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Original Research Article

A CROSS-SECTIONAL OBSERVATIONAL STUDY OF CLINICAL AND ONYCHOSCOPIC FEATURES OF VARIOUS NAIL PATHOLOGIES

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ABSTRACT

Background: Nail disorders may result from infectious, inflammatory, pigmentary, traumatic, and systemic conditions. Clinical examination alone may not identify subtle or overlapping features. Onychoscopy is a rapid, non-invasive technique that enables magnified assessment of the nail plate, nail bed, lunula, and nail folds. The aim is to evaluate the clinical and onychoscopic features of various nail pathologies and assess the additional findings detected by onychoscopy.

Materials and Methods: This cross-sectional observational study included 561 patients of all ages and both sexes with clinically diagnosed nail disorders attending the dermatology outpatient department from January 2023 to December 2024. Detailed history and general, systemic, cutaneous, nail, and onychoscopic examinations were performed. A handheld dermatoscope (DermLite DL4) at 10× magnification was used in polarized and non-polarized modes, with and without ultrasound gel. Images were recorded using a smartphone camera. Potassium hydroxide examination was performed in selected suspected cases of onychomycosis.

Results: Onychomycosis was the most frequent diagnosis (37.1%), followed by psoriasis (26.0%), lichen planus (11.1%), and eczema (10.5%). In onychomycosis, the commonest findings were onycholysis (87.5% onychoscopically), chromonychia (79.8%), subungual hyperkeratosis (79.3%), and nail plate thickening (78.4%). Onychoscopy additionally demonstrated spikes and ruinous appearance in 73.1% each. In nail psoriasis, pitting was observed in 80.8%, onycholysis in 63.0%, subungual hyperkeratosis in 55.5%, and fuzzy lunula in 28.8%. In nail lichen planus, onychorrhexis (67.7%), longitudinal ridging (50.0%), and onycholysis (45.2%) predominated. Characteristic patterns were also documented in alopecia areata, Darier's disease, melanonychia, warts, pseudomonal infection, subungual hematoma, and Koenen tumors.

Conclusion: Onychoscopy is a simple and valuable adjunct that improves visualization, documentation, and recognition of characteristic features across diverse nail disorders, particularly in subtle or evolving lesions.

Keywords: Onychoscopy; nail disorders; onychomycosis; nail psoriasis; nail lichen planus.

INTRODUCTION

The nail unit is a specialized keratinized structure composed of the nail matrix, nail plate, nail bed, hyponychium, and surrounding nail folds. Although nails occupy a small surface area, their examination may provide important information about local disease, cutaneous disorders, infections, inflammatory conditions, trauma, tumors, and systemic illness. Changes in colour, thickness, surface texture, contour, attachment, and periungual tissue can reflect pathology arising from different

parts of the nail unit. However, many disorders share manifestations such as onycholysis, subungual hyperkeratosis, chromonychia, pitting, ridging, dystrophy, and splinter haemorrhages. Clinical examination alone may therefore be insufficient, particularly in early, subtle, atypical, or overlapping presentations. A systematic examination of all fingernails and toenails is essential when evaluating suspected nail disease.[1] Diagnosis may require integration of the patient's history, general and cutaneous examination, direct nail assessment, microbiological testing, histopathology, and imaging. Potassium hydroxide examination, fungal culture, nail clipping, and nail-unit biopsy remain important in selected cases. Nevertheless, some investigations are time-consuming, may be inconclusive, or may be difficult because the nail unit is small, curved, hard, and anatomically complex. Nail biopsy may also cause pain, scarring, or permanent dystrophy when the matrix is involved. These limitations have encouraged the use of rapid, non-invasive techniques that improve visualization without replacing necessary confirmatory tests. Onychoscopy has consequently emerged as a useful link between unaided clinical inspection and laboratory or histopathological evaluation.[2] Onychoscopy refers to dermoscopic examination of the nail plate, nail bed, hyponychium, nail folds, and visible portions of the matrix. It may be performed with polarized or non-polarized light, using contact or non-contact techniques and, when required, an interface medium such as ultrasound gel. Magnification and reduction of surface reflection permit visualization of subtle pits, longitudinal lines, vascular abnormalities, proximal borders of onycholysis, subungual debris, haemorrhagic patterns, and cuticular changes. Onychoscopy is particularly useful in inflammatory disorders because similar forms of nail dystrophy may arise from psoriasis, lichen planus, alopecia areata, eczema, traumatic manipulation, and fungal infection. Characteristic patterns can refine the differential diagnosis, guide selection of a nail for further testing, and support photographic follow-up.[3] Onychomycosis is an important diagnostic consideration because it may resemble psoriasis, traumatic onycholysis, or other causes of dystrophy. Discoloration, thickening, onycholysis, and subungual hyperkeratosis are suggestive but not specific. Onychoscopic assessment of the proximal onycholytic margin, distal nail edge, colour distribution, longitudinal striae, spikes, and subungual keratin may improve diagnostic confidence at the bedside. However, dermoscopy should remain an adjunct rather than a substitute for mycological confirmation, particularly before prolonged systemic antifungal treatment. Combining clinical morphology, onychoscopic patterns, and appropriate laboratory testing provides a rational approach to distinguishing fungal disease from its mimics.[4] Inflammatory nail disorders produce varied changes according to whether the matrix, nail bed, or periungual structures are predominantly affected. Nail psoriasis may manifest with pitting, crumbling, leukonychia, onycholysis, oil-drop discoloration, subungual hyperkeratosis, splinter haemorrhages, and vascular changes. Onychoscopy can clarify pit morphology, demonstrate erythematous borders around onycholysis, reveal fine haemorrhages, and identify abnormalities of the lunula or hyponychium. Such evaluation is clinically relevant because nail involvement may be significant even when cutaneous psoriasis is limited and may influence overall disease assessment.[5] Pigmented lesions are another major indication for onychoscopy. Longitudinal melanonychia may result from melanocytic activation, benign melanocytic proliferation, infection, medication, trauma, or nail-unit melanoma. Evaluation requires attention to colour, width, regularity, spacing, and parallelism of longitudinal lines, together with proximal widening and pigmentation of the surrounding skin or cuticle. Onychoscopy assists in distinguishing reassuring patterns from suspicious features, although lesions with concerning findings require histopathological evaluation. Interpretation must remain cautious because benign and malignant patterns can overlap, particularly across different ages and skin phototypes.[6]

