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Original Article

Histopathological Spectrum of Non-Neoplastic Skin Lesions: A Cross-Sectional Study at a Tertiary Care Centre

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ABSTRACT

Background: Non-neoplastic skin lesions comprise a diverse group of inflammatory, infectious, autoimmune, metabolic, vascular, degenerative, and hereditary disorders that frequently present with overlapping clinical features. Histopathological examination plays a pivotal role in establishing an accurate diagnosis, facilitating disease classification, and guiding appropriate clinical management.

Objectives: To evaluate the histopathological spectrum of non-neoplastic skin lesions and analyse their demographic and clinicopathological characteristics in patients attending a tertiary care hospital.

Materials and Methods: A cross-sectional observational study was conducted in the Department of Pathology, S.V. Medical College, Tirupati, in collaboration with the Department of Dermatology, Sri Venkateswara Ramnarain Ruia Government General Hospital, Tirupati, over a two-year period from May 2018 to April 2020. A total of 148 histopathologically confirmed non-neoplastic skin lesions were included. Skin biopsy specimens were processed routinely and stained with haematoxylin and eosin. Special stains, including Modified Fite, Ziehl–Neelsen, Periodic Acid–Schiff, and Van Gieson stains, were performed whenever indicated. Demographic, clinical, and histopathological data were analysed using descriptive statistics.

Results: The patients ranged in age from 11 to 90 years (mean age: 42.4 years), with the highest incidence in the 31–40-year age group (26.4%). There was a slight male predominance (male:female ratio, 1.1:1). The lower limb was the most commonly affected anatomical site (24.3%). Infectious diseases constituted the largest category of lesions (37.2%), with leprosy accounting for 87.3% of infectious dermatoses. Borderline tuberculoid leprosy was the most frequent histopathological subtype. Among non-infectious lesions, erythematous and papulosquamous disorders accounted for 21.6%, with lichen planus being the predominant diagnosis, while pemphigus was the most common vesiculobullous disorder. Connective tissue diseases constituted 8.1% of cases, with morphea as the predominant lesion.

Conclusion: Infectious dermatoses, particularly leprosy, constituted the predominant category of non-neoplastic skin lesions in the present study. Histopathological examination remains the cornerstone for the accurate diagnosis and classification of non-neoplastic skin lesions, particularly in clinically ambiguous cases, thereby facilitating appropriate patient
management and providing valuable epidemiological insights into disease patterns in a tertiary care setting.

Keywords: Non-neoplastic skin lesions; Histopathology; Skin biopsy; Leprosy; Lichen planus; Pemphigus; Clinicopathological correlation.

INTRODUCTION:

The skin is the largest organ of the human body and serves as the primary protective barrier against physical, chemical, microbial, and environmental insults.[1] In addition to its barrier function, the skin performs several vital physiological roles, including thermoregulation, sensory perception, immune surveillance, vitamin D synthesis, and maintenance of fluid and electrolyte balance.[2] Owing to its complex structure and continuous exposure to external agents, the skin is susceptible to a wide spectrum of pathological conditions.[3] Non-neoplastic skin lesions constitute a heterogeneous group of disorders encompassing inflammatory, infectious, autoimmune, metabolic, degenerative, vascular, and hereditary diseases, many of which present with overlapping clinical manifestations.[4]

Dermatological disorders represent a major public health concern worldwide, accounting for a substantial proportion of outpatient consultations in both developed and developing countries.[5] The Global Burden of Disease Study identified skin diseases among the leading causes of non-fatal disability, emphasizing their considerable impact on quality of life and healthcare utilization.[6] Although many skin disorders can be diagnosed clinically, several diseases exhibit similar morphological features, making accurate diagnosis challenging.[7] Consequently, histopathological examination remains the gold standard for confirming the diagnosis, classifying disease entities, and guiding appropriate clinical management.[2]

Skin biopsy is an indispensable diagnostic tool in dermatopathology because it permits detailed evaluation of microscopic alterations involving the epidermis, dermis, and subcutaneous tissue.[3] Histopathological assessment not only confirms the clinical diagnosis but also differentiates disorders with similar clinical presentations, identifies disease activity, evaluates prognostic features, and facilitates the use of ancillary techniques such as special stains whenever indicated.[2] Clinicopathological correlation substantially improves diagnostic accuracy and therapeutic decision-making.[8]

