Study of Nail Psoriasis and Dermoscopic Correlation with Dermoscopic and Modified Dermoscopic Nail Psoriasis Severity Indexes (dNAPSI and dmNAPSI)

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ABSTRACT

Background: Nail involvement in psoriasis may be assessed clinically, ultrasonologically, and dermoscopically. The aim of this study was to assess the dermoscopic features of nails in psoriasis, to compare them with the clinical findings, and to correlate them with the Nail Psoriasis Severity Index (NAPSI) score.

Methods: We recruited 120 patients with psoriatic nail changes for the study. The Psoriasis Area Severity Index (PASI) was used to assess the severity of disease. Clinical and dermoscopic (DermLite DL4, ×10, polarized and non-polarized) nail examination determined NAPSI, modified NAPSI (mNAPSI), and NAPSI determined with dermoscopic findings (dermoscopic NAPSI [dNAPSI] and dermoscopic modified NAPSI [dmNAPSI]) were used to assess severity of nail involvement.

Results: Subungual hyperkeratosis (50.8%) and nail plate thickening (56.7%) were the commonest clinical nail changes found, and dermoscopically, they were subungual hyperkeratosis and pitting (68.3% each). The average median with interquartile range of PASI and NAPSI scores were 7.5 [5.7-10.8] and 8.0 [6-12], respectively. NAPSI scores increased significantly with the increase in PASI scores (P < 0.001). A comparison of NAPSI and mNAPSI with dNAPSI and dmNAPSI revealed that NAPSI, mNAPSI, and dNAPSI increased significantly with an increase in PASI scores. The dNAPSI scores increased significantly with increased mNAPSI and dmNAPSI, and mNAPSI and dmNAPSI were significantly good predictors of joint involvement in psoriasis.

Conclusions: Dermoscopy allows for better visualization of nail findings. Evaluating NAPSI and mNAPSI scores in conjunction with dNAPSI and dmNAPSI increases their helps detect early psoriasis, detection of worsening moderate-to-severe psoriasis (PASI >10) and predict joint involvement and their severity.

Introduction

Nail changes in psoriasis are significant findings and associated with a significant psychological impact [1]. Nail lesions are observed in about one-half of patients with psoriasis, with an estimated lifetime incidence of 80-90% [2]. Most psoriasis cases present with nail changes, while isolated nail psoriasis is rare, occurring in 1-5% of patients [3]. These changes are most common in older patients, in severe forms of psoriasis, in cases with longer duration of disease, and in the presence of psoriatic arthritis, in which case the incidence of nails changes is over 80% [4]. More severe nail psoriasis is associated with a more severe cases of psoriatic arthritis [5].

The clinical presentation of nail psoriasis varies according to the severity and localization of the lesion: the nail matrix, the nail bed, and in severe forms, the entire nail structure [6,7]. The most common nail lesion reported is pitting, followed by nail bed discoloration, onycholysis, subungual hyperkeratosis, abnormalities of the nail plate, and splinter hemorrhages [8]. They lead to significant functional impairment, pain, and psychosocial distress, and patients report significantly worse values in satisfaction with their treatment due to the stress and time involved in treatment [2,9].

Dermoscopy with polarized and non-polarized modes is useful in the evaluation of superficial nail plate/matrix changes, such as pitting and crumbling, and deeper nail bed psoriatic nail involvement in the form of onycholysis, oil spots, subungual hyperkeratosis and splinter hemorrhages, especially when there are no typical clinical features [10,11].

Objectives

The focus of our study was to determine the frequency of dermoscopic findings in psoriatic nails and to compare the dermoscopic examination with the clinical examination to investigate the relationships between the indicators of disease severity.