MATERIALS AND METHODS

This cross-sectional observational study was conducted among patients with clinically diagnosed nail disorders attending the outpatient Department of Dermatology. The study was carried out over two years, from January 2023 to December 2024. A total of 561 patients of either sex and all age groups presenting with nail disorders were enrolled using random sampling. Newly presenting patients with nail disorders who provided written informed consent were eligible for inclusion in the study.

Methodology: A detailed medical history was obtained from each participant. Information was recorded regarding the onset, duration, and progression of nail changes; the number and distribution of affected nails; associated symptoms; underlying dermatological conditions; systemic illnesses; and other relevant complaints.

All participants underwent a general physical examination, systemic examination, and detailed cutaneous and nail examination. The clinical diagnosis of each nail disorder was recorded before onychoscopic evaluation.

Relevant laboratory investigations were performed whenever clinically indicated. A potassium hydroxide (KOH) mount was performed in selected cases in which onychomycosis was suspected or diagnostic uncertainty existed. Demonstration of fungal elements on KOH examination was considered supportive of the diagnosis of onychomycosis.

Onychoscopic examination: All affected nails were examined using a handheld dermatoscope (DermLite DL4; 3Gen Inc., San Juan Capistrano, California, USA) at 10× magnification. Each nail was initially examined using both polarized and non-polarized modes without an interface medium. Contact dermoscopy was subsequently performed using ultrasound gel as the interface medium. Onychoscopic images were captured and documented using the digital camera of a OnePlus 10 Pro smartphone attached to the dermatoscope. The observed onychoscopic features were recorded systematically and correlated with the corresponding clinical diagnosis.

Ethical considerations: The study was conducted after obtaining approval from the Institutional Ethics and Research Board. The ethical approval and study registration number was F.29.(Acad)SPMC/2022/6050. Written informed consent was obtained from all adult participants before enrolment. For participants younger than the legally permissible age for consent, written informed consent was obtained from a parent or legal guardian, with assent from the participant wherever applicable. Participant confidentiality was maintained throughout the study.

Statistical analysis: The collected data were entered into Microsoft Excel and analysed using appropriate statistical methods. Categorical variables were summarized as frequencies and percentages, whereas continuous variables were presented as mean and standard deviation or median and interquartile range, depending on the distribution of the data. Appropriate statistical tests were applied where required, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 561 patients with various nail disorders were included in the study. Onychomycosis was the most common diagnosis, seen in 208 patients (37.1%), followed by psoriasis in 146 patients (26.0%). Lichen planus was the third most common disorder, observed in 62 patients (11.1%), followed closely by eczema in 59 patients (10.5%). Immunobullous disorders were seen in 28 patients (5.0%), while longitudinal melanonychia was present in 14 patients (2.5%). Less frequent diagnoses included periungual/subungual warts in 11 patients (2.0%), subungual hematoma in 10 patients (1.8%), alopecia areata in 7 patients (1.2%), disseminated discoid lupus erythematosus in 6 patients (1.1%), Darier's disease in 5 patients (0.9%), pseudomonal nail infection in 3 patients (0.5%), and Koenen tumors in 2 patients (0.4%).

Among 208 patients with onychomycosis, onycholysis was the most common finding, observed clinically in 180 patients (86.5%) and onychoscopically in 182 patients (87.5%). Chromonychia was seen in 166 patients (79.8%), while subungual hyperkeratosis was present in 165 patients (79.3%). Nail plate thickening was observed clinically in 160 patients (76.9%) and onychoscopically in 163 patients (78.4%). Onychoscopy additionally demonstrated characteristic findings such as distal irregular termination in 146 patients (70.2%), spiked pattern of onycholysis in 152 patients (73.1%), and ruinous appearance in 152 patients (73.1%). Nail dystrophy was noted in 31 patients (14.9%), while leukonychia was seen in 20 patients (9.6%). Onychoscopic subtypes of leukonychia included white fluffy shadows in 8 patients (3.8%) and homogeneous opacity in 12 patients (5.8%). Damaged cuticle was present in 123 patients (59.1%).

