysis Bullosa	1 (0.1)	0	1 (0.1)	0.359	0	1 (0.4)	0.112	1 (0.3)	0	0.195
14	Natal teeth	2 (0.19)	1 (0.1)	1 (0.1)	0.359	0	1 (0.4)	0.112	1 (0.3)	0	0.441
15	Nevus depigmentosus	1 (0.1)	1 (0.1)	0	0.359	0	1 (0.4)	0.112	1 (0.3)	0	0.195
16	Simian Crease	1 (0.1)	1 (0.1)	0	0.359	1 (0.1)	0	0.530	0	1 (0.2)	0.441
17	Club foot	1 (0.1)	1 (0.1)	0	0.359	0	1 (0.4)	0.112	1 (0.3)	0	0.195
Group three - Iatrogenic and Traumatic Injuries.											
1	Birth trauma	170 (16.6)	94 (9.2)	76 (7.4)	0.641	124 (12.1)	46 (4.5)	0.682	66 (18.6)	104 (17.5)	0.651

Correlation of each cutaneous manifestation with weight of newborn and maturity of the newborns was also carried out **(Table 2)**. Epstien Pearls, hyperpigmentation, desquamation erythema toxicum neonatorum and Mongolion Spot were significantly more common in newborns with normal birth weight ($p<0.05$). Hypertrichosis and cutis marmorata were significantly more common in newborns with low birth weight ($p<0.05$). There was no significant difference in the frequency of other manifestations **(Table 2)**. Similarly, there was no significant difference in the frequency of all developmental abnormalities of skin and oral mucosa, other than faun tail which was significantly more common in in newborns with normal birth weight (**Table 2)**.

Transient benign cutaneous lesions were more common in full term babies ($p<0.05$). Epstien Pearls, Mongolion Spot, Hypertrichosis, Hyperpigmentation, Desquamation, Erythema Toxicum Neonatorum were significantly more common in full term babies, while Sebaceous Hyperplasia was significantly more common in preterm babies **(Table 2)**.

There was no significant difference in the frequency of milia, desquamation, cutis marmorata, nail changes, Bohn's nodule, miliara and acrocyanosis.

Out of all developmental abnormalities of skin and oral mucosa, only cafe-au-lait macules were significantly more common in full term babies **(Table 2)**.

Cutaneous manifestations were observed in 92.5% of the newborns. Our findings were consistent with Gokdemir G *et al*;[6] Ahsan U *et al.*[12] and Krüger EMM *et al.*[14] and Choudhary P *et al*.[15] A higher prevalence of 98% and 99.3% was reported by Pandit VS *et al.*[16] in Indian newborns and Rivers JK *et al.*[17] in Australian newborns respectively. Others Habib RB *et al.*[18] and Giuffrida R *et al.*[19] reported a lower prevalence of cutaneous manifestations in 68% of Bangladeshi neonates and 69.88% of Italian newborn babies respectively. Similarly, Ábrahám R *et al;*[20] Shehab MM *et al;*[21] Firouzi H *et al.*[10] and Quazi S *et al.*[8] found cutaneous manifestations in 74.35%, 74.6%, 79.8% and 81.01% newborns respectively. This much variation in the prevalence of cutaneous manifestations in newborns may be related to different study methodologies and environmental and racial factors.

Majority (74.27%) of babies had more than one cutaneous manifestation. Previously Quazi S *et al;*[8] Ahsan U *et al;*[12] Moosavi Z *et al;*[11] Krüger EMM *et al.*[14] and Virupakshappa T *et al.*[22] found more than one cutaneous manifestation concomitantly in 81.01%, 82.5%, 84.5%, 84.6% and 89.2% of the newborn babies respectively. We found four cutaneous manifestations concomitantly in 72 (7.02%) babies. Virupakshappa T *et al.*[22] reported four or more than four lesions in 50% of the newborns.

We found epstien pearls (41.7%), Mongolion spots (38.9%), sebaceous hyperplasia (39.67%), hypertrichosis (18.5%), salmon (14.1%) and milia (13.5%) to be the most common cutaneous manifestations **(Table 2)**. Our findings were different from those of Ahsan U *et al;*[12] who reported Mongolian spots (63.2%), Epstein pearls (47.8%), sebaceous hyperplasia (44.8%), miliaria (12.8%), hypertrichosis (12%), Erythema toxicum 12% and Milia (7.5%) to be the most common manifestations in Pakistani newborns. Similarly, Firouzi H *et al.*[10] reported higher prevalence of milia, erythema toxicum, salmon patch and Mongolian spots **(Table 2)**.

