



Original Article

Histopathology audit of pigmented skin lesions at a tertiary care hospital in rural Bangalore, South India

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Pigmented Nevi

ABSTRACT

Background: Pigmented skin lesions are a frequently encountered skin lesion in routine dermatological practice. About 90% of them are benign, and a small percentage are malignant. Clinically, many of these lesions can mimic melanocytic tumours, including malignant melanoma, creating diagnostic challenges. The present study was undertaken to evaluate the histopathological spectrum of pigmented skin lesions and their clinicopathological correlation in rural population of South India.

Materials and Methods: This hospital-based, cross-sectional study was conducted in the Department of Pathology at a tertiary care hospital in rural Bangalore over a period of 4 years, January 2021 to January 2025, after prior ethical approval. A total of 119 cases of pigmented skin lesions were included using convenience sampling. Descriptive analysis was done.

Results: Out of the 119 pigmented skin lesions, 66(55.46%) cases were melanocytic, and 53(44.5%) were non-melanocytic. Malignant melanoma accounted for 7(5.8%) cases among melanocytic lesions, while pigmented basal cell carcinoma constituted 10(8.4%) cases among non-melanocytic lesions. A female preponderance was observed, with the most affected age group being 21–40 years. The head and neck region was the most frequently involved site, 73(61.34%) cases. Clinicopathological correlation was observed in 87(73.1%) cases, while 32(26.89%) cases showed discordance.

Conclusion: Benign melanocytic nevi constituted the majority of lesions, while malignant melanoma and pigmented basal cell carcinoma represented the most common malignant counterparts. The observed clinicopathological discordance highlights the limitations of clinical assessment alone and highlights the role of histopathological examination in establishing accurate diagnosis.

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INTRODUCTION

The skin is the largest organ of the human body, functioning as an interface between the external environment and the internal organs and providing protection against various external insults.¹ Pigmentation abnormalities result from altered melanin synthesis, impaired melanosome transfer, or abnormal migration of melanocytes during embryogenesis.² Pigmented skin lesions, therefore, represent a wide range of conditions, varying from benign lesions to those with malignant potential.

While benign melanocytic nevi are commonly encountered in routine practice, a proportion of pigmented lesions may be malignant, making accurate diagnosis essential. Clinical distinction between melanocytic and non-melanocytic lesions is often difficult because of overlapping features, and histopathological examination remains the definitive diagnostic modality.³ This difficulty is further increased by the histological continuum between clearly benign and overtly malignant lesions, particularly within the diagnostic grey zone.⁴

The present study was undertaken to evaluate and analyse the histopathological spectrum of pigmented skin lesions, their anatomical site predilection, and their clinicopathological correlation, encountered at our tertiary care hospital.

MATERIALS AND METHODS

This is a hospital-based cross-sectional study of pigmented skin lesions carried out in the Department of Pathology at a rural tertiary care centre. Patients of all age groups presenting clinically with pigmented skin lesions to the Department of Dermatology were included. After written informed consent, skin biopsies were taken irrespective of the site of the lesion.

The study was conducted over the period of four years from January 2021 to January 2025. Prior ethical approval from the Institutional Ethical Committee was taken (Ref no. MVJMC&RH/PG/Synopsis/072/2020-21). A total of 119 cases of pigmented skin lesions were studied.

The biopsy sample collected from skin lesions that were diagnosed clinically was promptly dispatched to the histopathology laboratory in 10% formalin. Information regarding patient name, age, sex, biopsy site, biopsy number, and gross characteristic features of the lesions (including size, shape, surface features, border, colour changes, and presence of any secondary changes) was documented. The specimen was placed in 10% neutral buffered formalin for 12 to 24 hours. Paraffin wax blocks were made using the Medimeas Embedding system, and thin sections measuring 3-4 micrometres were stained with H&E stain for histological examination under a microscope. Special stains like Fontana-Masson stain, PAS stain, and Perl's Prussian Blue were performed when deemed necessary for diagnostic clarification.

All the neoplastic and non-neoplastic pigmented skin lesions from all age groups and both genders were included in the study. Inadequate biopsy specimens, specimens received in poorly preserved or autolysed state, and skin biopsies other than pigmented lesions were excluded from this study. Statistical analysis was performed using IBM-SPSS 27 trial version.

