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DIAGNOSTIC CONCORDANCE IN HYPERPIGMENTED SKIN LESIONS: A CLINICOPATHOLOGICAL PERSPECTIVE

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ABSTRACT

Background: Hyperpigmented skin lesions comprise a heterogeneous group of inflammatory, melanocytic, and epidermal disorders with overlapping clinical appearances. Histopathological examination is often required for definitive classification. Objectives: To describe the histopathological spectrum of hyperpigmented sk in lesions and assess clinicopathological concordance.

Materials and Methods: This hospital-based cross-sectional descriptive study was conducted in the Department of Pathology, Saveetha Medical College and Hospital, from January 2023 to January 2024. Fifty clinically diagnosed pigmented skin lesions from patients of all age groups were evaluated. Formalin-fixed, paraffin-embedded sections stained with hematoxylin and eosin were examined, and special stains were used when indicated. Clinical diagnosis, histological type, age, sex, and anatomical location were recorded.

Results: The largest proportion of patients belonged to the 21–30-year age group (28%), with a slight female predominance (male:female ratio approximately 1:1.1). Lichen planus, seborrheic keratosis, and psoriasis vulgaris each accounted for 20% of cases. Lichen planus pigmentosus, epidermal nevus, and Becker nevus each constituted 10%, while post-inflammatory dermatosis and intradermal nevus each accounted for 4%; dermatofibroma represented 2%. The most frequent histological findings were elongation of rete ridges and perivascular inflammatory infiltrates. Clinicopathological concordance was observed in 70% of cases.

Conclusion: Histopathology provides essential diagnostic clarification in clinically overlapping hyperpigmented lesions. Adequate clinical information combined with systematic microscopic evaluation improves diagnostic concordance.

KEYWORDS: hyperpigmentation; pigmented skin lesions; histopathology; clinicopathological correlation; lichen planus

INTRODUCTION

Hyperpigmented skin lesions encompass a broad spectrum of dermatological disorders, ranging from benign inflammatory and epidermal conditions to melanocytic proliferations and, less commonly, potentially malignant neoplasms. Although many lesions can be clinically suspected from their morphology and distribution, considerable overlap exists in colour, surface characteristics, and anatomical presentation.

Histopathological examination remains an important diagnostic tool in such cases because it allows assessment of epidermal architecture, basal-layer pigmentation, pigment incontinence, inflammatory patterns, melanocytic proliferation, and lesion-specific structures such as horn cysts. Correlation with clinical findings is essential, as the same microscopic feature may occur in more than one disease and the final diagnosis often depends on integrated interpretation.

The present study was undertaken to determine the distribution of histopathological diagnoses among patients presenting with hyperpigmented skin lesions and to evaluate the degree of agreement between clinical and histopathological diagnoses.

MATERIALS AND METHODS

Study design and setting: A hospital-based cross-sectional descriptive study was conducted in the Department of Pathology, Saveetha Medical College and Hospital, over one year from January 2023 to January 2024.

Study population: A total of 50 patients of all age groups with clinically identified pigmented skin lesions and subsequent histopathological evaluation were included. Lesions were analysed according to histological type, anatomical location, age, sex, and available clinical details.

Specimen processing: Skin-biopsy specimens were fixed in formalin, processed routinely, embedded in paraffin, sectioned, and stained with hematoxylin and eosin. Special stains were performed whenever considered necessary.

Eligibility: Cases with adequate clinical details and representative biopsy material were included. The poster source states that inflammatory, infectious, metabolic, and endocrine lesions were excluded; however, inflammatory dermatoses were represented in the reported results. For manuscript submission, the original case-selection criteria should therefore be verified against the study records and ethics-approved protocol.

Data analysis: Findings were summarized using frequencies and percentages. Clinicopathological concordance was calculated as the proportion of cases in which the clinical and histopathological diagnoses agreed.

RESULTS

Among the 50 cases, the 21–30-year age group constituted the largest proportion (28%). A slight female predominance was observed, with a reported male-to-female ratio of approximately 1:1.1.

Lichen planus, seborrheic keratosis, and psoriasis vulgaris were the most frequent clinical diagnostic categories, each comprising 10 cases (20%). Lichen planus pigmentosus, epidermal nevus, and Becker nevus each accounted for five cases (10%). Post-inflammatory dermatosis and intradermal nevus each represented two cases (4%), while dermatofibroma was identified in one case (2%).

