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Original Article

Paediatrics Section

Nail Features of Term Healthy Neonates: An Observational Study

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ABSTRACT

Introduction: Nail disorders in neonates can be indicators of underlying dermatological or systemic disorders, such as Iso-Kikuchi syndrome, Y-shaped bifurcation of the distal phalanx and Nail Patella syndrome. However, there are very few studies describing the features of nails in newborns, especially in the Indian subcontinent.

Aim: To study the morphological features of nails in term newborns.

Materials and Methods: A descriptive observational study was conducted from November 2021 to July 2022 on term newborn babies born at and visiting Navodaya Medical College Hospital in Raichur, Karnataka, India. A total of 112 babies born to mothers without any co-morbidities were included in the study. Birth and antenatal history were recorded. Finger and toenails were systematically examined, photographed and data were collected regarding fingernail shape, toenail length, width, width ratio and pigmentation.

Results: A total of 112 newborns were studied, of which 58 were males and 54 were females, with a mean age of 3±1.5 days. The mean fingernail length, width and width ratio were 4.70±0.53 mm, 3.41±0.11 mm and 0.55±1.95, respectively. Macronychia was observed in 39 newborns (34.8%). The most common fingernail shape was rectangular, observed in 91 (81.25%) cases. The lunula was present in 54 neonates (48.2%). The mean toenail length, width and width ratio were 2.7±0.17 mm, 3.23±0.73 mm and 0.56±1.78, respectively. Micronychia was noted in 65 neonates (58.0%) and macronychia in 8 (7.1%). Hyperpigmentation of the distal phalanx was noted in nine dark-skinned neonates, while 23 newborns (20.5%) exhibited pseudo-hypertrophy of fingernails and 38 newborns (33.9%) showed pseudo-hypertrophy of toenails.

Conclusion: Macronychia is common in the fingernails of newborns, whereas micronychia is more common in toenails. Koilonychia can be a physiological finding at birth and the lunula is less common in toes compared to fingernails in newborns.

Keywords: Koilonychia, Lunula, Macronychia, Micronychia

INTRODUCTION

The nail unit consists of the matrix, proximal nail fold, nail bed and hyponychium. Nail conditions in the paediatric population can be the result of a wide spectrum of aetiologies, including congenital and hereditary malformations, infections, tumours, inflammatory processes and systemic diseases like Iso-Kikuchi syndrome, Y-shaped bifurcation of the distal phalanx and nail patella syndrome [1]. It is essential for healthcare providers to examine the entire nail unit for abnormalities, as these may be the initial manifestations of a systemic illness [2,3].

The nail is an appendage derived from primordial ectoderm. The development of the nail starts around the 8th week of gestation and continues up to five months after delivery [2]. The fingers are formed at 11 weeks. At 13 weeks, the nail plate can be noted distally to the proximal nail fold. By 22 weeks of gestation, it advances over the nail bed with the constitution of the nail plate; hence, some congenital disorders can affect nail development [4,5]. Fingernails grow faster (3 mm/month) compared to toenails (1-1.5 mm/month) and this rate of nail growth can affect the shape of nails at birth [6]. The nails of newborns are thin, soft and completely formed at birth and their size is related to the weight of the newborn and gestational age [2]. Koilonychia and a transient light brown or ochre pigmentation of the proximal nail fold are two important exclusive physiological aspects of the nails of the newborn [2,3].

There are not many studies available on the physiological aspects of newborn nails, except for one by Chinazzo M et al., on 52 newborns in France and another by Seaborg B and Bodurtha J conducted on 48 infants; however, no such study has been conducted in the Indian subcontinent [4,5]. Most publications so far regarding nail diseases refer to single cases of rare inherited disorders. Hence, present study aimed to study the morphological features of nails in term newborns.

MATERIALS AND METHODS

A descriptive observational study was conducted for a period of nine months, from November 2021 to July 2022, on all newborn babies in their first week of life born at and visiting Navodaya Medical College Hospital, Raichur, Karnataka, India. The study commenced after obtaining approval from the Institutional Research Ethical Committee meeting held on 08.07.2022 at Navodaya Medical College Hospital in Raichur, Karnataka, India. Term neonates were examined in their first week of life after obtaining informed signed consent from the mothers participating in the study.