Methods

This was a prospective observational study conducted from October 2018 to October 2019 in the Department of Dermatology in a tertiary care teaching hospital. Approval from the institutional ethics committee of Command Hospital Air Force Bangalore was obtained vide EC/CHAF Bangalore/2018/27 dated 14 May 2018. Clinically diagnosed psoriasis patients who visited the dermatology Outpatient Clinic were screened, and 120 patients aged 14-75 years with nail psoriasis were examined clinically and with dermoscope (DermLite DL4, ×10; polarized and non-polarized modes). Onychomycosis was ruled out after performing KOH mount on nails and fungal cultures from all the suspected cases.

Patients with coexisting onychomycosis, erythrodermic psoriasis, patients in remission following systemic treatment for psoriasis, pregnant women, patients not consenting to the study, and patients with systemic disorders that may have influenced nail changes were excluded from the study. The clinical-demographic profile of the participants was documented. Clinical images of the hands and feet and radiographs were taken, and the Classification Criteria for Psoriatic Arthritis (CASPAR) scores were calculated.

Disease severity was assessed using Psoriasis Area Severity Index (PASI) as a clinical assessment tool for each patient. All nails were examined clinically followed by a dermoscopic examination. Dermoscopic images were captured with DermLite DL4, ×10, polarized and non-polarized modes. The Nail Psoriasis Severity Index (NAPSI) and modified NAPSI (mNAPSI) scores were calculated for both fingernails and toenails. With dermoscopic findings we recalculated NAPSI and labeled it dermoscopic NAPSI (dNAPSI) and dermoscopic modified NAPSI (dmNAPSI).

Statistical Analysis

All characteristics were summarized. For continuous variables, the summary statistics of mean ± standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. If the Pvalue/ Zvalue was < 0.05, then the results were statistically significant; otherwise, they were considered as not statistically significant. A receiver operating characteristic (ROC) curve was plotted for NAPSI, d NAPSI, dmNAPSI, and mNAPSI to compare their predictive ability for clinical joint involvement. The odds ratio of NAPSI and dmNAPSI to their correlation with CASPAR was also analysed. Data were analyzed using SPSS software v.23.0.

Results

A total of 120 patients with psoriatic nail involvement were included in the study. The mean age of the patients was 47.3 ± 13.1 years (range 14-74 years). Fifty-five percent of patients had the disease for more than 5 years, and the duration of treatment ranged from 0.2 to 11 years (4.9 ± 2.6 years). The mean body mass index (BMI) of the study population was 26.3 ± 3.2 kg/m². Hypertension was the commonest comorbidity (Table 1).

Chronic plaque psoriasis was the commonest clinical presentation (79.2%) and 72.5% of the patients had a PASI score <10; 51.7% of study subjects had a NAPSI score bewteen 6 and10. Arthritis was noted in 11.7% of cases (n = 14), 90% (n = 108) had a CASPAR score of 3 or more. The mean numbers of fingernails and toenails affected were 3.5 ± 1.2 and 3.6 ± 1.5 with a mean NAPSI score of 10.1 ± 6.1. A larger number of nail changes were detected with dermoscopy. Nail

Table 1. Socio-Demographic Details of Patients (n=120)

Demographic Details	n (%)
Age-group, years	
≤ 30	16 (13.3)
31-40	18 (15.0)
41-50	33 (27.5)
51-60	35 (29.2)
>60	18 (15.0)
Gender	
Males	99 (82.5)
Females	21 (17.5)
BMI (kg/m²) (Asia-Pacific guidelines)[17]	
Underweight (<18.5)	01 (0.8)
Normal (18.5 - 22.9)	16 (13.3)
Overweight (23.0 - 24.9)	28 (23.3)
Obese Class I (25.0 - 29.9)	56 (46.7)
Obese Class II (≥ 30.0)	19 (15.8)
Disease duration	
1 – 6 months	07 (05.8)
6 – 12 months	12 (10.0)
1 – 5 years	35 (29.2)
> 5years	66 (55.0)
Comorbidities	
Hypertension	29 (24.2)
Diabetes	19 (15.8)
Arthritis	14 (11.7)
Others	02 (01.7)

BMI = body mass index.

matrix signs were noted in 95.8 % of cases and nail bed signs were noted in 85.0% of cases. Clinically, nail plate thickening (56.7%) and subungual hyperkeratosis (50.8%) were the most common presentations and, on dermoscopic examination, pitting (72.5%) and subungual hyperkeratosis (68.3%) the most frequent ones (Figure 1) (Table 2).

