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## Clinical spectrum of nail disorders

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### Abstract

**Background:** The nail disorders comprise approximately 10% of all dermatological conditions. The nail unit may reflect dermatological disorder by its own and may show specific changes that are markers for a wide range of systemic disorders.

**Aims:** To study the clinical spectrums of nail disorders including congenital, developmental, infectious, neoplastic, degenerative, dermatologic and systemic diseases affecting the nail unit.

**Materials and Methods:** 200 consecutive cases with nail disorders attending to the Dermatology. Complete dermatologic and systemic examinations were carried out. Hematological investigations, including hemoglobin, total leukocyte count, differential leukocyte count and urine examination were carried out in all patients.

**Results:** In this study, the involvement of nail was more common among males when compared to females. Onychomycosis was the commonest finding (27%) followed by psoriatic nail change (14.5%), Onycholysis (5.5%), Pitting (4.5%), Onychogryphosis (4.5%), Trachyonychia (4.5%), Chronic Paronychia (4.5%), Clubbing (4%), Subungual Warts (3.5%), Clubbing with resorption of terminal fingers (2.5%) and Ingrowing toe nail (2%). The other uncommon nail changes included Onychomadesis (1.5%), Pincer nail (1.5%), Onycholysis & pitting (1.5%), Nail discoloration (1.5%), Anonychia (1.5%), Half-and-Half nail (1.5%) Koilonychia (1.5%), Longitudinal Melanonychia (1.5%), Nail biting (1.5%), Worn down nail (1%), Transverse grooves (1%), Racket nail with clubbing (1%), Idiopathic total leuconychia (1%) and Beaus lines (1%). Also observed as single cases (0.5%) were Dorsal pterygium, Macrolunula, Longitudinal grooves, Darriers disease, Pachyonychia congenita, Acute Paronychia and Acrodermatitis continua of Hallopeau.

**Conclusion:** Study has revealed onychomycosis, onycholysis, chronic paronychia, ingrowing toenail etc, as the common nail disorders. These conditions were associated with subclinical trauma. Nail biopsy in these patients may clarify this issue further.

**Keywords:** Onychomycosis, onycholysis, chronic paronychia

### Introduction

Nail disorders include those abnormalities that affect any portion of the nail unit. The nail unit includes the plate, matrix, bed, proximal and lateral folds, hyponychium, and some definitions include the underlying distal phalanx [2]. These structures may be affected by heredity, skin disorders, infections, systemic disease, the ageing process, internal and external medications, physical and environmental agents, trauma, and tumors, both benign and malignant.

Nail disorders comprise approximately 10% of all dermatologic conditions [2]. When there is an abnormality of the nail unit, the patient may have pain or interference with function, or both. Nail disorders may affect walking, the picking up of fine objects, tactile sensation, and protective function. Functional effects may result in problems wearing shoes. In many societies, the aesthetic aspect of the nail unit may affect occupation, employability, and interaction with other people. There is no significant difference in distribution of nail disorders between sexes [2]. However, ingrown nails appear to be more common in men, particularly young athletes who may have concomitant hyperhidrosis. Nail disorders, although infrequent in children, increase in scope throughout life and affect a high percentage of the geriatric population. This is due in part to particular susceptibility of the nail to fungal infections, faulty biomechanics from arthritis, impaired circulation, greater susceptibility to neoplasms and the use of systemic medications.

The nail unit may show specific changes that are markers for a wide range of systemic disorders. These include collagen vascular, liver, renal, endocrine, cardiac, and neoplastic diseases. For example, Oildrop Sign in Psoriasis, Hutchinson's Sign in Melanoma (skin disorders), Lindsay's 'Half and Half Nail' and 'Terry's Nails' in Chronic Renal Failure, Koilonychia in Iron Deficiency Anaemia (systemic diseases), Yellow Nail in Yellow Nail Syndrome, Aplasia or Dysplasia in Nail Patella Syndrome and Subungual Fibromas in Tuberous Sclerosis Complex (Congenital and developmental disorders). Since very few studies have been undertaken with respect to nail and its disorders, a study of this nature would be useful to know the spectrum of nail disorders and its associations.