RESULTS

A total of 119 cases of pigmented skin lesions were analysed in the present study. These were broadly categorized into melanocytic lesions, 66 (55.46%) cases, and non-melanocytic lesions, 53 (44.5%) cases. Among melanocytic lesions, 59 (49.57%) cases were benign melanocytic nevi, and 7

(5.8%) were malignant melanoma. Among the 53 (44.5%) cases of non-melanocytic lesions, 17 (14.28%) cases were of seborrheic keratosis, 10 (8.4%) cases were of pigmented Basal cell carcinoma (BCC), 9 (7.56%) cases of lichen planus pigmentosa, 6 (5.04%) cases of lichen simplex chronicus, 4 (3.36%) cases of nevus sebaceous, 2 (1.68%) cases of actinic keratosis and post-inflammatory pigmentation each, 1 (0.84%) case of molluscum contagiosum, squamous cell carcinoma (SCC) and metastatic deposit of transitional cell carcinoma bladder each were encountered.

There were 40 males and 79 females, yielding a male-to-female ratio of 1:2 (Table 1). Benign lesions were more commonly seen in females, while a higher number of malignant lesions were observed in males. The age range of the patients was 9 to 80 years. Benign lesions were predominantly seen in the 1st to 4th decades of life, with the highest number reported in the 3rd decade, 30 (25.2%) cases (Table 2).

Table 1: Distribution of Melanocytic and Non-melanocytic skin lesions based on their histopathology and sex ratio

S.No.	Type of lesion	Males	Females	Total
Melanocytic lesions				
1	Junctional nevus	1	2	3
2	Intra-dermal nevus	6	27	33
3	Compound nevus	3	16	19
4	Common blue nevus	1	1	2
5	Congenital nevus	-	2	2
6	Malignant melanoma	5	2	7
Non-Melanocytic lesions				
7	Seborrheic keratosis	8	9	17
8	Lichen planus pigmentosus	2	7	9
9	Actinic keratosis	2	0	2
10	Nevus sebaceous	2	2	4
11	Lichen simplex chronicus	1	5	6
12	Post-inflammatory pigmentation	0	2	2
13	Molluscum contagiosum	1	0	1
14	Pigmented Basal cell carcinoma	6	4	10
15	Squamous cell carcinoma	1	0	1
16	Metastatic Transitional cell carcinoma Bladder	1	0	1
Total		40	79	119

Table 2: Distribution of pigmented skin lesions among different age groups

Age Group	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	Total
Seborrheic keratosis	-	-	1	1	1	10	4	-	17
Lichen planus pigmentosus	-	-	-	1	4	4	-	-	9
Actinic keratosis	-	-	-	-	2	-	-	-	2
Nevus sebaceous	1	3	-	-	-	-	-	-	4
Lichen simplex chronicus	-	1	2	3	-	-	-	-	6
Intradermal nevus	-	3	13	12	1	3	1	-	33
Junctional nevus	-	1	2	-	-	-	-	-	3
Compound nevus	-	2	12	3	1	1	-	-	19
Common blue nevus	-	1	1	-	-	-	-	-	2
Congenital nevus	1	1	-	-	-	-	-	-	2
Post-inflammatory pigmentation	-	-	1	1	-	-	-	-	2
Molluscum contagiosum	-	1	-	-	-	-	-	-	1
Malignant Melanoma	-	-	-	-	-	2	5	-	7
Pigmented Basal cell carcinoma	-	-	-	-	1	3	5	1	10
Squamous cell carcinoma	-	-	-	-	-	-	1	-	1
Metastatic Transitional cell carcinoma bladder	-	-	-	-	-	-	-	1	1
Total									119

Malignant lesions 19 (15.9%), were more frequent in the 5th to 7th decades, with a peak in the 6th decade. Anatomically, the head and neck regions were the most frequently involved site, 73 (61.3%), followed by the trunk, 19 (15.9%), and the upper limb with 11 (9.2%) cases. The least affected site was

the chest wall with 3 (2.5%) cases (Table 3).

Clinicopathological correlation was observed in 87 (73.1%) cases, whereas 32 (26.9%) showed discordance between clinical and histopathological diagnosis (Table 4).