The mean (range) of PASI, NAPSI, mNAPSI, dNAPSI and dmNAPSI scores were 7.5 (1.8-36.0), 8.5 (3-39), 7.0 (0-34), 11.0 (3-45) and 11.0 (0-44), respectively. NAPSI, mNAPSI and dNAPSI scores increased significantly with the rise in PASI scores (r = 0.56, P < 0.001), (r = 0.57, P < 0.001) and (r = 0.54, P < 0.001), respectively (Figures 2 and 3).

The scores of dNAPSI also increased significantly with the increase of mNAPSI and dmNAPSI scores (r = 0.84 with P < 0.001 and r = 0.87 with P < 0.001, respectively) (Figure 4).

Keeping the variables like age, gender, BMI, NAPSI scores, presence of comorbidities, duration of onset of disease, and duration of treatment constant in for analysis the increase in dNAPSI scores by 1 unit is likely to detect PASI scores <10 by 1.08 times and PASI scores between 10 and 20 by 1.01 times compared to PASI scores >20. The increase in NAPSI scores by 1 unit is less likely to detect PASI scores <10 and between 10 and 20 by 0.69 times compared to PASI scores >20. Similarly, the increase in dmNAPSI scores by 1 unit is less likely to detect PASI scores <10 by 0.59 times and PASI scores between 10 and 20 by 0.69 times compared to PASI scores >20.

The adjusted odds values showed that dNAPSI scores were more likely to detect psoriasis at an early stage compared to NAPSI and dmNAPSI. Although the scores were not significant predictors in detecting psoriasis at an early stage (P > 0.05) (Table 3), dNAPSI was likely to detect a rise in PASI in moderate-to-severe psoriasis better than NAPSI. Hence, follow-up of cases with this index can alert an impending worsening of the condition.

The receiver operating characteristic (ROC) curve plotted for NAPSI, d NAPSI, dmNAPSI, and mNAPSI to compare their predictive ability for clinical joint involvement revealed that mNAPSI and dmNAPSI were significantly better predictors of joint involvement compared to other nail psoriasis severity indices (NAPSI, dNAPSI) (P < 0.05) (Figure 5).

Though none of the severity measure scores (NAPSI, dNAPSI, mNAPSI and dmNAPSI) were statistically significant (P > 0.05) for joint involvement, dmNAPSI scores showed higher odds ratio values, indicating that unitary increase in dmNAPSI scores increased the odds of being in the CASPAR scores of 2, 3 and 4 by 2.10 times, 2.19 times, and 2.13 times compared to a CASPAR score of 5. Similarly, NAPSI scores showed higher odds ratio values, indicating that unit increase in NAPSI scores increased the odds of being in the CASPAR scores of 2, 3 and 4 by 1.58 times, 1.85 times and 2.03 times compared to a CASPAR score of 5. The odds of NAPSI scores increased with increase in the grades of severity of joint involvement based on CASPAR criteria, and odds of dmNAPSI remained almost the same, with no statistical difference between these two (P > 0.05) (Table 4).

The mean ranks of mNAPSI increased significantly with the duration of the disease (1-6 months = 47.57; 12-60 months = 60.00; >60 months = 67.34, with P < 0.05), except at 6-12 months (31.88, P > 0.05). The mean ranks of other scores, ie dNAPSI, dmNAPSI and NAPSI, did not vary significantly in relation to the durations of the disease (P > 0.05) (Table 5).

