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A Comparative Study of Psoriasis Vulgaris and Psoriasiform Dermatitis Variants on Basis of Ki67, P53, Cyclind1, and VEGF Immunohistochemical Expression

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Abstract:

BACKGROUND: Psoriasis is the prime example of psoriasiform tissue pattern and should be differentiated from other psoriasiform dermatoses both clinically and histopathologically, which is a diagnostic challenge, however, it has some implications for the patient's management and prognosis.

AIM: To evaluate immunohistochemical expression of Ki67, p53, cyclinD1, and VEGF in psoriasis vulgaris and psoriasiform dermatoses for diagnostic purpose.

MATERIAL & METHODS: An analytical cross-sectional study was carried at Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi, India. Immunohistochemical stains for Ki67, p53, cyclin D1, and VEGF were performed on 24 cases including psoriasis vulgaris, chronic plaque psoriasis, plantar psoriasis, pustular psoriasis, guttate psoriasis, parapsoriasis, erythrodermal psoriasis, and rupioid psoriasis.

RESULT: There was no significant difference between psoriasis vulgaris and psoriasiform dermatoses groups in the result of Ki67. CyclinD1, and p53 distribution were also similar; however, there were a difference between the groups concerning cyclinD1 intensity which is higher in psoriasiform dermatoses than psoriasis vulgaris. VEGF staining showed a higher vascular proliferation in psoriasis vulgaris than in psoriasiform dermatoses groups.

CONCLUSION: The present study showed that Ki67, p53, and cyclinD1 aid in confirming the clinically and histopathologically diagnosed psoriasiform dermatitis cases. VEGF immunostaining shows a significantly more expressed vascular proliferation in psoriasis vulgaris patients, and can be helpful as immune marker for differentiating psoriasis vulgaris and psoriasiform dermatoses group.

INTRODUCTION

Psoriasis is a chronic inflammatory skin condition that affects approximately 2% of the worldwide population.[1] Clinically, it is marked by the presence of erythematous, scaly plaques, while histologically, it is characterized by significant epidermal hyperplasia, dilated dermal vessels, and immune cell infiltration. The histopathological signature includes hyperproliferation and abnormal differentiation of keratinocytes, leading to an increased rate of epidermal turnover and a high mitotic index. Nevertheless, diagnosing psoriasis can be difficult due to the similarity of its features with other conditions, especially psoriasiform dermatitis.

Psoriasiform dermatitis encompasses a range of inflammatory skin disorders that histologically resemble psoriasis by displaying psoriasiform hyperplasia. The overlapping characteristics of these conditions hinder accurate diagnosis, which is crucial for the initiation of suitable treatment and prognostic assessment. Therefore, it is important to identify specific markers that can differentiate psoriasis from other psoriasiform disorders for diagnostic purposes.[2]

Immunohistochemistry (IHC) serves as a valuable complement to histopathology in enhancing diagnostic accuracy. Among the IHC markers, p53 is particularly significant. This tumor suppressor protein consists of 393 amino acids and is responsible for regulating the cell cycle and ensuring genomic stability. Abnormal expression of p53 is linked to various cutaneous inflammatory and neoplastic disorders, including psoriasis and chronic dermatitis. The overexpression of p53 may indicate heightened cell turnover and a DNA repair response, which are frequently observed in psoriatic lesions.[3]

Ki67 is another well-established nuclear marker used to evaluate cellular proliferation. It is expressed during all active phases of the cell cycle (G1, S, G2, and M), but not in resting cells (G0). Ki67 expression is elevated in psoriatic epidermis, reflecting increased keratinocyte proliferation. Its labeling index can provide insight into the extent and pattern of proliferation, offering a distinction between psoriasis and other inflammatory dermatoses that lack such heightened activity.[4]

VEGF (primarily VEGF-A) binds to its receptors (VEGFR-1/Flt-1 and VEGFR-2/Flk-1) on endothelial cells, stimulating the rapid, disorganized growth of new blood vessels (angiogenesis) within the dermal papillae. It works as an autocrine regulator, directly stimulating keratinocyte proliferation, leading to the thickening of the epidermis (acanthosis) typical of plaque psoriasis. VEGF production is upregulated by hypoxia (low oxygen) and inflammation (via cytokines). This leads to increased oxygen consumption and activation of transcription factors like HIF-\(1\alpha\), resulting in a continuous, self-perpetuating cycle of inflammation and angiogenesis. It interacts with other signaling molecules, such as PAK1, and activates JAK/STAT pathways in keratinocytes, contributing to the pathogenesis of the disease.[5]