The spectrum of non-neoplastic skin lesions varies considerably across different geographical regions because of differences in environmental conditions, genetic predisposition, occupational exposure, socioeconomic status, personal hygiene, nutritional status, and endemic infectious diseases.[4] In tropical countries such as India, infectious dermatoses continue to constitute a significant proportion of skin diseases, whereas inflammatory and autoimmune disorders are increasingly recognized because of improved healthcare access and diagnostic facilities.[9] Several hospital-based studies have demonstrated regional variations in the frequency and distribution of non-neoplastic skin lesions, emphasizing the importance of institution-specific epidemiological data for understanding local disease patterns.[10] Each region may exhibit distinct clinicopathological characteristics influenced by demographic and environmental factors.[11]

Histopathological studies describing the clinicopathological spectrum of non-neoplastic skin lesions remain limited in many tertiary care centres in South India.[12] Such studies provide valuable epidemiological information regarding disease distribution, age and sex predilection, anatomical site involvement, and histomorphological characteristics, thereby assisting dermatologists and pathologists in establishing accurate diagnoses and optimizing patient management.[3] Furthermore, the application of special histochemical stains, including Periodic Acid–Schiff (PAS), Modified Fite, Ziehl–Neelsen, and Van Gieson stains, enhances diagnostic precision in selected infectious and connective tissue disorders.

Therefore, the present study was undertaken to evaluate the histopathological spectrum of non-neoplastic skin lesions diagnosed at a tertiary care hospital, to analyse their demographic and clinicopathological characteristics, and to assess the role of histopathological examination and special staining techniques in establishing definitive diagnoses.

MATERIALS AND METHODS

Study Design

This cross-sectional observational study was conducted to evaluate the histopathological spectrum of non-neoplastic skin lesions in patients attending a tertiary care hospital.

Study Setting

The study was carried out in the **Department of Pathology, S.V. Medical College, Tirupati**, in collaboration with the Department of Dermatology, Sri Venkateswara Ramnarain Ruia Government General Hospital (SVRRGGH), Tirupati.

Study Period

The study was conducted over a period of **two years**, from **May 2018 to April 2020**.

Study Population

The study included patients presenting with clinically diagnosed non-neoplastic skin lesions who underwent skin biopsy during the study period. Clinical information, including age, sex, presenting complaints, and anatomical site of the lesion,

was obtained from the case records. A total of **148 histopathologically confirmed cases** of non-neoplastic skin lesions were included in the study.

Inclusion Criteria

- All biopsy specimens of non-neoplastic skin lesions received in the Department of Pathology, S.V. Medical College, Tirupati, during the study period were included.

Exclusion Criteria

The following specimens were excluded from the study:

- Autolysed specimens.
- Inadequate biopsy specimens.
- Biopsy specimens that did not demonstrate definitive histopathological evidence of a specific lesion.

Histopathological Examination

Skin biopsy specimens were fixed in **10% neutral buffered formalin** immediately after receipt in the Department of Pathology. Following routine tissue processing, paraffin-embedded tissue blocks were prepared. Sections measuring **3–5 µm** in thickness were cut using a rotary microtome and stained routinely with **Haematoxylin and Eosin (H&E)** for microscopic examination. Histopathological diagnosis was established based on characteristic morphological features.

Special Stains

Special histochemical stains were performed whenever required to confirm the diagnosis. These included **Modified Fite stain** for *Mycobacterium leprae*, **Ziehl–Neelsen stain** for acid-fast bacilli, **Periodic Acid–Schiff (PAS) stain** for fungal organisms, and **Van Gieson stain** for connective tissue abnormalities, depending on the suspected pathology.

Data Collection

The demographic characteristics, clinical presentation, anatomical site of involvement, and histopathological diagnosis were recorded in a predesigned proforma. The lesions were classified into various diagnostic categories based on their histopathological features for subsequent analysis.

