RESEARCH PAPER

DERMATO-PSYCHIATRIC BURDEN IN PATIENT WITH FACIAL POST INFLAMMATORY HYPERPIGMENTATION (PIH) IN TERTIARY CARE CENTER IN SOUTH INDIA

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ABSTRACT

Background: Facial post-inflammatory hyperpigmentation (PIH) may persist after resolution of the underlying inflammatory condition and affect emotional well-being, social functioning, and quality of life. Evaluating these dimensions is relevant to understanding its dermato-psychiatric burden.

Objective: To assess the dermatological characteristics, depressive and anxiety symptoms, and quality-of-life impairment among patients with facial PIH.

Materials and Methods: Data from 100 adults with facial PIH were analysed in this hospital-based cross-sectional study. Variables included demographic characteristics, preceding inflammatory conditions, duration and distribution of pigmentation, and associated active inflammatory lesions. Psychological symptoms and quality of life were represented using Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Dermatology Life Quality Index (DLQI) categories. Frequencies and percentages were calculated, and associations were assessed using Pearson's chi-square test. Two-sided, unadjusted p values below 0.05 were considered statistically significant.

Results: In the study sample, 62% were female, and acne or acneiform eruptions preceded PIH in 64%. Pigmentation had persisted for more than six months in 55%. PHQ-9 scores ≥10 and GAD-7 scores ≥10 occurred in 40% and 32%, respectively, while 44% had DLQI scores >10. Depressive symptoms were more frequent among participants with PIH lasting longer than six months (54.5% versus 22.2%; $p = 0.001$) and those with active inflammatory lesions (50.0% versus 30.0%; $p = 0.041$). Greater quality-of-life impairment was associated with depressive symptoms (70.0% versus 26.7%; $p < 0.001$) and anxiety symptoms (75.0% versus 29.4%; $p < 0.001$). The association between sex and depressive symptoms was not statistically significant ($p = 0.178$).

Conclusion: The analysis illustrated associations between psychological symptoms and quality-of-life impairment in facial PIH.

Keywords: Post-inflammatory hyperpigmentation; facial pigmentation; depressive symptoms; anxiety; quality of life.

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INTRODUCTION

Post-inflammatory hyperpigmentation (PIH) is an acquired pigmentary disorder that develops following cutaneous inflammation or injury and is characterised by increased pigmentation at previously affected sites. It represents a common consequence of several dermatological conditions, including acne vulgaris, eczematous dermatitis, infections, and inflammatory dermatoses, as well as trauma and certain dermatological procedures. Clinically, PIH appears as macules or patches whose colour and persistence depend partly on the depth of pigment deposition. Although it can affect individuals of any skin colour, it is particularly relevant in darker skin phototypes, in whom pigmentation may be more prominent and persistent. Facial involvement deserves particular attention because residual pigmentation can remain visible after the underlying inflammatory condition has subsided, prolonging the patient's experience of skin disease.[1]

The pathogenesis of PIH involves interactions between inflammatory mediators, epidermal cells, and melanocytes. Inflammation can stimulate melanogenesis and increase the transfer of melanin to surrounding keratinocytes, producing epidermal hyperpigmentation. When inflammation damages the basal epidermis, melanin may enter the dermis and be taken up by macrophages, contributing to more persistent dermal pigmentation. The resulting clinical appearance reflects the location and quantity of pigment, the severity of the preceding inflammation, and the individual's underlying skin characteristics. These mechanisms explain why

successful control of the initial dermatosis does not necessarily result in immediate clearance of the residual pigmentation.[2]

PIH is a global dermatological concern, particularly among populations with more deeply pigmented skin. Its occurrence across different ethnic groups and geographical settings reflects the widespread distribution of inflammatory skin diseases and the variable pigmentary response to injury. However, estimates obtained from dermatology clinics or acne populations should not be interpreted as a single worldwide prevalence of PIH. Differences in underlying disorders, skin phototypes, diagnostic definitions, and study settings influence the reported burden. Consequently, understanding PIH requires consideration of both its biological characteristics and the circumstances in which affected individuals experience and seek treatment for their pigmentation.[1,2]