Cyclin D1 binds with cyclin-dependent kinases CDK4/6 to form active complexes. These complexes phosphorylate the retinoblastoma protein (pRb), releasing E2F transcription factors that initiate the S-phase, forcing keratinocytes to proliferate uncontrollably. Due to this accelerated cycle, the epidermal turnover time is reduced from a normal 13 days to roughly 3-4 days in affected patients. In psoriasis, increased numbers of Cyclin D1-positive cells are found in the basal layers, likely due to a dysfunction in the degradation of the Cyclin D1 protein rather than increased mRNA expression, leading to localized buildup. Cyclin D1 upregulation works in conjunction with high Ki-67 and lowered p16 levels, creating a highly proliferative environment.[6]

METHOD

The present study was hospital-based prospective study done at Vardhman Mahavir Medical College. The study included a minimum of 24 clinically diagnosed and histopathologically confirmed cases of psoriasis. Informed consent was taken from patients who participated in study. Clinically diagnosed cases with adequate biopsies were included, while inadequate samples and unwilling participants were excluded. This study was a prospective observational investigation designed to evaluate the immunohistochemical expression of Ki67, p53, Cyclin-D1 and VEGF in skin biopsy specimens for the differentiation between psoriasis vulgaris and psoriasiform dermatitis.

Statistical analysis The data were entered in Microsoft excel 2019 using SPSS (v17/20) and StatCal2 software, and a p-value of ≤ 0.05 was considered statistically significant for determining relevant associa-

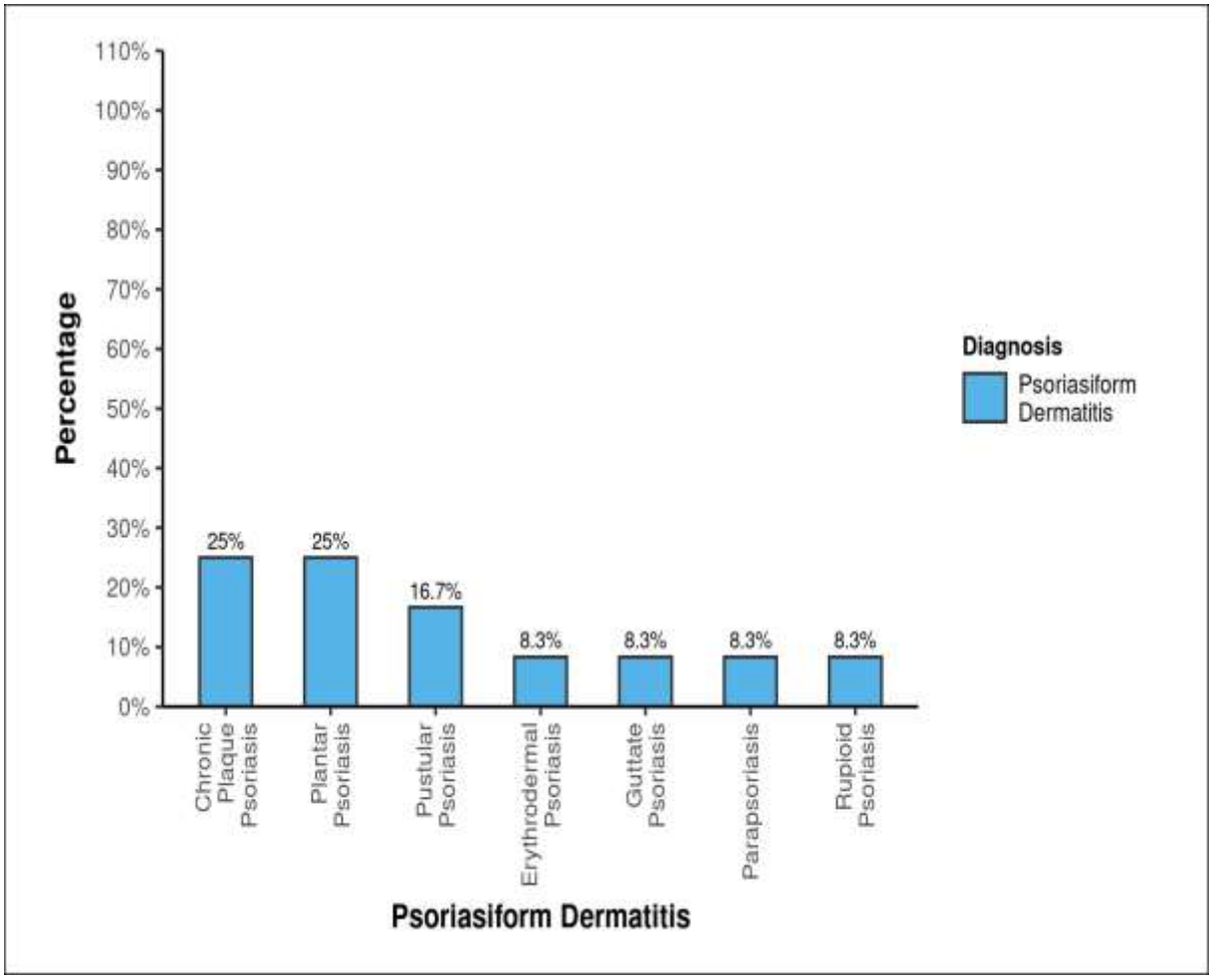
tions.[7]