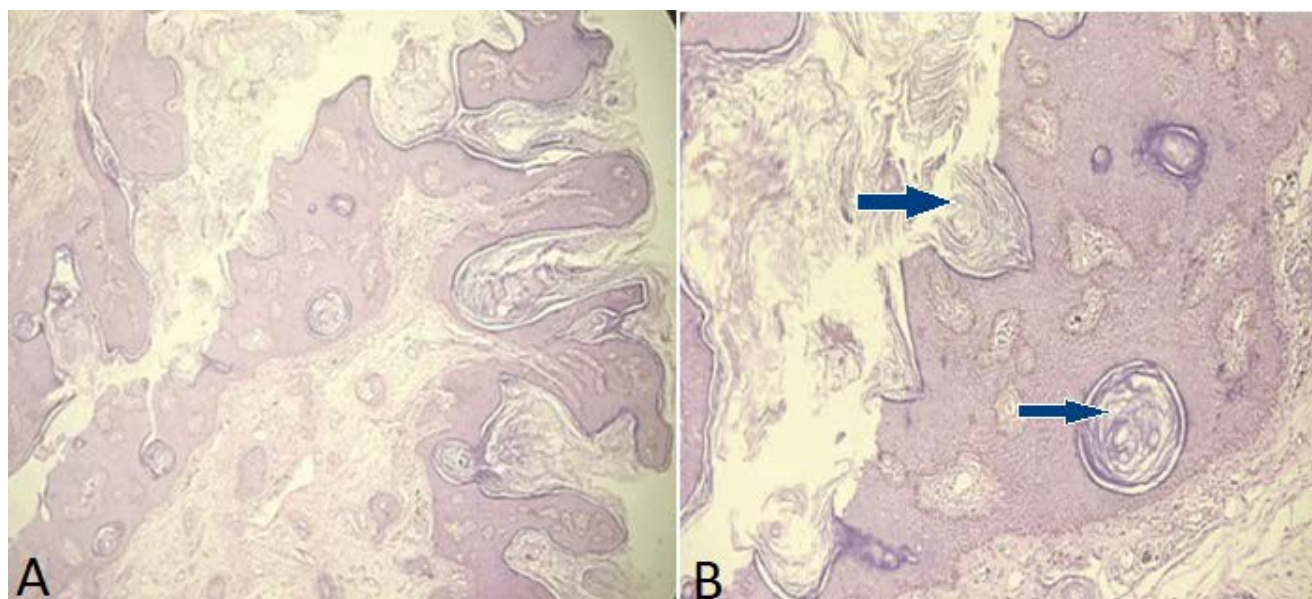


Figure 1: Seborrheic Keratosis. A) Epidermis shows hyperkeratosis, acanthosis and papillomatosis [HE stain, 10x]; B) Hyperkeratotic with horn pseudocysts formation (blue arrow) [HE stain, 40x].