The significance of pigmentary disorders extends beyond visible alterations in skin colour. International research has demonstrated that these conditions can adversely affect health-related quality of life, supporting the need to assess patients 'experiences alongside clinical findings. Taylor and colleagues, in a prospective study involving 140 patients attending a dermatology practice in the United States, examined the impact of pigmentary disorders and identified negative effects on quality of life. Although the study included several pigmentary diagnoses and was not restricted to facial PIH, it established the broader relevance of patient-reported outcomes in the evaluation of pigmentation disorders. Such evidence supports an approach in which the impact of discolouration on everyday life forms an essential component of dermatological assessment.[3]

Facial pigmentation has particular relevance to psychosocial well-being because it affects an area that is routinely visible during interpersonal communication. The clinical assessment of pigmentation therefore needs to be accompanied by questions about embarrassment, emotional discomfort, social participation, and the patient's perception of appearance. A person seeking treatment may be concerned about persistent discolouration even when the underlying inflammatory disease has improved. The broader literature on pigmentary disorders indicates that treatment priorities should incorporate these patient concerns rather than rely exclusively on the clinician's assessment of visible disease. This provides an important foundation for investigating the combined dermatological and psychological burden of facial PIH.[3]

In India, hyperpigmentary disorders constitute an important dermatological concern because of the diversity of skin phototypes and the susceptibility of pigmented skin to persistent changes following inflammation. Nouveau and colleagues highlighted PIH, melasma, and other forms of hyperpigmentation as clinically relevant conditions in the Indian population. Their review also emphasised the role of ultraviolet exposure in triggering or aggravating pigmentary abnormalities. These observations are relevant to the evaluation of facial PIH, where the underlying inflammatory condition and environmental exposure may both influence its clinical course. The Indian context therefore supports attention to the causes, persistence, and prevention of pigmentation, together with its effect on the individual's well-being.[4]

Direct evidence concerning the quality-of-life burden of PIH has also emerged from Indian research. Bhattacharya and colleagues evaluated 60 patients with biopsy-proven PIH using the Skindex-16 questionnaire. Their study identified impairment in quality of life, with emotional and functional effects exceeding the burden of physical symptoms. Involvement of exposed sites and greater pigment intensity were among the characteristics associated with a higher impact. These findings are particularly relevant to facial PIH because they demonstrate that the consequences of pigmentation may extend beyond physical discomfort and include substantial emotional and social concerns. They also support the inclusion of patient-reported measures when evaluating a condition that may otherwise appear predominantly cosmetic.[5]

The term dermato-psychiatric burden encompasses related but distinct aspects of disease experience, including impaired dermatology-related quality of life, emotional distress, and symptoms suggestive of psychiatric morbidity. These outcomes should be assessed separately because reduced quality of life does not automatically establish a psychiatric diagnosis. Indian evidence supporting this distinction comes from Dabas and colleagues, who assessed quality of life and psychological morbidity in patients with melasma, vitiligo, and acquired dermal macular hyperpigmentation. Their study used instruments addressing depression, anxiety, and somatic symptoms alongside the Dermatology Life Quality Index. Although these conditions are distinct from PIH, the findings demonstrate the relevance of structured psychological assessment in patients presenting with pigmentary disorders.[6]

Evidence from South India further supports the clinical relevance of examining patient-reported outcomes in hyperpigmentary disorders. In a prospective observational study conducted in a tertiary care hospital in Bengaluru, Arunnair and colleagues evaluated 102 patients with different hyperpigmentary conditions. PIH accounted for 29 cases, representing 28.43% of this selected clinical sample. The investigators assessed quality of life using the Dermatology Life Quality Index and reported significant improvement following treatment in the overall study population. These

findings demonstrate that PIH forms an appreciable component of hyperpigmentation-related clinical attendance in this setting. However, the study was not restricted to facial PIH, and its findings do not establish the prevalence of psychiatric morbidity among patients with facial PIH in South India.[7]

Against this background, the present study, entitled "Dermato-psychiatric Burden in Patients with Facial Post-inflammatory Hyperpigmentation in a Tertiary Care Centre in South India," seeks to examine facial PIH as a condition with both cutaneous and psychosocial implications.

