Brief Report

Nail Changes in Leprosy: An Observational Study of 125 Patients

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Abstract

Introduction: Leprosy is a disease primarily affecting skin and nerve. Nail involvement, although indirect, is observed in several patients. This is a study to determine the pattern of nail changes in leprosy. **Methods:** It was an observational study involving 125 patients. Apart from cutaneous and neurological examination, nails were examined. Diagnosis was confirmed by previous records in already diagnosed cases, while by slit skin smear and histopathologically in new cases. Patients were grouped as per Ridley-Jopling classification and further subdivided as per age, sex, and duration and reaction status. Nail changes in these groups were summarized and compared. **Results:** Overall prevalence of nail changes was 80% with 66.6% in TT patients, 79.4% in BT patients 50% in BB patients, 83.7% in BL patients and 84.3% in LL patients. Longitudinal melanonychia and longitudinal ridges were frequent finger nail changes with longitudinal melanonychia being more common among tuberculoid pole and longitudinal ridges among lepromatous pole. Brachyonychia, subungual hyperkeratosis and brown black pigmentation were frequent finger nail changes, with onychorrhexis being commonest among TT patients, subungual hyperkeratosis among BT patients, while brachyonychia among BL and LL patients. Anonychia and rudimentary nails were not found in tuberculoid pole. Beau's lines, terry nails, pterygium, pincer nail, and onychorrhexis were significantly more frequent in ENL patients. Onychomadesis, which is not reported yet in leprosy, was found in one patient after severe ENL. **Conclusion:** Various changes in leprosy are due to multiple causes like neuropathic, traumatic, vascular, osseous, infections and drugs reflecting extensive systemic morbidity caused by Mycobacterium leprae.

Keywords: *Leprosy, morbidity, nail changes, prevalence*

Introduction

Nails are windows to one's systemic health. Many systemic diseases are associated with some characteristic nail changes. Leprosy, being a chronic infectious disease caused by Mycobacterium leprae and primarily affecting skin and nerves, can also involve nails directly or indirectly. The nail changes in leprosy are not specific but they are highly characteristic.

Although dystrophic changes and mutilation of hands and feet are considered more or less synonymous with the symptomatology of the disease,[1-4] nail changes in leprosy are not discussed in detail. There are limited studies on nail changes in leprosy showing nail involvement in nearly every 3 out of 4 patients.[5-8] In all these studies, changes were studied in groups of paucibacillary and multibacillary which do not represent complete spectrum of disease. Hence, this is a study to determine the prevalence as well as pattern of nail changes in leprosy patients as per spectrum of disease. Further, they were divided on the basis of age, sex and duration of disease. Changes in ENL patients were studied separately.

Nail changes in leprosy are caused by many factors, neuropathy being the main and others include repeated trauma, vascular impairment, infections, or adverse effects of drugs used in treatment leading to involvement of nail plate, matrix, bed as well as the periungual skin folds.[6,7] The possible changes are many, affecting the shape, size, thickness, surface, consistency, and the color of the nail plate, bed or the nail tissues overall.[5]

Methods

It was an observational study conducted at a medical education institute over a period of 6 months. During this period, total 130 leprosy patients visited the hospital. Out of these 130 patients, 125 who have completed treatment were included in the study. At

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the same time, 5 leprosy patients having other cutaneous diseases like psoriasis, lichen planus, alopecia areata which have specific nail changes and diseases causing peripheral neuropathy like diabetes, vitamin B12 deficiency were excluded from the study. No controls were selected as study was designed to compare nail changes between different groups in leprosy patients.

Detailed cutaneous and neurological examination was done. In new cases, diagnosis was confirmed by histopathological study of the skin lesions and slit skin smear, while details of already diagnosed cases were obtained from previous records. Deformities of hands and feet were graded according to the WHO guidelines.[9] X-rays of the hands and or feet were done in patients having grade 2 deformities including trophic ulcer. Nail changes in these patients were noted in a predesigned proforma having detailed examination of all fingers and toes. Clinical photographs of nails were taken for record purpose. KOH mounts were done whenever fungal infections were suspected.