Among 146 patients with nail psoriasis, pitting was the predominant nail plate finding, seen clinically in 115 patients (78.8%) and onychoscopically in 118 patients (80.8%). Deep and irregular pitting was identified on onychoscopy in 107 patients (73.3%). Longitudinal ridging was recorded clinically in 104 patients (71.2%) and onychoscopically in 107 patients (73.3%). Nail plate thickening was found clinically in 53 patients (36.3%) and onychoscopically in 56 patients (38.4%). Among nail bed findings, onycholysis was observed clinically in 88 patients (60.3%) and onychoscopically in 92 patients (63.0%). Distal onycholysis with a proximal erythematous band was detected on onychoscopy in 70 patients (47.9%). Subungual hyperkeratosis was present in 81 patients (55.5%), while splinter haemorrhages were seen clinically in 25 patients (17.1%) and onychoscopically in 30 patients (20.5%). Oil-drop sign was observed in 11 patients (7.5%), and fuzzy lunula was identified on onychoscopy in 42 patients (28.8%).

Among 62 patients with nail lichen planus, onychorrhexis was the most frequent finding, seen in 42 patients (67.7%) on both clinical and onychoscopic examination. Longitudinal ridging was present in 31 patients (50.0%). Onychoschizia was detected clinically in 25 patients (40.3%) and onychoscopically in 24 patients (38.7%). Nail plate thinning was noted in 20 patients (32.3%), while pterygium was observed in 18 patients (29.0%). Nail bed involvement included onycholysis in 28 patients (45.2%) and subungual hyperkeratosis in 14 patients (22.6%).

In alopecia areata, nail pitting was the commonest finding and was detected clinically in 5 of 7 patients (71.4%), whereas onychoscopy identified pitting in all 7 patients (100.0%). Longitudinal ridging was present in 2 patients (28.6%). In Darier's disease, distal V-shaped nicking and damaged cuticle were observed in all 5 patients (100.0%). Longitudinal red and white streaks were seen in 3 patients (60.0%). Splinter haemorrhages were detected clinically in 2 patients (40.0%) and onychoscopically in 3 patients (60.0%), while subungual hyperkeratosis was present in 2 patients (40.0%).

In disseminated discoid lupus erythematosus, periungual erythema was present in all 6 patients

(100.0%). Subungual hyperkeratosis was seen in 5 patients (83.3%), nail dystrophy in 4 patients (66.7%), and longitudinal ridging in 2 patients (33.3%). In immunobullous disorders, nail fold involvement was prominent, with damaged cuticle seen in all 28 patients (100.0%) and paronychia in 25 patients (89.3%). Nail dystrophy was present in 11 patients (39.3%), onychomadesis in 6 patients (21.4%), splinter haemorrhages clinically in 9 patients (32.1%) and onychoscopically in 11 patients (39.3%), and subungual hyperkeratosis in 5 patients (17.9%).

In longitudinal melanonychia, regular, parallel, and uniform brown–black bands were observed in 13 of 14 patients (92.9%) on both clinical and onychoscopic examination. One patient (7.1%) showed a brown background with brown-to-black longitudinal lines irregular in thickness and spacing, with pigmentation wider proximally than distally. The same patient also showed a dark band visible through the transparent cuticle and proximal nail fold. Among patients with periungual/subungual warts, red–black dots and globules were observed in all 11 patients (100.0%), while a yellow–white fissured verrucous surface was seen in 6 patients (54.5%). Onycholysis was present in 4 patients (36.4%). In pseudomonal nail infection, greenish discoloration of the nail plate, onycholysis, and paronychia were present in all 3 patients (100.0%). In subungual hematoma, well-circumscribed red–black dots and blotches with peripheral fading, streaks, and a clear proximal edge were seen in all 10 patients (100.0%).

Table 1. Distribution of patients according to clinical diagnosis (N = 561)

Clinical diagnosis	Number of patients, n	Percentage (%)
Alopecia areata	7	1.2
Darier's disease	5	0.9
Disseminated discoid lupus erythematosus	6	1.1
Eczema	59	10.5
Immunobullous disorders	28	5.0
Koenen tumors	2	0.4
Lichen planus	62	11.1
Longitudinal melanonychia	14	2.5
Onychomycosis	208	37.1
Periungual/subungual warts	11	2.0
Pseudomonal nail infection	3	0.5
Psoriasis	146	26.0
Subungual hematoma	10	1.8
Total	561	100.0

Table 2. Clinical and onychoscopic nail findings in patients with onychomycosis (n = 208)

