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# Nail Involvements as an Indicator of Skin Lesion Severity in Psoriatic Patients

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**ABSTRACT** Psoriasis is a recurrent chronic inflammatory skin disease with various mild to severe clinical manifestations. The relationship between severity of the skin lesions and nail involvement has always been underestimated.

Aim of the study was to evaluate the severity of skin involvement in psoriatic patients with and without nail manifestations.

In this analytic cross-sectional study, patients with psoriasis referred to Razi University Hospital of Rasht from November 2015 to March 2016 were enrolled. Demographical features (i.e. age, gender) were obtained. Psoriasis severity and nail involvement criteria were assessed by Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI), respectively. All the gathered data were analyzed by SPSS software.

In this study, 71 psoriatic patients with a mean age of 39.23±17.9 years (mean ± Standard Deviation; range: 4 to 77 years old) were studied. 22 patients (31%) had nail involvements. PASI scores were 11.7±5.7 and 5.7±4.5 in the two groups with and without nail involvements, respectively (P<0.001). There were no significant differences between age, age of onset, and duration of the disease between the two groups (P>0.05).The correlation coefficient between PASI and NAPSI was 0.367, which was statistically significant (P<0.001).

Based on the findings of our study, nail involvement is an important criterion in determining the severity of skin manifestations in psoriatic patients. Additionally, a high percentage of such patients probably manifest both skin and nail manifestations. Therefore it is highly recommended to consider nail involvement when evaluating psoriasis.

**KEY WORDS:** psoriasis, nail involvement, PASI, NAPSI

## INTRODUCTION

Psoriasis is considered a chronic, recurrent, inflammatory disease with underlying cellular immunity mediated etiologies (1-3). The disease is found in 1-3% of the general population. Common clinical manifestations include erythematous dry papules and plaques in different sites, covered by silvery scales.

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The various types of the disease which are mainly differentiated based on their clinical manifestations are: plaque, guttate, scalp, inverse, nail, pustular, and erythrodermic (4-6). The patients often suffer from the disease throughout their lives as no definite treatment has yet been introduced (7,8).

Psoriatic skin lesions might start as a simple red small papule, later progressing to the characteristic plaques (9-11). The scalp, extensor surfaces on the limbs, the periumbilical area, sacrum, and nails are the most frequent sites for disease presentations (12,13). Psoriasis often develops gradually, and pruritus is considered the most bothersome symptom among the majority of psoriatic patients (60-90%) (14). Some etiological factors including genetics, traumas, infections, medications, psychological stresses, hormonal changes, exposure to sunlight, and metabolic reactions have been proven to either trigger the disease or to have significant effects on the severity of skin symptoms of psoriasis (15-17).

Nail manifestations, on the other hand, occur in 10-55% of all patients with psoriasis. They are often diagnosed by close physical examination, particularly in the subjects with severe skin presentations (18-20). These include pitting, leukonychia, nail plate crumbling, oil drop discoloration, onycholysis, hyperkeratosis, and splinter hemorrhages (20-22). Proper therapeutic approaches to nail manifestations, sometimes even with incomplete treatment, leads to relief from the social and personal burdens of such symptoms (23).

Based on the literature review, there are contradictory studies in regard to the possible relationship between the severity of skin lesions and nail manifestations among patients with psoriasis. Although some researchers found no relationship, others found a correlation between these symptoms. Moreover, cutaneous psoriasis is more severe in individuals with nail involvement (7,10,12,15,18). Therefore in the present study we aimed to evaluate the severity of skin manifestations in psoriatic patients with and without nail involvements.

## PATIENTS AND METHODS

All patients with clinical signs and symptoms of psoriasis vulgaris were enrolled in this prospective cross-sectional analytical study. The study protocol was approved by the ethical and scientific committee of Guilan University of Medical Sciences (Dermatology Research Center). A written informed consent was obtained from the subjects, following a thorough explanation of the study and based on the consent forms available at www.gums.ac.ir. Moreover, all the data were kept completely confidential by the authors and the results were reported as overall statistics not naming any specific individuals. The study was carried out from November 2015 to March 2016.

The only inclusion criterion was the presence of clinical symptoms of psoriasis vulgaris, while the exclusion criteria were as follows:

1. Application of artificial or cosmetic nails in the past six months.
2. Patients who did not agree to participate in the study.
3. Patients who took topical or systemic medications for skin or nail lesions in the past three months.
4. Onycholysis or leukonychia due to nail traumas.
5. Senile hyperkeratosis in the nail bed confirmed by the attending dermatology professor.
6. Hyperkeratosis in the nail bed and onycholysis or both in toenails which revealed positive results in potassium hydroxide smear (KOH) and culture for dermatophytosis.