### Materials and Methods

Two Hundred consecutive cases reporting with nail disorders to the Dermatology outpatients department, from February 2016 to December 2017 were included in this study. The clinical data pertaining to all patients were recorded as per the proforma. Complete dermatologic and systemic examinations were carried out. Hematological investigations, including hemoglobin, total leukocyte count, differential leukocyte count and urine examination were carried out in all patients. In addition, Gram's staining, culture for microorganisms, Tzank smear, scraping for fungus, nail clipping for KOH mount and fungal culture were carried out wherever required.

**Specimen collections for Onychomycosis:** A severely affected nail was selected as the target nail, where more than one nail was affected. The material from the same affected nail was obtained for KOH examination and culture. When both fingernails and toenails were involved simultaneously, specimens were collected from both sites after selecting target nails. The selected nail and surrounding skin were cleaned with 70% alcohol to remove contaminants. The nail was clipped short using nail clipper. The initial clipping and their debris were discarded. Scrapings were collected (a) from the nail bed, as proximally to the cuticle as possible, and (b) from the underside of the nail plate, with a no 23 sterile scalpel blade. In cases of paronychia, i.e. where a yeast infection was suspected, exudates was expressed from the paronychia folds by probing with a flat excavator and collecting on a swab previously moistened with sterile saline.

**Microscopy:** Direct microscopic examination of the collected material was performed after the addition of 2-3 drops of 20% potassium hydroxide.

**Culture:** Specimens were cultured for the isolation of dermatophytes, yeast and nondermatophytic molds. Sabouraud's Dextrose Agar (SDA): chloramphenicol (0.05 g/L) was added to the culture media to inhibit bacterial growth. The cultures were examined daily for colony growth. Lack of growth on SDA within 4 weeks confirmed a negative fungal culture. The molds were identified by gross colony morphology, microscopic examination with lactophenol cotton blue preparation and slide culture examination.

Yeast colonies were confirmed microscopically by gram staining and species were identified by the germ tube test and sugar assimilation tests. For the determination of the causative pathogens a modification of the diagnostic criteria of English was used.

Briefly for dermatophytes if a dermatophyte was isolated in culture, it was taken to be the pathogen, for yeasts, if direct microscopy was positive for yeast and culture grew colonies at high counts (>20 colonies) the yeast was taken to be the pathogen.

**Collection of data for psoriasis:** The diagnosis of psoriasis was made clinically and KOH smears were examined in all cases where a possibility of fungal infection was considered. If positive for dermatophytes, these subjects were examined from the psoriasis study.

Among the individual nail changes looked for were: pits, discoloration, onycholysis, thickening, Subungual hyperkeratosis, oil drop and folds, palms and soles and the body surface area involved were also noted for each patient. Biopsy from the nail bed for histopathological examination was undertaken as and when the diagnosis was doubtful in consenting cases.

Only investigations relevant to the clinical management of the patient were undertaken. Informed consent for inclusion into the study, photography and relevant investigations was taken from the cases as per the consent form shown in annexure.

### Results

Two Hundred consecutive cases reporting with nail changes to the Dermatology OPD. Among 200 cases 135 (67.5%) were males and 65 (32.5%) were female. The ratio of male to female was 2.1:1.

The age group of cases studied varied from 4 years to 74 years. Mean age - 36.05 years. Duration of nail disorders ranged from 5 days - 35 years. Mean duration of illness was 2.84 years.

**Table 1:** Spectrum of Nail Changes (n=200).

Nail Diseases	No of Cases	Percentage
Onychomycosis	54	27
Psoriasis	29	14.5
Onycholysis	11	5.5
Trachyonychia	9	4.5
Pitting	9	4.5
Onychogryphosis	9	4.5
Chronic paronychia	9	4.5
Clubbing	8	4
Subungual warts	7	3.5
Clubbing with resorption of terminal fingers	5	2.5
Onychomadesis	4	2
In growing toenail	4	2