Table 1. Distribution of clinical diagnoses (n=50)

Clinical diagnosis	Number of cases	Percentage
Post-inflammatory dermatosis	2	4%
Lichen planus pigmentosus	5	10%
Intradermal nevus	2	4%
Seborrheic keratosis	10	20%
Lichen planus	10	20%
Psoriasis vulgaris	10	20%
Epidermal nevus	5	10%
Becker nevus	5	10%
Dermatofibroma	1	2%
Total	50	100%

The common microscopic findings were elongation of rete ridges and perivascular inflammatory infiltrates. Pigment incontinence was recorded in lichen planus, lichen planus pigmentosus, and post-inflammatory dermatosis. Horn cysts and pseudohorn cysts were characteristic of seborrheic keratosis, while increased basal pigmentation was documented in Becker nevus, intradermal nevus, and epidermal nevus. Papillomatosis was observed in seborrheic keratosis and epidermal nevus.

Table 2. Selected histopathological findings reported in the poster

Histopathological finding	LP	LPP	BN	SK	PID	IN	EN
Pigment incontinence	5	5	—	—	2	—	—
Elongation of rete ridges	10	—	4	8	2	2	4
Perivascular inflammatory infiltrate	10	5	3	—	2	2	4
Horn cysts/pseudohorn cysts	—	—	—	10	—	—	—
Increased basal pigmentation	—	—	4	—	—	2	4
Papillomatosis	—	—	—	5	—	—	3

Abbreviations: LP, lichen planus; LPP, lichen planus pigmentosus; BN, Becker nevus; SK, seborrheic keratosis; PID, post-inflammatory dermatosis; IN, intradermal nevus; EN, epidermal nevus.

Overall clinicopathological concordance was reported in 70% of cases, indicating that histopathological evaluation altered or refined the diagnosis in approximately 30%.

DISCUSSION

The present hospital-based study demonstrates the heterogeneity of hyperpigmented skin lesions encountered in routine dermatopathology. The peak frequency in the 21–30-year age group and the slight female predominance suggest that pigmentary disorders represent an important diagnostic concern among young adults, in whom lesions occurring over visible sites may also have considerable psychosocial impact. Age and sex distributions vary among published series because the case mix depends on referral patterns, geographic setting, inclusion of neoplastic lesions, and whether the study is restricted to acquired hyperpigmentary disorders.

Lichen planus, seborrheic keratosis, and psoriasis vulgaris were the largest diagnostic groups in the present series, each accounting for 20% of cases. This distribution is broadly comparable to Indian studies in which lichen planus and its variants formed a major proportion of inflammatory pigmented lesions. Rajendra Prasad et al. evaluated 88 pigmented lesions and reported lichen planus as the most frequent inflammatory diagnosis, while benign melanocytic nevi and seborrheic keratosis predominated among benign lesions [6]. In another prospective series of 80 patients, inflammatory lesions constituted 42.5% and classical lichen planus was the leading inflammatory condition [7]. The relative frequencies nevertheless differ from the current study because those reports included malignant melanocytic and keratinocytic neoplasms, whereas the present series was dominated by benign and inflammatory conditions.

The commonest microscopic findings in this study were elongation of rete ridges and superficial perivascular inflammatory infiltrates. These changes are shared by several disorders and illustrate why isolated microscopic features must be interpreted as a pattern. In lichen planus, irregular acanthosis with saw-toothed rete ridges, wedge-shaped hypergranulosis, basal vacuolar degeneration, Civatte bodies, and a band-like lymphocytic infiltrate support the diagnosis. Pigment incontinence results from basal keratinocyte injury and transfer of melanin to dermal macrophages. The presence of pigment incontinence in all evaluated cases of lichen planus pigmentosus is consistent with published clinicopathological studies describing basal-cell degeneration, dermal melanophages, and variable lichenoid or perivascular inflammation as central features of this entity [8,9].