These patients were divided into two groups, with and without nail involvements. Disease severity was evaluated according to the Psoriasis Area and Sever-

**Table 1.** Nail Involvement frequencies in patients with psoriasis

| Involved limb | Count | Percent (in all the psoriatic patients, N=71) | Percent (in psoriatic patients with nail involvement, n=22) |
|---|---|---|---|
| Right hand | 18 | 25.4 | 81.0 |
| Left hand | 19 | 26.8 | 86.0 |
| Right foot | 12 | 16.9 | 55.0 |
| Left foot | 13 | 18.3 | 59.0 |
| Hand nails | 20 | 28.0 | 90.0 |
| Toenail | 15 | 21.0 | 68.0 |
| Only hands | 6 | 8.0 | 27.0 |
| Only feet | 2 | 3.0 | 9.0 |
| Hands and feet | 13 | 18.0 | 59.0 |
| Nails of all four limbs | 8 | 11.0 | 36.0 |

**Table 2.** Clinical manifestations frequencies in patients with psoriasis

| Clinical manifestations | Count | Percent (in all the psoriatic patients, N=71) | Percent (in psoriatic patients with nail involvement, n=22) |
|---|---|---|---|
| Pitting | 18 | 32.1 | 82.0 |
| Crumbling | 8 | 14.2 | 36.0 |
| Leukonychia | 1 | 1.7 | 5.0 |
| Red-spotted lanula | 0 | 0.0 | 0.0 |
| Onycholysis | 16 | 28.5 | 73.0 |
| Subungual hyperkeratosis | 11 | 19.6 | 50.0 |
| Splinter hemorrhage | 1 | 1.7 | 5.0 |
| Oildrop | 1 | 1.7 | 5.0 |

ity Index (PASI) (23), while the nail presentations and their severity were recorded based on the Nail Psoriasis Severity Index (NAPSI) criteria.

Frequently used as an endpoint in psoriasis clinical trials, PASI is a composite index indicating the severity of the three main signs of psoriatic plaques (erythema, scaling, and thickness) and is weighted by the amount of coverage of these plaques in the four main body areas (head, trunk, upper extremities, and lower extremities). PASI scores range from 0-72, with higher scores indicating greater disease severities (23).

NAPSI has been developed as an objective and reproducible tool for estimating nail involvement and can therefore be used to determine the efficacy of therapeutic interventions. Each nail is divided into four quadrants, which are evaluated for the presence of any manifestations of psoriasis in the nail matrix (pitting, leukonychia, nail plate crumbling, and red lanula) and nail bed involvement (oil drop, onycholysis, hyperkeratosis, splinter hemorrhages). If any sign is present in all four quadrants, the nail is given a score of 4; a score of 0 is given if there are no signs of involvement in any quadrants. Each nail is assigned a nail matrix and a nail bed score of 0-4, which are combined to yield a total score of 0-8 for each nail. All nails may be evaluated, with the total NAPSI score being the sum of the scores, up to 80 if only fingers (10 nails) are considered or up to 160 if toes are also included (20 nails). The NAPSI is reproducible and simple to perform (24).

Subjects were also assessed regarding the age at disease onset and duration of psoriasis in the two groups. All the data, including demographic features (i.e. age, gender), were recorded and then analyzed by the SPSS version 19 software. The Kolmogorov-Smirnov test was applied to evaluate the normality of the variables. The results were reported as mean and Standard Deviation. The t-test was also used to compare the quantitative variables among the two