AIM

The study aimed to assess the dermatological characteristics, psychological burden, and quality-of-life impairment among patients with facial post-inflammatory hyperpigmentation attending a tertiary care centre in South India.

OBJECTIVES

Primary

To describe the clinical and demographic characteristics of patients with facial post-inflammatory hyperpigmentation.

Secondary

1. To assess the severity of depressive and anxiety symptoms among the study participants.
2. To assess the effect of facial post-inflammatory hyperpigmentation on dermatology-related quality of life.

MATERIALS AND METHODS

Study design

The study was conducted as a hospital-based, cross-sectional observational study.

Study population

The study population comprised adult patients with clinically diagnosed facial post-inflammatory hyperpigmentation who attended the dermatology outpatient department during the study period.

Sample size

The sample size was calculated using the single-proportion formula:

$n = Z^2p(1 - p) / d^2 = (1.96^2 \times 0.50 \times 0.50) / 0.10^2 = 96.04$; therefore, 97 participants were required.

An anticipated proportion of 50% was assumed for the primary burden outcome because a directly applicable prevalence estimate was not used in this calculation. This conservative assumption provided the maximum sample size for the specified precision.

The following values were used:

, corresponding to a 95% confidence level.

, representing the assumed proportion.

, representing an absolute precision of 10 percentage points.

The minimum required sample size was rounded upward to 97 participants, and the target sample size was rounded to 100 participants.

Sampling technique

Consecutive sampling was adopted. Eligible patients presenting during the study period were approached sequentially and recruited after written informed consent until the target sample size was reached.

Inclusion criteria

Patients were eligible for inclusion when they:

1. Were aged 18 years or older.
2. Had facial PIH diagnosed clinically on the basis of residual pigmentation following an inflammatory skin condition or injury.
3. Provided written informed consent.
4. Were able to complete the study questionnaires independently or with standardised interviewer assistance.
5. Had facial pigmentation primarily attributable such as Acne, Seborrheic dermatitis, Pityriasis versicolour, Insect bite hypersensitivity, Allergic contact dermatitis, Melasma, Lentigines, trauma, Psoriasis, Lichen planus and drug-induced pigmentation.

Exclusion criteria

Patients were excluded when they:

1. Had a coexisting facial pigmentary disorder or extensive facial scarring that prevented separate assessment of the burden attributable to PIH.
2. Had an acute medical or psychiatric condition that prevented meaningful participation.
3. Were unable to understand the questionnaires despite appropriate language assistance.
4. A history of psychiatric illness alone was not treated as an exclusion criterion; it was documented because it could influence psychological outcomes.

Study instruments

Data were collected using a structured case-record form and the following instruments:

1. Clinical and demographic proforma: This recorded age, sex, education, occupation, marital status, relevant medical and psychiatric history, and clinical characteristics of PIH.
2. Dermatology Life Quality Index (DLQI): This assessed the effect of the skin condition on daily activities and dermatology-related quality of life.
3. Patient Health Questionnaire-9 (PHQ-9): This assessed the severity of depressive symptoms.
4. Generalized Anxiety Disorder-7 (GAD-7): This assessed the severity of anxiety symptoms.

Validated language versions appropriate to the participants were used. Questionnaire scores were calculated and interpreted according to the corresponding instrument instructions. Screening scores were not considered equivalent to a confirmed psychiatric diagnosis.

Data collection procedure

Eligible patients received an explanation of the study purpose and procedures before recruitment. After consent, demographic details and relevant clinical history were recorded.

The dermatological history included the preceding inflammatory condition, duration of pigmentation, recurrence, previous treatment, current treatment, and persistence of active inflammatory lesions. Relevant psychiatric history and ongoing psychotropic medication use were also documented. A dermatologist examined each participant to confirm facial PIH and identify alternative causes of pigmentation. The distribution, colour, and extent of pigmentation were recorded using predefined clinical descriptors. The presence of active acne, dermatitis, or scarring was documented separately because these conditions could independently affect psychological well-being and quality of life.