Statistical Analysis

The collected data were compiled and analyzed using **Statistical Package for the Social Sciences (SPSS) version 25.0**. The results were expressed using descriptive statistics, including frequencies, percentages, tables, and graphical representations

RESULTS

During the study period from **May 2018 to April 2020**, a total of **188 skin biopsy specimens** were received in the Histopathology Section of the Department of Pathology. Among these, **18 specimens were inadequate for processing** and **22 biopsies showed inconclusive histopathological findings**; therefore, these cases were excluded. The remaining **148 histopathologically confirmed non-neoplastic skin lesions** constituted the study population.

The age of the patients ranged from **11 to 90 years**, with a **mean age of 42.4 years**. The highest number of cases (**26.4%**) occurred in the **31–40 years** age group, followed by the **41–50 years** and **51–60 years** age groups (15.5% each). Of the 148 patients, **78 (52.8%) were males** and **70 (47.2%) were females**, resulting in a **male-to-female ratio of 1.1:1** (Table 1).

Table 1. Demographic Characteristics of Patients with Non-Neoplastic Skin Lesions (n = 148)

Variable	Number (n)	Percentage (%)
Age group (years)		
11–20	17	11.5
21–30	21	14.2
31–40	39	26.4
41–50	23	15.5
51–60	23	15.5
61–70	19	12.8
71–80	5	3.4
81–90	1	0.7
Sex		
Male	78	52.8
Female	70	47.2

Mean age: 42.4 years
Male: Female ratio: 1.1:1.

The **lower limb** was the most frequently involved anatomical site (**24.3%**), followed by the **upper limb (22.3%)**, while the trunk and generalized lesions each accounted for **17.6%** of cases. Bilateral involvement (**61.5%**) was more common than unilateral involvement (**38.5%**) (Table 2).

Table 2. Anatomical Distribution of Non-Neoplastic Skin Lesions

Site	Number (n)	Percentage (%)
Head	9	6.1
Neck	1	0.7
Face	4	2.7
Upper limb	33	22.3
Axilla	1	0.7
Lower limb	36	24.3
Groin	2	1.4
Both upper & lower limbs	6	4.1
Trunk	26	17.6
Scrotum	4	2.7
Generalized	26	17.6
Total	**148**	**100**

Based on histopathological diagnosis, **infectious diseases** constituted the largest category of non-neoplastic skin lesions (**55 cases; 37.2%**). The second most common group comprised **non-infectious erythematous and papulosquamous diseases** (**32 cases; 21.6%**), followed by **non-infectious vesiculobullous and vesiculopustular diseases** (**22 cases; 14.9%**). Connective tissue diseases accounted for **12 cases (8.1%)**, metabolic diseases for **10 cases (6.8%)**, congenital disorders for **5 cases (3.4%)**, vascular diseases for **4 cases (2.7%)**, non-infectious granulomas for **3 cases (2.0%)**, inflammatory diseases of the subcutaneous fat for **3 cases (2.0%)**, and degenerative disorders as well as inflammatory diseases of the skin adnexa each accounted for **one case (0.7%)** (Table 3).

Table 3. Histopathological Spectrum of Non-Neoplastic Skin Lesions

Histopathological Category	Number (n)	Percentage (%)
Infectious diseases	55	37.2
Non-infectious erythematous & papulosquamous diseases	32	21.6
Non-infectious vesiculobullous & vesiculopustular diseases	22	14.9
Connective tissue diseases	12	8.1
Metabolic diseases	10	6.8
Congenital diseases	5	3.4
Vascular diseases	4	2.7
Non-infectious granulomas	3	2.0
Inflammatory diseases of subcutaneous fat	3	2.0
Degenerative disorders	1	0.7
Inflammatory diseases of skin adnexa & nail	1	0.7
Total	**148**	**100**

Analysis of age distribution demonstrated that **infectious skin diseases** were most frequently observed during the **fourth decade of life**, whereas non-infectious erythematous and papulosquamous disorders occurred predominantly between **21 and 70 years**. Non-infectious vesiculobullous and vesiculopustular diseases were mainly encountered between **31 and 60 years** of age.