Inclusion criteria: Term neonates in their first week of life with a birth weight of more than 1500 g and without any co-morbidities in either the baby or the mother were included in the study.

Exclusion criteria: Neonates with congenital anomalies, general/systemic diseases and babies born to mothers with a history of alcohol consumption during pregnancy were excluded. Newborns weighing less than 1500 g and those born before term pregnancy were also excluded from the study.

Study Procedure

Antenatal history, including a history of alcohol consumption, was recorded. The birth history of the newborns was documented. A systematic examination of the finger and toenails was performed. Interpretation by an expert was conducted with the help of photographic recordings. A standardised questionnaire was used to record the following data for each infant: history of previous pregnancies, past history/co-morbidities, gender and gestational age of the neonate, as well as length, weight, Appearance, Pulse, Grimace, Activity, Respiration (APGAR) score and any related medical history. The descriptions of nail features were also recorded.

The width of a nail was considered as micronychia if the width of the nail plate in the middle of its length, divided by the width of the toe or finger at the same point, was <0.5 and as macronychia if it was >0.8. A nail plate growing beyond the edge of the finger was considered a long nail. A vertical cliff-like appearance of the nail folds around the nail due to a depressed nail plate was considered pseudohypertrophy of the nail fold. Examination was conducted for all the nails in all subjects [Table/Fig-1].

Shape of nail	Triangle	Distally tapering nail to an acute angle	
	Square	Nail width is equal to length with sides right angled to each other	
	Oval	Nail width is smaller than length with curved nail edge	
	Round	Length of nail same as width with curved nail edge	
	Rectangular	Nail width is smaller than its length with sides right angled to each other	
Width of nail (width of the nail at middle of its length by width of the toe/ finger at the same place)	Macronychia	More than 0.8 of total nail ratio	
	Micronychia	Less 0.58 of total nail ratio	
Nail fold	Pseudo (false) hypertrophy	Vertical cliff like appearance of nail folds around the nail due to depressed nail plate	
	Thickening or Hypertrophy	More than usual height of skin of nail folds.	
Nail plate	Surface	White nails (leukonychia)	Complete or incompletely white coloured nail
	Surface	Scales	Shedding or accumulation of stratum corneum in visible flakes
	Curvature	Koilonychia	Spoon shaped concave nail
		Flat	Non curved nail in both length and width
	Nail plate tip or distal aspect	Long nail	Nail plate growing beyond edge of finger
		Onychoschizia	Layered nail due nail plate softening and splitting at nail edges
		Onycholysis	Nail plate separated from the underlying nail bed beginning from the edge of nail

[Table/Fig-1]: Definition of terms used [4].

STATISTICAL ANALYSIS

Mean±Standard Deviation (SD) or median (range) were used to describe quantitative data, while frequency/percentage was used for qualitative data, respectively.

RESULTS

In total, 112 newborns were eligible according to the inclusion criteria and all 112 were included in the study (58 males and 54 females), with none being excluded during or after the study. None of the newborns had any general diseases. The mean gestational age at birth was 37.8±2.56 weeks, the mean birth weight was 2.753±0.489 kg and the mean length was 48.21±2.69 cm. The mean Apgar score was 8±1.05 [Table/Fig-2].

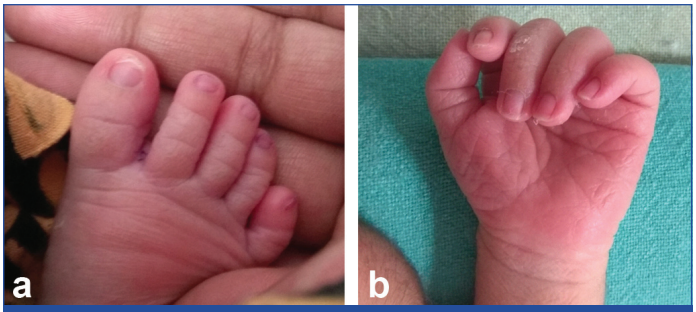
Data	Mean±SD/n(%)
Gestational age (weeks)	37.8±2.56
Birth weight (kg)	2.753±0.489
Length at birth (cm)	48.21±2.69
Apgar score	8±1.05
Gender	
Male	58 (51.8)
female	54 (48.2)
Maternal age (years)	22.3±2.52
Gravida	
G1	41 (36.6)
G2	50 (44.6)
G3	14 (12.5)
G4	5 (4.5)
G5	2 (1.8)
Mode of delivery	
Normal vaginal delivery	43 (38.4)
Lower segment caesarean section	69 (61.6)

