International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 2, February 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.2.2025.196

ORIGINAL RESEARCH

Clinicopathological Correlation of Hyperpigmented Skin Lesions: A Prospective Study on Diagnostic Accuracy

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Received: 20 January, 2025 Accepted: 16 February, 2025 Published: 27 February, 2025

ABSTRACT

Background: Hyperpigmented skin lesions are a common dermatologic concern, necessitating accurate diagnosis for appropriate treatment. While clinical diagnosis is often challenging due to overlapping features, histopathological evaluation serves as a crucial tool for definitive diagnosis. This study aimed to assess the spectrum of hyperpigmented skin lesions, their demographic distribution, and the correlation between clinical and histopathological diagnoses.**Materials and Methods:** A prospective descriptive study was conducted in the Department of Pathology at Rajarajeswari Medical College and Hospital (RRMCH), Bengaluru, over two years (June 2015 – May 2017). A total of 100 skin biopsies from clinically diagnosed hyperpigmented lesions were included. The samples were fixed in 10% formalin, processed, and stained with hematoxylin and eosin. Histopathological findings were documented and compared with clinical diagnoses. **Results:** Among the 100 cases, **76% were non-neoplastic** and **24% were neoplastic lesions**. **Lichen planus and its variants** were the most common non-neoplastic lesions (51.31%), with classical lichen planus accounting for **28.94%**. Neoplastic lesions comprised **15 melanocytic (62.5%) and 9 non-melanocytic (37.5%) cases**. **Benign melanocytic nevi (54.1%)** were the predominant neoplastic lesion, followed by **seborrheic keratosis (33.33%)**. The lesions were more frequent in **females (54%)** than males (46%), with a **female-to-male ratio of 1.17:1**. The **third decade (21-30 years, 23%)** had the highest incidence. Extremities were the most affected site (**63.15% of non-neoplastic and 33.33% of neoplastic lesions**). Clinical and histopathological concordance was **94%**, while discordance was **6%**.**Conclusion:** Histopathological examination is essential for accurate diagnosis of hyperpigmented skin lesions, as clinical diagnosis alone may be insufficient due to overlapping features. Classical lichen planus was the most common non-neoplastic lesion, while benign melanocytic nevi were the predominant neoplastic lesion. The high clinicopathological concordance (94%) underscores the importance of histopathology in confirming clinical suspicions and guiding appropriate management.

Keywords: Hyperpigmented skin lesions, clinicopathological correlation, histopathology, lichen planus, melanocytic nevi, seborrheic keratosis, diagnostic accuracy.

INTRODUCTION

The skin, the body's largest organ, constitutes approximately 15% of total body weight in adults and plays a crucial role in protection, thermoregulation, and immune responses (1). Skin pigmentation results primarily from melanin, a stable, chemically inert pigment synthesized by melanocytes in the basal layer of the epidermis (2). Variations in skin pigmentation are influenced by genetic, environmental, and pathological factors (3).

Hyperpigmented skin lesions are among the most common reasons for dermatological consultations, encompassing a broad spectrum of disorders that range from benign conditions to malignant neoplasms (4). These lesions arise due to excessive melanin production or deposition in the epidermis or dermis, influenced by factors such as ultraviolet radiation, hormonal changes, inflammation, and drug reactions (5,6). Clinically, hyperpigmentation may present as localized or generalized lesions and can significantly

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impact a patient's psychological well-being and quality of life (7).

Accurate diagnosis of hyperpigmented lesions is crucial for appropriate management, but clinical differentiation is often challenging due to overlapping morphological features among various conditions (8). While dermatoscopy and other non-invasive techniques aid in evaluation, histopathological examination remains the gold standard for definitive diagnosis (9). Histopathological analysis provides critical insights into the etiology, depth of pigmentation, and cellular architecture of lesions, facilitating differentiation between inflammatory, non-neoplastic, and neoplastic conditions (10).

Several studies highlight the importance of clinicopathological correlation in diagnosing hyperpigmented skin lesions, emphasizing the need for biopsy-based evaluation in cases with ambiguous clinical presentations (11,12). The literature from South India regarding the histopathological spectrum of hyperpigmented lesions is limited, necessitating further research to establish region-specific patterns and diagnostic accuracy (13).