RESULT

The study analyzed a total of 24 clinically suspected cases of psoriasis at Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi, all of which were confirmed histopathologically in this cohort study.

Parameters	Diagnosis		p value
	Psoriasis Vulgaris (n = 12)	Psoriasiform Dermatitis (n = 12)	
Psoriasiform Dermatitis			1.000[1]
Chronic Plaque Psoriasis		3 (25.0%)	
Plantar Psoriasis		3 (25.0%)	
Pustular Psoriasis		2 (16.7%)	
Erythrodermal Psoriasis		1 (8.3%)	
Guttate Psoriasis		1 (8.3%)	
Parapsoriasis		1 (8.3%)	
Rupioid Psoriasis		1 (8.3%)	
Age (Years)	34.33 ± 14.74	35.50 ± 19.22	0.885[2]
Age			0.687[3]
10-20 Years	2 (16.7%)	4 (33.3%)	
21-30 Years	4 (33.3%)	2 (16.7%)	
31-40 Years	3 (25.0%)	1 (8.3%)	
41-50 Years	0 (0.0%)	2 (16.7%)	
51-60 Years	2 (16.7%)	2 (16.7%)	
61-70 Years	1 (8.3%)	1 (8.3%)	
Gender			0.667[3]
Male	7 (58.3%)	9 (75.0%)	
Female	5 (41.7%)	3 (25.0%)	
Ki67 (Yes)	4 (33.3%)	5 (41.7%)	1.000[3]
p53 (Yes)	10 (83.3%)	10 (83.3%)	1.000[3]
CyclinD1 (Yes)	10 (83.3%)	9 (75.0%)	1.000[3]
VEGF (Yes)	9 (75.0%)	5 (41.7%)	0.098[1]