Anatomical site	Nail finding	Clinical examination, n (%)	Onychoscopic examination, n (%)
Nail plate	Chromonychia	166 (79.8)	166 (79.8)
	Nail plate thickening	160 (76.9)	163 (78.4)
	Distal irregular termination	—	146 (70.2)
	Nail dystrophy	31 (14.9)	31 (14.9)
	Leukonychia	20 (9.6)	20 (9.6)
	White fluffy shadows	—	8 (3.8)
	Homogeneous opacity	—	12 (5.8)
Nail bed	Onycholysis	180 (86.5)	182 (87.5)
	Spiked pattern of onycholysis	—	152 (73.1)
	Subungual hyperkeratosis	165 (79.3)	165 (79.3)
	Ruinous appearance	—	152 (73.1)
Nail fold	Damaged cuticle	123 (59.1)	123 (59.1)

Table 3. Clinical and onychoscopic nail findings in patients with nail psoriasis (n = 146)

Anatomical site	Nail finding	Clinical examination, n (%)	Onychoscopic examination, n (%)
Nail plate	Nail plate thickening	53 (36.3)	56 (38.4)
	Pitting	115 (78.8)	118 (80.8)
	Deep and irregular pitting	—	107 (73.3)
	Longitudinal ridging	104 (71.2)	107 (73.3)
Nail bed	Oil-drop sign	11 (7.5)	11 (7.5)
	Onycholysis	88 (60.3)	92 (63.0)
	Distal onycholysis with proximal erythematous band	—	70 (47.9)
	Subungual hyperkeratosis	81 (55.5)	81 (55.5)
	Splinter haemorrhages	25 (17.1)	30 (20.5)
Lunula	Fuzzy lunula	—	42 (28.8)

Table 4. Clinical and onychoscopic nail findings in patients with nail lichen planus (n = 62)

Anatomical site	Nail finding	Clinical examination, n (%)	Onychoscopic examination, n (%)
Nail plate	Longitudinal ridging	31 (50.0)	31 (50.0)
	Onychorrhexis	42 (67.7)	42 (67.7)
	Onychoschizia	25 (40.3)	24 (38.7)

	Pterygium	18 (29.0)	18 (29.0)
	Nail plate thinning	20 (32.3)	20 (32.3)
Nail bed	Onycholysis	28 (45.2)	28 (45.2)
	Subungual hyperkeratosis	14 (22.6)	14 (22.6)

Table 5. Clinical and onychoscopic findings in other nail disorders

Clinical diagnosis	Anatomical site	Nail finding	Clinical examination, n (%)	Onychoscopic examination, n (%)
Alopecia areata (n = 7)	Nail plate	Longitudinal ridging	2 (28.6)	2 (28.6)
		Pitting	5 (71.4)	7 (100.0)
Darier's disease (n = 5)	Nail plate	Distal V-shaped nicking	5 (100.0)	5 (100.0)
		Longitudinal red and white streaks	3 (60.0)	3 (60.0)
	Nail bed	Splinter haemorrhages	2 (40.0)	3 (60.0)
		Subungual hyperkeratosis	2 (40.0)	2 (40.0)
	Nail fold	Damaged cuticle	5 (100.0)	5 (100.0)
Disseminated discoid lupus erythematosus (n = 6)	Nail plate	Longitudinal ridging	2 (33.3)	2 (33.3)
		Nail dystrophy	4 (66.7)	4 (66.7)
	Nail bed	Subungual hyperkeratosis	5 (83.3)	5 (83.3)
	Nail fold	Periungual erythema	6 (100.0)	6 (100.0)
Immunobullous disorders (n = 28)	Nail plate	Onychomadesis	6 (21.4)	6 (21.4)
		Nail dystrophy	11 (39.3)	11 (39.3)
	Nail bed	Splinter haemorrhages	9 (32.1)	11 (39.3)
		Subungual hyperkeratosis	5 (17.9)	5 (17.9)
	Nail fold	Damaged cuticle	28 (100.0)	28 (100.0)
		Paronychia	25 (89.3)	25 (89.3)
Longitudinal melanonychia (n = 14)	Nail plate	Regular, parallel and uniform brown–black bands	13 (92.9)	13 (92.9)
		Brown background with brown-to-black longitudinal lines irregular in thickness and spacing, with pigmentation wider proximally than distally	1 (7.1)	1 (7.1)
	Nail fold	Dark band visible through transparent cuticle and proximal nail fold	1 (7.1)	1 (7.1)
Periungual/subungual warts (n = 11)	Nail bed	Onycholysis	4 (36.4)	4 (36.4)
	Nail fold	Red–black dots and globules	11 (100.0)	11 (100.0)
		Yellow–white fissured verrucous surface	6 (54.5)	6 (54.5)
Pseudomonal nail infection (n = 3)	Nail plate	Greenish discoloration of nail plate	3 (100.0)	3 (100.0)
	Nail bed	Onycholysis	3 (100.0)	3 (100.0)
	Nail fold	Paronychia	3 (100.0)	3 (100.0)
Subungual hematoma (n = 10)	Nail bed	Well-circumscribed red–black dots and blotches with peripheral fading, streaks and clear proximal edge	10 (100.0)	10 (100.0)
Tuberous sclerosis complex with Koenen tumors (n = 2)	Nail plate	Longitudinal ridging	2 (100.0)	2 (100.0)
	Nail fold	Multiple polypoidal and digitate growths with garlic-clove morphology arising from proximal nail fold	2 (100.0)	2 (100.0)