[Table/Fig-2]: Maternal and newborn birth data.

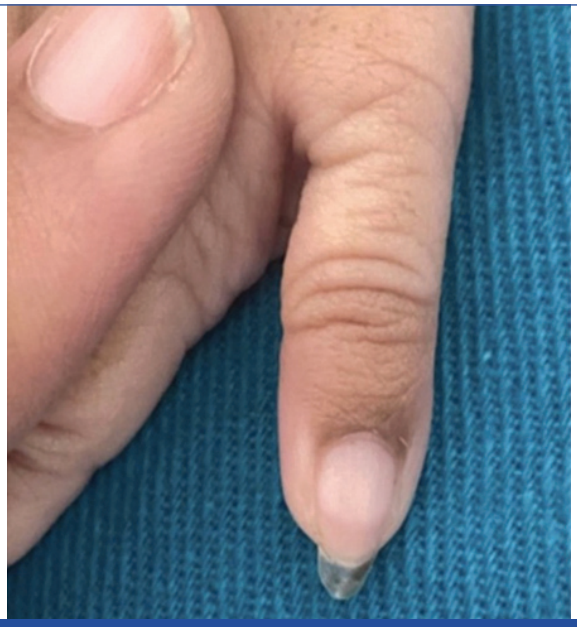
The mean fingernail length, width and width ratio were 4.70±0.53 mm, 3.41±0.11 mm, and 0.55±1.95, respectively. The nails were predominantly rectangular, observed in 91 (81.25%) of the fingers and pink was the predominant colour of the nails [Table/Fig-3,4a,b]. Thirty-nine newborns (34.8%) had macronychia and 25 (22.3%) had micronychia. Long nails were noted in 7 (6.2%) newborns [Table/Fig-5] and 9 (8%) dark-skinned patients showed hyperpigmentation of the distal phalanx [Table/Fig-5,6]. Pseudohypertrophy of the lateral fold of the hallux of fingernails was noted in 23 newborns (20.5%), while in the proximal fold, it was noted in 10 (8.9%). The curvature of fingernails was convex in 24 (21.4%) cases. Lunulae

Nail feature*			Fingernails (n=112)	Toenails (n=112)
Width of nail	Micronychia:<0.5		25 (22.3%)	65 (58.0%)
	Macronychia:>0.8		39 (34.8%)	8 (7.1%)
Mean width of nail (mm)			3.41±0.11	3.23 ±0.73
Mean width ratio of nail			0.55 ±1.95	0.56±1.78
Mean length of nail (mm)			4.70±0.53	2.7±0.17
Nail fold	"Pseudo-hypertrophy" of proximal nail fold		10 (8.9%)	20 (17.9%)
	"Pseudo-hypertrophy" of lateral nail fold		23 (20.5%)	38 (33.9%)
Shape	Oval		12 (10.71%)	56.2 (50.2%)
	Rectangular		91 (81.25%)	30.35 (27.1%)
	Triangular		7 (6.25%)	22.84 (20.4%)
	Round		2 (1.78%)	2.6 (2.3%)
Plate	Curvature	Convex	24 (21.4%)	0
		Concave	0	0
		Koilonychias	0	7 (6.2%)
		Flat	0	18 (16.0%)
	Presence of lunula		50 (44.6%)	4 (3.5%)
	Anomaly of surface	Punctuated leuconychia	0	0
Distal part	Onychoschizia		0	0
	Onycholysis		0	0
	Scales		1 (0.8%)	1 (0.8%)
	Long nails		7 (6.2%)	3 (2.6%)
	Pigmentation of proximal nail fold		9 (8.0%)	9 (8.0%)