Patients were grouped according to Ridley-Jopling classification into polar tuberculoid, TT borderline tuberculoid, BT, mid-borderline, BB; borderline lepromatous, BL and polar lepromatous, LL disease for purposes of analyses.[10] Further, they were subdivided as per age (less than 25 years, 25-50 years and more than 50 years), sex (male, female) and duration of disease (less than 2 years from diagnosis and more than 2 years from diagnosis). A sub-group of patients having erythema nodosum leprosum reaction within the last 3 months was made. Nail changes in these groups were summarised and compared.

Observations and Results

Out of 125 patients included in the study, 15 patients were having TT leprosy, 39 patients were having BT leprosy, 2 patients were having BB leprosy, 43 patients were having BL leprosy and 26 were having LL leprosy. 10 TT patients, 31 BT patients, 1 BB patient, 36 BL patients and 22 LL patients were having nail changes giving an overall prevalence of 80%, with prevalence of 66.6% in TT group, 79.4% in BT group, 50% in BB group, 83.7% in BL group and 84.6% in LL group. Seventeen out of 19 patients who had ENL within last 3 months showed nail changes.

Table 1 shows clinical profile of the nail changes including details as per age, sex and duration of disease. In TT group, prevalence of changes was more in younger patients, in BT group changes were more common in middle-aged patients while in BL and LL group, changes were more prevalent in elderly patients. Though males and females were having nearly same prevalence in all groups, brachyonychia, parrot beak nails, anonychia, paronychia & koilonychia were more common in females. Changes were more frequent in newer cases in TT and BT groups, while in BL and LL groups, older cases were having more changes. Pattern of changes was similar over the duration in TT and BT groups, but in BL and LL groups subungual hyperkeratosis, Beau's lines, brown black pigmentation, longitudinal melanonychia, terry nails were more frequent in less than 2 years duration of disease, while anonychia, rudimentary nails, brachyonychia, onychorrhexis, oychogryphosis were extensively common in cases with more than 2 years of duration.

Details about prevalence and frequency of finger and toe nail involvement are given in Table 2.

Table 1: Clinical profile of the nail changes including details as per age, sex and duration of disease

Group	Status	TT	BT	BB	BL	LL	Total
Over all	Present	10 (66.6%)	31 (79.4%)	1 (50%)	36 (83.7%)	22 (84.6%)	100 (80%)
	Absent	5 (33.3%)	8 (20.5%)	1 (50%)	7 (16.2%)	4 (15.3%)	25 (20%)
Age							
<25 yrs	Present	5 (71.4%)	10 (76.9%)	1 (100%)	6 (75%)	3 (75%)	25 (75.7%)
	Absent	2 (28.6%)	3 (23.1%)	0 (00%)	2 (25%)	1 (25%)	08 (24.2%)
25-50 yrs	Present	3 (60%)	12 (85.7%)	0 (00%)	18 (85.7%)	12 (85.7%)	45 (81.8%)
	Absent	2 (40%)	2 (14.3%)	1 (100%)	3 (14.3%)	2 (14.3%)	10 (18.1%)
>50 yrs	Present	2 (66.6%)	9 (75%)	0	12 (85.7%)	7 (87.5%)	30 (81.0%)
	Absent	1 (33.3%)	3 (25%)	0	2 (14.3%)	1 (12.5%)	7 (78.9%)
Sex							
Male	Present	5 (62.5%)	16 (80%)	1 (50%)	20 (83.3%)	10 (83.3%)	52 (78.8%)
	Absent	3 (27.5%)	4 (20%)	1 (50%)	4 (16.6%)	2 (16.6%)	14 (21.1%)
Female	Present	5 (71.4%)	15 (78.9%)	0	16 (84.2%)	12 (85.7%)	48 (81.3%)
	Absent	2 (28.6%)	4 (21%)	0	3 (15.8%)	2 (14.3%)	11 (18.6%)
Duration							
Diagnosed within 2 yrs	Present	8 (75%)	27 (77.1%)	1 (50%)	28 (84.8%)	12 (80%)	74 (77.9%)
	Absent	4 (25%)	8 (22.8%)	1 (50%)	5 (15.1%)	3 (20%)	21 (22.1%)
Diagnosed before 2 yrs	Present	2 (66.6%)	4 (66.6%)	0	10 (90.9%)	10 (90.9%)	26 (86.6%)
	Absent	1 (33.3%)	2 (33.3%)	0	1 (09.1%)	1 (09.1%)	4 (13.3%)

TT - Polar tuberculoid; BT - Borderline tuberculoid; BB - Borderline; BL - Borderline lepromatous; LL - Polar lepromatous

In TT patients, finger and toe nails were involved in same frequency but in BT, BL and LL patients, changes were more common in toe nails than in finger nails.