Conclusions

Dermoscopy allows for better visualization of the nail bed and nail matrix abnormalities, and detects early or mild, as well as late changes in the disease, as was also seen in the present study [12]. With its routine use in clinical practice, early and late descriptions of skin, nail and hair diseases are being elaborated in literature increasingly. However, their relevance and importance to standard clinical findings need
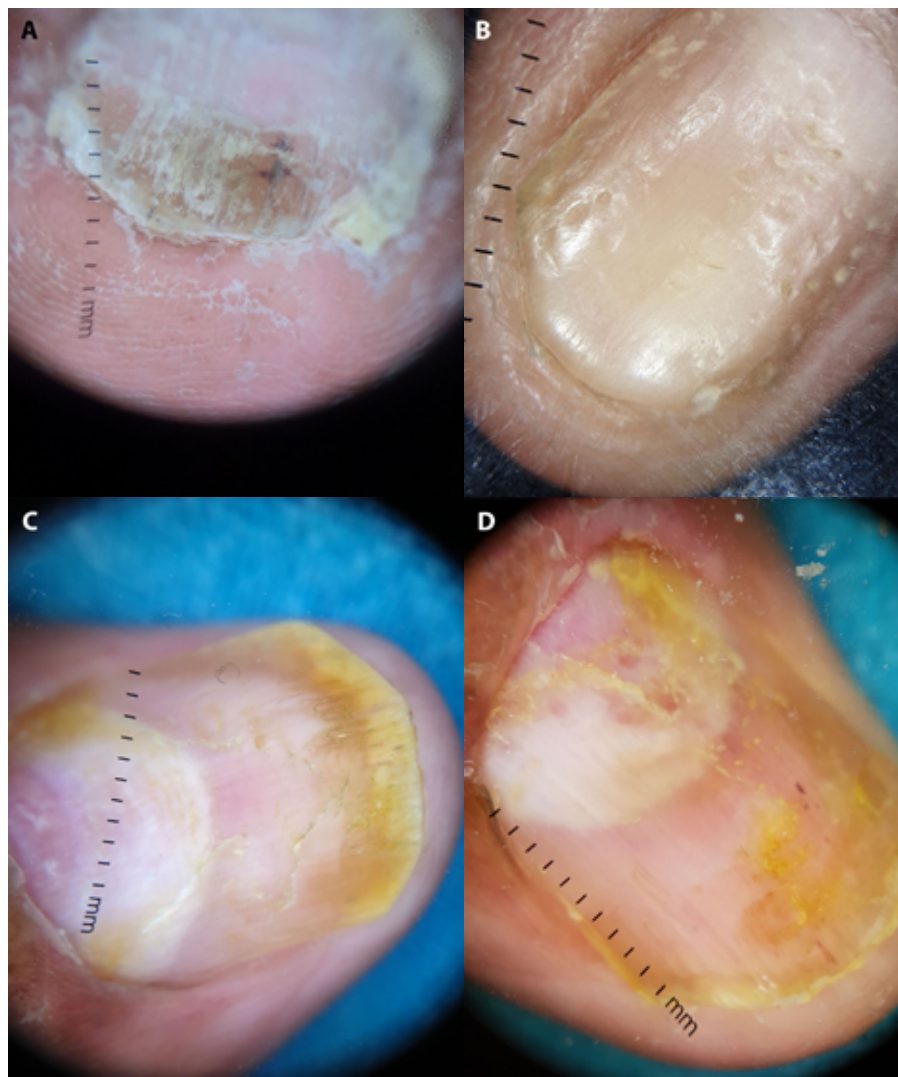
Figure 1. Dermoscopic image. (A) subungual hyperkeratosis. (B) pitting. (C) distal onycholysis. (D) splinter hemorrhages (DermLite DL4, ×10, polarized).