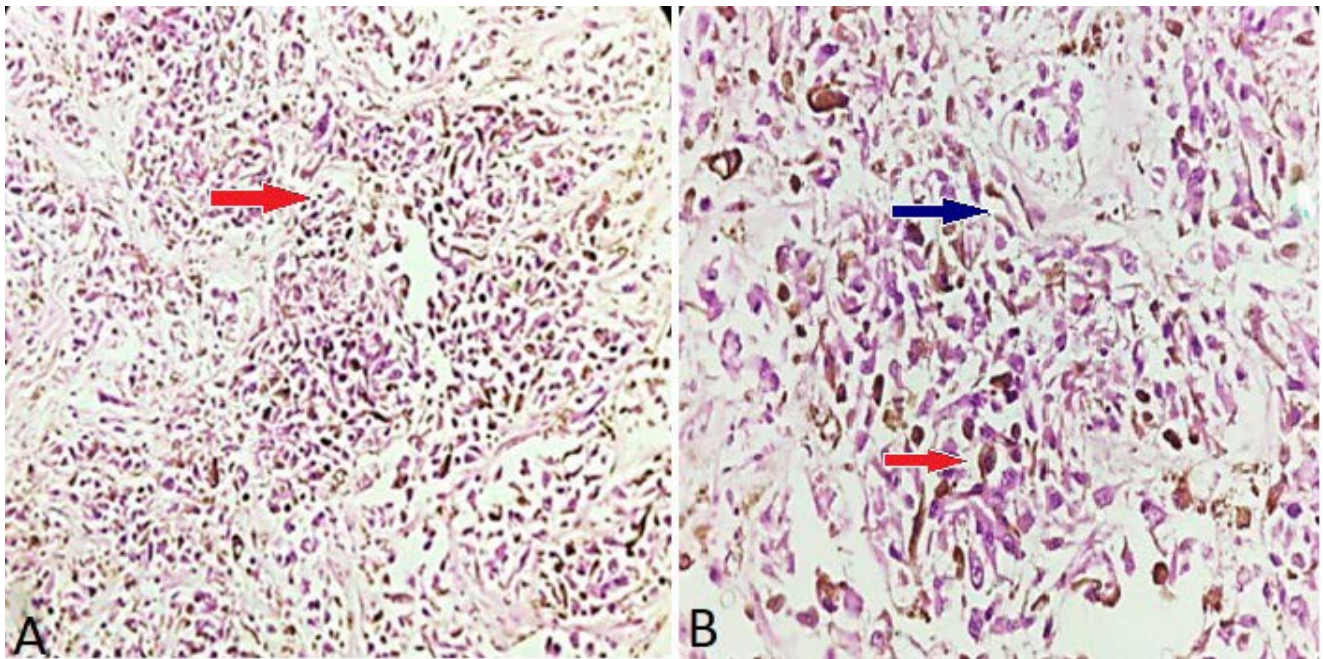


Figure 2: Malignant Melanoma. A) Tumour cells are arranged in nests (red arrow) separated by fibrous septae admixed with melanin pigment [HE stain, 100x]; B) Individual tumour cells are pleomorphic nuclei with prominent eosinophilic nucleoli (red arrow) with extracellular and intracellular melanin pigment (black arrow) [HE stain, 400x].

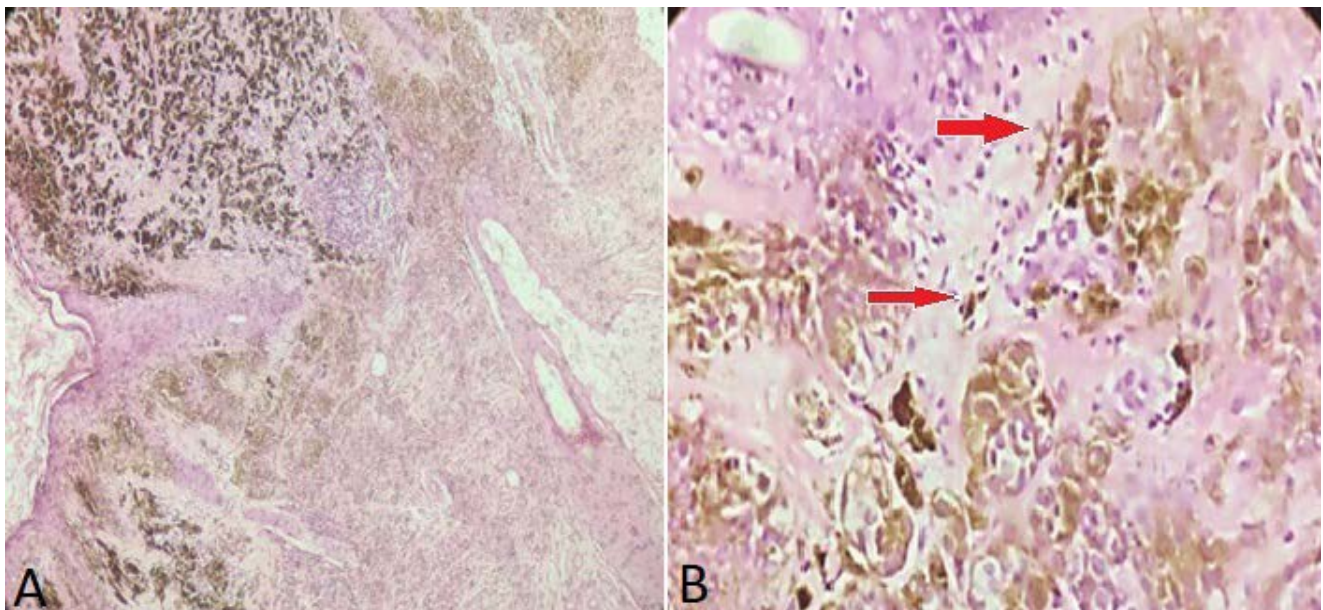


Figure 3: Compound Nevus. A) Melanocytic nests at the dermo-epidermal junction and in the dermis [HE stain, 40x]. B) Nested melanocytic proliferation of round to oval nests at dermo-epidermal junction (red arrow) [HE stain, 400x].

