Section: Pathology

Original Research Article

EVALUATION OF KI-67 EXPRESSION IN PSORIASIS AND ITS CORRELATION WITH DISEASE SEVERITY: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Psoriasis is a long-standing, immune-related skin condition marked by excessive keratinocyte proliferation. Although its prevalence is globally well documented, comprehensive Indian data is limited. Ki-67, a nuclear protein, serves as a reliable marker for cellular proliferation in psoriatic tissues.The aim is to assess the Ki-67 positivity index in the basal and suprabasal layers of psoriatic skin and to analyze its relationship with disease severity. **Materials and Methods**: An analytical cross-sectional study was conducted over 18 months at the Departments of Pathology and Dermatology, Hind Institute of Medical Sciences, Safedabad, Barabanki. Fifty individuals with histologically confirmed psoriasis were selected through consecutive sampling. Clinical evaluation included PASI scoring, and skin biopsies were analyzed using immunohistochemical staining for Ki-67, with quantification in both basal and suprabasal epidermal layers. **Results**: The average age of participants was 38.76 ± 14.05 years, with males comprising 74% of the cohort. Most patients had disease duration >2 years (58%). Commonly affected sites included palms/soles (72%) and extremities. Cutaneous features such as scaling (46%) and plaques (41%) were prevalent. Ki-67 expression was significantly elevated in psoriatic lesions, predominantly in basal and suprabasal layers, and showed a strong positive correlation with PASI scores ($p < 0.001$). **Conclusion**: Elevated Ki-67 levels signify increased keratinocyte activity and reflect psoriasis severity. Ki-67 may be considered a supplementary marker in assessing disease progression.

INTRODUCTION

Psoriasis is an enduring inflammatory skin condition driven by immune dysregulation and marked by abnormal epidermal proliferation.[1] It affects approximately 2–3% of the global population and presents with erythematous, scaly plaques that predominantly involve the scalp, trunk, and extensor surfaces.[2] Indian hospital-based studies have estimated the prevalence between 0.44% and 2.8%.[3,4] The disease affects all age groups and both genders, with notable effects on life quality.

The pathophysiology involves a multifaceted interaction among genetic predisposition, environmental stimuli, and immune responses, primarily driven by T-cell activation and pro-inflammatory cytokines like TNF-α, IL-17, and IL-23.[5,6] This inflammatory cascade results in rapid keratinocyte proliferation and faulty epidermal maturation. Histologically, psoriatic skin lesions exhibit hyperkeratosis, parakeratosis, elongation of rete ridges, and an increased mitotic index within the basal layer.[7,8]

Ki-67 is a cell cycle-associated nuclear antigen expressed during active proliferation phases (G1, S, G2, and M) but absent in quiescent (G0) cells.[9] It is a well-established marker for assessing cell turnover, widely utilized in oncology and dermatopathology. In psoriatic lesions, Ki-67 expression is markedly elevated, reflecting

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increased keratinocyte turnover. Its detection via immunohistochemistry provides valuable insight into disease activity and severity.[10] PASI remains the gold standard for clinical assessment of psoriasis severity.[11]

This study seeks to evaluate Ki-67 expression within the basal and suprabasal epidermis in psoriatic skin and to correlate these findings with PASI scores, aiming to validate Ki-67 as a histological indicator of disease severity.

MATERIALS AND METHODS

Study Design and Setting: This observational, analytical study spanned 18 months at the Departments of Pathology and Dermatology, Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh, India. Ethical clearance was obtained, and written consent was secured from all participants.

Participants: Fifty participants with clinically and histopathologically confirmed psoriasis were enrolled. Participants were selected through non-probability consecutive sampling. Patients with any prior systemic treatment for psoriasis in the past four weeks or other dermatological or autoimmune disorders were excluded.

Clinical Assessment: A detailed clinical history, including demographic data, duration of illness, lesion distribution, and symptoms, was recorded. The severity was assessed using the PASI score, which quantifies erythema, thickness, scaling, and the area affected.