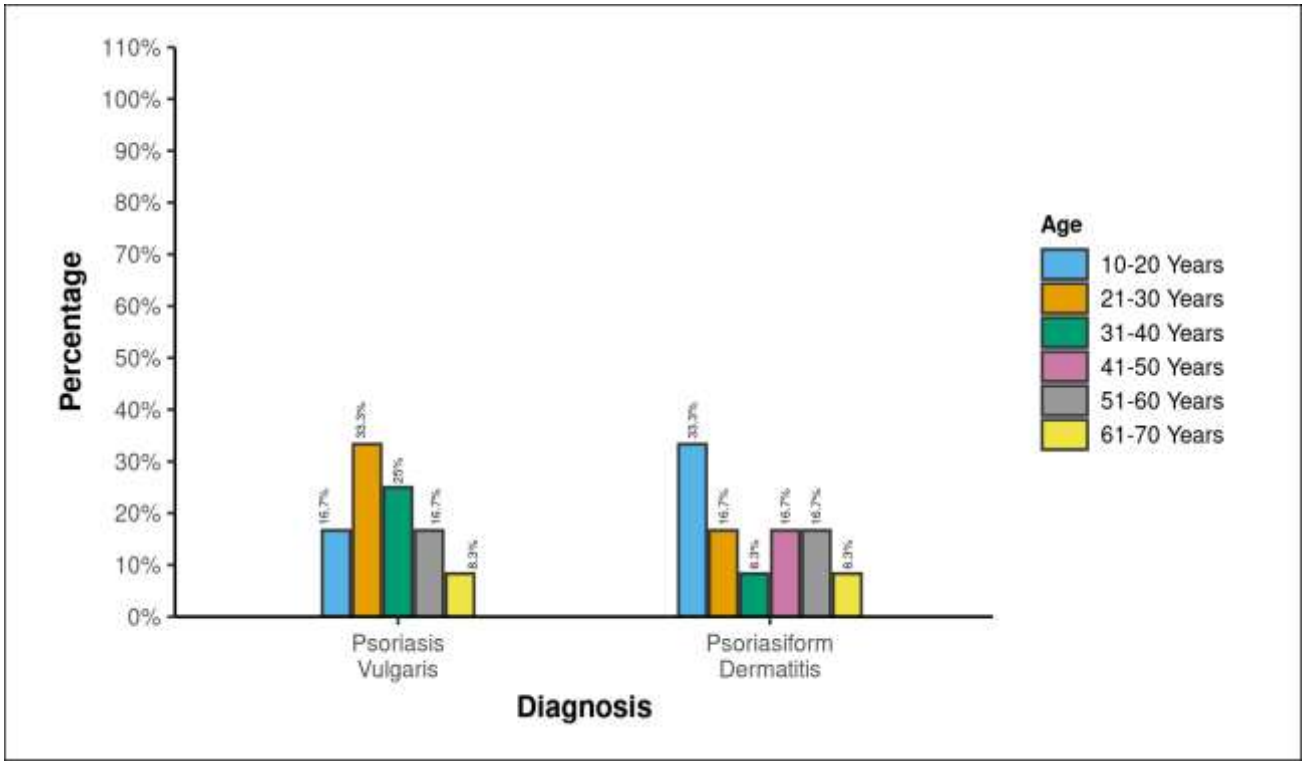
Figure: Association between Diagnosis and Psoriasiform Dermatitis



1. **Association between 'Diagnosis' and 'Age (Years)'**

Age (Years)	Diagnosis		Wilcoxon-Mann-Whitney U Test	
	Psoriasis Vulgaris	Psoriasiform Dermatitis	W	p value
Mean (SD)	34.33 (14.74)	35.50 (19.22)	75.000	0.885
Median (IQR)	30.5 (25.25-39.25)	31.5 (19.5-51.75)		
Min - Max	16 - 63	10 - 64		

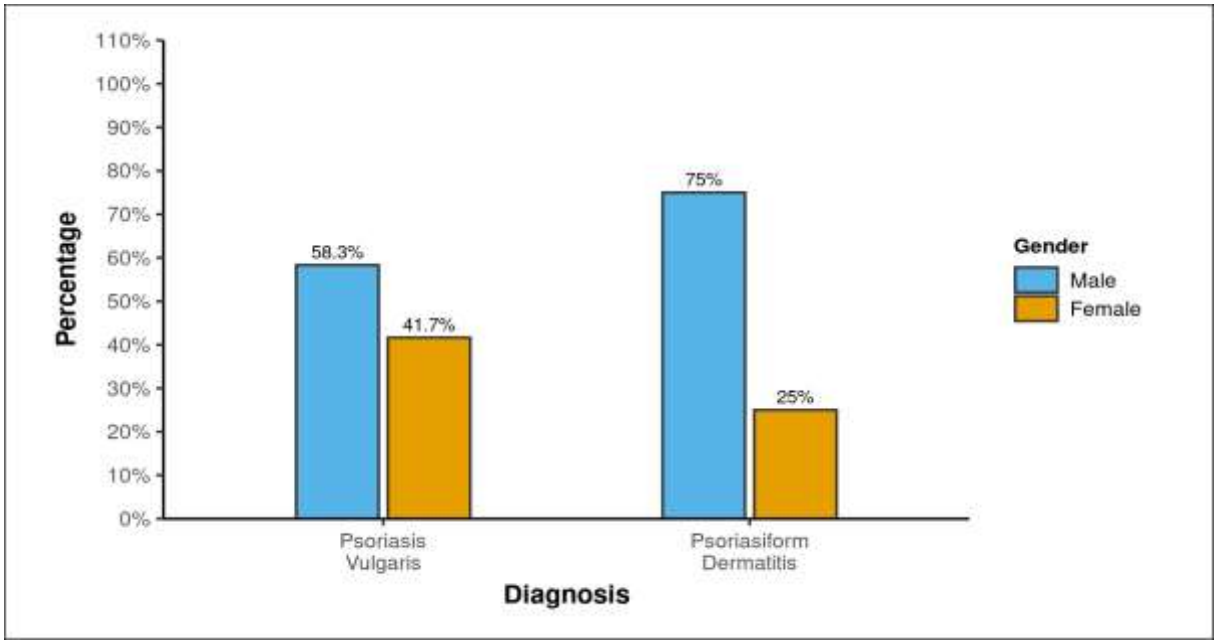
Figure: Association between Diagnosis and Age