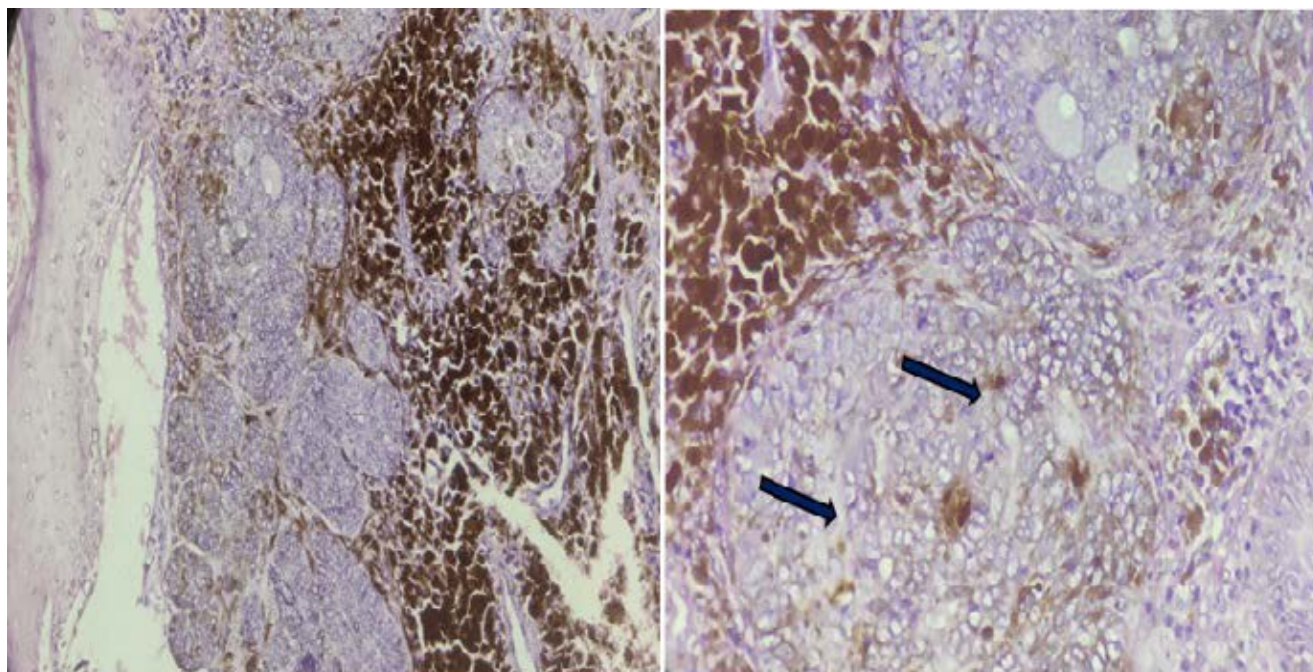


Figure 4: Pigmented Basal cell carcinoma. A) Basaloid cell lobules admixed with melanocytes [HE stain, 100x]. B) Basaloid cell lobules with peripheral nuclear palisading (blue arrow) along with melanin pigment [HE stain, 400x].