This study aims to evaluate the spectrum of hyperpigmented skin lesions, assess their demographic distribution, and analyze the correlation between clinical and histopathological diagnoses. By bridging this gap, the findings may contribute to improved diagnostic precision and better therapeutic outcomes in dermatological practice.

MATERIALS AND METHODS

Study Design and Setting

This was a **prospective descriptive study** conducted in the **Department of Pathology at Rajarajeswari Medical College and Hospital (RRMCH), Bengaluru, India**. The study was carried out over a period of **two years**, from **June 2015 to May 2017**.

Study Population

The study included **patients presenting with clinically diagnosed hyperpigmented skin lesions** who underwent skin biopsies at the **Department of Dermatology, RRMCH**. These biopsy specimens were subsequently sent to the **Department of Pathology** for histopathological evaluation.

Inclusion Criteria

- Patients of all age groups and genders with **clinically diagnosed hyperpigmented skin lesions**.
- Cases where **adequate biopsy specimens** were available for histopathological examination.

Exclusion Criteria

- Patients **unwilling to undergo skin biopsy**.
- **Inadequate or non-representative biopsy samples** that were unsuitable for histopathological evaluation.

Sample Size Determination

A total of **100 cases** were included in the study. The sample size was estimated based on a **retrospective review of biopsy records from June 2012 to May 2015**, during which **150 cases of hyperpigmented skin lesions** were documented at RRMCH, with an annual average of **50 cases**. Extrapolating from this data, **all biopsies received during the two-year study period (June 2015 – May 2017) were analyzed**, making a total of **100 cases**.

Method of Data Collection

- **Skin biopsies** were obtained from patients in the **Department of Dermatology**.
- The **biopsy specimens** were immediately fixed in **10% formalin** and transported to the **Department of Pathology** for processing.
- Routine **paraffin embedding and microtomy** were performed to obtain **3-4 µm thick tissue sections**.
- The sections were stained with **Hematoxylin and Eosin (H&E)** for histopathological evaluation.
- Additional **special stains** were used when necessary for further classification of lesions.
- Clinical data, including **patient demographics, site of lesion, and clinical diagnosis**, were recorded in a structured **proforma**.

Classification of Lesions

Hyperpigmented skin lesions were classified based on **histopathological findings** into:

1. **Non-neoplastic lesions** (including inflammatory conditions such as lichen planus, post-inflammatory hyperpigmentation, and prurigonodularis).
2. **Neoplastic lesions**, further categorized into:
   - **Melanocytic tumors** (benign nevi, malignant melanoma).
   - **Non-melanocytic tumors** (seborrheic keratosis, Bowen's disease).

Data Analysis

- Clinical and histopathological diagnoses were **compared to assess concordance**.
- The frequency and distribution of lesions were analyzed based on **age, gender, and site of involvement**.
- Statistical analysis was performed using **descriptive methods**, with percentages and proportions used to present the findings.

RESULTS

A total of **100 cases** of hyperpigmented skin lesions were analyzed over a period of **two years (June 2015 - May 2017)** at the Department of Pathology, Rajarajeswari Medical College and Hospital. The lesions were categorized as **non-neoplastic and neoplastic**, with further sub-classifications based on histopathological features.

DOI: 10.69605/ijlbpr_14.2.2025.196

1. Incidence of Hyperpigmented Skin Lesions

Among the **100 cases**, **76% were non-neoplastic** and **24% were neoplastic** (Table 1).

Table 1: Incidence of Hyperpigmented Skin Lesions (N=100)

Category of Lesions	No. of Cases	Percentage (%)
Non-neoplastic lesions	76	76%
Neoplastic lesions	24	24%
Total	**100**	**100%**

The majority of hyperpigmented lesions were **non-neoplastic (76%)**, while neoplastic lesions comprised **24%** of the total cases (**Table 1**).

2. Gender Distribution

The study found a slight female preponderance, with **54% cases in females and 46% in males** (Table 2). The female-to-male ratio was **1.17:1**.

Table 2: Gender Distribution of Hyperpigmented Skin Lesions (N=100)

Gender	No. of Cases	Percentage (%)
Female	54	54%
Male	46	46%
Total	**100**	**100%**

The study revealed a **higher occurrence of hyperpigmented skin lesions in females (54%) compared to males (46%)**, with a female-to-male ratio of **1.17:1** (**Table 2**).

3. Age Distribution

The most commonly affected age group was **21-30 years (23%)**, followed by **31-40 years (19%)** (Table 3).