Table 2. Frequency Distribution of Clinical and Dermoscopic Nail Bed and Nail Matrix Findings Among Patients

| Findings	Clinical Examination		Dermoscopic Examination	
	Number (n)	Percentage (%)	Number (n)	Percentage (%)
Nail Bed Signs				
Splinter hemorrhages	06	05.0	31	25.8
Subungual hyperkeratosis	61	50.8	82	68.3
Distal onycholysis	54	45.0	62	51.7
Oil drop sign	37	30.8	47	39.2
Dilated hyponychial capillaries	18	15.0	18	15.0
Nail Matrix Signs				
Nail plate thickening	68	56.7	71	59.2
Pitting	60	50.0	87	72.5
Leukonychia	13	10.8	26	21.7
Transverse grooves	14	11.7	24	20.0
Trachyonychia	01	0.8	14	11.7
Red spots on lunula	04	03.3	05	04.2
Crumbling	23	19.2	23	19.2
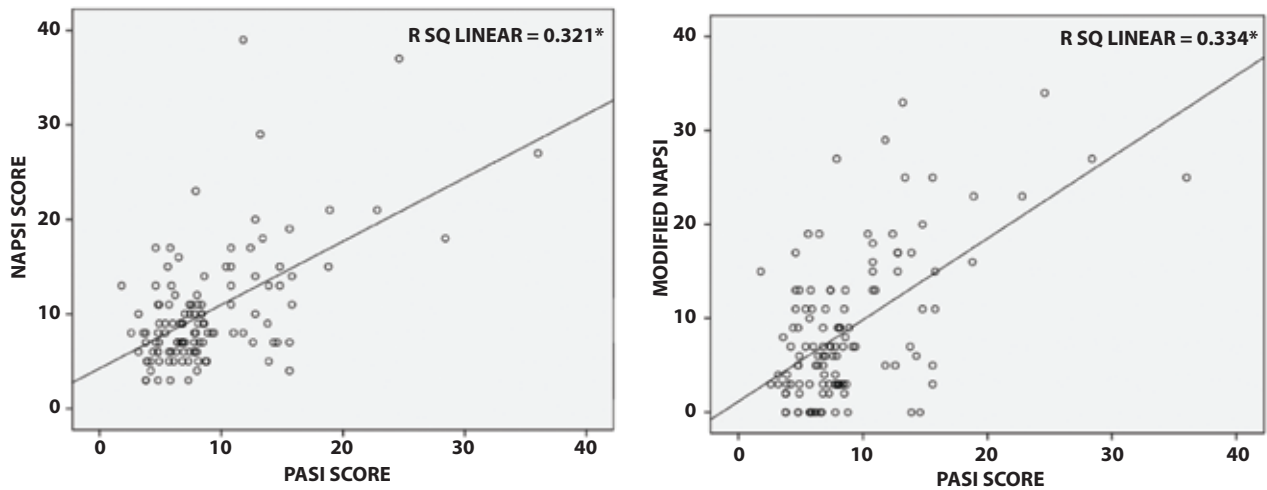
Figure 2. (A) Correlation of PASI and NAPSI scores. (B) Correlation of PASI and mNAPSI scores. mNAPSI = modified Nail Psoriasis Severity Index; PASI = Psoriasis Area Severity Index.
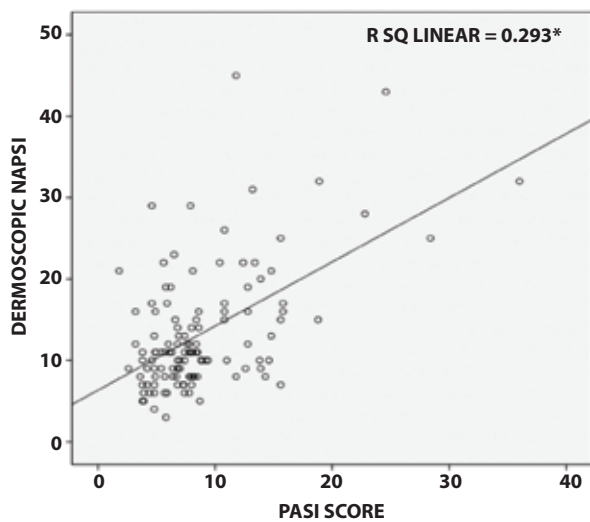