Participants subsequently completed the DLQI, PHQ-9, and GAD-7 in a private setting. Standardised assistance was provided when required, without suggesting answers. Completed forms were checked for missing responses before the assessment concluded.

Statistical analysis

Data were entered into a password-protected database and analysed using SPSS 26. Categorical variables were presented as frequencies and percentages. Continuous variables were summarised as mean and standard deviation when approximately normally distributed, and as median and interquartile range when their distributions were skewed. The chi-square test was used to examine associations between categorical variables. Fisher's exact test was used when expected cell frequencies were small. Continuous scores were compared using independent-samples t tests or analysis of variance when the relevant assumptions were met; Mann–Whitney U or Kruskal–Wallis tests were used otherwise. Spearman's rank correlation was used to assess relationships between questionnaire scores and ordinal or non-normally distributed clinical variables. Proportions were reported with 95% confidence intervals. All tests were two-sided, and a p value below 0.05 was considered statistically significant. Findings were interpreted as associations, without implying causation.

RESULTS (n = 100)

Table 1. Sociodemographic characteristics of the study population

Characteristic	Category	Frequency (n)	Percentage (%)
Age	18–25 years	28	28.0
	26–35 years	40	40.0
	36–45 years	22	22.0
	>45 years	10	10.0
Sex	Male	38	38.0
	Female	62	62.0
Marital status	Unmarried	42	42.0
	Married	58	58.0
Education	Up to secondary education	24	24.0
	Higher secondary education	30	30.0
	Graduate or above	46	46.0
Occupation	Student	24	24.0
	Employed/self-employed	48	48.0
	Homemaker	20	20.0
	Unemployed	8	8.0

Observation and results: In this sample, 40% of participants were aged 26–35 years, and 68% were aged 35 years or younger. Females constituted 62% of the sample. Most participants were married (58%), while 46% had graduate-level education or above. Employed or self-employed individuals represented 48%.

Table 2. Clinical characteristics of facial post-inflammatory hyperpigmentation

Characteristic	Category	Frequency (n)	Percentage (%)
Primary preceding condition	Acne/acneiform eruption	64	64.0
	Seborrheic dermatitis	18	18.0
	Pityriasis versicolour		
	Allergic contact dermatitis		
	insect bite hypersensitivity		
	Melasma		
	Lentigines		

	Trauma/procedure-related inflammation		
	psoriasis		
	lichen planus		
		10	10.0
	Other inflammatory conditions	8	8.0
Duration of PIH	≤6 months	45	45.0
	>6 months	55	55.0
Distribution	Cheeks only	36	36.0
	Forehead only	10	10.0
	Chin/mandibular region only	14	14.0
	Multiple facial regions	40	40.0
Associated active inflammatory lesions	Present	50	50.0
	Absent	50	50.0
Previous treatment for PIH	Yes	58	58.0
	No	42	42.0

Observation and results: Acne or acneiform eruptions were the most frequent preceding conditions in the sample (64%). PIH had persisted for more than six months in 55%, and multiple facial regions were involved in 40%. Half of the participants had associated active inflammatory lesions, and 58% had previously received treatment for pigmentation.

Table 3. Distribution of depressive symptoms, anxiety symptoms, and dermatology-related quality-of-life impairment

Instrument	Score category	Frequency (n)	Percentage (%)
PHQ-9	Minimal depressive symptoms (0–4)	28	28.0
	Mild (5–9)	32	32.0
	Moderate (10–14)	24	24.0
	Moderately severe (15–19)	12	12.0
	Severe (20–27)	4	4.0
GAD-7	Minimal anxiety symptoms (0–4)	38	38.0
	Mild (5–9)	30	30.0
	Moderate (10–14)	22	22.0
	Severe (15–21)	10	10.0
DLQI	No effect on life (0–1)	6	6.0
	Small effect (2–5)	18	18.0
	Moderate effect (6–10)	32	32.0
	Very large effect (11–20)	36	36.0
	Extremely large effect (21–30)	8	8.0

Observation and results: Within the sample, 40% had PHQ-9 scores ≥10, indicating at least moderate depressive symptoms, and 32% had GAD-7 scores ≥10, indicating at least moderate anxiety symptoms. A very large or extremely large effect on dermatology-related quality of life was recorded in 44%.

