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A Study of Physiological Skin Changes in Neonates of a Tertiary Care Centre

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Abstract

Background: The skin of the newborn differs structurally and functionally from that of the adult and displays a wide range of transient, benign changes during the first weeks of life. These physiological skin changes are common, self-limiting, and require no treatment, yet they are frequently a source of considerable parental anxiety and unnecessary intervention.
Objectives: To determine the pattern and frequency of physiological skin changes in neonates at a tertiary care centre and to examine their relationship with maternal and neonatal factors such as sex, gestational age, birth weight, and mode of delivery.
Methods: A hospital-based, descriptive, cross-sectional study was carried out over 12 months. Consecutively born neonates underwent a complete cutaneous examination by a dermatologist within the first days of life. Physiological and transient skin findings were documented using standard morphological criteria, and their associations with maternal and neonatal variables were analysed.
Results: The great majority of neonates showed at least one physiological skin change. The commonest findings were Mongolian spots, sebaceous gland hyperplasia, Epstein pearls, physiological scaling/desquamation, erythema toxicum neonatorum, and milia. Certain changes such as Mongolian spots and erythema toxicum neonatorum showed associations with birth weight and gestational age.
Conclusion: Physiological skin changes are almost universal in neonates and are overwhelmingly benign. Familiarity with these transient changes allows clinicians to reassure parents, avoid unnecessary investigation and treatment, and reliably distinguish them from pathological conditions.

Keywords: *neonate; newborn; physiological skin changes; transient neonatal dermatoses; Mongolian spot; erythema toxicum neonatorum.*

INTRODUCTION

The neonatal period, defined as the first four weeks of extrauterine life, is a time of rapid cutaneous adaptation from the aqueous intrauterine environment to a dry, terrestrial one.[1] The skin of the newborn differs from that of the adult in several important respects: it is thinner—approximately 40% to 60% of adult thickness—has weaker intercellular cohesion and a less developed dermo-epidermal junction, produces less sweat and sebum, and has a higher surface-area–to–body-weight ratio.[1,2] As the skin adjusts to extrauterine life and to the influence of transplacentally acquired maternal hormones, it displays a broad spectrum of changes, the overwhelming majority of which are physiological and transient.[2,3]

Neonatal cutaneous findings are conventionally grouped into physiological and transient changes, birthmarks, and pathological conditions.[3,4] Physiological and transient changes encompass a wide variety of entities: physiological desquamation, vernix caseosa, lanugo, sebaceous gland hyperplasia, milia, cutis marmorata, salmon patch, acrocyanosis, harlequin colour change, erythema toxicum neonatorum, transient neonatal pustular melanosis, Epstein pearls, and pigmentary changes such as Mongolian spots (congenital dermal melanocytosis) and the effects of maternal hormones sometimes termed "miniature puberty."[5] By definition, these findings are self-limiting, resolve without treatment, and

carry no long-term sequelae.[3,5]

Although benign, physiological skin changes are clinically important for two reasons. First, they are extremely common—hospital-based studies consistently report that the majority of newborns exhibit one or more such change, and that physiological and transient lesions greatly outnumber pathological ones.[6,7] In a study of 1000 newborns, sebaceous gland hyperplasia, Epstein pearls, and Mongolian spots were each present in more than 80% of babies, and erythema toxicum neonatorum in almost a quarter.[6] A tertiary-centre study in eastern Nepal similarly found that the great majority of cutaneous manifestations were physiological, led by sebaceous gland hyperplasia, Mongolian spots, and erythema toxicum neonatorum.[7] Second, despite their benign nature, these changes are a frequent source of parental anxiety and can prompt unnecessary investigations and treatment if not correctly recognised.[3,7]

Accurate recognition therefore serves a dual purpose: it allows the clinician to reassure anxious parents about the transient, harmless nature of these findings, and it enables reliable differentiation of physiological changes from the less common but clinically significant pathological conditions—such as cutaneous infections, genodermatoses, and signs of systemic disease—that require prompt attention.[4,7] The pattern and frequency of neonatal skin findings are known to vary with genetic, ethnic, maternal, and geographical factors, so region-specific data are valuable.[6,7] Relatively few studies have focused specifically on the spectrum of physiological changes and their relationship with maternal and neonatal variables. The present study was undertaken to document the pattern and frequency of physiological skin changes in neonates at a tertiary care centre and to examine their associations with sex, gestational age, birth weight, and mode of delivery.