All finger nail changes are summarized in Table 3, while all toe nail changes are summarized in Table 4. Longitudinal melanonychia was the most common finding in finger nails, followed by longitudinal ridges, brachyonychia, brown black pigmentation, Beau's lines and parrot beak nails. Longitudinal melanonychia and onycholysis were more common among tuberculoid pole wile longitudinal ridges and brown black pigmentation was more common among lepromatous pole. Brachyonychia was commonest change in toe nails followed by subungual hyperkeratosis, brown black pigmentation, onychorrhexis, Beau's lines and onychauxis. Onychorrhexis was most common finding among TT patients, subungual hyperkeratosis among BT patients while brachyonychia among BL and LL patients. Anonychia and rudimentary nails were seen only in lepromatous pole and not found in tuberculoid pole.

Tables 3 and 4 show details of finger and toe nail changes in ENL patients. Frequency of changes like longitudinal ridges, brachyonychia, subungual hyperkeratosis, brown black pigmentation and onycholysis in ENL patients was nearly similar to that in BL and LL patients. But Beau's lines, terry nails, pterygium, pincer nail, onychomadesis and onychorrhexis were significantly more frequent in ENL patients compared to BL and LL patients. Other findings like parrot beak nails, onychauxis, onychogryphosis, rudimentary nails and others were less common in ENL patients.

Table 2: Prevalence and frequency of finger and toe nail involvement

Sr no	Finger/toe nail changes	Type of disease						
		TT	BT	BB	BL	LL	Total	ENL (total 19 cases) No.(%)
1	With only Finger nails	3 (20%)	3 (7.7%)	0	3 (6.9%)	2 (7.7%)	11	02 (10.5)
2	With only toe nails	3 (20%)	11 (28.2%)	0	13 (30.2%)	5	32	04 (21.0)
3	With both finger & Toe nails changes	4 (26.6%)	17 (43.5%)	1 (50%)	20 (46.5)	15	57	11 (57.9)
4	Total With finger involvement	7 (46.7%)	20 (51.2%)	1 (50%)	23 (53.4%)	17	68	13 (68.4)
5	Total With toe involvement	7 (46.7%)	28 (71.7%)	1 (50%)	33 (76.6%)	20	89	15 (78.9)

TT - Polar tuberculoid; BT - Borderline tuberculoid; BB - Borderline; BL - Borderline lepromatous; LL - Polar lepromatous; ENL - Eryhthema nodosum leprosum