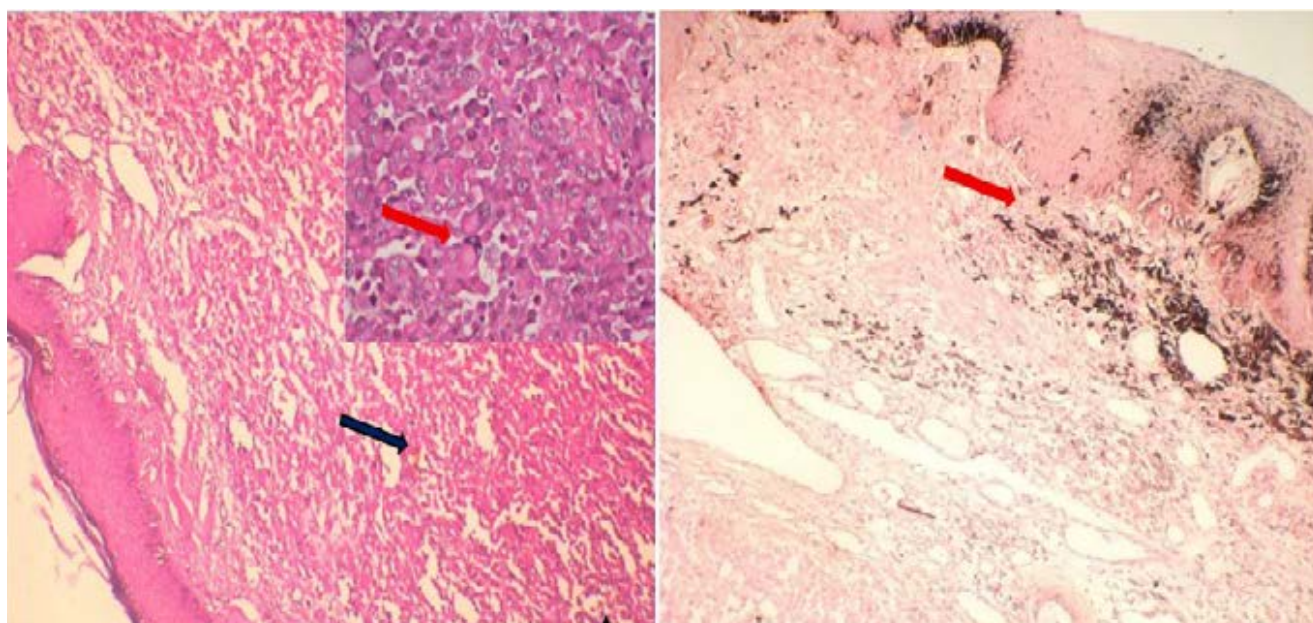


Figure 5: Malignant Melanoma (HE stain, 10x) rhabdoid variant. A) Tumour cells are arranged in nests (black arrow) [HE stain, 40x]. Inset: Higher magnification shows large polygonal cells with abundant eosinophilic cytoplasm and eccentric nucleus (red arrow); B) Melanin pigments

Table 3: Site-wise distribution of pigmented lesions

	SK	LPP	LSC	AK	NS	IN	JN	CPN	CBN	CN	MM	pBCC	PIP	MCM	SCC	Mets	TCC	%
Face	2	1	1	1	1	17		13	-	2	2	8	2		1	-		51
Neck	3	3	2	-	-	6	-	-	-	-	-	-	-	-	-	-		14
Upper Limb	1	2	-	-	-	2	1	3	-	-	2	-	-	-	-	-		11
Lower Limb	-	-	3	-	-	1	1	1	1	-	-	-	-	-	-	-		9
C h e s t 2 wall		-	-	-	-	1	-	-	-	-	-	-	-	-	-	-		3
Trunk	6	-	-	-	-	6	1	2	-	-	1	1		1		1		19
Scalp	1	-	-	1	3	1	-	-	1	-	-	1	-	-	-	-		8
U p p e r back		3	-	-	-	1	-	-	-	-	-	-	-	-	-	-		4
Total	17	9	6	2	4	33	3	19	2	2	7	10	2	1	1	1		119

SK: Seborrheic keratosis; LPP: Lichen planus pigmentosus; LS: Lichen simplex; AK: Actinic keratosis; NS: Nevus sebaceous; CPN: Compound nevus; CBN: Common blue nevus; CN: Congenital nevus; IN: Intradermal nevus; JN: Junctional nevus; MM: Malignant Melanoma; pBCC: Pigmented Basal Cell Carcinoma; MCM: Molluscum Contagiosum; PIP: Post-inflammatory Pigmentation; SCC: Squamous cell carcinoma; BCC: Basal cell carcinoma; TCC: Transitional cell carcinoma

Table 4: Clinical diagnosis and histopathological correlation of pigmented skin lesions