Figure 3. Correlation of PASI and dNAPSI (dermoscopically assessed NAPSI) scores. dNAPSI = dermoscopic Nail Psoriasis Severity Index; PASI = Psoriasis Area Severity Index.

to be validated. In this study we compared nail changes observed in both dermoscopic and clinical examinations and determined their association using NAPSI score and their correlation between the indicators of disease severity, ie PASI and NAPSI scores.

Chronic plaque psoriasis is known to be the commonest pattern of psoriasis, as evidenced in our study. The mean age of our cohort (47.3 ± 13.1 years) with psoriasis was similar to those reported literature [13]. In our study, we had 55% males and a duration of disease of 4.9 years, which is higher than other studies reporting nail findings [14,15]. Elobeid et al found a mean BMI of 25.3 kg/m², similar to our findings if not for a marginally higher BMI (26.3 kg/m²) which may have been due to different study populations and study settings [16][17].

In psoriasis, nail lesions usually manifest 10 years later than skin lesions, and nail involvement is present in 20%-50%

of psoriatic patients [18-21]. According to Polat and Kapicioglu, the most common clinical and dermoscopic findings were pitting and leukonychia [12], and Wanniang et al noted salmon patch (oil drop sign) and splinter hemorrhages significantly better with the dermoscope [22]. In addition to pitting, Yorulmaz and Artuz found salmon patch (oil drop sign) to be associated with higher NAPSI scores [13]. However, in our study, pitting, subungual hyperkeratosis, nail plate thickening, and distal onycholysis were present in the majority of patients, and all nail changes were noted significantly better on dermoscopy. The difference in our observations from the reported literature may be due to different disease duration and severity with an average NAPSI score of 8 in our study *versus* 23, indicating higher disease severity among their patients [22]. Dermoscopic nail findings of subungual hyperkeratosis and oil drop signs were significantly associated with a higher median NAPSI score >8 in our study. The scores of NAPSI, mNAPSI and dNAPSI increased significantly with the rise in PASI scores, which partially corroborates the findings of studies by Hallaji et al and Prevezas et al [23,24].

The dNAPSI helped detect early psoriasis but did not perform well in detecting changes in severity in early psoriasis. However, dNAPSI was better than NAPSI at detecting worsening PASI in moderate-to-severe psoriasis.

Cassell et al formulated mNAPSI as a gold standard with good correlation with other disease severity measures [25]. The scores of dmNAPSI along with mNAPSI were found to be significantly better predictors of joint involvement compared to other nail psoriasis severity indices.