2. Association Between 'Diagnosis' and 'Gender'

Gender	Diagnosis			Fisher's Exact Test	
	Psoriasis Vulgaris	Psoriasiform Dermatitis	Total	χ2	P Value
Male	7 (58.3%)	9 (75.0%)	16 (66.7%)	0.750	0.667
Female	5 (41.7%)	3 (25.0%)	8 (33.3%)		
Total	12 (100.0%)	12 (100.0%)	24 (100.0%)		

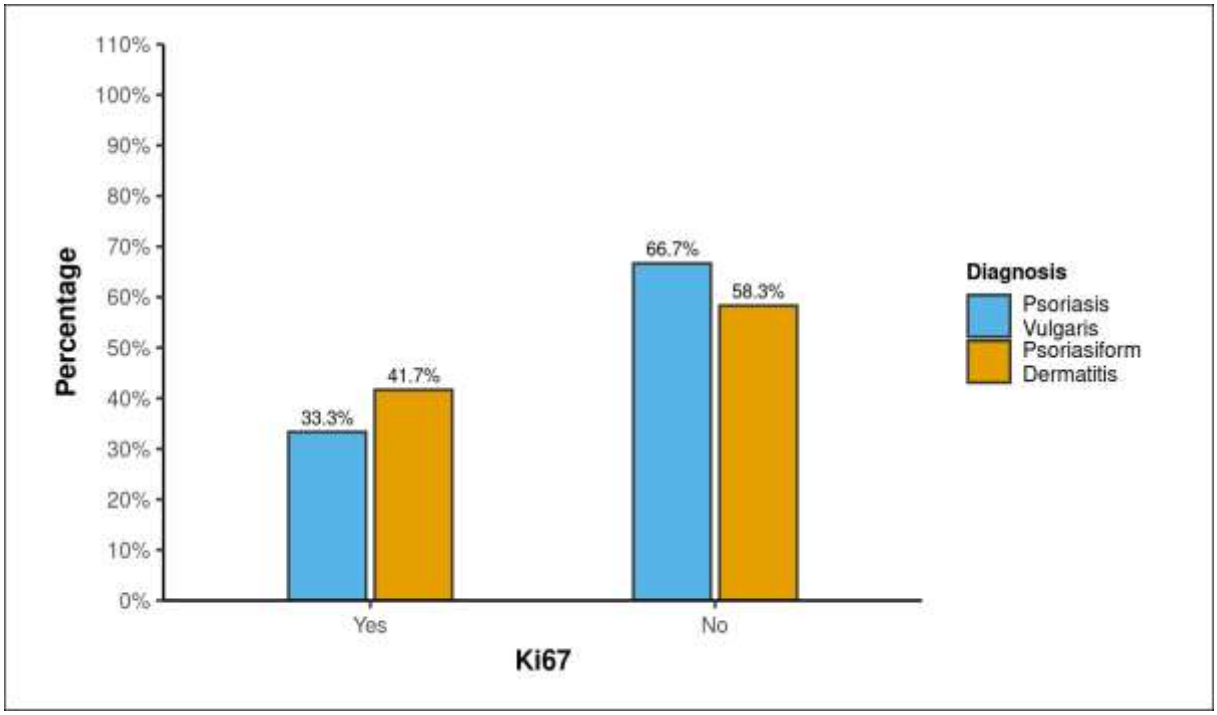
Figure: Association between Diagnosis and Gender