Pincer nail	3	1.5
Onycholysis & pitting	3	1.5
Nail discoloration	3	1.5
Longitudinal melanonychia	3	1.5
Koilonychia	3	1.5
Half and half nail	3	1.5
Anonychia	3	1.5
Nail biting	3	1.5
Transverse grooves	2	1
Racket nail with clubbing	2	1
Worn down nail	2	1
Idiopathic total leuconychia	2	1
Beaus lines	2	1
Acrodermatitis continua of Hallopeau	2	1
Macrolunula	1	0.5
Longitudinal grooves	1	0.5
Dariers disease	1	0.5
Pachyonychia congenita	1	0.5
Dorsal Pterygium	1	0.5
Acute Paronychia	1	0.5
<b>Total</b>	<b>200</b>	<b>100.0%</b>

Among 200 cases with nail changes, the most common condition was Onychomycosis - 54 cases (27%) followed by Nail Psoriasis - 29 cases (14.5%).

**Table 2:** Nail Changes in Systemic Diseases (N=58).

Systemic Diseases	No. of Cases	Percentage (%)
Idiopathic	10	17.54
Diabetes mellitus	9	15.51
Hypertension & Diabetes mellitus	7	12.25
Chronic Renal Failure on Dialysis	5	8.8
HIV on HAART#	5	8.8
Iron deficiency anaemia	3	5.3
Ischaemic Heart disease & Hypertension	3	5.3
Systemic sclerosis	3	5.3
Diabetes mellitus & Rheumatoid Arthritis	2	3.5
Congenital	2	3.5
Developmental	2	3.5
Koch's	2	3.5
Acute Pneumonia	1	1.75
Bronchial asthma	1	1.75
Chronic Bronchitis	1	1.75
PIVD*	1	1.75
Typhoid fever	1	1.75
Total	58	100

# - Human Immunodeficiency Virus positive on highly active retroviral therapy \* - Prolapsed intervertebral disc

Among 200 cases, Nail changes along with preexisting Systemic disorder were seen in 58 cases (29%). Most common systemic disorder with nail changes was

Diabetes Mellitus - 10 cases (5%) followed by Hypertension associated with Diabetes Mellitus - 7 cases (3.5%),

**Table 3:** KOH and culture characteristics of mycological isolates (n=19)

Pathogen	KOH- positive	Culture positive	No growth	Percentage
Dermatophytes: <i>Trichophyton spp.</i>	7	10		52.64
Non- dermatophytes: <i>Aspergillus spp.</i>	3	8		42.10
Candida	1	1		5.26
Total	11	19		100.00

**Table 4:** Age group and sex distribution in nail disorders

Psoriasis (N=24)	Male	Female	Total
11 – 20	-	1	1
21 – 30	1	2	3
31 – 40	8	3	11
41 – 50	-	-	-
51 – 60	-	4	4
>60	-	5	5
Total	9	15	24

Onycholysis (N=11)			
< 10	3	1	4
11 – 20	1	2	3
21 – 30	1	2	3
31 – 40		1	1
Total	5	6	11
Trachyonychia (N = 9)			
< 10	1		1
11 – 20	1		1
21 – 30	1	2	3
31 – 40		3	3
> 40	1		1
Total	4	5	9
Paronychia(N=9)			
20 - 30	1	-	1
31 - 40	1	4	5
41 - 50	2	-	2
> 60	1	-	1
Total	5	4	9

Onychomycosis was the most common nail disorder in our present study, which accounts for 54 cases (27%), age group varying from 12 - 74 years (Mean age - 38.88 years) and duration varying between 2 months - 5 years, (Mean - 1.72 years). Twenty-nine cases (14.5) were Nail Psoriasis. Male: Female = 22:7. Age varies between 14 - 69 years (Mean - 38 years). Mean Duration of nail changes was 3.72 years. Eleven cases (5.5%) were Onycholysis. Male: Female = 5:6. The causes were due to Trauma/Eczema/Idiopathic - 4/3/4.