Moosvi *et al.*[11] reported Mongolian spots, epstein pearls, sebaceous hyperplasia, hypertrichosis, Salmon patch, erythema toxicum and milia to be the most common manifestations.

We found Epstein pearls to be the most common cutaneous manifestation. Our findings were consistent previous studies.[6,17,12,22] Others have reported a higher[11,23] and lower[7-8,15,19,24] prevalence. Epstein pearls were significantly more common in female babies, babies with normal birth weight and full term babies **(Table 2).**

Mongolian spots were found in 38.9% of newborns. Mongolian spots were significantly more common in female babies, babies with normal birth weight and full term babies. (**Table 2**). A wide variation in the prevalence of Mongolian spot has been reported in different races.[4,6,12,14,16,22-23,25] Prevalence is high in dark-skinned populations,[7,9,11-12,23] and in Japanese.[4] A low prevalence has been reported in Caucasians.[14,19,21]

Sebaceous Hyperplasia was observed in 39.7% newborns. Our findings were consistent with most of the previous studies.[6,11-12,17,21,25] Sebaceous Hyperplasia was significantly more common in male and full term babies. (**Table 2**). Prevalence of Hypertrichosis was found to be 11.2%, which was consistent with previous studies.[6,12,22] Moosvi *et al;*[11] Krüger EMM *et al;* [14] and Rivers JK *et al.*[17] reported higher frequency. Hypertrichosis was significantly more common in low birth weight and full term babies **(Table 2).**

Milia were seen in 7.1% newborns which was consistent with previous studies.[7,9,11-13,17,20-22] Genital hyperpigmentation was seen in 6.8% babies. Our findings were consistent with the previous studies.[10,14,17,22] Rivers JK *et al.*[17] reported very high prevalence of hyperpigmentation (47.6%) in Australian newborns which is very unusual. Hyperpigmentation was significantly more common in male babies, babies with normal birth weight and full term babies. (**Table 2**).

Salmon patch was observed in 6.3% babies. Previously Ahsan *et al.*[12] reported a prevalence of 12% in Pakistani newborns. A higher prevalence has been reported by other authors.[4,10-11,14,17,23] We found Salmon patch to be significantly more common in female newborn babies.

Skin desquamation was observed in 2.3% of the newborns. A similar frequency of desquamation has been reported previously.[8,15,22] Desquamation was significantly more common in normal birth weight and full term babies **(Table 2).**

Erythema Toxicum Neonatorum was observed in 1.4% newborns which was very low as compared to previous studies.[4,6,8-13,17,19,22] The difference in our findings may be the result of the time of examination. 95.4% of the newborns were examined during first 24 hours of life. Erythema toxicum neonatorum was significantly more common in babies with normal birth weight.

Port wine stain (2.4%) Congenital Melanocytic Naevus (1.6%), sacral dimple ((1.3%) and faun tail 1% were most common Developmental abnormalities. Cafe-au-Lait Macule and Hemangioma other than Port wine stain were found in 0.3% newborns each. Saraçli T *et al.*[9] reported a very high prevalence of Port wine stain (22.5%) and congenital melanocytic naevi (5.7%) in Negro babies. Ahsan U *et al.*[12] reported hemangiomas and Port wine stains in 3.5% of Pakistani newborn babies. A lower frequency of Port wine stain of 0.6% and 0.7% has been reported previously by Ábrahám R *et al.*[20] and Techasatian L *et al.*[23] Ahsan U *et al.*[12] reported café-au-lait macules in 2.6% and congenital melanocytic nevi in 2.4% of Pakistani newborns. Gokdemir G *et al.*[6] found Hemangioma 1.4% and Congenital melanocytic nevi in 1.1% Turkish newborn babies. Krüger EMM *et al.*[14] found Melanocytic nevus in 0.8% newborns and Café au lait spots 0.3% in

Brazilian newborn babies.

Conclusion

Cutaneous manifestations are very common in newborn babies. Most of these are benign and self-limiting. All the newborns should be carefully examined. Physicians caring for newborn babies should be trained to differentiate the physiologic skin lesions from the more serious skin conditions in order to avoid unnecessary referrals and treatments.

Limitations of study

The study included only those babies who were detained or admitted to Neonatal intensive care unit and those babies who were handed over to parents outside labour room could not be included in the study.

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

Financial support and sponsorship None.

Conflict of interest Authors declared no conflict of interest.

Authors' contribution

AH: Substantial contributions to study design, acquisition of data, manuscript writing, have given final approval of the version to be published.

SSn, RBA: Substantial contributions to acquisition of data, manuscript writing, have given final approval of the version to be published.

SSd, SGAN, SA: Substantial contributions to analysis and interpretation of data, critical review, have given final approval of the version to be published.

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