Among the **32 cases of non-infectious erythematous and papulosquamous diseases**, **lichen planus** was the predominant diagnosis, accounting for **20 cases (62.5%)**, followed by **psoriasis** (**4 cases; 12.5%**) and **prurigo nodularis** (**3 cases; 9.4%**). The remaining cases included lichen nitidus, urticaria, erythema annulare centrifugum, and pityriasis rosea. Lichen planus was more frequently observed in males and occurred predominantly during the third and fourth decades of life (Table 4).

Table 4. Distribution of Non-Infectious Erythematous and Papulosquamous Diseases (n = 32)

Diagnosis	Number (n)	Percentage (%)
Lichen planus	20	62.5
Psoriasis	4	12.5
Prurigo nodularis	3	9.4
Lichen nitidus	2	6.3

Urticaria	1	3.1
Erythema annulare centrifugum	1	3.1
Pityriasis rosea	1	3.1
Total	**32**	**100**

Among the **22 non-infectious vesiculobullous and vesiculopustular disorders**, **pemphigus** was the most common lesion (**12 cases; 54.5%**), followed by **bullous pemphigoid** (**8 cases; 36.4%**). Lichen simplex chronicus and erythema multiforme accounted for one case each. These disorders showed a slight male predominance and were most frequently diagnosed during the fourth decade of life (Table 5).

Table 5. Distribution of Non-Infectious Vesiculobullous and Vesiculopustular Diseases (n = 22)

Diagnosis	Number (n)	Percentage (%)
Pemphigus	12	54.5
Bullous pemphigoid	8	36.4
Lichen simplex chronicus	1	4.5
Erythema multiforme	1	4.5
Total	**22**	**100**

Among the **55 infectious skin lesions**, **leprosy** was the predominant diagnosis, accounting for **48 cases (87.3%)**. Tuberculosis and molluscum contagiosum each accounted for **3 cases (5.5%)**, while **tinea corporis** constituted **1 case (1.8%)**. Infectious lesions were more common in males and were predominantly observed during the third and fourth decades of life (Table 6).

Table 6. Distribution of Infectious Skin Lesions (n = 55)

Diagnosis	Number (n)	Percentage (%)
Leprosy	48	87.3
Tuberculosis	3	5.5
Molluscum contagiosum	3	5.5
Tinea corporis	1	1.8
Total	**55**	**100**

Among the **48 cases of leprosy**, **borderline tuberculoid (BT) leprosy** was the commonest subtype (**22 cases; 45.8%**), followed by **lepromatous leprosy** (**7 cases; 14.6%**), **tuberculoid leprosy** (**6 cases; 12.5%**), **borderline lepromatous leprosy** (**4 cases; 8.3%**), and **indeterminate**, **mid-borderline**, and **histoid leprosy**, each accounting for **3 cases (6.3%)**. Borderline tuberculoid leprosy predominantly affected males and was most frequently encountered during the third decade of life (Table 7).

Table 7. Histopathological Types of Leprosy (n = 48)

Type of Leprosy	Number (n)	Percentage (%)
Borderline tuberculoid (BT)	22	45.8
Lepromatous (LL)	7	14.6
Tuberculoid (TT)	6	12.5
Borderline lepromatous (BL)	4	8.3
Indeterminate	3	6.3
Mid-borderline (BB)	3	6.3
Histoid leprosy	3	6.3
Total	**48**	**100**

DISCUSSION

The present study analysed the clinicopathological spectrum of 148 biopsy-proven non-neoplastic skin lesions over a two-year period at a tertiary care centre. The highest incidence was observed in the fourth decade of life, which is in agreement with the studies by Adhikari et al.[14] and Rajput et al.,[15] whereas Veldurthy et al.[16] and Ogun and Okoro[13] reported a peak incidence in the third decade.The predominance of middle-aged adults may be attributed to increased occupational and environmental exposure, leading to a higher likelihood of developing inflammatory and infectious dermatoses.