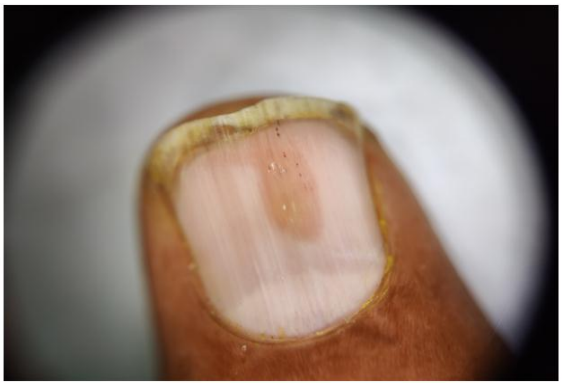

Figure 1: Onychoscopic picture of nail psoriasis, showing oil spot (irregular translucent area of yellow-brown discoloration), splinter hemorrhages and fuzzy lunula.

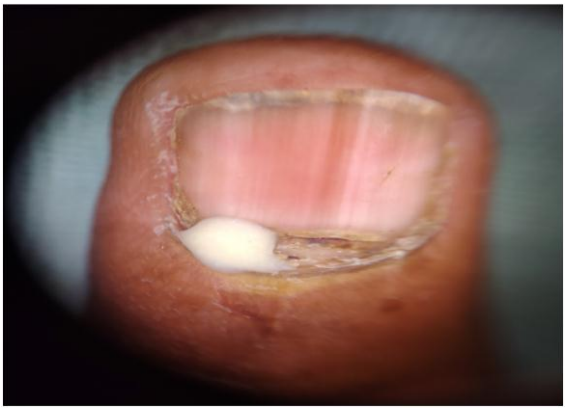

Figure 2: Onychoscopic picture of nail changes associated with pemphigus vulgaris, showing onychomadesis, pus discharge and paronychia.

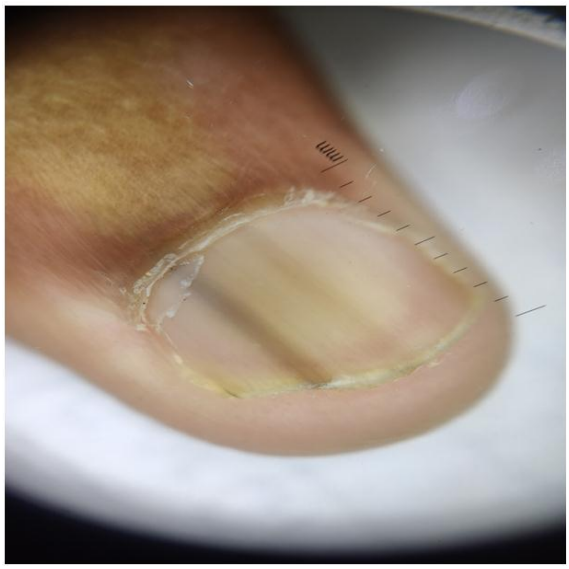

Figure 3: Onychoscopic picture of benign longitudinal melanonychia, showing regular, parallel, and uniform brown–black bands.

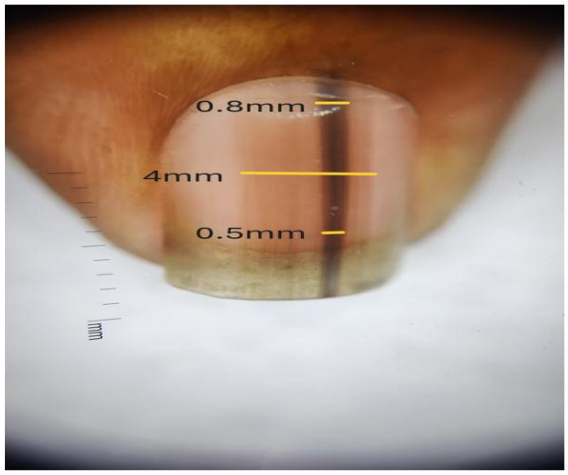

Figure 4: Onychoscopic picture of malignant longitudinal melanonychia, showing brown to black longitudinal lines within a brown background (4mm), irregular in thickness and spacing, with pigmentation wider proximally (0.8mm) than distally (0.5mm) and pigmentation extending to proximal nail fold.

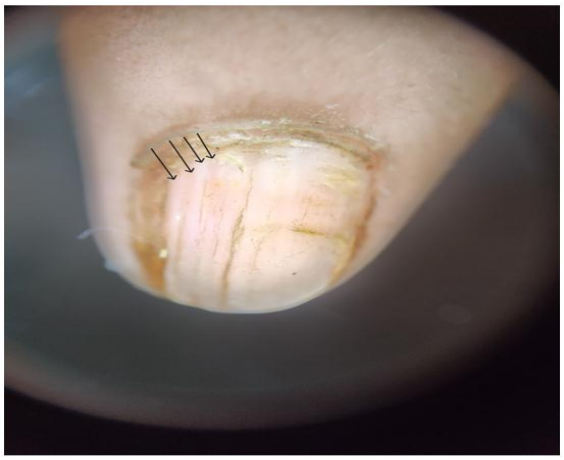

Figure 5: Onychoscopic picture of Darier's disease, showing longitudinal red and white streaks denoted by consecutive arrows

