Correlation between clinical severity, dermoscopic findings and high-frequency ultrasonographic changes in patients with chronic plaque psoriasis: a prospective cross-sectional observational study

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ABSTRACT

Background

Chronic plaque psoriasis is an immune-mediated inflammatory disorder characterised by epidermal hyperproliferation and changes in the superficial dermal vasculature. The Psoriasis Area and Severity Index (PASI) quantifies overall clinical disease burden but does not directly measure the microvascular and structural characteristics of an individual plaque. Dermoscopy and high-frequency ultrasonography (HFUS) may provide complementary, non-invasive information.

Objectives

To assess the relationships between clinical severity, dermoscopic features and HFUS measurements in adults with chronic plaque psoriasis.

Methods

A prospective cross-sectional observational study was reported to have been conducted in the Departments of Dermatology and Radiology at NIMRA Institute of Medical Sciences, Andhra Pradesh, India, from April 2024 to April 2025. The supplied summary workbook reports 95 participants. PASI was used to assess clinical severity. Dermoscopic variables included vascular pattern, erythematous background and scaling. HFUS variables included superficial hyperechoic band thickness, subepidermal low-echogenic band (SLEB) thickness and dermal thickness. Correlations were reported as coefficients with p-values.

Results

The aggregate summary supplied for 95 participants reported a mean age of 39.8 ± 12.4 years, mean disease duration of 6.2 ± 4.8 years and mean PASI of 12.6 ± 5.4. There were 61 men (64.2%) and 34 women (35.8%). Mean dermoscopic scores (0–3) were 2.0 ± 0.8 for vascular pattern, 2.1 ± 0.7 for erythematous background and 2.2 ± 0.7 for scaling. Mean HFUS measurements were 0.42 ± 0.12 mm for the superficial hyperechoic band, 0.31 ± 0.11 mm for SLEB and 1.62 ± 0.38 mm for the dermis. PASI was reported to correlate positively with vascular score ($r=0.62$), erythematous background ($r=0.55$), scaling ($r=0.49$), superficial hyperechoic band thickness ($r=0.54$), SLEB thickness ($r=0.66$) and dermal thickness ($r=0.38$); all were reported as $p<0.001$.

Conclusion

The results suggest positive associations between PASI and selected dermoscopic and HFUS parameters, with the largest reported coefficient for SLEB thickness.

Keywords: chronic plaque psoriasis; PASI; dermoscopy; high-frequency ultrasonography; subepidermal low-echogenic band; skin imaging.

INTRODUCTION

Psoriasis is a chronic, immune-mediated inflammatory disease involving the skin and, in some patients, the joints. It has a variable clinical course and may impose substantial physical, psychological and social burdens. Chronic plaque psoriasis, also termed psoriasis vulgaris, is the most common phenotype and typically presents as well-demarcated erythematous plaques with adherent scale. [1–3]

The pathogenesis of psoriasis reflects interactions between genetic susceptibility, innate and adaptive immune responses, keratinocytes and inflammatory mediators. The interleukin-23/interleukin-17 axis is central to the maintenance of inflammation, contributing to epidermal hyperplasia, altered differentiation, inflammatory cell infiltration and changes in superficial dermal vessels. [2,3]

Clinical assessment remains central to diagnosis and management. The Psoriasis Area and Severity Index combines the extent of involvement across four body regions with the severity of erythema, induration and scaling. It provides a standardised measure of overall disease burden, but it does not directly quantify the microvascular architecture or structural changes within a selected plaque. [4]

Dermoscopy permits magnified, non-invasive examination of superficial cutaneous structures. In psoriasis, typical findings include regularly distributed dotted or globular vessels, an erythematous background and diffuse white scaling. Dermoscopic criteria have been studied in the differentiation of psoriasis from other inflammatory dermatoses. [5]

HFUS provides information about the thickness and echogenicity of superficial skin layers. Psoriatic plaques may show thickening of the superficial hyperechoic band, a hypoechoic subepidermal band and changes in dermal thickness. The measured appearance depends on the transducer frequency, equipment, settings, anatomical site and operator technique. [6,7]

Dermoscopy and HFUS therefore assess different but potentially complementary components of a psoriatic plaque. Dermoscopy characterises surface morphology and superficial vascular patterns, whereas HFUS provides structural measurements. A previous study evaluated clinical, dermoscopic and ultrasound changes during biologic treatment and reported relationships among these measures. [7] However, treatment-monitoring findings do not necessarily establish the same relationships in a cross-sectional outpatient population.