Histopathology: 4 mm punch biopsy was taken from lesional skin after administering local anesthesia. The specimens were fixed in 10% neutral-buffered formalin, processed routinely, and stained with H&E. Hallmark features such as parakeratosis, acanthosis, elongation of rete ridges, Munro's microabscesses, and suprapapillary thinning were documented.

Immunohistochemical Analysis for Ki-67

Tissue sections embedded in paraffin were stained using mouse monoclonal Ki-67 antibody. Immunostaining was assessed in the basal and suprabasal layers. The Ki-67 positivity index was expressed as the proportion of stained nuclei among 100 keratinocytes per layer, averaged over five high-power fields. Expression was graded as Absent (<5%), Weak (5–25%), Moderate (25–75%), and Intense (>75%).21

Statistical Methods: Data analysis was carried out using IBM SPSS version 29. Descriptive data were shown as mean ± standard deviation. Correlation between PASI score and Ki-67 expression was evaluated using Pearson's coefficient. A p-value <0.05 was considered statistically significant.

RESULTS

The average age of participants was 38.76 ± 14.05 years, with males comprising 74% of the cohort (Figure:1). Psoriasis vulgaris was the most common variant (80%). Histologically, acanthosis, hyperkeratosis, and dermal infiltration were present in 94% of cases (Figure:2).

The histopathological changes in psoriasis vary depending on disease intensity. While some features (e.g., hyperkeratosis, acanthosis, capillary dilation) are common across all severity levels, others (e.g., spongiosis, Munro-micro abscesses, suprapapillary thinning) are more prevalent in severe disease (Figure:2). Spongiosis, Munro-micro abscesses, Kogoj abscesses, and suprapapillary thinning are significantly more common in the PASI >10 group. Statistically Significant Changes ($p < 0.05$) were seen in Spongiosis ($p = 0.026$), Munro-micro Abscess ($p = 0.003$) and Suprapapillary Thinning ($p = 0.001$). Thus, Spongiosis , Munro-micro Abscess and Suprapapillary thinning is significantly more common in the PASI >10 group, suggesting that it may be a marker of severe disease. (Table : 1).

Basal and Suprabasal layer show moderate Ki67 expression in 90% and 62% cases respectively. Expression of Ki67 and PASI scores in suprabasal layer showed a statistically significant link, indicating a association with disease severity.

Ki67 expression in basal layer between the PASI <10 and PASI >10 groups revealed a statistically insignificant difference with p value of 0.588 higher than the significance level of 0.05. Ki67 expression in suprabasal layer between the PASI <10 and PASI >10 groups groups revealed a statistically significant difference with p value less than 0.001 lower than the significance level of 0.05.

The difference of Ki67 expression between the PASI <10 and PASI >10 groups suggests that intense Ki67 expression in suprabasal layer may be associated with more severe psoriasis (PASI >10). [Table 2 & 3]

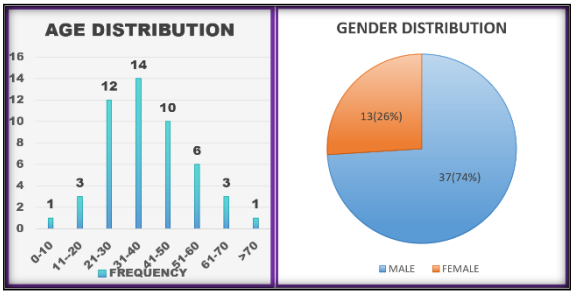

Figure 1: Age and sex distribution graph of patients with psoriasis

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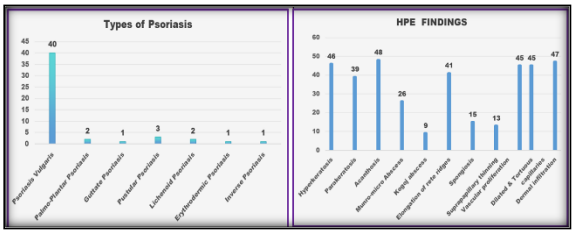