Table 3: Details of finger nail changes as per spectrum of disease

Sr no	Finding	TT (%)	BT (%)	BB (%)	BL (%)	LL (%)	Total	ENL (%)
1	Longitudinal melanonychia	3 (20%)	12 (30.7%)	-	6 (13.9%)	3 (11.5%)	24	2 (11.8)
2	Longitudinal ridges	-	3 (7.7%)	-	7 (16.2%)	6 (23.1%)	16	4 (23.5)
3	Brachyonychia	-	3 (7.7%)	-	4 (9.3%)	4 (15.3%)	11	2 (11.8)
4	Brown black pigmentation	-	-	1 (50%)	5 (11.6%)	4 (15.3%)	10	2 (11.8)
5	Beau's lines	1 (6.6)	2	-	4 (9.3%)	2 (7.7%)	9	4 (23.5)
6	Parrot beak nail	-	1	-	3 (7%)	5 (19.2%)	9	1 (5.9)
7	Rudimentary Nail				2 (4.6%)	6 (23.1%)	8	
8	Onycholysis	2 (13.2%)	3 (7.7%)	-	2 (4.6%)	-	7	
9	Paronychia	1 (6.6)	2 (5.1%)	-	1 (2.3%)	1 (3.8%)	5	
10	Subungual hyperkeratosis	-	2 (5.1%)	-	2 (4.6%)	1 (3.8%)	5	1 (5.9)
11	Onychauxis		1 (2.5%)		2 (4.6%)	2 (7.7%)	5	1 (5.9)
12	Terry nail				4 (9.3%)	1 (3.8%)	5	4 (23.5)
13	Anonychia				1 (2.3%)	4 (15.3%)	5	
14	Onychogryphosis	-	1 (2.5%)	-	1 (2.3%)	2 (7.7%)	4	1 (5.9)
15	Onychorrhexis	-	1 (2.5%)	-	1 (2.3%)	2 (7.7%)	4	1 (5.9)
16	Onychomycosis	1 (6.6%)	1 (2.5%)	-	1 (2.3%)	-	3	
17	Koilonychia	-	1 (2.5%)	-	2 (4.6%)	-	3	

TT - Polar tuberculoid; BT - Borderline tuberculoid; BB - Borderline; BL - Borderline lepromatous; LL - Polar lepromatous; ENL - Eryhthema nodosum leprosum

Table 4: Details of toe nail changes as per spectrum of disease

Sr no	Finding	TT	BT	BB	BL	LL	Total	ENL
1.	Brachyonychia	2 (13.3%)	10 (25.6%)	-	13 (30.2%)	11 (42.3%)	36 (28.8%)	7 (41.2)
2.	Subungual hyperkeratosis	2 (13.3%)	11 (28.2%)	-	11 (25.5%)	9 (34.6%)	23 (18.4%)	6 (35.3)
3.	Brown black pigmentation	1 (6.6%)	6 (15.3%)	1 (50%)	7 (16.2%)	6 (23.1%)	21 (16.8%)	3 (17.6)
4.	Onychorrhexis	3 (20%)	5 (12.8%)	-	7 (16.2%)	5 (19.2%)	20 (16%)	5 (29.4)
5.	Beau's lines	2 (13.3%)	4 (10.2%)	-	8 (18.6%)	5 (19.2%)	19 (15.2%)	7 (41.2)
6.	Onychauxis	1 (6.6%)	5 (12.8%)	-	8 (18.6%)	5 (19.2%)	19 (15.2%)	1 (5.9)
7.	Rudimentary Nail	-	-	-	6 (13.9%)	9 (34.6%)	15 (12%)	1 (5.9)
8.	Onycholysis	2 (13.3%)	2 (5.1%)	-	4 (9.3%)	3 (11.5%)	11 (8.8%)	2 (11.8)
9.	Longitudinal ridges	-	4 (10.2%)	-	4 (9.3%)	3 (11.5%)	11 (8.8%)	2 (11.8)
10.	Onychogryphosis	-	2 (5.1%)	-	4 (9.3%)	5 (19.2%)	11 (8.8%)	1 (5.9)
11.	Anonychia	-	-	-	2 (4.7%)	6 (23.1%)	8 (6.4%)	-
12.	Parrot beak nail	-	1 (2.5%)	-	2 (4.7%)	3 (11.5%)	6 (4.8%)	1 (5.9)
13.	Longitudinal melanonychia	1 (6.6%)	3 (7.7%)	-	-		4 (3.2%)	-
14.	Koilonychia	-	2 (5.1%)	-	2 (4.7%)	-	4 (3.2%)	1 (5.9)
15.	Pincer nail	-	1 (2.5%)	-	2 (4.7%)	1 (3.8%)	4 (3.2%)	2 (11.8)
16.	Pterigym	-	-	-	3 (7%)	-	3 (2.4%)	3 (17.6)
17.	Terry nail	-	-	-	3 (7%)	-	3 (2.4%)	3 (17.6)
18.	Onychoschizia	-	2 (5.1%)	-	-	-	2 (1.6%)	2 (11.8)
19.	Paronychia	-	-	-	1 (2.3%)	-	1 (0.8%)	
20.	Onychomycosis	-	-	-	1 (2.3%)		1 (0.8%)	
21.	Onychomadesis	-	-	-	1 (2.3%)	-	1 (0.8%)	1 (5.9)
22.	Ectopic nail	-	-	-	-	1 (3.8%)	1 (0.8%)	
23.	Polynychia	-	-	-	-	1 (3.8%)	1 (0.8%)	
	Total	15	39	2	43	26	125	