Nine cases (4.5%) were Trachyonychia. Male: Female = 4:5. The causes were due to Alopecia Areata/Psoriasis/Lichen Planus/Idiopathic - 3/2/1/3. Nine cases (4.5%) were Chronic Paronychia. Male: Female = 5:4 cases. Occupation of those cases were Housewives-4, Cooks-3, Ex-servicemen- 2 cases. KOH Positive cases were two and Culture positive cases were 4. Among the 4 Culture positive cases, 3 were Candida albicans and 1 was Pseudomonas spp.

**Table 5:** Pattern of nail involvement in psoriasis (n = 24)

Nail Changes	Finger Nail	Toe Nail	Both	Total	Perce- Tage
Pitting	11	2	3	16	55.17
Pitting& Onycholysis			1	1	3.44
Pitting & Transverse grooves	1	1		2	6.89
Pitting, Subungual Hyperkeratosis & Onycholysis	2	1	4	7	24.13
Total Nail dystrophy			1	1	3.44
Transverse grooves	1			1	3.44
Yellowish nail discoloration & Pitting		1		1	3.44
Total	15	5	9	29	99.95

**Table 6:** Trachyonychia and associated diseases (n = 9).

Associated Diseases	Male	Female	Total	Percentage
Alopecia Areata	2	1	3	33.33
Psoriasis	1	1	2	22.22
Lichen Planus		1	1	11.11
Idiopathic	1	2	3	33.33
Total	4	5	9	99.99

Nine cases (4.5%) were Trachyonychia. Male: Female = 4:5. The causes were due to Alopecia Areata/Psoriasis/Lichen Planus/Idiopathic - 3/2/1/3.

**Photographs in study**



**Fig 1:** Raquette nail with clubbing



**Fig 2:** Pachyonychia congenita – Curved hard nail



**Fig 3:** Beaus line



**Fig 4:** Systemic Sclerosis – Clubbing with terminal resorption of fingers



**Fig 5:** Onychomadesis



**Fig 6:** Psoriasis – Onycholysis, pitting and oil drop sign.

**Discussion**

Among 200 cases observed, Male to Female ratio was 2.1:1. But, according to the Scher RK, Danies CR *et al.* [2], there is no significant difference in distribution of nail disorders

between sexes. The male predominance in our study could be due to the fact that majority of the cases having nail changes attending OPD. Among 200 cases, 54 cases (27%) were Onychomycosis. This was the most common nail change in our study. According to Leyden JJ [3], Onychomycosis is a most common infection and accounts for 20% of all the nail disorders. According to the present study majority of cases (50%) belonged to the age group of 20-40 yrs, this is consistency with study done by Grover S (56%). According to Grover S, [4] Sujatha V, Grover S [5] and Garg A, Vimala V *et al.* [6] the occurrence of morphological pattern Distal Lateral Subungual Onychomycosis (DLSO) ranged from 64.44 - 90.5%. They also observed that the most severe pattern of Onychomycosis (TDO) ranged from 6 - 7.77%. In the present study, the observed percentage of DLSO cases was 59.26% and Onychomycosis (TDO) was 7.04% of cases. Sujatha V, Grover S *et al.* [5] observed that Onychomycosis (Superficial White Onychomycosis) in 2.86% of cases. Similarly Grover S<sup>5</sup> (2%) and Garg A, Vimala V *et al.* [6] (1.11%) also observed a low prevalence of Onychomycosis (SWO) in their studies. In comparison to the above, the study however shows a higher rate of SWO (9.26%). This could be attributed to increase prevalence of HIV Positive cases in general population.

In our study KOH smear examination of nail material under microscope was positive in 11 cases (20.37%).

The fungal filaments in 10 patients (18.51%), one patient (1.85%) showed spores and pseudomycelia. In 43 (79.62%), the smear was found negative.

In our study Culture of nail material revealed growth in 19 (35.19%) patients, Dermatophytes was grown in 10 (52.64%) patients, Aspergillus niger was grown in 8 (42.10%) patients and Candida was grown in 1(5.26) patient.