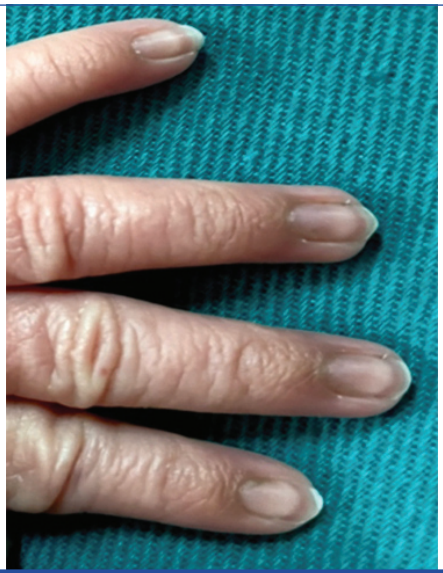
[Table/Fig-3]: Features of finger- and toenails of term newborns.



[Table/Fig-4]: a) Pink coloured nails in newborn; b) Pink nail with rectangle shape.



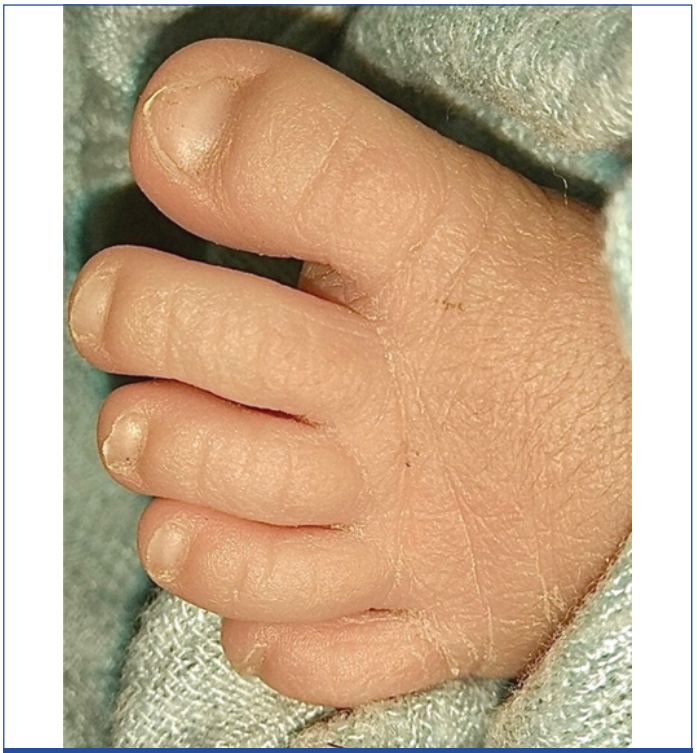
[Table/Fig-5]: Newborn with long nail and hyperpigmented finger proximal nail fold.



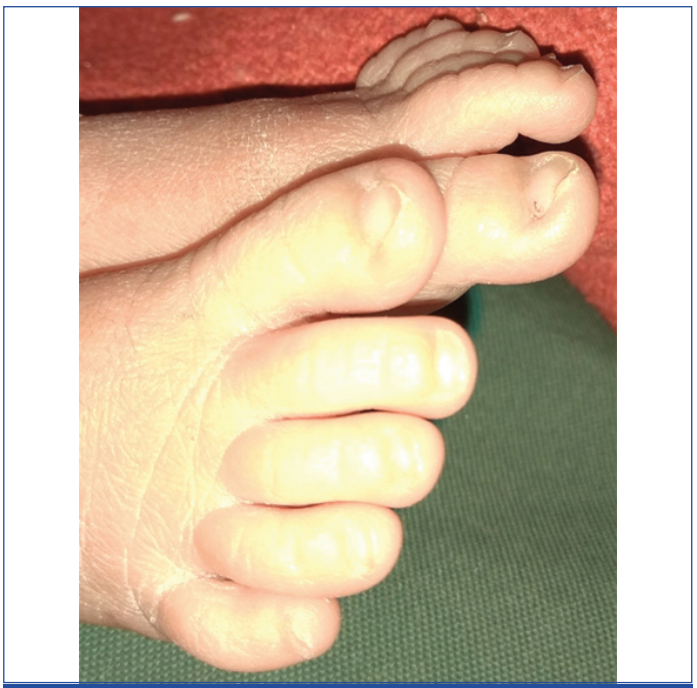
[Table/Fig-6]: Newborn nail with hyperpigmentation of distal phalanx of the finger nails.

were present in 50 (44.6%) newborns. No other surface anomalies were noted.