Both mNAPSI and dmNAPSI increased with severe joint involvement, based on the CASPAR criteria, with no statistically significant difference between these two scores. Hence, dmNAPSI is consistent as mNAPSI in correlation with joint severity.
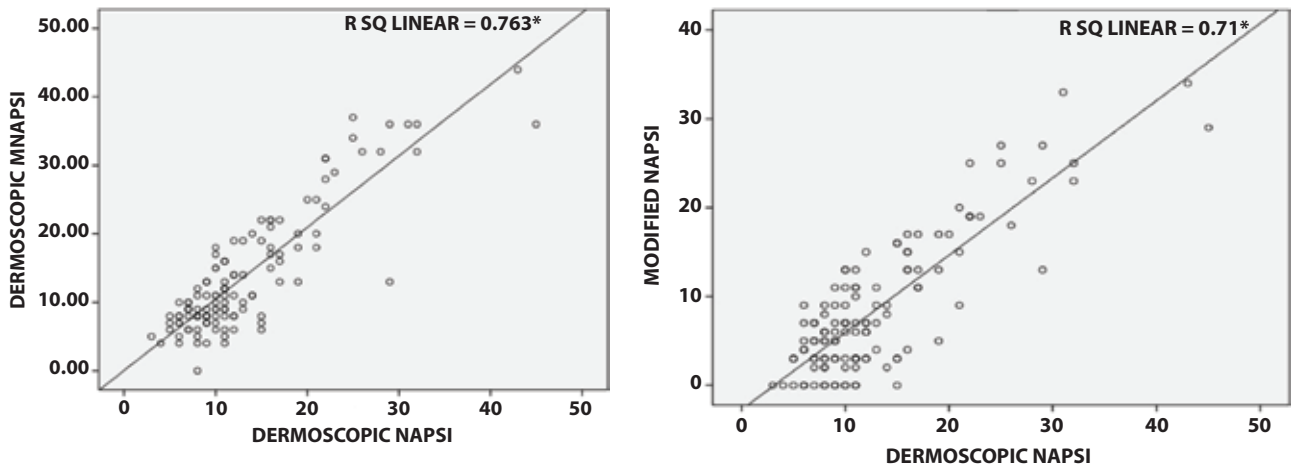
Figure 4. (A) Correlation between dmNAPSI and dNAPSI scores. (B) Correlation between mNAPSI and dNAPSI scores. dNAPSI = dermoscopic Nail Psoriasis Severity Index; dmNAPSI = dermoscopic modified Nail Psoriasis Severity Index; mNAPSI = modified Nail Psoriasis Severity Index.

Table 3. Predictors of Severity of Nail Psoriasis Based on PASI Scores

PASI Severity Scores	Measures of Nail Psoriasis Severity Index	Unadjusted Odds Ratio (OR)	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	P-value
<10	dNAPSI§	0.08	1.08	0.31 – 3.79	0.90
	NAPSI	- 0.36	0.69	0.25 – 1.99	0.50
	dmNAPSI¥	- 0.52	0.59	0.34 – 1.06	0.08
10-20	dNAPSI§	0.02	1.01	0.29 – 3.52	0.98
	NAPSI	- 0.36	0.69	0.25 – 1.95	0.49
	dmNAPSI¥	- 0.38	0.69	0.39 – 1.20	0.19

Reference Category: PASI score more than 20;
§-dermoscopic NAPSI; ¥ - dermoscopic modified NAPSI
dNAPSI = dermoscopic NAPSI; dmNAPSI = dermoscopic modified NAPSI; NAPSI = Nail Psoriasis Severity Index; PASI = Psoriasis Area and Severity Index
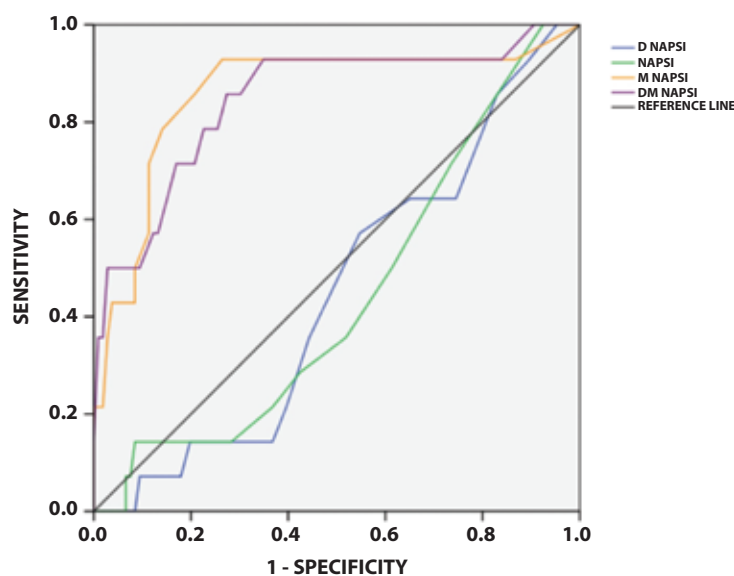

Figure 5. Predictive ability of NAPSI, mNAPSI, dmNAPSI, and dNAPSI in detecting joint involvement. dNAPSI = dermoscopic Nail Psoriasis Severity Index; dmNAPSI = dermoscopic modified Nail Psoriasis Severity Index; mNAPSI = modified Nail Psoriasis Severity Index; NAPSI = Nail Psoriasis Severity Index.