TT - Polar tuberculoid; BT - Borderline tuberculoid; BB - Borderline; BL - Borderline lepromatous; LL - Polar lepromatous; ENL - Eryhthema nodosum leprosum

Discussion

We found various nail chages in leprosy patients in our study. The over all prevalence was 80% in our study. Patki and Baran found it to be 64%, while Kaur *et al.* had a prevalence of 77.3%, and in a study by El-Darouti *et al.* in Turkey, it was 86%[6-8] We had difference in prevalence in different groups similar to findings of Kaur *et al.*, but Patki & Baran and El-Darouti *et al.* observed same prevalence in both paucibacillary and multibacillary patients.[6-8]

In TT and BT groups, prevalence of changes was more in younger and newer patients while in BL and LL groups, prevalence of changes was more in older and in those who have completed treatment indicating early onset of changes in tuberculoid pole as suggested by Patki and Baran.[7]

Changes in all groups had different patterns indicating role of different causes in different groups; similar to findings of Kaur *et al.*[6] El-Darouti *et al.* compared nail changes in leprosy patients with that of diabetic patients having neuropathies and found higher incidence among leprosy patients explaining multi factorial causation in leprosy.[8] Along with neuropathy, other factors like repeated trauma, vascular impairment, infections, acro-osteolysis and adverse effects of drugs are responsible for nail changes.[5,7] Toe nails were involved more than finger nails probably due to more trauma to feet.

Longitudinal melanonychia, [Figure 1a] and longitudinal ridges [Figure 1b] were commonest findings similar to Kaur *et al.* and El-Darouti *et al.*[6,8] Activation of melanocytes in the nail matrix by repeated trauma is the cause as suggested by Baran.[11] Onycholysis, [Figure 1c] a finding more frequent in tuberculoid pole may also be a result of injury and can get secondarily infected leading to green nails.[6,7,12] Trauma can also cause subungual hemorrhage leading to brown black pigmentation. [Figure 1d] Beau's line due to trauma is shown in Figure 1e.

Onychauxis occurs as a result of trophic changes caused by neuropathy resulting in hardening of nail plate. Further hardening along with repeated trauma results in onychogryphosis. [Figure 2a][13] Along with neuropathy, vascular component also plays role in development of trophic changes[14,15] Onychorrhexis [Figure 2b] and onychoschizia [Figure 2c] can also result due to brittle nail plate secondary to trophic changes. But these are reported less often in leprosy[4] Figure 2 shows changes caused by neuropathy. Trophic and trauma induced changes were more frequent in patients having grade 1 deformities.