Lichen planus pigmentosus is particularly relevant in the Indian population because its grey-brown macules and patches may overlap clinically with erythema dyschromicum perstans, post-inflammatory hyperpigmentation, drug-induced pigmentation, and other facial melanoses. Histology is useful not merely for confirmation but for excluding disorders with different therapeutic implications. Patel et al. emphasized that acquired hyperpigmentary conditions frequently show substantial clinical overlap and that diagnosis depends on correlating the level and pattern of pigment deposition with epidermal injury, dermal inflammation, adnexal changes, and the clinical distribution of lesions [10]. Thus, the combination of pigment incontinence, melanophages, interface change, and a compatible clinical pattern is more meaningful than any single finding.

Seborrheic keratosis accounted for 20% of the present cases. The identification of horn cysts and pseudohorn cysts in all seborrheic keratoses and papillomatosis in a proportion of cases represents a characteristic histological combination. Acanthosis, papillomatosis, hyperkeratosis, and keratin-filled invaginations produce the typical architecture, while increased basal melanin may impart a clinically dark appearance. Histological examination is particularly valuable in heavily pigmented, irritated, clonal, or atypical lesions because seborrheic keratosis may clinically resemble melanocytic nevus, pigmented basal-cell carcinoma, or melanoma. A clinicopathological and dermoscopic study by Alapatt et al. similarly demonstrated that histological variants of seborrheic keratosis can show different surface and pigment patterns, reinforcing the need for microscopic evaluation in clinically uncertain lesions [11].

Increased basal pigmentation was documented in Becker nevus, intradermal nevus, and epidermal nevus, but the final diagnosis in these lesions depends on associated architectural features. Becker nevus typically shows epidermal acanthosis, elongation and fusion of rete ridges, basal hyperpigmentation, and often increased smooth-muscle bundles or hair follicles in the dermis. Epidermal nevus is characterized by hyperkeratosis, papillomatosis, acanthosis, and elongated rete ridges. Intradermal nevus, in contrast, requires identification of dermal nests and cords of nevomelanocytes with maturation at increasing depth. These examples highlight the limitation of describing a lesion only as 'hyperpigmented'; the diagnostic process must determine whether pigmentation is secondary to epidermal proliferation, melanocytic proliferation, interface injury, inflammation, or dermal pigment deposition.

Clinicopathological concordance was 70% in the present study. This is lower than the 85% concordance reported in the 88-case study by Rajendra Prasad et al. and the 90% positive correlation described in the 80-case prospective series [6,7]. Differences may reflect the spectrum of lesions, clinical expertise, biopsy-site selection, lesion stage, and the level of diagnostic specificity used to define agreement. A 70% concordance still indicates that clinical diagnosis was accurate in most patients; however, the remaining 30% represents a substantial group in whom histopathology corrected, refined, or redirected the diagnosis. This finding supports biopsy in atypical lesions, lesions with discordant clinical features, persistent or treatment-resistant pigmentation, and conditions in which exclusion of a neoplasm is necessary.

Optimal clinicopathological correlation begins before microscopy. The requisition form should document the duration and evolution of pigmentation, symptoms, distribution, exposure to drugs or topical agents, preceding inflammation, systemic disease, and the clinical differential diagnosis. Biopsy from a representative active edge is preferable in interface dermatoses, while adequate depth is required for melanocytic lesions and lesions with adnexal or dermal components. Special stains such as Fontana-Masson or melanin bleach can be useful in selected cases, although routine hematoxylin and eosin morphology remains the cornerstone. Dermoscopy may further improve selection of the biopsy site and allow correlation between surface structures and the underlying histological pattern.

The study has several limitations. The sample size was limited to 50 cases from a single centre, and the available poster data did not provide lesion-wise concordance, anatomical distribution, duration of symptoms, or statistical comparison among diagnostic groups. Complete microscopic data were not reported for psoriasis vulgaris and dermatofibroma. The exclusion criteria in the original poster also require verification because inflammatory lesions were included in the final diagnostic spectrum. Future studies should use a clearly predefined classification, record dermoscopic findings, calculate lesion-specific sensitivity and concordance, and include follow-up where the diagnosis or treatment response remains uncertain. Despite these limitations, the study demonstrates the practical contribution of histopathology to the evaluation of clinically overlapping pigmented lesions.