Sl.No.	Clinical Diagnosis	No. of cases	Histopathological Diagnosis	
			Concordance - n	Discordance - n
1	Seborrheic keratosis	21	14	7 3 -Malignant Melanoma 3 -Dermal Nevi 1 -pBCC
2	Lichen planus pigmentosus	9	7	2 2-Post-inflammatory Pigmentation
3	Lichen simplex Chronicus	7	6	1 1-Actinic Keratosis
4	Actinic keratosis	3	1	2 2- Lichen Planus pigmentosus
5.	Nevus sebaceous	4	4	-
6	Junctional Nevi	3	3	-
7	Intradermal nevi	27	23	4 3 - Compound Nevus 1-Molluscum Contagiosum
8	Compound nevus	23	16	7 7-Intra dermal nevus
9	Common blue nevus	2	2	-
10	Congenital nevus	1	1	-
11	Malignant melanoma	5	1	4 1- SCC 1 -Metastatic TCC Bladder 1 -Congenital Nevi 1 -Seborrheic Keratosis
12	Pigmented basal cell carcinoma	14	9	5 3 -Malignant Melanoma 2 -Seborrheic Keratosis
Total		119	87 (73.1%)	32 (26.9%)

DISCUSSION

Pigmented skin lesions are frequently encountered in dermatological practice and constitute a substantial proportion of specimens submitted for histopathological evaluation. The clinical imperative in many cases is to rule out malignant melanoma, owing to its aggressive behaviour, potential for metastasis, and the serious implications of delayed diagnosis. Histopathological examination remains the gold standard in distinguishing benign from malignant lesions and in identifying clinically deceptive mimickers of melanoma.

In the present study, of 119 cases of pigmented skin lesions, 66 (55.46%) were melanocytic, and 53 (44.5%) were non-melanocytic. The predominance of melanocytic lesions in our study is in comparison with Singh et al. (81.8%), Parvathi et al. (69.3%), and Suvernakar et al. (56.8%), reflecting a similar trend across different geographical regions (Table 5).^{2,3,5} Notably, 3.4% of clinically suspected melanomas were histologically benign, highlighting diagnostic challenges also emphasized by Crasta et al., who reported 7.4–30% clinical overdiagnosis of melanoma.⁶ This underscores the indispensable role of histopathological confirmation in suspected melanoma cases, particularly in resource-limited settings where access to advanced diagnostic tools may be restricted.

As per anatomical distribution, the head and neck region emerged as the most commonly involved site, with the face alone accounting for 51 (42.8%) cases, followed by the trunk and upper limb. The predominance of facial and head-and-neck lesions mirrors findings from studies by Suvernakar et al., Crasta et al., Arab K A et al., and Youl et al., and underscores the contribution of chronic ultraviolet exposure to the pathogenesis of pigmented skin lesions in sun-exposed areas.^{5,6,12,18}

Our study revealed a significant female predominance, yielding a male-to-female ratio of 1:2. Similar gender patterns were reported by Gupta I et al., and Jagannadham R P et al.^{7,8} This female preponderance may be attributed to a greater awareness of skin changes, cosmetic concerns, and earlier health-seeking behaviour among women, particularly in relation to pigmented lesions on cosmetically sensitive areas such as the face.

Among the Non-melanocytic lesions in our study, seborrheic keratosis was the most common lesion, followed by pigmented BCC and lichen planus pigmentosus. These results are consistent with the findings by Thapa S et al., suggesting a comparable pattern of lesion distribution in the Indian subcontinent.¹¹ Post-inflammatory pigmentation constituted 1.68% of cases, predominantly in females, similar to findings by Singh A et al., who had documented 5 (6.7%) cases.²

Among malignant non-melanocytic lesions, pigmented BCC constituted 8.4% of cases, while SCC and cutaneous metastasis of transitional cell carcinoma of bladder accounted for 0.84% each. Three cases (21.5%) clinically diagnosed as pigmented BCC were confirmed as malignant melanoma histologically, reflecting significant clinic-dermoscopic overlap. Similar diagnostic complexity has been reported by Singh A et al. and Suvernakar et al.^{2,5}

Benign melanocytic lesions were more common in younger individuals (1st – 4th decades), peaking in the third decade, with intradermal nevus being the most frequent subtype. Malignant melanoma comprised 7 (5.8%) cases, predominantly in the seventh decade, aligning with studies by Parvathi et al., Laishram R S et al., and Bohra et al., demonstrating an age-related increase in melanoma incidence.^{3,9,10}