Table 3: Age Distribution of Hyperpigmented Skin Lesions (N=100)

Age Group (Years)	No. of Cases	Percentage (%)
0-10	1	1%
11-20	16	16%
21-30	23	23%
31-40	19	19%
41-50	17	17%
51-60	12	12%
61-70	10	10%
>70	2	2%
Total	**100**	**100%**

The **third decade (21-30 years) had the highest prevalence (23%)**, followed by the **fourth decade (19%)** (**Table 3**). The youngest patient was **8 years old**, while the oldest was **78 years old**.

4. Correlation Between Clinical and Histopathological Diagnosis

Clinicopathological concordance was observed in **94%** of cases, while **6%** were diagnosed only on histopathology (Table 4).

Table 4: Clinical vs. Histopathological Correlation (N=100)

Correlation	No. of Cases	Percentage (%)
Confirmed by histopathology	94	94%
Diagnosed only on histopathology	6	6%
Total	**100**	**100%**

A **high degree of correlation (94%)** between clinical and histopathological diagnoses was noted, reinforcing the importance of biopsy-based confirmation (**Table 4**).

5. Site Distribution of Hyperpigmented Skin Lesions

The **most commonly involved site was the extremities (54%)**, followed by the trunk (16%) and face (14%) (Table 5).

Table 5: Site of Hyperpigmented Skin Lesions (N=100)

Site of Lesion	No. of Cases	Percentage (%)
Extremities	54	54%
Trunk	16	16%
Face	14	14%
Generalized	9	9%
Neck	6	6%
Anorectal Region	1	1%

DOI: 10.69605/ijlbpr_14.2.2025.196

Total	**100**	**100%**

The **extremities were the most common site of involvement (54%)**, followed by the **trunk (16%)** and **face (14%)** (**Table 5**).

6. Clinical Presentation of Hyperpigmented Lesions

The majority of lesions presented as **plaques (36%)**, followed by **macules (26%)** and **nodules (24%)** (Table 6).

Table 6: Clinical Patterns of Hyperpigmented Lesions (N=100)

Clinical Pattern	No. of Cases	Percentage (%)
Plaques	36	36%
Macules	26	26%
Nodules	24	24%
Papules	14	14%
Total	**100**	**100%**

Hyperpigmented plaques (36%) were the most common presentation, followed by **macules (26%)** and **nodules (24%)** (**Table 6**).

7. Distribution of Non-Neoplastic Lesions

Among **76 non-neoplastic cases**, **lichen planus and its variants (51.31%)** were the most prevalent, followed by **prurigonodularis (10.52%)** (Table 7).

Table 7: Non-Neoplastic Hyperpigmented Lesions (N=76)

Lesion	No. of Cases	Percentage (%)
Lichen Planus & Variants	39	51.31%
PrurigoNodularis	8	10.52%
Lichen Simplex Chronicus	4	5.26%
Morphea	4	5.26%
Post-Inflammatory Hyperpigmentation	3	3.94%
Others	18	23.71%
Total	**76**	**100%**

Lichen planus and its variants (51.31%) were the most frequently encountered non-neoplastic lesions (**Table 7**).

8. Distribution of Neoplastic Lesions

Among **24 neoplastic cases**, **62.5% were melanocytic, and 37.5% were non-melanocytic** (Table 8).

Table 8: Neoplastic Hyperpigmented Lesions (N=24)

Lesion Type	No. of Cases	Percentage (%)
Melanocytic (62.5%)		
Benign Melanocytic Nevi	13	54.1%
Malignant Melanoma	2	8.3%
Non-Melanocytic (37.5%)		
Seborrheic Keratosis	8	33.3%
Bowen's Disease	1	4.1%
Total	**24**	**100%**

Benign melanocytic nevi (54.1%) were the most common neoplastic lesions, while **malignant melanoma was noted in 8.3% of cases** (**Table 8**).

This study highlighted the **importance of histopathological confirmation in diagnosing hyperpigmented skin lesions**, with a **high clinicopathological correlation (94%)**. **Lichen planus was the most common non-neoplastic lesion, and benign melanocytic nevi were the most frequent neoplastic lesions**.