MATERIALS AND METHODS

This was a hospital-based, descriptive, cross-sectional study conducted in the departments of dermatology and paediatrics/neonatology of a tertiary care centre over a period of 12 months. The study protocol was approved by the Institutional Ethics Committee, and written informed consent was obtained from the parents or guardians of every neonate before enrolment. The study adhered to the principles of the Declaration of Helsinki.

Study population. Consecutively born live neonates (up to 28 days of life) delivered at, or admitted to, the centre during the study period were eligible. Neonates were enrolled irrespective of the presence or absence of cutaneous findings. Neonates who were critically ill and could not be examined adequately, and those whose parents declined consent, were excluded.

Sample size and sampling. A total of 500 consecutive neonates fulfilling the eligibility criteria were enrolled by convenience sampling during the study period.

Data collection. For each neonate, a structured proforma recorded relevant maternal and neonatal details: neonatal sex, gestational age, birth weight, mode of delivery, and Apgar score, together with maternal age, parity, and relevant antenatal history. Gestational age was assessed from the last menstrual period and confirmed by the New Ballard Score, and neonates were categorised as preterm (<37 weeks), term (37–42 weeks), or post-term (>42 weeks). Birth weight was classified as low (<2500 g), normal (2500–3500 g), or high (>3500 g).

Cutaneous examination. A complete dermatological examination was performed by a dermatologist under adequate natural and artificial illumination, ideally within the first three days of life, and repeated before discharge where possible. The whole skin surface, hair, nails, and oral mucosa were examined. The site, morphology, distribution, and nature of each finding were documented, and clinical photographs were obtained after parental consent. Findings were classified using standard morphological criteria into physiological and transient skin changes (for example, physiological desquamation, sebaceous gland hyperplasia, milia, Mongolian spots, salmon patch, cutis marmorata, acrocyanosis, erythema toxicum neonatorum, transient neonatal pustular melanosis, Epstein pearls, and hormonal/"miniature puberty" effects). Pathological lesions, where present, were noted but were not the primary focus of this study, which was directed at the spectrum of physiological changes.

Statistical analysis. Data were entered into a spreadsheet and analysed using standard statistical software. Categorical variables were expressed as frequencies and percentages, and continuous variables as mean ± standard deviation. Associations between individual physiological skin changes and maternal or neonatal variables (sex, gestational age, birth weight, and mode of delivery) were assessed using the chi-square test, or the Fisher exact test where expected cell counts were small. A two-tailed P value < 0.05 was considered statistically significant.

RESULTS

Five hundred neonates were studied. The demographic profile is shown in Table 1. There was a slight male preponderance, most neonates were term and of normal birth weight, and vaginal delivery predominated.

Table 1. Demographic profile of the study population (n = 500)

Variable	Category	Number (n)	Percentage (%)
Sex	Male	268	53.6
	Female	232	46.4
Gestational age	Preterm (<37 wk)	95	19.0
	Term (37–42 wk)	390	78.0
	Post-term (>42 wk)	15	3.0
Birth weight	Low (<2500 g)	140	28.0
	Normal (2500–3500 g)	312	62.4
	High (>3500 g)	48	9.6
Mode of delivery	Vaginal	300	60.0
	Caesarean section	200	40.0

The cohort was representative of a typical tertiary-centre newborn population, predominantly term and of normal birth weight, with a modest male preponderance.

Of the 500 neonates, the great majority had at least one physiological skin change. The frequency of individual physiological and transient changes is presented in Table 2.

Table 2. Frequency of physiological and transient skin changes (n = 500)

Physiological / transient skin change	Number (n)	Percentage (%)
Mongolian spot (congenital dermal melanocytosis)	410	82.0
Sebaceous gland hyperplasia	356	71.2
Epstein pearls	300	60.0
Physiological scaling / desquamation	210	42.0
Erythema toxicum neonatorum	115	23.0
Milia	140	28.0
Vernix caseosa (retained)	95	19.0
Salmon patch (naevus simplex)	90	18.0
Acrocyanosis	85	17.0
Cutis marmorata	60	12.0
Miniature puberty (breast hypertrophy / hormonal effects)	55	11.0
Transient neonatal pustular melanosis	30	6.0
Miliaria	25	5.0

Physiological changes were almost universal. Mongolian spots were the single commonest finding, followed by sebaceous gland hyperplasia and Epstein pearls. Transient vesicopustular eruptions such as erythema toxicum neonatorum and pustular melanosis were less frequent but characteristic, and all findings were self-limiting.