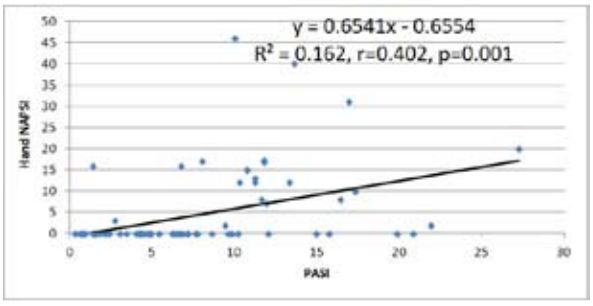


**Figure 1.** Correlation between Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI) on the hands.

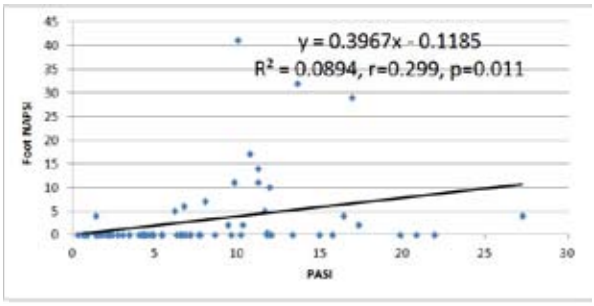


**Figure 2.** Correlation between Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI) on feet.

**Table 3.** Comparison between nail manifestations according to Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI)

| P Value | Subungual Hyperkeratosis | Onycholysis | Crumbling | Pitting | Nail manifestation |
|---|---|---|---|---|---|
| 0.911 | 29.64±23.41 | 23.88±21.70 | 23.50±17.10 | 25.56±23.72 | NAPSI (Mean ± SD*) |
| 0.867 | 12.65±6.35 | 11.08±6.23 | 10.79±3.14 | 11.37±5.01 | PASI (Mean ± SD) |

*SD: Standard Deviation

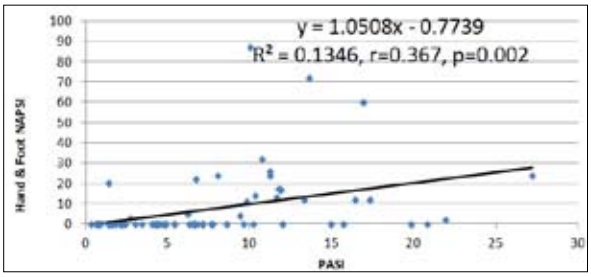


**Figure 3.** Correlation between Psoriasis Area and Severity Index (PASI) and Nail Psoriasis Severity Index (NAPSI) on the hands and feet.

groups. Finally, to evaluate the PASI and NAPSI scores and correlations, Spearman's correlation coefficient was used.

## RESULTS

A total of 71 patients were enrolled in the study with a mean age ± Standard Deviation 39.33±17.4 (ranging from 4 to 77 years). There was a slight male predominance in our study (53.5% men and 46.5% women). The mean age at disease onset was 29.2 years (3 to 73 years), while the mean duration of the disease was 117.7 months (2 months to 36 years). Patients with and without nail involvement had a mean age of 39.8±13.9 and 38.9±18.9 years, respectively (P=0.85).

23 patients (32.4%) had a positive family history of psoriasis. 22 cases (31%) had both nail and skin involvements. Patients with a positive family history of psoriasis revealed higher rates of nail involvements than others with no family histories (52.2% vs 20.8%, P=0.012). Hands were the most common site of affected nails (Table 1).

Pitting (32.1%) and onycholysis (28.5%) were the most frequent manifestations of nail involvement in our patients, followed by subungual hyperkeratosis (19.6%) and nail bed crumbling (14.2%). There were also no cases with red spotted lunula (Table 2). The PASI scores varied from 0.3 to 27.2, with 20 patients obtaining scores over 10 and three getting 20. Mean PASI scores were 6.7±5.8 and 8.5±6.1 for men and women, respectively, with no significant differences (P=0.411). There were no significant differences between any of the four most frequent nail manifestations of our study according to PASI or NAPSI (Table 3).

The main finding of our study was a significant correlation between PASI and NAPSI (P<0.05) (Figure 1, Figure 2, Figure 3). There were no significant relationships between age, duration of the disease, and the age of onset in patients with or without nail involvements (P<0.05) (Table 4).

The mean PASI scores in patients with a positive family history of psoriasis were significantly higher than those with a negative family history (10±7.2 and 6.4±4.3 respectively, P=0.01). There was also a significant correlation between mean PASI scores and age in those with nail involvement (P=0.01, r=0.295). On the other hand, no significant correlation was found between PASI and disease duration (P=0.126, r=0.183).

Correlation coefficients from the Spearman test for NAPSI scores of fingernails, toenails, and nails on all the hands and feet comparing them with PASI scores revealed a significant relationship (correlation coefficients: 0.402, 0.299, and 0.367, respectively, P<0.05) (Figure 1, Figure 2, Figure 3).

The severity of nail involvement according to NAPSI scores in cases with and without family histories of psoriasis was significant (33.1±5.9 and 11.6±5.8, respectively, P=0.01).