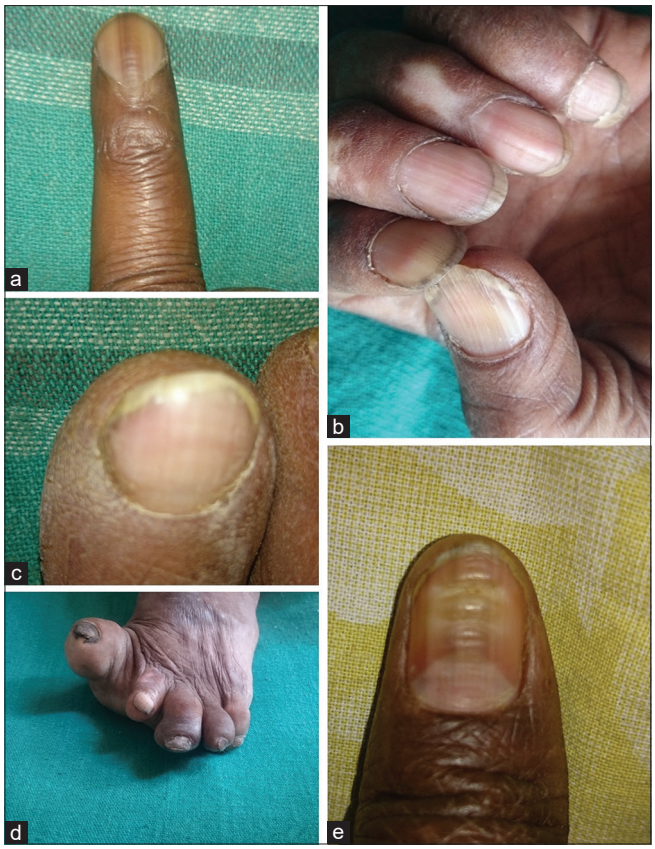

Figure 1: Changes primarily due to trauma (a) Longitudinal melanonychia, (b) longitudinal ridges (c) Onycholysis, (d) Subungual hematoma, (e) Beau's lines

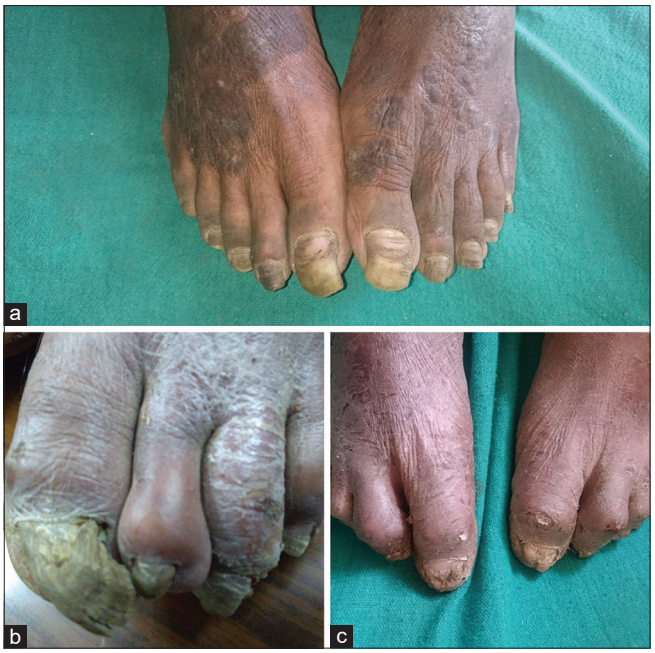

Figure 2: Changes caused by neuropathy (a) Onychauxis and onychogryphosis (b) Onychogryphosis and Onychorrhexis (c) Onychoschizia

Subungual hyperkeratosis [Figure 3a] was very obvious finding in our study similar to Kaur *et al*.[6] Clofazimine is thought to be the culprit behind it.[16] In addition, clofazimine can also cause pigmentation of nails [Figure 3b].

Beau's line was one of the common findings in our study and it was more frequent in ENL patients. It is multifactorial, trauma being the cause for unilateral Beau's lines. Dapsone can also cause Beau's lines as its adverse effect [Figure 3c].[17] In ENL, it is probably due to vasculitis leading to temporary cessation of nail matrix growth.[18] Onychomadesis (proximal shedding of nail plate), [Figure 4a] a severe form of Beau's line, generally seen in hand foot mouth disease in children was noted in one of our patients after severe ulceronecrotic ENL reaction[19]

Pterygium, [Figure 4b] Terry nails [Figure 4c] and pincer nail [Figure 4d] were common findings in ENL suggesting probable vascular etiology behind them. Pterygium has been reported in association with ENL by Patki.[20,21] Terry nails, first reported in liver cirrhosis, is macrolunula involving whole nail except a band of 1 to 2 mm along the distal border that remains pink or brown.[22] It has been reported in leprosy in past but we found it more frequent in ENL patients.[9,23] Majeski *et al.* recently reported a case of pincer nail deformity associated with systemic lupus erythematosus and in their case underlying pathogenesis was hypothesized to be altered nail keratinization because of vasculitis and subsequent fibrous deposits around the distal interphalangeal joints.[24] Similar pathogenesis can lead to pincer nail in ENL. These changes are shown in Figure 4.