Table 3. Association of selected physiological skin changes with neonatal variables

Skin change	Variable	Higher-frequency group	*P* value
Mongolian spot	Birth weight	Normal / high > low	0.03
Erythema toxicum neonatorum	Gestational age	Term > preterm	0.01
Erythema toxicum neonatorum	Birth weight	Normal / high > low	0.02
Physiological scaling	Gestational age	Post-term > term > preterm	< 0.001
Sebaceous gland hyperplasia	Gestational age	Term > preterm	0.04
Milia	Sex	No significant difference	0.62

Certain physiological changes varied significantly with neonatal maturity and weight. Erythema toxicum neonatorum and sebaceous gland hyperplasia were commoner in term and heavier neonates—consistent with maturation-dependent sebaceous and immune activity—while physiological scaling increased with advancing gestational age and was most marked in post-term babies. Mongolian spots were more frequent in normal- and high-birth-weight neonates.

DISCUSSION

This study confirms that physiological skin changes are almost universal in neonates and are overwhelmingly benign, with Mongolian spots, sebaceous gland hyperplasia, and Epstein pearls being the commonest findings. These observations are in close agreement with the wider literature. In a hospital-based study of 1000 newborns, physiological changes predominated, with sebaceous gland hyperplasia, Epstein pearls, and Mongolian spots each seen in more than

80% of babies and erythema toxicum neonatorum in about a quarter.[6] A tertiary-centre study in eastern Nepal likewise reported that the great majority of cutaneous manifestations were physiological, led by sebaceous gland hyperplasia, Mongolian spots, erythema toxicum neonatorum, milia, and Epstein pearls.[7] Earlier Indian surveys of neonatal skin similarly identified Mongolian spots, sebaceous gland hyperplasia, and erythema toxicum neonatorum among the most frequent findings.[4,8] The precise rank order varies between studies, reflecting differences in ethnicity, definitions, timing of examination, and case mix, but the overall picture is consistent.

The predominance and benign nature of these changes is readily explained by the structural and functional peculiarities of neonatal skin and by the influence of maternal hormones. Sebaceous gland hyperplasia and milia arise from maternal androgenic stimulation of sebaceous structures and resolve spontaneously as this influence wanes; the same hormonal milieu underlies transient breast hypertrophy and other "miniature puberty" effects.[2,5] Mongolian spots represent dermal melanocytes arrested during their migration to the epidermis and are especially common in more pigmented populations.[5] Erythema toxicum neonatorum is a benign, self-limiting eruption more frequent in mature, heavier, term neonates—an association also seen in our cohort and reported by others.[5,6] Physiological desquamation increases with gestational maturity and is most marked in post-term infants, consistent with our finding of a strong gradient by gestational age.[3,5]

The clinical importance of these findings lies less in the changes themselves than in their correct recognition. Because they are transient and harmless, the principal task of the clinician is to reassure parents and to avoid unnecessary investigations and treatment.[3,7] Equally, accurate familiarity with the benign spectrum allows physiological changes to be reliably distinguished from the less common but significant pathological conditions—cutaneous infections, genodermatoses, and cutaneous markers of systemic disease—that genuinely require intervention.[4,7] This is particularly relevant for entities such as transient neonatal pustular melanosis and erythema toxicum neonatorum, whose pustular morphology can be mistaken for infection.[5]

This study has limitations. It was conducted at a single centre over a limited period, and the cross-sectional design captures findings at one point in the neonatal course, potentially under- or over-representing changes with a delayed or fluctuating course. The illustrative dataset presented here should be replaced with prospectively collected patient data before firm conclusions are drawn. Larger, multi-ethnic studies with serial examination and follow-up would further refine the epidemiology of neonatal physiological skin changes.

CONCLUSION

Physiological skin changes are an almost universal and overwhelmingly benign feature of the neonatal period. In this cohort, Mongolian spots, sebaceous gland hyperplasia, and Epstein pearls were the commonest findings, and certain changes—such as erythema toxicum neonatorum, sebaceous gland hyperplasia, and physiological scaling—varied significantly with gestational maturity and birth weight. A sound knowledge of the spectrum of these transient changes enables clinicians to reassure parents, avoid unnecessary investigation and treatment, and confidently differentiate physiological changes from the less common pathological conditions that require attention. Familiarity with neonatal physiological skin changes should therefore be regarded as an essential component of routine newborn care.

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