According to Grover S, [4] Sujatha V, Grover S *et al.* [5] Mohanty JC *et al.* [7] and Garg A *et al.* [6] in their studies revealed the KOH positivity rate varied from 35.65% to 82.96% and culture rate from 36% to 70.2%. In the present study, Psoriasis accounted for 29 cases (14.5%). Most common age group observed was 30 - 40 yrs. According to Ghosal A, Gangopadhyay *et al.* [8], the involvement of fingernail was reported in 88.88% of cases and Pitting (90.23%) was the most common fingernail change observed. In the present study, involvement of fingernail was observed in 82.73% of cases and pitting (92.77) was the most common change observed.

**Table 6:** Age-wise distribution of onychomycosis (n=54)

Age group (yrs)	Male	Female	Total	Percentage (This study)	Gupta AK <sup>9</sup>	Grover S <sup>4</sup>
11-20	1	3	4	7.4	12.99	
21 – 30	5	6	11	20.37	13.79	56%
31 – 40	9	7	16	29.63	16.13	
41 – 50	14		14	25.92	15.14	
51 – 60	3	2	5	9.26	14.15	16%
> 60	4		4	7.4	10.15	14%
Total	36	18	54	100.0	100.0	100%

In 11 cases (5.5%) of Onycholysis, it was observed that 4 cases were due to local Trauma, 3 cases associated with Hand eczema and 4 cases were unknown. Trachyonychia was observed in 9 cases (4.5%). These were associated with Alopecia Areata (3), Psoriasis (2), Lichen Planus (1) &

Idiopathic (3). Taniguchi S, Kutsuna H *et al.*, 56 Tosti A *et al.* 58 and Jerasututus S59 stated in their studies association of Trachyonychia with alopecia Areata, Lichen planus and Psoriasis and have suggested that the nail changes could possibly be caused by an autoimmune process.

**Table 7:** Frequency of nail involvement in psoriasis (n=24).

Nails affected	No. of cases	Percentage (This study)	Ghosal A Gangopadhy DN <i>et al.</i> [10].
Finger nails only	15	51.72	33.33
Toe nails only	5	17.24	11.11
Both finger and toe nails	9	31.03	55.55
Total finger nails (1+3)	24	82.73	88.88
Total toe nails (2+3)	14	48.27	66.66

Chronic Paronychia was observed in 9 cases. Mean age was 39.77 years. Four cases were housewives, three cases were cook and 2 cases were ex-servicemen. In 3 cases *Candida albicans* was grown and *Pseudomonas* spp in one case. Tosti *et al.* [11] have concluded that Chronic Paronychia predominantly is a disease of domestic workers. In our study, 77.77% of cases were domestic workers.

Pitting was observed in nine cases. All three cases were of unknown cause. According to Onychogryphosis was observed in 9 cases (4.5%). Mean age at presentation was 58.88 yrs. In 77.77% of cases were due to local trauma. Great toenail was involved in 88.88% of cases. According to Cohen DR *et al.* [12] Onychogryphosis is an acquired dystrophy usually affecting the great toenail. It is most commonly seen in the elderly, although trauma and biomechanical foot problems may precipitate similar change in middle age.

In 8 cases (4.5%) of clubbing, the most common cause was Idiopathic (5 cases), Pulmonary Koch's (2 cases) and COPD (1 case). According to Baran R & Dawber RPR, [13] the cause of clubbing are thoracic organ disorder (80%), alimentary tract (5%) and other causes are Endocrine, Idiopathic forms etc. This difference could be due to the fact that majority of the soldiers are non-smokers, young and healthy without any thoracic disorders.

In 7 cases (3.5%) of Subungual Warts, all were associated with *Verruca Vulgaris*. Subungual warts were the common tumours in the study. De Berker DAR *et al.* [14] observed that subungual warts were the most common tumour involving nail. Periungual, subungual warts are mildly contagious and probably are caused by inoculation of HPV DNA into skin after biting or pricking.

Five cases (2.5%) of Clubbing with resorption of terminal fingers were seen. Among them, 3 cases (1.5%) were of Systemic Sclerosis and 2 cases (1%) were of Hansen's disease (BL). Hay RJ, Baran R *et al.* [15] observed that in leprosy, the phalanges develop osteolysis and there is progressive telescoping of the distal bones. Tosta A *et al.* [11] stated that parrot's beak nail can occur as a consequence of atrophy of the soft tissue which characterises severe acrosclerosis in Systemic Sclerosis.