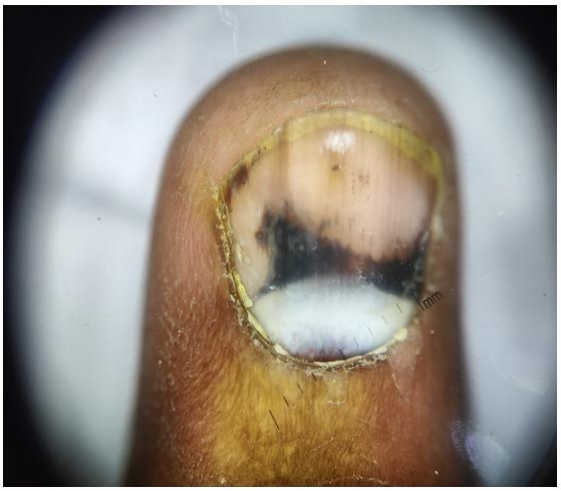

Figure 6: Onychoscopic picture of subungual hematoma, showing well circumscribed red-black dots, blotches, peripheral fading and streaks with clear proximal edge

DISCUSSION

A broad spectrum of nail disorders was observed among the 561 patients enrolled in the present study. Onychomycosis was the most frequent diagnosis, accounting for 208 cases (37.1%), followed by nail psoriasis in 146 (26.0%), nail lichen planus in 62 (11.1%), and eczema-associated nail changes in 59 (10.5%). Immunobullous disorders represented 5.0% of cases, while longitudinal melanonychia, periungual/subungual warts, subungual hematoma, alopecia areata, disseminated discoid lupus erythematosus, Darier's disease, pseudomonal infection, and Koenen tumors individually accounted for less than 3% of the study population. Abu El-Hamd et al. (2022), in a study of 104 patients, similarly reported onychomycosis as the most common nail disorder, although its frequency was higher than that in the present study (54.81% vs. 37.1%). Conversely, nail psoriasis and nail lichen planus were more frequent in the present study than in their study (26.0% vs. 19.2% and 11.1% vs. 3.8%, respectively). These differences may be related to geographic variation, patterns of referral, inclusion criteria, environmental exposure, and the relative proportion of patients presenting with infectious and inflammatory nail disorders. As this was a hospital-based study of patients presenting with nail abnormalities, these figures describe the clinical spectrum encountered in the dermatology outpatient department rather than the prevalence of these disorders in the general population.[7]

Onychomycosis was the largest diagnostic group in the present study, comprising 208 patients. Onycholysis was its most frequent manifestation and was identified clinically in 86.5% and onychoscopically in 87.5% of patients. Chromonychia was observed in 79.8%, subungual hyperkeratosis in 79.3%, and nail plate thickening in 76.9% clinically and 78.4% on onychoscopy. Kayarkatte et al. (2020) studied 88 confirmed cases

and reported onycholysis in 96.6%, chromonychia in 85.2%, and subungual hyperkeratosis in 85.2%, all of which were somewhat more frequent than the corresponding values in the present study. They also reported a spiked pattern in 86.4% and distal irregular termination in 81.8%, compared with 73.1% and 70.2%, respectively, in the present study. In contrast, the ruinous appearance was more common in the present study than in their study (73.1% vs. 59.1%). Despite these numerical differences, both studies demonstrate that the combination of onycholysis, chromonychia, subungual hyperkeratosis, an irregular distal nail edge, spikes, and ruinous subungual debris constitutes a characteristic onychoscopic pattern of onychomycosis. The variation in frequencies may reflect differences in clinical subtype, duration and severity of infection, confirmation methods, and the criteria used for recording individual onychoscopic findings.[8]

Onychoscopy detected several findings in onychomycosis that were not adequately appreciable on naked-eye examination. Distal irregular termination was identified in 70.2%, a spiked pattern of onycholysis in 73.1%, and a ruinous appearance in 73.1% of patients. Onychoscopy also detected slightly more cases of nail plate thickening than clinical examination (78.4% vs. 76.9%) and slightly more cases of onycholysis (87.5% vs. 86.5%). Leukonychia was present in 9.6%, including white fluffy shadows in 3.8% and homogeneous opacity in 5.8%. Chetana et al. (2018), in 234 confirmed cases of onychomycosis, reported spikes in 43.16%, distal irregular termination in 34.6%, longitudinal striae in 49.1%, a jagged pattern in 29.9%, and a linear edge in 3.4%. Thus, spikes and distal irregular termination were considerably more frequent in the present study. These differences may have arisen from variation in the distribution of distal and lateral subungual, superficial, and total dystrophic onychomycosis; differences in dermoscope magnification; or differences in whether findings were calculated per patient or per affected nail. Nevertheless, both studies support the ability of onychoscopy to demonstrate the morphology of the proximal onycholytic border and distal nail edge more clearly than routine clinical examination. Damaged cuticle, observed in 59.1% of the present patients, additionally indicates that periungual structures may be affected along with the nail plate and nail bed.[9]