Brachyonychia [Figure 5a] is small sized nails where transverse length of nail is more than longitudinal.[25] In leprosy, it usually appears following the acro-osteolysis and subsequent loss of tissue pad of the fingers supporting the hypothesis of Baran and Juhlin that nail development is linked to that of the underlying bone.[26] More severe acro-osteolysis associated with advanced stages of leprosy leads to changes like parrot beak nails, [Figure 5b] rudimentory nails and anonychia.[6,27] These changes were more frequent in BL and LL groups, especially those having grade 2 deformities including trophic ulcers. Figure 5 shows changes associated with acro-osteolysis.

Ectopic nails [Figure 5c] i.e. onychoheterotopia and polynychia [Figure 5d] are very rare but interesting findings associated with acro-osteolysis which develop either after a single overwhelming trauma or after chronic repetitive injuries, which lead to both splitting and implantation of the germinal matrix or heterotopic inoculation of the nail bed cells.[6,28] One of our cases has rudimentary dystrophic nail resembling cutaneous horn. [Figure 5e] Similar case has been reported by Patki.[29]

Onychomycosis and chronic paronychia were found in very few patients. This is because of a dryness caused by neuropathy causing unfavourable conditions for fungal growth.[7]

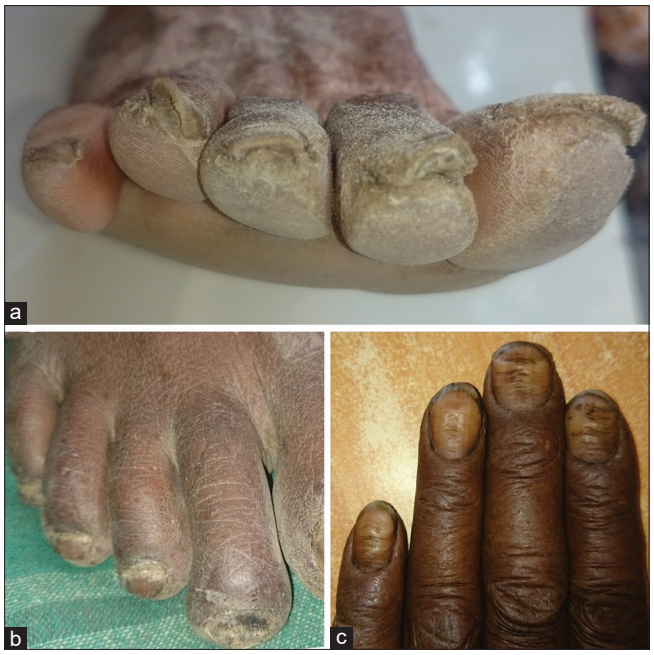

Figure 3: Changes probably due to drugs (a) Subungual hyperkeratosis (b) Pigmentation (c) Beau's lines

Flag sign, shoreline nail, leuconychia are some changes found in leprosy but had not been detected in our study.[8,30] ENL patients had more characteristic and different changes but type 1 reaction did not have any specific pattern, so they were not studied separately. Patients with deformities and trophic ulcers were having more acro-osteolysis associated changes, but weren't analyzed in detail. As this was an observational study, difficulty to distinguish and analyze the changes before diagnosis of disease was limitation of this study and a prospective study in future will help to distinguish the changes before and after diagnosis.

Nail changes in leprosy are not only of aesthetic importance affecting social interaction but also of functional importance affecting day to day activity. Premanshu *et al.* reported a patient with bilateral dystrophy of medial fingernails leading to a diagnosis of leprosy.[31] Thus, awareness of nail changes can help even in diagnosis of disease.

Conclusion

Changes in leprosy although not specific but are multifactorial. We found less prevalence of nail changes and unilateral involvement common in tuberculoid spectrum probably due to neuropathy, repeated trauma and secondary infections. Changes are more in lepromatous spectrum with quite different pattern than tuberculoid spectrum indicating role of few more causative factors. Even the pattern was different among BL, LL and ENL groups. Changes like anonychia, rudimentary nails, oychogryphosis, brachyonychia and onychorrhexis are extensively common in chronic LL and BL cases especially in those having grade 2 deformities. Subungual hyperkeratosis, Beau's line, brown black pigmentation, longitudinal melanonychia, terry nails were more frequent in active disease. Besides neuropathy and trauma, vasculopathy during type 2 reactions, and drugs used may be responsible for these changes.