We found no correlation between NAPSI and disease duration (r=0.88, P=0.467) or the age of onset (r=0.27, P=0.826).

## DISCUSSION

Psoriasis is considered an inflammatory disorder with a variety of possible underlying etiologies. The disease is found in all nations worldwide and imposes significant economic, psychological, and aesthetic burdens in different societies. Although various studies have examined different aspects of the disease, much more research is still needed (19,20,25).

**Table 4.** Demographic features and Psoriasis Area and Severity Index (PASI) scores in patients with and without nail involvement

| Variable | With nail involvement | Without nail involvement | T-test | P-Value |
|---|---|---|---|---|
| Age (years, mean ± SD*) | 39.8±13.9 | 38.9±18.9 | 0.19 | 0.86 |
| Start age (years, mean ± SD) | 29.5±12.7 | 29.0±17.7 | 0.10 | 0.91 |
| Disease duration (months, mean ± SD) | 123.5±110.1 | 115.2±126 | 0.28 | 0.78 |
| PASI score (mean ± SD) | 11.7±5.7 | 5.7±4.5 | 4.75 | <0.001 |

*SD: Standard Deviation

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Among all of the symptoms, skin and nail manifestations were always important as they influence the daily functions of individuals. The cosmetic aspects of these serious symptoms should also be considered, but, conversely, these presentations are often underestimated or ignored for some patients (21-23).

In the present study, we evaluated 71 patients in whom 22 cases (31%) manifested nail symptoms. This rate was relatively lower than other studies including Choi *et al.* (85.5%), Augustin *et al.* (40.9%), Brazzelli *et al.* (76.9%), Radtke *et al.* (72.8%), and Hallaji *et al.* (42%) (7,10,15,18,26). We only considered the eight criteria of NAPSI as nail involvement, but other studies also included other nail manifestations (i.e. paronychia, beau lines, color changes of the nails, and longitudinal lines on the nail plates) as nail presentations, which can explain the variability of these outcomes (10,15,18). Barzegari *et al.*, on the other hand, reported 33% of nail presentation, which is consistent with our results (19).

The different prevalence of nail psoriasis in different populations reflects the complexity of establishing a precise value of nail psoriasis prevalence in patients with psoriasis (27).

Pits can be seen in normal individuals and in patients with chronic eczema, alopecia areata, and lichen planus. Therefore, looking at the other psoriatic nail features would be helpful for the diagnosis of psoriatic nail pitting. It has also been suggested that pits in patients with nail psoriasis are typically deeper than with other dermatological conditions (26).

De Berker *et al.* suggested a likely psoriatic cause for the presence of more than 20 fingernail pittings. More than 60 pits per person are unlikely to be found in the absence of psoriasis (28). This was considered as the basis for the division of nail pits according to the number. In the present study, we considered the total number of pits in all fingernails to be at least 20 to classify it as pitting. Pittings in the group without psoriatic nail involvement were less than 20 in number.

In the present study, PASI scores were higher for patients with nail symptoms (11.7 vs 5.7). Hallaji *et al.*, Augustin *et al.*, and Brazzelli *et al.* reported scores of 13.16±11.87, 12.7 and 12 for the subject with nail presentations, respectively (7,10,18). These studies also reported a PASI score of 4.74±4.71, 9.3, and 8.7 for patients without nail manifestations (7,10,18). These results confirm the findings of our study. But in Radtke *et al.*, Williamson *et al.*, Barzegari *et al.*, and Valden *et al.*, PASI scores were not evaluated criteria for nail symptoms (4,12,15,19).

There was a significant relationship between PASI and NAPSI scores in the present study (P<0.0001), while Reich *et al.* found no such relationship among their patients (6). Hallaji *et al.* reported mild to moderate correlations among these two indices (P<0.0001) (7), Williamson *et al.* only considered one section of PASI criteria and compared it with NAPSI scores, finding a significant relationships between these two indices (12). Augustin *et al.* reported that patients with nail manifestations had higher PASI scores than those without (13.5±10.7 vs. 10±8.6) (10).

We also found no significant relationships between gender and PASI scores (6.7±5.8 in men and 8.5±6.1 in women). Brazzelli *et al.* reported a similar non-significant relationship for men (12.9) and women (9.34) (18), while Augustin *et al.* found significant results among men (11.6±9.7) and women (9.5±8.3), (P<0.001) (10).