Nail psoriasis was the second most common diagnosis, affecting 146 patients (26.0%). Pitting was the predominant finding and was identified clinically in 78.8% and onychoscopically in 80.8%, while deep and irregular pits were demonstrated in 73.3%. Onycholysis was recorded clinically in 60.3% and onychoscopically in 63.0%, and a proximal erythematous band bordering distal onycholysis was visualized in 47.9%. Subungual hyperkeratosis occurred in 55.5%, nail plate thickening in 36.3% clinically and 38.4% on onychoscopy, splinter haemorrhages in 17.1% clinically and 20.5% on onychoscopy, and the oil-drop sign in 7.5%. Chauhan et al. (2020) evaluated 55 patients and reported pitting in 60.5% of affected fingernails, subungual hyperkeratosis in 52.8%, and onycholysis in 40.8%. They also reported fuzzy lunula in 33.6% of fingernails and 4.95% of toenails, whereas it was detected in 28.8% of patients in the present study. Although the frequency of pitting and onycholysis was higher in the present study, subungual hyperkeratosis was comparable. Direct numerical comparison should be undertaken cautiously because the present findings were expressed per patient, whereas several observations by Chauhan et al. were calculated per examined nail. Both studies nevertheless establish pitting, onycholysis, subungual hyperkeratosis, proximal erythema, and fuzzy lunula as useful onychoscopic indicators of nail psoriasis.[10]

The incremental value of onychoscopy was particularly evident in psoriatic pitting, onycholysis, nail plate thickening, and splinter haemorrhages. Compared with clinical examination, onychoscopy detected three additional cases of pitting, four additional cases of onycholysis, three additional cases of nail plate thickening, and five additional cases of splinter haemorrhage. Khokhar et al. (2023), in a study of 50 patients, observed clinical pitting in 68% and onychoscopic pitting in 86%, compared with 78.8% and 80.8%, respectively, in the present study. Their frequencies of clinical onycholysis, subungual hyperkeratosis, splinter haemorrhage, and oil-drop sign were 54%, 42%, 20%, and 14%, respectively, compared with 60.3%, 55.5%, 17.1%, and 7.5% in the present study. Fuzzy lunula was more frequent in the present series than in their study (28.8% vs. 8%). Overall, the increased onychoscopic recognition of pitting, onycholysis, and splinter haemorrhage in both studies supports its use as an adjunct to routine examination.[11]

Among the 62 patients with nail lichen planus, onychorrhexis was the most frequent finding and was present in 67.7% on both clinical and onychoscopic examination. Other nail plate findings included longitudinal ridging in 50.0%, onychoschizia in 40.3% clinically and 38.7% onychoscopically, nail plate thinning in 32.3%, and pterygium in 29.0%. Nail bed involvement was characterized by onycholysis in 45.2% and subungual hyperkeratosis in 22.6%. Singal et al. (2024), in a retrospective series of 15 patients with isolated nail lichen planus, reported onychorrhexis in 73.3%, longitudinal ridging in 66.7%, onychoschizia in 53.3%, nail thinning in 80.0%, dorsal pterygium in 33.3%, onycholysis in 73.3%, and subungual hyperkeratosis in 40.0%. Onychorrhexis and pterygium were relatively comparable between the two studies, whereas thinning, onycholysis, subungual hyperkeratosis, ridging, and onychoschizia were less frequent in the present study. The frequent occurrence of onychorrhexis, ridging, splitting, thinning, and pterygium indicates predominant nail-matrix damage, while onycholysis and subungual

hyperkeratosis reflect associated nail-bed involvement.[12]

In alopecia areata, pitting was identified clinically in five of seven patients (71.4%) and onychoscopically in all seven patients (100%), demonstrating that onychoscopy detected subtle pits not visible on routine examination. Longitudinal ridging was observed in two patients (28.6%). Gandhi et al. (2003) examined 100 patients with alopecia areata and found nail changes in 44%, with pitting in 28%, longitudinal striations in 10%, lamellar splitting in 18%, and trachyonychia in 9%. The substantially higher frequency of pitting in the present study is likely attributable to selection, because all seven patients were recruited through presentation with a nail disorder rather than from an unselected alopecia areata population. The present findings nevertheless agree with their observation that pitting is the most characteristic nail change in alopecia areata. In the five patients with Darier's disease, distal V-shaped nicking and damaged cuticle were present in all cases, longitudinal red and white streaks in 60%, subungual hyperkeratosis in 40%, and splinter haemorrhages in 40% clinically and 60% onychoscopically. The small number of Darier's disease cases prevents reliable percentage-based comparison, but the complete occurrence of distal V-shaped nicking indicates that it was a highly consistent finding in this series.[13]