3. Association Between 'Diagnosis' and 'Ki67'

Ki67	Diagnosis			Fisher's Exact Test	
	Psoriasis Vulgaris	Psoriasiform Dermatitis	Total	χ2	P Value
Yes	4 (33.3%)	5 (41.7%)	9 (37.5%)	0.178	1.000
No	8 (66.7%)	7 (58.3%)	15 (62.5%)		
Total	12 (100.0%)	12 (100.0%)	24 (100.0%)		

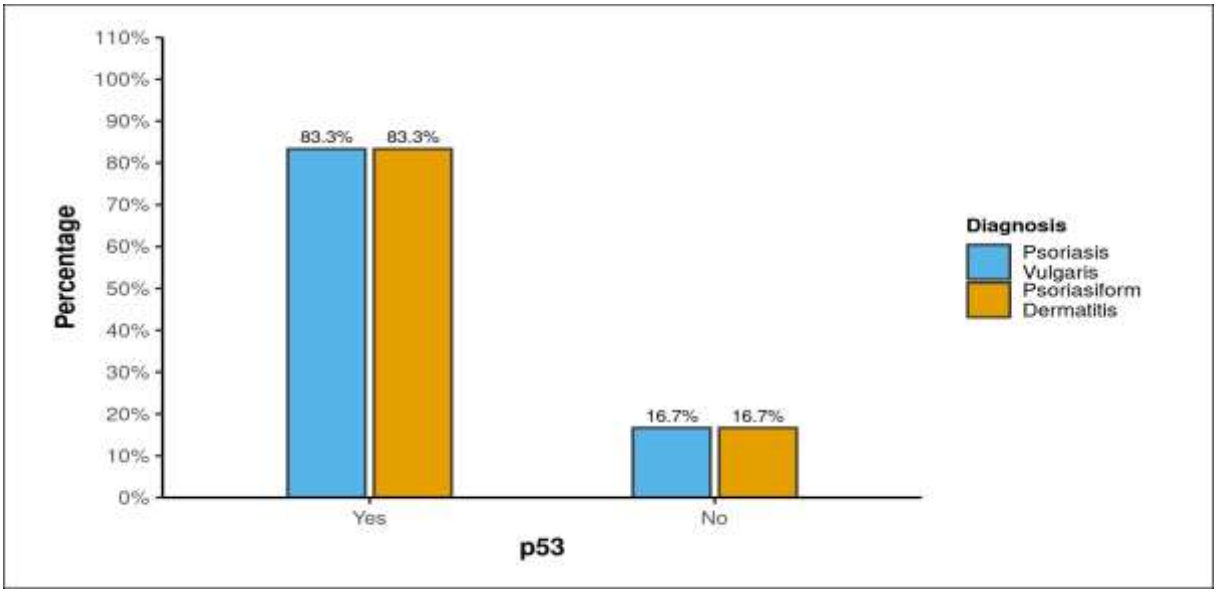
Figure: Association between Diagnosis and Ki67



4. Association Between 'Diagnosis' and 'p53'

p53	Diagnosis			Fisher's Exact Test	
	Psoriasis Vulgaris	Psoriasiform Dermatitis	Total	χ2	P Value
Yes	10 (83.3%)	10 (83.3%)	20 (83.3%)	0.000	1.000
No	2 (16.7%)	2 (16.7%)	4 (16.7%)		
Total	12 (100.0%)	12 (100.0%)	24 (100.0%)		