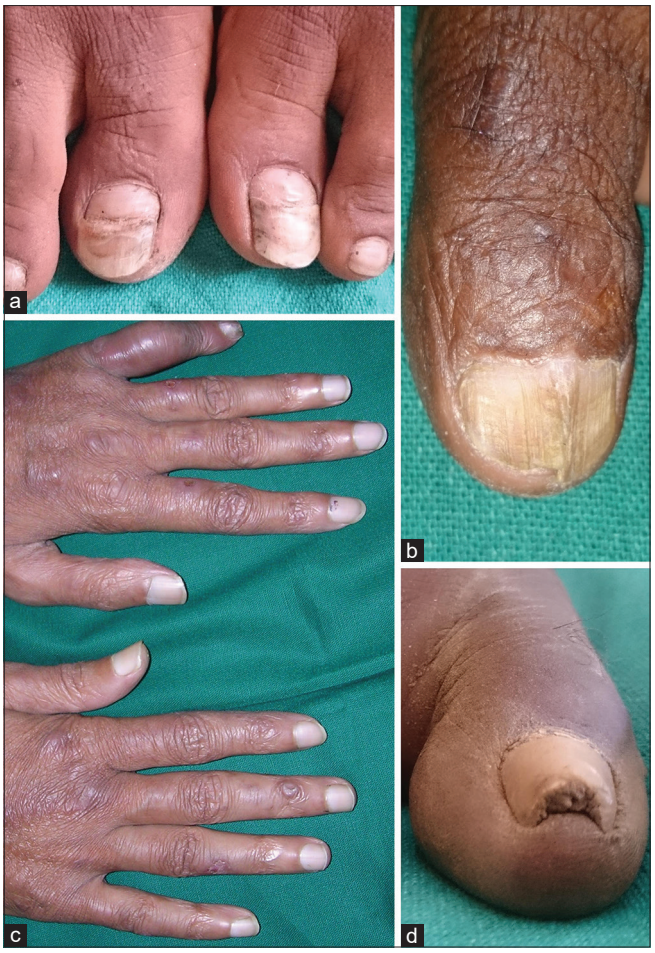

Figure 4: Changes probably due to vascular etiology common in ENL. (a) Onychomadesis after ulceronecrotic ENL (b) Pterygium (c) Terry nail (d) Pincer nail

Nail changes can be an important clue towards type of leprosy, for predicting complications of disease itself or of drugs used in treatment and sometimes even in diagnosing. So, as a part of complete examination, nails should always be looked for in a case of leprosy.

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Conflicts of interest

There are no conflicts of interest.

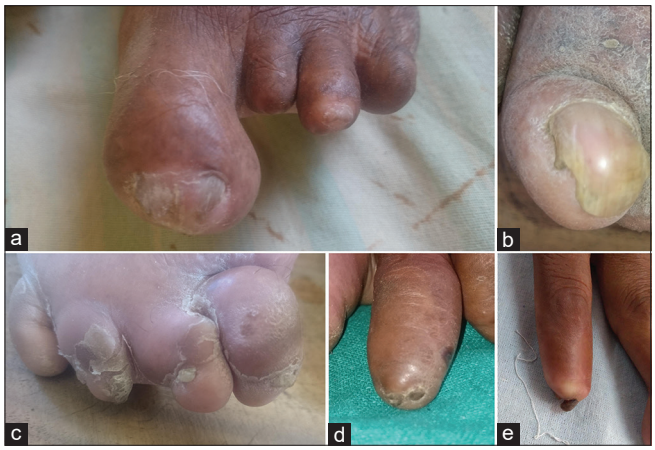

Figure 5: Changes caused by acro-osteolysis (a) Brachyonychia of great toe and 3rd toe with anonychia of 2nd toe. (b) parrot beak nail (c) Rudimentary nails with 3rd toe having ectopic nail (d) Polynychia (e) Rudimantory dystrophic nail resembling cutaneous horn

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