Nail involvement was prominent in both disseminated discoid lupus erythematosus and immunobullous disorders. Among the six patients with disseminated discoid lupus erythematosus, periungual erythema was present in 100%, subungual hyperkeratosis in 83.3%, nail dystrophy in 66.7%, and longitudinal ridging in 33.3%. Among the 28 patients with immunobullous disorders, damaged cuticle was observed in all patients and paronychia in 89.3%, demonstrating predominant nail-fold involvement. Nail dystrophy and onychoscopic splinter haemorrhages were each present in 39.3%, while onychomadesis and subungual hyperkeratosis were found in 21.4% and 17.9%, respectively. Gopal et al. (2018) evaluated 40 patients with autoimmune blistering disorders and 40 controls and found nail abnormalities in 72.5% of cases compared with 17.5% of controls; paronychia and onychorrhexis were the most frequent abnormalities. The high frequency of paronychia in the present study is therefore concordant with their observations and supports the concept that inflammation and blistering around the proximal and lateral nail folds can produce secondary matrix and plate abnormalities. The present frequencies may be higher because patients were enrolled specifically for nail disorders, whereas the comparator study evaluated consecutive patients with autoimmune blistering disease irrespective of the presence of nail complaints.[14]

Onychoscopy provided clinically relevant morphological information in longitudinal melanonychia, pseudomonal infection, and subungual hematoma. Thirteen of the 14 patients with longitudinal melanonychia (92.9%) showed regular, parallel, uniformly coloured brown–black bands. One patient (7.1%) showed irregular lines of variable thickness and spacing, proximal widening, and pigmentation visible through the transparent cuticle and proximal nail fold, warranting careful clinicopathological assessment. All three pseudomonal infections showed green nail discoloration, onycholysis, and paronychia. All ten subungual hematomas demonstrated well-circumscribed red–black dots and blotches with peripheral fading, distal streaks, and a clear proximal edge. Khidhir et al. (2020) similarly found regular parallel brown lines in all three melanocytic nevi, irregular brown–black lines in their single melanoma, bright or dark green pigmentation in five pseudomonal infections, and blood spots in all seven subungual hematomas. Their pseudomonal cases included onycholysis in three and paronychia in two, compared with both findings in all three patients in the present study. The periungual/subungual warts in the present study showed red–black dots and globules in all 11 cases, a yellow–white fissured verrucous surface in 54.5%, and onycholysis in 36.4%. Collectively, these observations demonstrate how colour, line regularity, vascular dots, blotches, and surface architecture can assist in differentiating pigmentary, vascular, infectious, and keratinizing nail disorders.[15]

Koenen tumors were the least frequent diagnosis and occurred in two patients (0.4%). Both patients demonstrated longitudinal ridging and multiple polypoidal or digitate growths with garlic-clove morphology arising from the proximal nail fold. Jindal et al. (2021) described a 63-year-old woman with multiple smooth-to-verrucous, firm, flesh-coloured periungual tumors emerging from the proximal nail folds of all 20 nails, with the largest lesion measuring 4 × 3 cm. The proximal nail-fold origin and multiple periungual distribution described by Jindal et al. were comparable to the findings in the present patients, although the previously reported case had substantially more extensive involvement. Longitudinal ridging in the present study was likely related to compression or distortion of the nail matrix by the proximal nail-fold tumors. Although the number of cases was small, the characteristic morphology and anatomical location enabled recognition of Koenen tumors and their association with tuberous sclerosis complex. These findings also emphasize the value of examining all fingernails and toenails because periungual fibromas may be multiple, asymmetrical, or initially overlooked when small.[16]

Limitations: The present study had several limitations. A handheld dermatoscope with 10× magnification was used; therefore, the use of a higher-magnification device might have allowed better visualization and delineation of subtle onychoscopic features. As this was a single-centre study, the findings may not be fully representative of the broader population. Multicentre studies with

larger and more diverse study populations are required to improve the generalizability of the observations and to provide more accurate information regarding the clinical and onychoscopic patterns of different nail disorders. Histopathological confirmation using nail-unit biopsy was not performed routinely, and its inclusion in diagnostically uncertain cases could have improved diagnostic accuracy. In addition, the diagnosis of onychomycosis was primarily based on clinical assessment, onychoscopic findings, and potassium hydroxide examination in selected patients. The use of additional mycological investigations, including fungal culture, periodic acid–Schiff staining of nail clippings, and polymerase chain reaction, would have strengthened diagnostic confirmation and helped identify the causative fungal species.

CONCLUSION

Onychoscopy is a simple, rapid, non-invasive, and useful adjunct to the clinical examination of nail disorders. It improves the visualization of nail plate, nail bed, lunular, and nail-fold abnormalities and helps identify subtle features that may not be apparent on routine examination. In the present study, onychoscopy supported the clinical diagnosis of various infectious, inflammatory, pigmentary, vascular, and neoplastic nail conditions and provided additional diagnostic information in several cases. It may facilitate earlier and more accurate recognition of evolving or clinically inconspicuous nail changes and help narrow the differential diagnosis. Although onychoscopy may reduce the need for invasive investigations in appropriately selected cases, it should not be considered a replacement for microbiological examination or nail-unit biopsy when fungal infection, melanocytic malignancy, or another uncertain diagnosis requires confirmation. Overall, incorporation of onychoscopy into routine dermatological practice can enhance the systematic evaluation and documentation of nail pathologies.

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