Figure 2: Types of psoriasis and histopathological features seen in patients with Psoriasis

Table 1: Association of PASI score with Histopathological changes

Histopathological changes	PASI SCORE				P-Value
	<10(n=40)		>10(n=10)		
	No.	%	No.	%	
Hyperkeratosis	36	90	10	100	1.000
Parakeratosis	30	75	09	90	0.425
Acanthosis	38	95	10	100	1.000
Spongiosis	09	22.5	06	60	0.026
Munro-micro Abscess	17	42.5	09	90	0.003
Kogoj abscess	05	12.5	04	40	0.057
Elongation of rete ridges	32	80	09	90	0.669
Suprapapillary thinning	06	15	07	70	0.001
Capillary dilation	35	87.5	10	100	0.588
Dermal infiltration	37	92.5	10	100	1.000

Table 2: Association of PASI score with Ki 67 expression in suprabasal layer

Ki67 expression	PASI Score				P-Value
	<10(n=40)		>10(n=10)		
	No.	%	No.	%	
Weak	00	00	00	00	00
Moderate	30	75	01	10	<0.001*
Intense	10	25	09	90	

Table 3: Association of PASI score with Ki 67 expression in basal layer

Ki67 expression	PASI score				P-Value
	<10(n=40)		>10(n=10)		
	No.	%	No.	%	
Weak	05	12.5	00	00	
Moderate	35	87.5	10	100	0.588*
Intense	00	00	00	00	00

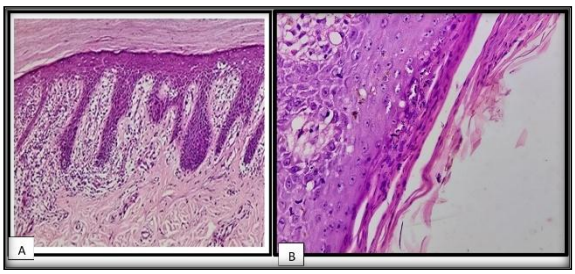

Figure 3A: Psoriatic epidermis showing Suprapapillary thinning, Elongation of dermal papillae (H&E, 100X view), Figure 3B: Histopathological section with Munro's microabscesses.

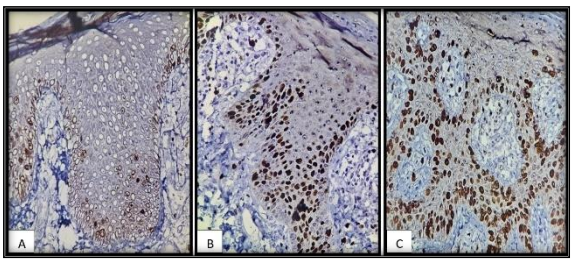

Figure 4: Photomicrograph Showing Immunohistochemistry of Ki-67(400X view), Weak positivity (A), Moderate positivity (B), Intense positivity (C)

DISCUSSION

Psoriasis is an enduring inflammatory skin condition with a multifactorial etiology. Age dispersal is bimodal with majority between 31-40 and few in 41-50 age groups which was also observed by Griffiths et al.[1] Male were more affected as compared to females also recorded by Griffiths et al.[1] Kumar et al.[4] Plaques and scales are the hallmark features of psoriasis, consistent with our

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study's findings (plaques: 41%, scales: 46%), correlating with Griffiths et al. and Kumar et al findings.[1,4]

Severity of Psoriasis is often categorized with Psoriasis Area and Severity Index (PASI), with <5 indicating mild, 5-10 indicating moderate, and >10 indicating severe disease. Our study showed a distribution of mild (32%), moderate (48%), and severe (20%) cases, which aligned with global trends. Griffiths et al,[1] reported that ~30-40% of psoriasis cases were mild, ~40-50% were moderate, and ~10-20% were severe, consistent with our findings.