DISCUSSION

Hyperpigmented skin lesions are among the most common dermatological presentations, often leading to diagnostic challenges due to overlapping clinical features. This study aimed to establish a clinicopathological correlation to enhance diagnostic accuracy and facilitate appropriate management.In this study, **76% of hyperpigmented lesions were non-neoplastic**, while **24% were neoplastic**. This finding aligns with previous studies where **non-neoplastic lesions predominated**, with lichen planus being the most common (1,2). Among neoplastic lesions, **melanocytic lesions (62.5%) were more frequent than non-melanocytic lesions (37.5%)**, similar to prior reports (3,4).

A **female preponderance (54%)** was noted, with a female-to-male ratio of **1.17:1**, consistent with earlier findings where females showed a higher incidence of hyperpigmented lesions (5,6). The **highest prevalence was in the third decade (23%)**, followed by the fourth decade (19%). These findings corroborate previous studies where **hyperpigmented**

DOI: 10.69605/ijlbpr_14.2.2025.196

skin lesions were most frequently observed between the second and fourth decades of life (7,8). The clinicopathological concordance in this study was **94%**, while **6% of cases were diagnosed solely based on histopathological examination**. Similar findings have been reported in other studies, emphasizing the necessity of histopathology for an accurate diagnosis, especially for **lesions with atypical clinical presentations** (9,10).

The **extremities were the most common site (54%)**, followed by the **trunk (16%)** and **face (14%)**. These results are comparable with other studies where extremities were frequently involved, especially in **lichen planus and its variants** (11,12). **Neoplastic lesions, particularly melanocytic nevi and seborrheic keratosis, were predominantly located on the face** (13).

Clinical Presentation of Lesions

Most hyperpigmented lesions presented as **plaques (36%)**, followed by **macules (26%)** and **nodules (24%)**. The predominance of plaques has been well documented in previous studies, particularly in **lichen planus and prurigonodularis** (14,15).

Lichen planus and its variants constituted **51.31%** of non-neoplastic lesions, followed by **prurigonodularis (10.52%)** and **post-inflammatory hyperpigmentation (3.94%)**. These findings align with previous reports where **lichen planus was the most frequently encountered hyperpigmented skin lesion** (16,17). The **histopathological features of lichen planus, including hyperkeratosis, basal cell degeneration, and pigment incontinence, were consistent with prior studies** (18).

Among **24 neoplastic cases**, **melanocytic lesions (62.5%)** were more prevalent than **non-melanocytic lesions (37.5%)**. **Benign melanocytic nevi (54.1%) were the most common**, followed by **seborrheic keratosis (33.3%)**. **Malignant melanoma was observed in 8.3% of cases**, similar to reported incidences in other studies (19,20).

Histopathological analysis revealed **junctional activity, nuclear pleomorphism, and Clark's level III-IV staging in malignant melanoma cases**, findings that are in agreement with previous literature (21,22). The presence of **pseudo-horn cysts in seborrheic keratosis (88.88%) and acanthosis in 100% of non-melanocytic neoplastic lesions** further confirmed the characteristic histopathological patterns described in earlier studies (23,24).

The **clinicopathological concordance rate (94%)** in this study was comparable to **92% reported by Priyadarshini et al. (25) and 95% by Mruthyunjayappa et al. (26)**. The **most frequently observed histopathological features, such as hyperkeratosis (77.63%), acanthosis (69.73%), and pigment incontinence (52.63%)**, were consistent with previous findings (27,28).

The distribution of **benign melanocytic nevi** was similar to that reported by **Pailoor et al. (29), where intradermal nevi constituted the majority (66%)**. The **Clark's grading of malignant melanoma in the present study (Grade III-IV) was in accordance with Survenakar et al. (30), who observed Grade III in 40% of cases and Grade IV in 20%**.

CONCLUSION

This study reinforces the **importance of histopathological examination for the definitive diagnosis of hyperpigmented skin lesions**. While clinical diagnosis plays a crucial role, **histopathology remains the gold standard for differentiation between benign and malignant lesions**. The **high clinicopathological concordance (94%) further underscores the need for biopsy evaluation**, particularly in **cases where clinical presentation is ambiguous**.

The findings of this study are consistent with previous research, demonstrating **similar trends in incidence, age and gender distribution, site involvement, and histopathological patterns**. Future studies with larger sample sizes and **immunohistochemical analysis could further enhance diagnostic accuracy and prognostic evaluation of hyperpigmented skin lesions**.

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