From a practical diagnostic perspective, a pattern-based approach may improve reproducibility. The first step is to determine whether pigmentation is predominantly epidermal, dermal, or mixed. Epidermal pigmentation is usually associated with increased basal melanin and may accompany epidermal hyperplasia, as in seborrheic keratosis, epidermal nevus, and Becker nevus. Dermal pigmentation is suggested by pigment-laden macrophages and is commonly secondary to interface damage, as in lichen planus pigmentosus and post-inflammatory dermatosis. A mixed pattern may occur when basal hypermelanosis coexists with pigment incontinence. The second step is to assess epidermal architecture, including hyperkeratosis, parakeratosis, acanthosis, papillomatosis, and the shape of rete ridges. The third step is to characterize the inflammatory reaction as lichenoid, perivascular, perifollicular, or diffuse. Finally, the pathologist should actively search for lesion-specific clues such as Civatte bodies, horn cysts, nevomelanocytic maturation, dermal fibrosis, increased smooth muscle, or atypia.

The clinical implications of accurate classification extend beyond nomenclature. Lichenoid and post-inflammatory disorders may require identification and removal of triggers, photoprotection, anti-inflammatory therapy, or systemic evaluation. Epidermal proliferations such as seborrheic keratosis are usually benign, but an atypical clinical appearance may necessitate exclusion of melanoma or pigmented basal-cell carcinoma. Melanocytic lesions require assessment of symmetry, maturation, circumscription, cytological atypia, mitotic activity, and the relationship between epidermal and dermal components. Therefore, a biopsy report should ideally provide a specific diagnosis, describe any limiting factors such as superficial sampling, and recommend clinical correlation or complete excision when the lesion cannot be fully evaluated in a partial specimen.

The 70% concordance observed in this study also highlights the value of multidisciplinary communication. Dermatologists contribute the morphology, distribution, temporal evolution, dermoscopic pattern, and therapeutic history, while pathologists identify the microscopic reaction pattern and specific tissue changes. Discordance should prompt review of the clinical photograph, reassessment of the biopsy site, deeper sections, special stains, or repeat biopsy when necessary. A structured clinicopathological conference for diagnostically difficult cases may reduce nonspecific labels such as 'post-inflammatory pigmentation' and improve the recognition of early or subtle interface disorders. Incorporating these practices into future prospective studies could improve both diagnostic accuracy.

Integrated Diagnostic Approach and Future Directions

A structured diagnostic pathway can reduce ambiguity when evaluating hyperpigmented lesions. The initial clinical assessment should document whether the pigmentation is localized or generalized, symmetrical or asymmetrical, congenital or acquired, and stable or progressive. Surface texture, border regularity, colour uniformity, symptoms, distribution, and exposure to medications, cosmetics, ultraviolet radiation, friction, or preceding inflammation should also be recorded. These observations help separate predominantly inflammatory disorders from epidermal proliferations and melanocytic lesions. Nevertheless, visual assessment alone may be misleading because brown, grey, blue-black, and violaceous colours can arise from different combinations of epidermal melanin, dermal melanophages, vascular alteration, keratin accumulation, or increased melanocyte density.

Microscopic interpretation is most reliable when performed in a fixed sequence. First, the level of pigmentation should be identified as epidermal, dermal, or mixed. Second, the epidermal reaction pattern should be assessed for hyperkeratosis, parakeratosis, acanthosis, papillomatosis, spongiosis, interface change, or epidermal atrophy. Third, the inflammatory infiltrate should be classified according to its density and distribution, including lichenoid, superficial perivascular, perifollicular, or diffuse patterns. Finally, the pathologist should search for lesion-defining features such as horn cysts, pseudohorn cysts, Civatte bodies, basal vacuolar degeneration, nevomelanocytic nests with maturation, dermal fibrosis, increased smooth-muscle bundles, or cytological atypia. This stepwise approach is particularly useful in small punch biopsies, in which only part of the lesion is represented.

Dermoscopy can provide an additional bridge between gross morphology and histopathology. Dermoscopic colours and structures reflect specific tissue changes; for example, brown pigmentation generally corresponds to melanin within the epidermis, whereas grey or blue-grey dots and globules often indicate dermal pigment incontinence and melanophages. Keratin-filled openings and comedo-like structures may support seborrheic keratosis, while pigment networks and globular patterns require correlation with the distribution of melanocytes and nevomelanocytic nests. Exact dermoscopic-pathological correlation improves interpretation because similar surface patterns may have different microscopic substrates [14]. Recent reports in lichen planus pigmentosus have also shown that dotted, globular, reticular, and perifollicular pigment patterns can be correlated with basal damage and dermal melanophages, supporting dermoscopy as a useful method for selecting a representative biopsy site [15].