The present study aimed to assess the correlations between PASI, dermoscopic findings and HFUS measurements in adults with chronic plaque psoriasis attending a tertiary-care medical institution.

MATERIALS AND METHODS

Study design and setting

This was described as a prospective cross-sectional observational study conducted in the Departments of Dermatology and Radiology at NIMRA Institute of Medical Sciences, Andhra Pradesh, India. The study

period supplied in the manuscript was April 2024 to April 2025. The investigators must confirm these dates against the recruitment log and ethics approval before submission.

Study population

The study population comprised adults aged 18 years or older with a clinical diagnosis of chronic plaque psoriasis attending the dermatology outpatient department. The supplied summary workbook reports 95 participants. The recruitment method (consecutive, convenience or other sampling) and the number screened, eligible, excluded and analysed were not available in the summary workbook and must be added from source records.

Eligibility criteria

The stated inclusion criteria were: (1) clinical diagnosis of chronic plaque psoriasis; (2) age 18 years or older; (3) willingness to undergo clinical, dermoscopic and ultrasonographic assessment; and (4) written informed consent.

The stated exclusion criteria were: (1) predominant pustular or erythrodermic psoriasis; (2) secondary infection or significant ulceration at the selected target plaque; (3) another inflammatory dermatosis affecting the examination site; (4) inability or unwillingness to provide informed consent; and (5) inability to obtain reliable dermoscopic or ultrasonographic measurements.

Sample size

The uploaded workbook provides a correlation-based sample-size rationale using an anticipated correlation coefficient of 0.30, a two-sided alpha of 0.05 and 80% power. Using Fisher's Z transformation, $n=[(1.96+0.84)/\text{atanh}(0.30)]^2+3$ gives approximately 84.8, rounded up to 85 evaluable participants. Allowing 10% for incomplete or unusable observations gives a recruitment target of 95 (85/0.90=94.4, rounded up). This is the calculation contained in the supplied workbook; the authors must confirm that these assumptions were specified before recruitment rather than added retrospectively.

Clinical assessment

Demographic and clinical information reportedly included age, sex, disease duration, age at onset, family history and previous or current treatment. Disease severity was assessed using PASI, which incorporates erythema, induration and scaling together with the percentage of affected body surface area in the head, upper limbs, trunk and lower limbs. The total score ranges from 0 to 72, with higher scores indicating greater severity. [4]

The summary workbook categorises participants as mild (PASI <10), moderate (PASI 10–20) and severe (PASI >20). The authors must verify that these thresholds were prespecified in the protocol and provide a supporting reference. If they were introduced after data collection, they should be described as post hoc categories and interpreted cautiously.

Dermoscopy

Dermoscopy was used to assess the vascular pattern, erythematous background and scaling of a representative psoriatic plaque. The summary workbook reports mean scores on a 0–3 scale. The original protocol must be consulted to specify the dermoscope manufacturer and model, magnification, polarisation/contact mode, exact operational definitions for each score, anatomical site, number of plaques examined per participant and number/training of observers. These technical details were not included in the uploaded workbook and have not been inferred.

High-frequency ultrasonography

HFUS was used to measure the superficial hyperechoic band, SLEB and dermal thickness. Measurements were expressed in millimetres. The original protocol must identify the ultrasound system, manufacturer and model, actual transducer frequency in MHz, imaging settings, anatomical site, plaque selection method, number of repeated measurements, averaging procedure and whether adjacent uninvolved skin was assessed. The term HFUS should be retained only if the equipment specifications support it.

Statistical analysis

The supplied summary reports correlation coefficients and p-values but does not identify the correlation method, statistical software/version, normality assessment, confidence intervals or missing-data handling. The final manuscript must state whether Pearson's correlation or Spearman's rank correlation was used for each analysis and why. Ordinal dermoscopic scores would generally favour rank-based analysis unless an alternative approach was justified. Report the coefficient type, 95% confidence interval where feasible, exact p-value, and number of observations for every correlation. State how missing values and multiple comparisons were handled. The workbook's reported $p<0.001$ values have been transcribed as supplied and have not been independently recalculated from participant-level records.