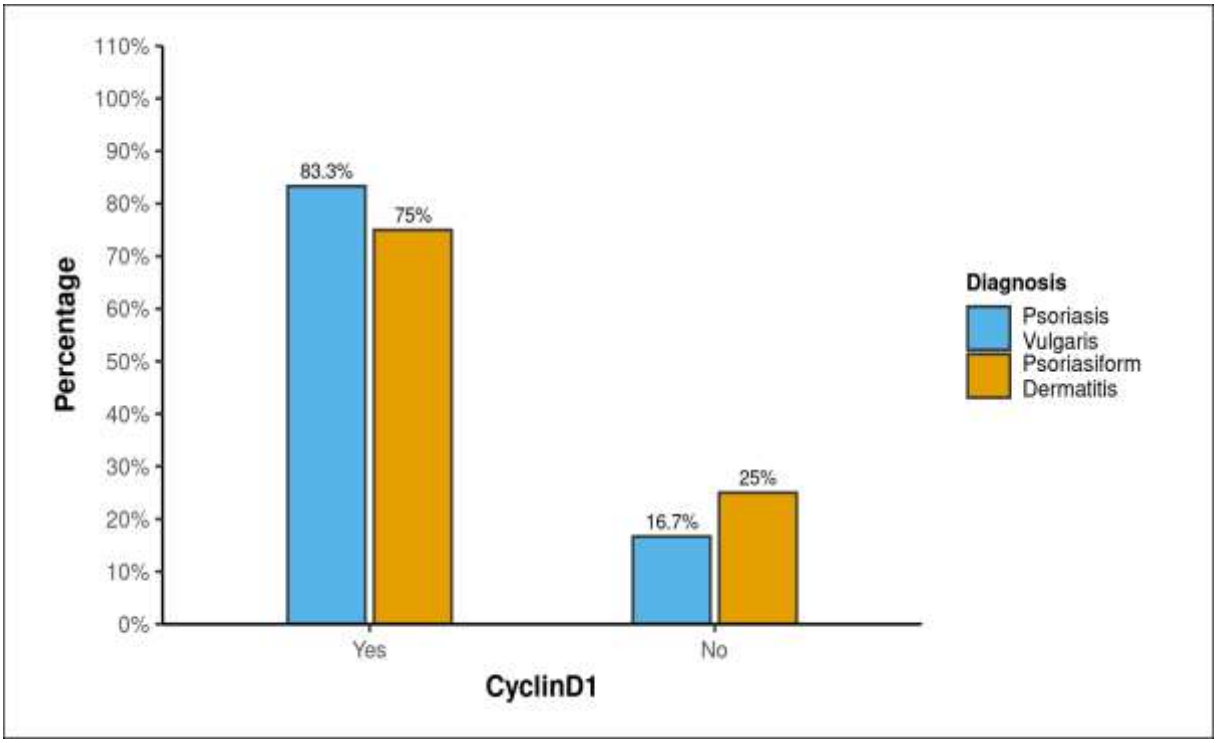
Figure: Association between Diagnosis and p53



5. Association Between 'Diagnosis' and 'CyclinD1'

CyclinD1	Diagnosis			Fisher's Exact Test	
	Psoriasis Vulgaris	Psoriasiform Dermatitis	Total	χ2	P Value
Yes	10 (83.3%)	9 (75.0%)	19 (79.2%)	0.253	1.000
No	2 (16.7%)	3 (25.0%)	5 (20.8%)		
Total	12 (100.0%)	12 (100.0%)	24 (100.0%)		

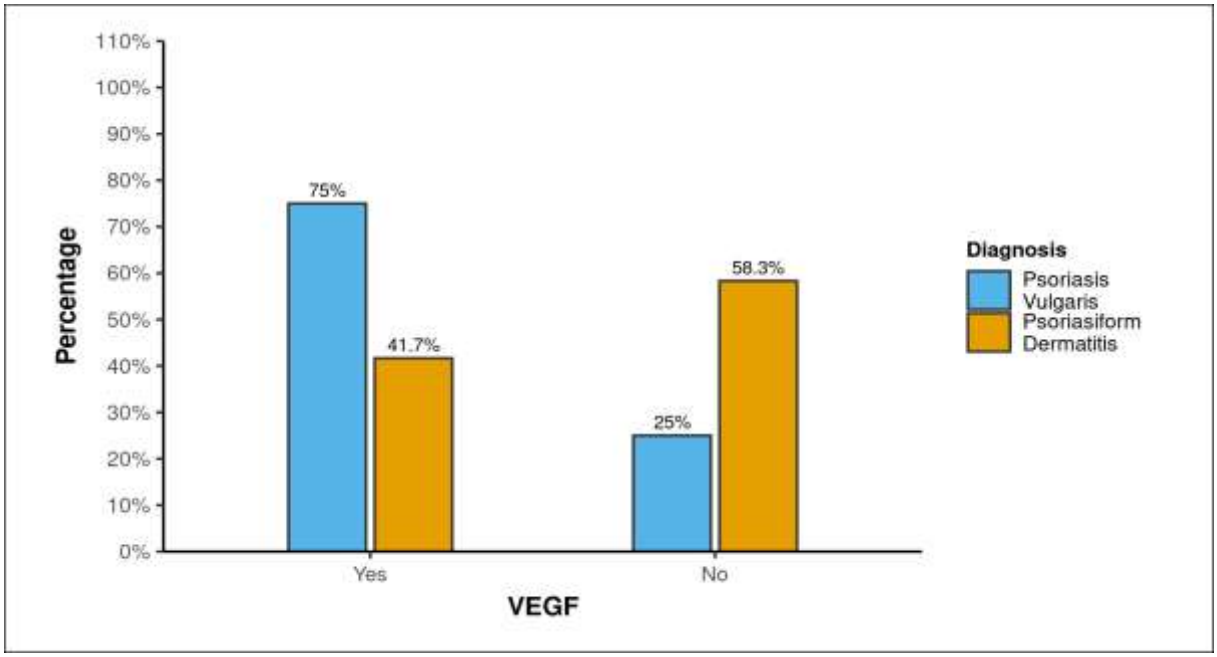
Figure: Association between Diagnosis and CyclinD1