Unlike other studies, we evaluated the family history of psoriasis and patients' age in our subjects, which showed a significant relationship with PASI scores. This could be due to genetic similarities and some interfering environmental factors in our research. Regarding the age of subjects, we believe that gradual changes in physiological or pathological mechanisms related to aging are the possible causes of elevated PASI scores in our study. There were also no significant relationships between disease duration and PASI scores, which has also not been assessed in any previous studies.

Augustin *et al.* found higher rates of nail involvements in patients with a positive family history of psoriasis than the ones with no such history (44.3% vs 37.3%) (10). Schons *et al.* also found more often reported family history of psoriasis among patients with nail psoriasis compared with those without nail involvement (40% vs. 7.4%, P=0.011). This finding was echoed in our study (27).

On physical examination, we found pitting and onycholysis was the most common nail presentation. Choi *et al.* also found pitting as the most common clinical feature (55.6%) (26). Brazzelli *et al.* reported onycholysis as the most common finding in nails (78.8%), followed by nail plate crumbling (65.4%), subungual hyperkeratosis (53.3%), and pitting, although it was mentioned that pitting and onycholysis were the most common features of fingernail involvements (18). Barzegari *et al.*, on the other hand, reported onycholysis as the most frequent type of nail manifestation, which is apparently in contrast with the majority of the literature, and it is explained in the article that the finding is probably due the a small sample size of the study (19). Velden *et al.* only examined the nails of the hands and found onycholysis (93.9%), splinter hemorrhage (89.9%), and pitting (73.5%) among the

patients (4). Williamson *et al.* confirmed color changes, onycholysis, and subungual hyperkeratosis in most of the patients, while only 18% of them presented with pitting on their nails (12).

Nail manifestations were mostly found in the hands of the patients with psoriasis in our study, which is similar to studies by Augustin *et al.* and Brazzelli *et al.* (18).

The mean age of subjects in the present study was 39.33 years old (ys/o), while this demographic parameter was reported in other studies as follows: Velden *et al.* 48 ys/o, Brazzelli *et al.* 52.53 ys/o; 53.71 ys/o in men and 49.8 ys/o in women (4,18), Augustin *et al.* 51.1±18.8 ys/o; 50.6 ys/o in men and 51.8 ys/o in women (10). These findings reveal older ages of patients in previous studies compared with ours. However, this finding could be due to the small samples size in our study. Lager studies are needed to confirm this finding in our region.

In our study, the age of disease onset was 29.2 ys/o, while it was 29 ys/o in Velden *et al.*, 37.3±17.3 ys/o in Brazzelli *et al.*, and 24 ys/o in Barzegari et al (18,19).

Finally, we found non-significant differences regarding age, disease duration, and age at disease onset among the subjects with and without nail involvements. Augustin *et al.* reported longer disease duration in patients with (21.9 years) and without (18.1 years) nail presentations compared with ours (10.29 and 9/6, years respectively) (10). Velden *et al.* and Brazzelli *et al.* only reported the duration of disease as 19 years and 5.23±11.32 years, respectively (4,18).

We excluded all cases of onychomycosis from the study after direct examination, KOH smear, and fungal culture. However, onychomycosis may present with clinical features resembling nail psoriasis. Furthermore, it is estimated that the prevalence of onychomycosis is about 4.6% to 30% of patients with psoriasis with nail involvement (27,29). The absence of nail biopsy procedures could be considered one of the limitations of our study.

## CONCLUSION

To the best of our knowledge, this is the first study showing a correlation between the severity of psoriatic skin lesions and nail involvement in the north of Iran. Based on the findings of the present study, many patients might present both skin and nail lesions which could often be missed during normal physical examinations.

## Limitations

This clinical study could be more valuable if we had also examined the treatment response of the patients and NAPSI or nail involvement.

In addition, we recommend future studies with larger sample sizes and performing similar studies in other universities around the country with identical standards for synchronized comparisons. Furthermore, nail involvement is commonly known to be accompanied with articular signs such as sacroiliitis, enthesitis (25), or psoriatic arthritis, which should be considered in future studies evaluating NAPSI or nail involvement and skin severity.

## Original Publication:

The authors state that this manuscript contains original unpublished work and is not being submitted for publication elsewhere at the same time.

## Ethics:

Written informed consent was obtained from the subjects and the study protocol was approved by the ethical and scientific committee of Guilan University of Medical Sciences (Dermatology Research Center) available at www.gums.ac.ir.

## Competing interests:

Authors declare no conflicts of interest.

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