The differential diagnosis of lichen planus pigmentosus deserves particular attention in patients with skin of colour. The disorder can overlap with ashy dermatosis, post-inflammatory hyperpigmentation, pigmented contact dermatitis, drug-induced pigmentation, and facial melanoses. Histological findings may vary with disease stage: early lesions may show more conspicuous interface inflammation and basal-cell injury, whereas older lesions may be dominated by melanophages with relatively sparse inflammation. Therefore, a nearly inactive biopsy does not exclude a previously active lichenoid process. Reviews of lichen planus pigmentosus emphasize that clinicopathological interpretation should incorporate the anatomical distribution, colour, progression, associated follicular changes, and potential triggers rather than relying on pigment incontinence alone [12].

Seborrheic keratosis similarly illustrates the importance of integrated assessment. Although it is a benign epidermal tumour, its clinical appearance ranges from lightly pigmented macules to dark, verrucous plaques and may mimic melanocytic nevus, pigmented basal-cell carcinoma, actinic keratosis, or melanoma. Histology usually demonstrates a sharply circumscribed epidermal proliferation composed predominantly of basaloid keratinocytes, with variable acanthosis, papillomatosis, hyperkeratosis, and horn cyst formation. Contemporary reviews describe several clinicopathological variants and stress that irritation, clonal change, heavy pigmentation, or partial sampling may complicate diagnosis [13]. Lesions with asymmetry, ulceration, rapid enlargement, marked cytological atypia, or an unusual dermoscopic pattern should therefore be sampled adequately to exclude an associated malignancy.

Future prospective studies should combine standardized clinical photography, dermoscopy, lesion-site mapping, and predefined histopathological criteria. Concordance should be analysed separately for each diagnostic group rather than only as an overall percentage. Recording the provisional clinical differential diagnosis would also permit calculation of complete agreement, partial agreement, and major diagnostic disagreement. Digital slide review and multidisciplinary consensus assessment may further improve reproducibility. In addition, follow-up information should be obtained for discordant cases to determine whether histopathological reclassification altered treatment or clinical outcome. Such an

approach would transform clinicopathological concordance from a descriptive statistic into a measurable indicator of diagnostic utility and patient-care impact.

CONCLUSION

The present study demonstrates that hyperpigmented skin lesions constitute a broad and diagnostically diverse group of disorders in which similar clinical appearances may represent distinctly different inflammatory, epidermal, or melanocytic processes. Lichen planus, seborrheic keratosis, and psoriasis vulgaris were the most frequently encountered diagnoses, while elongation of rete ridges, perivascular inflammatory infiltrates, pigment incontinence, basal-layer hyperpigmentation, papillomatosis, and horn cysts formed the principal microscopic findings. The observed clinicopathological concordance of 70% indicates that clinical assessment alone was sufficient in a substantial proportion of cases; however, histopathological examination altered, refined, or confirmed the diagnosis in the remaining cases. This finding is clinically important because inappropriate classification of a pigmented lesion may delay suitable treatment or fail to identify a lesion requiring closer evaluation.

Accurate diagnosis is best achieved through systematic integration of lesion morphology, distribution, duration, symptoms, dermoscopic findings, biopsy-site selection, and microscopic reaction patterns. A pattern-based histological approach—beginning with localization of pigment to the epidermis, dermis, or both, followed by assessment of epidermal architecture, inflammatory distribution, melanocytic proliferation, and lesion-specific clues—can improve diagnostic reproducibility. Histopathology therefore remains an essential component in the evaluation of clinically atypical, persistent, progressive, treatment-resistant, or diagnostically discordant hyperpigmented lesions. Future prospective studies with larger sample sizes, standardized clinicodermoscopic documentation, lesion-wise concordance analysis, and follow-up of discordant cases may provide a more precise estimate of diagnostic utility and further strengthen multidisciplinary dermatopathological practice.

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