6. Association Between 'Diagnosis' and 'VEGF'

VEGF	Diagnosis			Chi-Squared Test	
	Psoriasis Vulgaris	Psoriasiform Dermatitis	Total	$\chi 2$	P Value
Yes	9 (75.0%)	5 (41.7%)	14 (58.3%)	2.743	0.098
No	3 (25.0%)	7 (58.3%)	10 (41.7%)		
Total	12 (100.0%)	12 (100.0%)	24 (100.0%)		

Figure: Association between Diagnosis and VEGF



DISCUSSION

The current study sought to assess immunohistochemical profiles to distinguish psoriasis from psoriasiform dermatitis within a cohort of 24 patients. Among these, 50% were diagnosed with psoriasis vulgaris, while the remaining 50% were identified with psoriasiform dermatitis, which included psoriasis vulgaris, chronic plaque psoriasis, plantar psoriasis, pustular psoriasis, guttate psoriasis, parapsoriasis, erythrodermal psoriasis, and rupioid psoriasis.

The average age of patients in the Psoriasis Vulgaris group was 34.33 years, whereas the average age in the Psoriasiform Dermatitis group was 35.50 years. The ages of patients in the Psoriasis Vulgaris group ranged from 16 to 63 years, while those in the Psoriasiform Dermatitis group ranged from 10 to 64 years. In the Psoriasis Vulgaris group, 58.3% of the diagnosed participants were male, while 41.7% were female. In contrast, 75.0% of the participants in the Psoriasiform Dermatitis group were male, and 25.0% were female.

In terms of immunohistochemical markers, 33.3% of participants in the Psoriasis Vulgaris group exhibited positivity for the marker Ki67, while 66.7% showed negative results. Conversely, 41.7% of participants in the Psoriasiform Dermatitis group tested positive for Ki67, with 58.3% showing negative findings.

Regarding the immunohistochemical marker p53, 83.3% of participants in the Psoriasis Vulgaris group demonstrated positivity, while 16.7% had negative results. Similarly, 83.3% of participants in the Psoriasiform Dermatitis group showed positivity for p53, with 16.7% exhibiting negative findings.

83.3% of the individuals diagnosed with Psoriasis Vulgaris exhibited positive results for CyclinD1. Conversely, 16.7% of the participants in Psoriasis Vulgaris displayed negative results for CyclinD1. In contrast, 75.0% of the individuals with Psoriasiform Dermatitis showed positivity for CyclinD1, while 25.0% of the participants in Psoriasiform Dermatitis had negative results for CyclinD1.
Furthermore, 75.0% of the participants in Psoriasis Vulgaris cases demonstrated positivity for VEGF, whereas 25.0% of the Psoriasis Vulgaris cases showed negative findings for VEGF. Additionally, 41.7% of the cases of Psoriasiform Dermatitis exhibited positivity for VEGF, while 58.3% of the participants in Psoriasiform Dermatitis showed negativity for VEGF.

CONCLUSION

The present study showed that Ki67, p53, and cyclinD1 aid in confirming the clinically and histopathologically diagnosed psoriasiform dermatitis cases. VEGF immunostaining shows a significantly more expressed vascular proliferation in psoriasis vulgaris patients, and can be helpful as immune marker for differentiating psoriasis vulgaris and psoriasiform dermatoses group.

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