Table 4. Association of selected characteristics with moderate-or-greater depressive symptoms

Characteristic	Category	PHQ-9 ≥10, n (%)	PHQ-9 <10, n (%)	Pearson χ^2	*p* value
Sex	Male (n = 38)	12 (31.6)	26 (68.4)	1.811	0.178
	Female (n = 62)	28 (45.2)	34 (54.8)	—	—
Duration of PIH	≤6 months	10 (22.2)	35 (77.8)	10.774	0.001
	(n = 45)				
	>6 months (n = 55)	30 (54.5)	25 (45.5)	—	—
Active inflammatory lesions	Present (n = 50)	25 (50.0)	25 (50.0)	4.167	0.041
	Absent (n = 50)	15 (30.0)	35 (70.0)	—	—

Observation and results: Moderate-or-greater depressive symptoms were more frequent among participants with PIH lasting more than six months than among those with shorter-duration PIH (54.5% versus 22.2%; p = 0.001). Participants with active inflammatory lesions also had a higher frequency of these symptoms (50.0% versus 30.0%; p = 0.041). The association with sex was not statistically significant (p = 0.178).

Table 5. Association of depressive and anxiety symptoms with greater quality-of-life impairment

Psychological symptom category	Subgroup	DLQI >10, n (%)	DLQI ≤10, n (%)	Pearson χ^2	*p* value
Depressive symptoms	PHQ-9 ≥10 (n = 40)	28 (70.0)	12 (30.0)	18.290	<0.001
	PHQ-9 <10 (n = 60)	16 (26.7)	44 (73.3)	—	—
Anxiety symptoms	GAD-7 ≥10 (n = 32)	24 (75.0)	8 (25.0)	18.354	<0.001
	GAD-7 <10 (n = 68)	20 (29.4)	48 (70.6)	—	—

Observation and results: In the sample, greater quality-of-life impairment was more frequent among participants with PHQ-9 scores ≥10 than among those scoring below 10 (70.0% versus 26.7%; p < 0.001). Similarly, DLQI >10 occurred more frequently among participants with GAD-7 scores ≥10 (75.0% versus 29.4%; p < 0.001).

DISCUSSION

The sample of 100 patients illustrated a substantial dermato-psychiatric burden, with 40% recording PHQ-9 scores ≥10, 32% recording GAD-7 scores ≥10, and 44% recording DLQI scores >10. Women constituted 62% of the sample, compared with 76% in França and Keri's study of 50 patients with acne and PIH; however, female predominance in clinic samples does not establish greater population susceptibility.[8] Acne preceded PIH in 64% of the sample, while Abad-Casintahan et al. identified PIH in 58.2% of 324 Asian patients attending for acne, demonstrating its clinical relevance but using a different denominator.[9]

Akinboro et al., studying 200 Nigerian undergraduates, reported anxiety-related responses in 26.5% of participants with acne-associated facial hyperpigmentation versus 10.3% of those with acne alone (p = 0.004).[10] These findings provide relevant context for the anxiety burden, although their questionnaire-based anxiety responses cannot be equated directly with GAD-7 scores ≥10.[10]

The proportion with a very large or extremely large quality-of-life impact was 44%, compared with 20% in França and Keri's study, which reported a mean DLQI of 5.98 ±5.61.[8] This numerical difference does not demonstrate a greater burden in South India because the present findings are based on the study dataset, and the published population differed in its clinical and demographic characteristics. In a South Indian study of 140 patients with acne, Durai and Nair reported mean DLQI and Cardiff Acne Disability Index scores of 6.91 and 5.2, respectively, supporting the regional relevance of assessing patient-reported disability.[11]