The mean toenail length, width and width ratio were 2.7±0.17 mm, 3.23±0.73 mm, and 0.56±1.78, respectively. Micronychia was observed in 65 newborns (58.0%) and macronychia in 8 newborns (7.1%). The common toenail shape was oval, seen in 50.2% of the cases [Table/Fig-7]. Hyperpigmentation of the distal phalanx was noticed in 9 (8%) dark-skinned newborns. Pseudohypertrophy of the lateral fold of the hallux of toenails was noted in 38 newborns (33.9%), while in the proximal fold, it was noted in 20 (17.8%). Flat toenails were noted in 18 newborns (16.07%) and koilonychia was observed in 7 (6.25%) newborns [Table/Fig-8].



[Table/Fig-7]: Newborn with triangular great toe nail, oval 2nd and 4th toe nail.



[Table/Fig-8]: Koilonychia in toe nail of newborn.

DISCUSSION

Children can suffer from the same nail disorders as adults, which can be present from birth or acquired later in life. Parents often have concerns about the difficulties their child might face with abnormal nails and associated illnesses. Therefore, it is important to have knowledge of what is considered normal or abnormal in the nails of newborns [7].

Pseudohypertrophy of the lateral folds of the hallux in fingernails was noted in 20.5% of neonates, whereas it was slightly more common in toenails (33.9%). This condition is physiological and no treatment is needed [4]. Long fingernails were observed in 6.25% of newborns in present study, which was less than half the frequency noted in the study by Chinazzo M et al., [Table/Fig-9]. All of the long-nail newborns were born at term gestation [4]. Fingernails should be cut in a timely manner, as they can pose a risk of scratches on the face or conjunctiva of the newborn [6].

Nail feature	Present study		Study by Chinazzo M et al.,		Comparison between studies
	Finger nails	Toe nails	Finger nails	Toe nails	
Micronychia	25 (22.3%)	65 (58.0%)	2 (3.8%)	31 (59.6%)	Micronychia comparable in finger nails whereas toenails it was more in present study.
Macronychia	39 (34.8%)	8 (7.1%)	13 (25%)	1 (1.9%)	More in both finger nails and toenails in present study.
Width ratio	0.55±1.95	0.56±1.78	0.71±0.09	0.54± 0.08	Ratio was more in finger nails suggesting whereas toenails it was comparable.
Shape	Rectangle-91 (81.25%) Oval-12 (10.71%) Triangle-7 (6.25%) Round- 2 (1.78%)	Oval-56.2 (50.2%) Rectangle-30.35 (27.1%) Triangle- 22.84 (20.4%) Round-2.6 (2.3%)	Oval - 36 (71.1%) Rectangle-10 (19.2%) Round- 5 (9.6%)	Triangle 26 (50%) Rectangle- 13 (25%) Round-11 (21.1%) Oval-2 (3.8%)	Rectangle was most common shape in finger nails compared to oval finger nails in Chinazzo M et al., whereas toenails it was oval and triangular, respectively.
Pseudohypertropy of proximal nail fold	10 (8.9%)	20 (17.8%)	1 (1.9%)	20 (38.4%)	More common in toenails in both study though present study revealed comparatively more percentage of finger nail fold hypertrophy.
Pseudohypertropy of lateral nail fold	23 (20.5%)	38 (33.9%)	4 (7.7%)	38 (73.1%)	More in toenails in both study though it was comparatively more in fingernails.
Nail plate curvature	Convex- 24 (21.4%)	Koilonychias- 7 (6.2%) Flat- 18 (16.0%)	Flat-33 (63.5%) Convex- 19 (36.5%)	Koilonychia-17 (32.7) Flat 27 (51.9%) Concave- 3 (5.8)	Koilonychias was seen in toes in both studies though it was less in present study whereas we could not see flat finger nails.
Lunula	50 (44.6%)	4 (3.5%)	26 (50%)	4 (7.7%)	Lunula was more common in finger nails with comparable results in both studies.
Punctuated leuconychia of nail plate	0	0	0	2 (3.8%)	Not seen in present study
Pigmentation of nail plate- homogenous	0	0	46 (88.5)	41 (78.8)	Not seen in present study
Pigmentation of nail plate in gradation	0	0	6 (11.5)	7 (13.4)	Not seen in present study
Onychoschizia	0	0	0	15 (28.8%)	Not seen in present study
Onycholysis	0	0	6 (11.5%)	14 (26.9%)	Not seen in present study
Scales on nail surface	1 (0.8%)	1 (0.8%)	11 (21.1%)	19 (36.5%)	Scales on surface was a rare finding in present study compared to Chinazzo M et al.,
Long nails	7 (6.2%)	3 (2.6%)	15 (28.8%)	2 (3.8%)	Long nails were less in present study in finger nails whereas in toenails it was marginally less.