Table 4. Comparison of Measures of Nail Psoriasis Severity Indices as Predictors of Psoriatic Arthritis Based on CASPAR Criteria

CASPAR Criteria	Measures of Nail Psoriasis Severity Index	Unadjusted Odds Ratio (OR)	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	P-value
2	dNAPSI§	- 0.02	0.99	0.48 -2.02	0.97
	mNAPSI	- 0.79	0.46	0.15 – 1.35	0.16
	NAPSI	0.46	1.58	0.54 – 4.62	0.40
	dmNAPSI¥	0.74	2.10	0.69 – 6.45	0.19
3	dNAPSI§	- 0.25	0.78	0.39 – 1.55	0.47
	mNAPSI	-0.87	0.42	0.15 – 1.22	0.11
	NAPSI	0.62	1.85	0.85 – 5.28	0.25
	dmNAPSI¥	0.79	2.19	0.73 – 6.61	0.16
4	dNAPSI§	- 0.31	0.74	0.35 – 1.54	0.42
	mNAPSI	- 0.75	0.48	0.16 – 1.40	0.18
	NAPSI	0.71	2.03	0.68 – 6.02	0.20
	dmNAPSI¥	0.76	2.13	0.69 – 6.52	0.19

Reference Category: CASPAR criteria of 5;
§-dermoscopic NAPSI; ¥ - dermoscopic modified NAPSI
CASPAR = Classification Criteria for Psoriatic Arthritis; dNAPSI = dermoscopic NAPSI; dmNAPSI = dermoscopic modified NAPSI; NAPSI = Nail Psoriasis Severity Index; PASI = Psoriasis Area and Severity Index.

Table 5. Comparison of Mean Ranks of Nail Psoriasis Severity Index Among Different Durations of Onset of Disease in Months

Measures of nail psoriasis severity index	Duration of Onset in Months				Z value (P value)
	1-6 (n=7)	6-12 (n=12)	12-60 (n=35)	>60 (n=66)	
Mean ranks of dNAPSI§	53.07	69.38	69.74	54.77	5.39 (0.15)
Mean ranks of mNAPSI¥	47.57	31.88	60.00	67.34	11.74 (0.008)*
Mean ranks of NAPSI	59.86	63.13	68.60	55.80	3.19 (0.36)
Mean ranks of dmNAPSI	43.79	45.12	58.99	65.87	5.63 (0.13)

¥-modified NAPSI; §-dermoscopic NAPSI; *statistically significant difference at P < 0.05
dNAPSI = dermoscopic NAPSI; dmNAPSI = dermoscopic modified NAPSI; NAPSI = Nail Psoriasis Severity Index.

The mean ranks of mNAPSI increased significantly with duration of onset of disease, except at 6-12 months. The mean ranks of other scores, ie dNAPSI, dmNAPSI and NAPSI, did not vary significantly across the durations of onset of disease.

Our aim in this study was to utilize the dermoscope to detect nail changes in psoriasis, and it revealed that nail changes are better visualized and detected earlier. Nail scoring for psoriasis utilizing dNAPSI helps in the early diagnosis and assessment and detection of worsening moderate-to-severe psoriasis (PASI >10) as compared to NAPSI. The use of dermoscopy for detecting joint severity as per CASPAR criteria was consistent with naked-eye assessment of nail findings. However, as none of these indices proved to be statistically significant by themselves, their true significance may be revealed with larger studies using dNAPSI and dmNAPSI. We do recommend the use of a dermoscope as a routine tool in assessing nail psoriasis.

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