80-90% of cases account for the most common subtype, Psoriasis vulgaris (chronic plaque psoriasis) consistent with our study's findings (80%) and also noted by Parisi et al.[2] Regular histopathological findings of Psoriasis vulgaris were hyperkeratosis, parakeratosis, and acanthosis, also documented in study by Griffiths et al.[1]

In our study, Spongiosis (60%) was significantly noted more in the PASI >10 group. Griffiths et al.1 reported that spongiosis is more prevalent in severe psoriasis, particularly in cases with acute exacerbations whereas Van de Kerkhof et al,[12] found that spongiosis is a common feature in psoriasis but did not find a significant association with disease severity.

In our study, Munro-micro abscesses (90%) were significantly more common in the PASI >10 group ($p = 0.003$). Weigle et al,[13] and Boehncke et al,[14] found in their study that Munro-micro abscesses were strongly associated with severe psoriasis.

Suprapapillary thinning (70%) was significantly more common in the PASI >10 group ($p = 0.001$ in the current study Nestle et al,[5] and Menter et al,[15] reported similar findings and stated in their study that suprapapillary thinning [Figure 3A &B]. was more pronounced in severe psoriasis, correlated with disease severity and was a useful histopathological marker for severe psoriasis.

Hyperkeratosis (100%), acanthosis (100%), and capillary dilation (100%) were common across all severity levels but exhibit a significant insignificant association with disease severity ($p \geq 0.05$). A study by Lowes et al,[6] found that hyperkeratosis and acanthosis were universal features of psoriasis, regardless of severity, which aligned with our findings. Another study by Schön et al,[8] reported that capillary dilation is a consistent feature of psoriasis but does not vary significantly with disease severity.

In our study Ki-67 expression in psoriatic skin was predominantly moderate in 90% of cases and weak in 10% of the cases, with basal layer expressing low expression. A study by Bianchi et al,[16] reported that Ki-67 in the psoriatic skin basal layer of was expressed significantly higher but the intensity was mostly moderate, aligning with our findings. Al-Mazeedi et al,[17] learned that expression of Ki67 in the basal layer of psoriatic patients was elevated but the intensity varied depending on disease severity. [Figure 4A, B&C].

In our study Ki-67 expression was predominantly moderate (62.0%) followed by intense (38.0%) expression, with no weak expression in the suprabasal layer. Expression of Ki67 in psoriatic skin suprabasal layer was recorded by Bianchi et al.[16] They reported moderate to intense expression, similar to our findings. Al-Mazeedi et al,[17] also noted high suprabasal Ki-67 expression with intense expression in severe cases.

In current study, Ki67 expression in basal layer between the PASI <10 and PASI >10 groups revealed a statistically insignificant difference. Similarly, Mansouri et al,[18] Al-Mutairi et al,[19] and Wilsmann-Theis et al,[20] found that Ki67 expression is consistently elevated in psoriatic lesions but does not correlate with clinical severity. While on the contrary, Boehncke et al,[14] found that Ki67 expression was significantly higher in severe psoriasis (PASI >10) compared to mild-to-moderate cases (PASI <10).

A statistically significant Ki67 expression is noted in the suprabasal layer between PASI <10, PASI >10 groups, with Intense Ki67 expression being associated with severe psoriasis, which was supported by several studies Nestle et al (2009),[5] Boehncke et al.[14] However, some studies (Mansouri et al,[18] Wilsmann-Theis et al,[20] have reported no significant correlation, underlining the intricasy of psoriasis pathology and the need for further research. Our results suggest that Intense Ki67 expression in the suprabasal layer could be a useful biomarker for severe psoriasis, but this should be validated in larger, multicenter studies.

CONCLUSION

Expression of Ki67 match up with clinical and histological severity of psoriasis. It can be used as a valuable diagnostic and prognostic marker in routine dermatopathological evaluations. Limitations include the single-center design and limited sample size.

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