[Table/Fig-9]: Comparison of nail features of newborns with study by Chinazzo M et al., [4].

In present study, nails were commonly rectangular, seen in 91 (81.25%) of the fingers, whereas in the study by Chinazzo M et al., an oval shape was noted in 36 infants (71.1%) [4].

Koilonychia was noted in 7 (6.2%) neonates, occurring only in toenails, which can be physiological in early neonates [3,8]. Newborn nails are thin, flat and soft; when vertical pressure is applied to the soft nail plate, the edges of the nail plate curve upward to create a spoon-shaped appearance. Thickening of the nail plate causes the spontaneous disappearance of koilonychia. Adult nails do not typically show signs of koilonychia physiologically, but it can be seen in patients with iron deficiency, haemochromatosis, lupus erythematosus, etc. [4].

The common toenail shape was oval, seen in 56.2 (50.2%) of cases, whereas in the study by Chinazzo M et al., it was triangular, noted in 26 (50%) of cases [4].

Higher mobility of fingernails in utero, or the presence of more skin compared to bone in toenails, could explain the higher frequency of koilonychia in toenails. This condition can also be inherited, as seen in familial koilonychias [4].

The lunula was observed in less than half of the fingernails (44.6%) of present study infants and rarely in toenails (3.5%). The absence of the lunula may not indicate any pathology in newborns, unlike in adults, where it can be associated with haematologic, congenital and infectious disorders [9,10].

Hyperpigmentation of the distal phalanx of both hands and feet was noted in 9 newborns, who were mostly dark-skinned and this is considered benign and transient [Table/Fig-7]. This condition usually fades by one year of age [11].

Authors did not find any nail changes such as Beau's lines, which usually result from foetal distress or birth difficulties and can be observed a few months after birth [12,13]. Similarly, onychoschizia and Chevron nails (herring-bone nail), in which the nail plate shows longitudinal diagonal ridges that converge toward a midpoint at the distal edge of the nail plate, were not noted. Authors could not find any newborns with nails showing onycholysis, concave nails, or pigmentation in gradation, in contrast to the study by Chinazzo M et al., which reported these features in a few newborns. Small pits that can occur in the nail plate due to alterations or imperfections in the proximal nail matrix were not found [3], nor were scattered white spots (punctuated leukonychia) seen in normal nails, or small white opacities, which may appear in neonates as a result of minimal birth trauma [14].

Limitation(s)

The limitation of the study was that a small number of patients were included and it only involved term neonates. Additionally, it was a single-centre study.

CONCLUSION(S)

The study could reveal the physiological aspects of newborn nails, such as length, width and width ratio. Koilonychia can be a physiological finding at birth and the lunula is less common in toenails compared to fingernails in newborns. Macronychia is common in the fingernails of newborns, whereas micronychia is more common in toenails. Further studies, including preterm newborns and follow-up of newborns, would help to better understand the physiology of newborn nails.

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