The frequency of malignant lesions (15.9%) in our study was similar to that of Parvathi et al. (18.3%).³ Although variation exists across studies, Laishram R S et al. reported a lower frequency (2.8%), and Suvernakar et al. reported a higher rate (38.7%).^{5,9} Regardless of the frequency, the head and neck consistently emerged as the most common site of malignancy across all studies. Our findings related to pigmented BCC (8.4%) and malignant melanoma (5.8%) fall within the ranges reported in other Indian studies (Table 5). The observed clinicopathological correlation rate was 73.1%, with 26.89% of cases showing clinical-histological discordance, paralleling Parvathi et al.'s observations.³

When compared to international studies (Table 5), variations in the total number of cases and lesion frequencies are evident, likely due to differences in study populations, referral patterns, and inclusion criteria. Nonetheless, some similarities persist, such as the predominance of head and neck involvement and the age distribution of malignant lesions, with a peak incidence beyond the fifth decade. The percentage of malignant lesions was substantially higher in certain international studies (e.g. Arab K A et al.), possibly reflecting selection bias in tertiary oncology settings.^{11,12} In contrast, Youl et al.'s large-scale study reported a malignancy rate of 56.4%, with BCC accounting for 35.1% and malignant melanoma for 1.6% of all cases, figures consistent with a few international studies.¹⁸

Our clinicopathological concordance rate of 73.1% and discordance rate of 26.89% further emphasize the crucial role of histopathological examination in ensuring diagnostic accuracy. Compared to the 55% clinicopathological agreement reported by Ranabhat S et al. (Table 5), our study demonstrates a higher concordance rate, indicating comparatively better clinical diagnostic correlation in our cohort, while still reflecting the diagnostic challenges inherent to pigmented lesions.¹⁵

Table 5: Result correlation of various studies

Studies/No of cases	Arab K A et al. (111)	Youl et al. ¹⁸ (9650)	Ranabhat et al. ¹⁵ (80)	Suvernakar et al. ⁵ (44)	Patel et al. ¹⁴ (60)	Parvati et al. ³ (44)	Present Study (119)
Place of study	Saudi Arabia	Australia	Nepal	Northern India	Western India	Southern India	Southern India
M:F ratio	1:1.1	1:0.7	1:1.4	1:1.1	1:0.6	1:2	1:2
Most common site	Head & neck	Face	Face	Head & neck	Head & neck	Face	Head & neck
Benign melanocytic lesions – n(%)	-	4210 (43.7%)	67 (83.7%)	12(27.3%)	13(21.6%)	22(50%)	59(49.6%)
Benign non melanocytic lesions – n(%)	-	-	-	13(29.5%)	25(%)	14(31.7%)	41(34.5%)
Malignant melanocytic lesions – n(%)	18 (16.2%)	152 (1.6%)	-	5(11.4%)	-	2(4.6%)	7(5.8%)
Malignant non-melanocytic lesions – n(%)	93 (83.8%)	5288 (54.8%)	13 (16.3%)	12(27.3%)	8 (13.3%)	6(13.7%)	12 (10%)
Concordance – n(%)	-	-	44 (55%)	37 (84%)	-	32(72.7%)	87(73.1%)
Discordance – n(%)	-	-	36 (45%)	07(16%)	-	12(27.3%)	33(26.9%)

This was a single-centre, rural hospital-based study with a relatively small sample size, which may have limited the applicability of the findings to the wider population, and long-term follow-up data were not available.

CONCLUSIONS

Pigmented skin lesions pose a significant diagnostic challenge due to their overlapping clinical appearances, making clinical assessment alone unreliable in many cases. The histopathological spectrum and its distribution observed were largely comparable to those reported in Indian studies, with variations noted in certain other international studies. The study also highlights the importance of histopathological examination in accurately differentiating melanocytic from non-melanocytic lesions and in distinguishing benign lesions from their malignant counterparts. A degree of clinicopathological discordance was observed, highlighting that both benign and malignant lesions may clinically mimic one another. Therefore, correlating clinical findings with histopathological confirmation remains the gold standard in establishing an accurate diagnosis and guiding appropriate management of pigmented skin lesions for clinicians.

Conflict of interest: None.

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