Four cases (2%) were in growing toenail, mean age was 37.7 years. Cambiaghi S *et al.* [16] study showed that the main cause for deformity is compression of toes from the side to ill fitting footwear and the main contributory cause is cutting the toenail in a half circle instead of straight across.

In 3 cases (1.5%) of Pincer nails, mean age was 49 yrs. Among them, 2 cases were due to Trauma and 1 case was

due to Diabetes Mellitus. Baran R *et al.* [13] in his study has claimed that the Pincer nail is associated with wearing ill-fitting shoe, trauma and degenerative osteo-arthritis.

Three cases (1.5%) were Nail discoloration, 2 cases were Longitudinal Melanonychia due to HIV on HAART and 1 case was brown black discoloration due to Potassium Permanganate soaks. Gupta AK *et al.* [6] stated that Longitudinal Melanonychia is the most frequent finding in HIV positive cases. It may be due to HAART or the disease itself. Nail symptoms are much more frequent in cases with HIV rather than in healthy control and some of them could be linked to the level of immuno-suppression. Baran R *et al.* [15] stated that Potassium Permanganate soaks were known to cause Brown-Black discoloration.

Three cases (1.5%) of Longitudinal Melanonychia, all 3 cases were male. There is no family history of Melanoma. Collins RJ [17] in his study has shown that the most common cause of Longitudinal Melanonychia is racial variation; 77% of Afro- Caribbean's over 20 years of age have Longitudinal Melanonychia and this prevalence rises to almost 100% by the age of 50 years. It is present in 10-20% of Japanese and is more common in Mediterranean races than in northern Europeans. However, in this context, the percentage of malignant melanomas presenting to the nail unit is higher in Afro-Caribbean's (15-20%) than in any other group (3% in white populations).

Three cases (1.5%) were onycholysis with nail pitting. In all the above 3 cases, Onycholysis with nail pitting was found to be due to hand eczema. De Barker DAR *et al.* [14] quotes that hand eczemas are one of the causes for onycholysis and nail pitting.

Koilonychia was found in 3 cases (1.5%) and were due to Iron deficiency anaemia. Half- and- half nail were found in three cases (1.5%) and they were cases of chronic renal failure on dialysis. Anonychia was observed in three cases (1.5%). Two cases were congenital variety and 1 case was due to local trauma. Baran R *et al.* [15] and Telf *et al.* [18] stated that Anonychia can be congenital or temporary Anonychia may arise from nail loss associated with transient local or systemic upset.

Racket nail with clubbing was observed seen in 2 cases (1%) involving all fingernails. All 3 cases were male. Baran *et al.* [13] states that racket nail was common developmental anomaly that was inherited as an autosomal dominant trait. Girls are more frequently affected than boys. It may affect any finger but thumb is commonly involved.

Worn down nail was seen in two cases (1%), both were due to erythroderma. One was due to psoriasis and other due to airborne contact dermatitis. Baran R *et al.* [13] stated that worn down nails were associated with atopic dermatitis or chronic erythroderma. It occurs due to scratching and rubbing.

## Conclusion

The present study showed, Onychomycosis as the commonest finding with male preponderance, DLSSO as the commonest clinical pattern with increasing SWO clinical pattern and dermatophyte as the commonest mycological isolate. Our study revealed majority of the patients of clubbing were idiopathic variety. In a case of acrodermatitis continua of Hallopeau, the nail changes was total nail dystrophy involving all toenails with no other signs of Psoriasis. The nail psoriasis in Indian patients is probably similar to those in their European and American

counterparts. More than a third of our subjects with nail changes have involvement of nail fold resulting in increased severity and reflecting changes more of nail matrix involvement. Nail biopsy in these patients may clarify this issue further. Two cases of Raquette nail with clubbing were seen. However, in our study both were male. In our study has revealed onychomycosis, onycholysis, chronic paronychia, in growing toenail etc. As the common nail disorders. These conditions were associated with subclinical trauma.

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