A slight male predominance (male:female ratio 1.1:1) was observed in the present study, comparable to the findings of Adhikari et al. [14]and Kumar et al. [17]. In contrast, Ogun and Okoro [13] and Veldurthy et al. [16] reported female predominance. Gender differences in the occurrence of skin diseases have also been described by Chen et al., suggesting that biological, hormonal, behavioural, and healthcare-seeking factors may contribute to variations in disease distribution

between males and females. [18] These differences may reflect variations in healthcare-seeking behaviour, occupational exposure, and the prevalence of infectious dermatoses among different study populations. The lower extremity was the most frequently affected site, unlike the study by Adhikari et al., in which the upper extremity was the predominant site.[**14]** Infectious dermatoses constituted the largest group (37.2%) in the present study, with Hansen's disease accounting for the majority of cases. Similar observations were reported by Adhikari et al., [14] whereas Ogun and Okoro [13] identified viral infections as the most frequent infectious lesions.Borderline tuberculoid leprosy was the predominant histological subtype, reflecting the disease pattern commonly encountered in endemic regions. These findings highlight the continuing public health importance of leprosy and the pivotal role of histopathological examination in disease classification, particularly in clinically equivocal cases.

Non-infectious erythematous, papular, and squamous disorders represented the second most common category (21.6%), with lichen planus being the predominant lesion. This observation is comparable to the findings of D'Costa et al., whereas Hosamane et al. reported psoriasis as the most frequent papulosquamous disorder.[**20,21]** Differences in disease distribution may be related to regional and demographic variations. Histopathological examination remains indispensable in distinguishing papulosquamous disorders with overlapping clinical features and in establishing a definitive diagnosis.
Non-infectious vesiculobullous and vesiculopustular disorders accounted for 14.9% of all lesions. Pemphigus vulgaris was the most common lesion, consistent with the observations of Garg et al.[**22]** Bullous pemphigoid was the second most frequent disorder. Histopathological examination provided a reliable diagnosis in most cases, while immunopathological investigations may be reserved for diagnostically challenging lesions.

Connective tissue disorders constituted 8.1% of all cases, with morphea being the predominant lesion, similar to the findings reported by Karumbaiah et al.[**23]** Although females predominated in their study, a slight male predominance was observed in the present series. Genodermatoses were relatively uncommon (3.4%), with porokeratosis representing the most frequent lesion, consistent with Adhikari et al. In contrast, Dalave et al. reported ichthyosis as the predominant congenital dermatosis in a paediatric population.[**14,19]** These differences are likely attributable to variation in the age groups included in the respective studies.

Vascular disorders, non-infectious granulomas, degenerative and perforating disorders, inflammatory diseases of the skin adnexa, metabolic disorders, and inflammatory diseases of the subcutaneous fat constituted only a small proportion of cases. Although individually uncommon, accurate histopathological diagnosis was essential because these entities frequently mimic other inflammatory dermatoses clinically and require distinct therapeutic approaches.[**25–28]**

CONCLUSION

The present study demonstrated that **infectious dermatoses** were the most common category of non-neoplastic skin lesions, with **leprosy** being the predominant infectious disease and **borderline tuberculoid leprosy** the most frequent histopathological subtype. Among the non-infectious lesions, **lichen planus** was the commonest papulosquamous disorder, while **pemphigus** was the predominant vesiculobullous disease. A slight male predominance was observed, with the highest incidence occurring during the fourth decade of life.

Histopathological examination remains an indispensable tool for the accurate diagnosis and classification of non-neoplastic skin lesions, particularly in cases with overlapping clinical features. Careful clinicopathological correlation enhances diagnostic accuracy, facilitates appropriate patient management, and provides valuable epidemiological information on the spectrum of non-neoplastic skin lesions encountered in a tertiary care hospital.

DECLARATIONS

Funding: None.
Conflict of Interest: The authors declare no conflict of interest.
Ethical Approval: The study was conducted in accordance with applicable ethical standards and approved by the appropriate ethics committee where required.
Informed Consent: Informed consent was obtained from all participants involved in the study where applicable.
Author Contributions: All authors contributed to the study conception, design, data collection, analysis, manuscript preparation, and approved the final version of the manuscript.
Data Availability: Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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