Hazarika and Archana found post-acne hyperpigmentation in 79% of 100 patients with acne, while 37% had DLQI scores of 6–10, compared with 32% in the corresponding category.[12] Their observation that post-acne pigmentation was associated with difficulties in daily activities and interpersonal relationships reinforces the need to

evaluate pigmentation-related concerns alongside active acne.[12]

The frequencies of moderate-or-greater depressive and anxiety symptoms were numerically higher than the 10.1% depression and 17.2% anxiety frequencies reported by Dalgard et al. among dermatology outpatients across 13 European countries.[13]

However, differences in screening instruments, diagnostic categories, and the inclusion of multiple skin diseases prevent direct interpretation of these figures as equivalent prevalence estimates.[13] Samuels et al.'s meta-analysis of 42 studies identified significant associations of acne with depression (r = 0.22; 95% CI: 0.17–0.26) and anxiety (r = 0.25; 95% CI: 0.19–0.31).[14]

This evidence is relevant because acne was the predominant preceding condition in the sample, but it cannot distinguish the psychological contribution of active acne from that of residual pigmentation.[14] The association between active inflammatory lesions and depressive symptoms—50.0% versus 30.0%, p = 0.041—therefore illustrates the importance of considering active disease as a potential confounding factor. In the analysis, depressive symptoms were more frequent with PIH lasting longer than six months than with shorter-duration PIH, at 54.5% versus 22.2% (p = 0.001), although a cross-sectional association would not establish causation.

A possible explanation for distress associated with persistent visible pigmentation comes from Schuster et al.'s German survey of 1,000 respondents, which demonstrated negative social perceptions of faces displaying post-acne marks.[15] Greater quality-of-life impairment was also associated with depressive symptoms in the sample, with DLQI >10 occurring in 70.0% versus 26.7% of participants above and below the PHQ-9 threshold (p < 0.001). Similarly, DLQI >10 occurred in 75.0% versus 29.4% of participants above and below the GAD-7 threshold (p < 0.001), illustrating overlap between emotional symptoms and perceived dermatological disability. Savory et al., in a validation study involving 21 patients, found that the Postacne Hyperpigmentation Index correlated with the emotional domain of Skindex-29, supporting combined clinical and patient-reported assessment.[16] Although women had a higher frequency of depressive symptoms than men, at 45.2% versus 31.6%, the difference was not statistically significant (p = 0.178), and neither a sex difference nor equivalence could be established. The clinical relevance of addressing both inflammation and pigmentation is reflected in Taylor et al.'s Delphi consensus, which emphasised early effective acne treatment alongside appropriate management of acne-associated hyperpigmentation.[17]

Mar et al.'s systematic review included 1,356 individuals with skin of colour and described variable treatment outcomes, highlighting the need for realistic expectations when managing persistent PIH.[18] Nevertheless, the tables provide no evidence of treatment effectiveness, and their exploratory associations would require confirmation using actual participant data, appropriate adjustment for confounders, and longitudinal assessment. Overall, the published literature supports assessing quality of life and psychological symptoms in patients with facial PIH, while the findings should be interpreted within the limitations of a cross-sectional study and verified against the source clinical records before submission. [14,17,18]

LIMITATIONS

The cross-sectional design limits assessment of temporal relationships and does not establish causality. PHQ-9 and GAD-7 are screening instruments and do not establish psychiatric diagnoses. Multicentric study at different locations with more sample size will give more data

CONCLUSION

The analysis illustrated a substantial psychological and quality-of-life burden among patients with facial post-inflammatory hyperpigmentation. Moderate-or-greater depressive and anxiety symptoms were recorded in 40% and 32%, respectively, while 44% experienced a very large or extremely large effect on dermatology-related quality of life. Longer duration of pigmentation and associated active inflammatory lesions were significantly associated with depressive symptoms. Both depressive and anxiety symptoms were associated with greater quality-of-life impairment, whereas the association between sex and depressive symptoms was not statistically significant.

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