The workbook identifies SPSS version 25 in the earlier manuscript draft, but the actual software and version must be confirmed before submission.

RESULTS

Demographic and clinical characteristics

The 95 participants, with a mean age of 39.8 ± 12.4 years and mean disease duration of 6.2 ± 4.8 years. There were 61 men (64.2%) and 34 women (35.8%). The reported mean PASI score was 12.6 ± 5.4. Based on the categories used in the workbook, 28 participants (29.5%) were classified as mild, 49 (51.6%) as moderate and 18 (18.9%) as severe.

Characteristic	Reported value
Total participants	95
Mean age, years	39.8 ± 12.4
Male, n (%)	61 (64.2%)
Female, n (%)	34 (35.8%)
Mean disease duration, years	6.2 ± 4.8
Mean PASI score	12.6 ± 5.4
Mild psoriasis (PASI <10), n (%)	28 (29.5%)
Moderate psoriasis (PASI 10–20), n (%)	49 (51.6%)
Severe psoriasis (PASI >20), n (%)	18 (18.9%)

Dermoscopic findings

The reported mean dermoscopic scores on the 0–3 scale were 2.0 ± 0.8 for vascular pattern, 2.1 ± 0.7 for erythematous background and 2.2 ± 0.7 for scaling.

Dermoscopic parameter	Reported mean score (0–3)
Vascular pattern	2.0 ± 0.8
Erythematous background	2.1 ± 0.7
Scaling	2.2 ± 0.7

Ultrasonographic findings

The reported mean superficial hyperechoic band thickness was 0.42 ± 0.12 mm. Mean SLEB thickness was 0.31 ± 0.11 mm, and mean dermal thickness was 1.62 ± 0.38 mm.

Ultrasonographic parameter	Reported mean thickness
Superficial hyperechoic band	0.42 ± 0.12 mm
Subepidermal low-echogenic band (SLEB)	0.31 ± 0.11 mm
Dermis	1.62 ± 0.38 mm

Correlation between PASI, dermoscopic features and HFUS measurements

The positive correlations between PASI and all six listed parameters. The largest reported coefficient was for SLEB thickness (r=0.66), followed by dermoscopic vascular score (r=0.62), erythematous background score (r=0.55), superficial hyperechoic band thickness (r=0.54), scaling score (r=0.49) and dermal thickness (r=0.38). Each was reported as p<0.001.

Variable	Correlation coefficient as supplied	Reported p-value
Dermoscopic vascular score	0.62	<0.001
Erythematous background score	0.55	<0.001
Scaling score	0.49	<0.001
Superficial hyperechoic band thickness	0.54	<0.001
SLEB thickness	0.66	<0.001
Dermal thickness	0.38	<0.001

Two additional associations were listed in the workbook: dermoscopic vascular score with SLEB thickness (r=0.58; p<0.001) and scaling score with epidermal/superficial hyperechoic band thickness (r=0.52; p-value not supplied). The coefficient type and analysis denominator were not specified.

Variable 1	Variable 2	Coefficient as supplied	p-value
Dermoscopic vascular score	SLEB thickness	0.58	<0.001
Scaling score	Superficial hyperechoic band thickness	0.52	Not supplied

DISCUSSION

This study was designed to examine the relationship between clinical severity, dermoscopic features and HFUS measurements in chronic plaque psoriasis. The aggregate summary supplied for the 95 participants reports positive correlations between PASI and the dermoscopic and ultrasonographic parameters assessed. The largest reported association was between PASI and SLEB thickness (r=0.66), followed by the dermoscopic vascular score (r=0.62). These observations, if confirmed by reanalysis of the original data, would support further evaluation of imaging parameters as adjuncts to clinical severity assessment.

Clinical severity and dermoscopic findings

The reported positive association between PASI and dermoscopic vascular score is biologically plausible. Psoriatic plaques are characterised by vascular changes, including dilated and tortuous capillary loops, which may be visualised as regularly distributed dotted or globular vessels on dermoscopy. Erythematous background and white scaling are also characteristic dermoscopic features. [5,6] The reported correlations with erythematous background and scaling may indicate that more extensive clinical disease is accompanied by more pronounced visible inflammatory and epidermal changes. However, PASI measures disease across multiple anatomical regions, whereas dermoscopy generally evaluates one or a limited number of target plaques. The relationship between a lesion-level score and a whole-body severity index should therefore be interpreted with caution.

Clinical severity and ultrasonographic findings

The strongest reported association in the supplied summary was between PASI and SLEB thickness. The SLEB is a hypoechoic band immediately beneath the superficial echogenic band and has been discussed as a sonographic feature associated with inflammatory and oedematous changes in superficial dermis. HFUS studies have described changes in the superficial hyperechoic band, SLEB and dermal thickness in psoriatic plaques. [6,7] Wang and colleagues evaluated clinical, dermoscopic and ultrasound changes during biologic treatment and reported that several imaging measures changed alongside clinical response. [7] Their longitudinal treatment-monitoring design differs from the present cross-sectional design; direct numerical comparisons are therefore inappropriate.

The reported association between PASI and superficial hyperechoic band thickness may reflect the epidermal hyperplasia characteristic of psoriasis. The comparatively lower reported coefficient for dermal thickness may indicate that this measurement is less closely related to overall clinical severity in this dataset. However, without the original images, acquisition settings and measurement protocol, these interpretations remain provisional.

Relationship between dermoscopy and ultrasonography

The workbook also reports a positive association between vascular score and SLEB thickness (r=0.58), and between scaling score and superficial hyperechoic band thickness (r=0.52). These associations are plausible because vascular prominence and subepidermal inflammatory changes may coexist, while scaling and superficial epidermal structural changes may share a relationship with keratinocyte hyperproliferation. Nevertheless, the scaling–epidermal association has no p-value in the supplied workbook and should not be described as statistically significant until the original output is checked.

Dermoscopy and HFUS should not be considered interchangeable. Dermoscopy provides rapid visualisation of superficial morphology and vascular patterns, while ultrasound provides quantitative information about tissue structure. Their combined use may be valuable in research settings, but the present design cannot determine whether using both modalities improves clinical decisions, predicts relapse or changes treatment outcomes.

Clinical implications

If confirmed, correlations between PASI and imaging measurements may support the use of dermoscopy and HFUS as adjunctive tools for characterising plaque psoriasis. Dermoscopy is relatively accessible and can be incorporated into outpatient assessment. HFUS may offer additional structural information, particularly in studies of lesion-level change. However, correlation alone does not establish incremental diagnostic value, responsiveness, reproducibility or cost-effectiveness. Prospective longitudinal studies with standardised imaging protocols are required before recommending routine use for treatment decisions.

Strengths

The study addresses a clinically relevant question and combines a validated clinical severity index with two non-invasive imaging modalities. The multidisciplinary involvement of dermatology and radiology is potentially useful for standardising clinical and imaging assessment. The inclusion of both dermoscopic and sonographic variables permits exploration of relationships between visible plaque features and deeper structural changes.

Limitations

Several limitations should be acknowledged. First, the cross-sectional design permits assessment of association but not temporal sequence or causality. Second, the sample size of 95 may limit precision and subgroup analyses. Third, the aggregate workbook does not provide patient-level records, missing-data patterns, confidence intervals or the statistical software output; the reported coefficients and p-values therefore require independent verification. Fourth, the dermoscopic scoring rubric, device specifications, ultrasound transducer frequency, anatomical sites and measurement reproducibility procedures were not available in the workbook. Fifth, PASI represents whole-body disease severity, whereas imaging may have been performed on a selected plaque. Finally, treatment exposure and other potential confounders may influence clinical and imaging findings and should be reported.

CONCLUSION

The aggregate summary provided for this study reports positive correlations between PASI and dermoscopic vascular, erythematous and scaling scores, as well as HFUS measurements of the superficial hyperechoic band, SLEB and dermis. SLEB thickness had the largest reported correlation coefficient with PASI. These findings are hypothesis-generating until verified against the original participant-level dataset and statistical output. Dermoscopy and HFUS may provide complementary information in chronic plaque psoriasis, but their additional clinical value requires confirmation in standardised longitudinal studies.

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