

# Study of Histomorphological Spectrum of Granulomatous Lesions of Skin

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## ABSTRACT

**Introduction:** The granulomatous reaction is defined as a distinctive inflammatory pattern characterised by the granuloma. The term Granuloma was first coined by Virchow in 1864. The granuloma is characterised by collection of activated histiocytes, epithelioid cells and multinucleate giant cells that may or may not be rimmed by lymphocytes and/or show central necrosis. The pattern of skin disease varies from one country to another and across different parts within same country. The granulomatous lesions of skin are a common and intriguing problem in developing countries.

**Aim:** To study the histomorphological spectrum of granulomatous lesions of skin.

**Materials and Methods:** This cross-sectional study was conducted in Department of Pathology, Sarojini Naidu Medical College, Agra, Uttar Pradesh, India, over a period of two years (from September 2018 to September 2020). All skin biopsies coming to the Department of Pathology were fixed in 10% neutral buffered formalin for duration of 12 to 24 hours. Paraffin wax blocks were made and 3-4 micrometer section were taken and stained with Haematoxylin and Eosin (H&E), showing granulomas on histology

were included in the study. On H&E, stained slide, granulomas were studied for type, morphology and site. Special stains were used for further evaluations and analysis.

**Results:** Out of total 124 cases studied, the maximum patients 34 (27.41%) were of 11-20 years age group. The epithelioid granuloma was the most common type in 76 (61.29%) cases followed by histiocytic granuloma in 24 (19.35%). The infectious granulomatous dermatoses were the most common histological type in which tuberculosis was most common followed by leprosy. Most commonly the lesions were found to involve the whole dermis in 74 (59.68%) cases, followed by upper and mid dermis in 35 (28.22%) cases. Out of 40 cases of leprosy, 17 (42.50%) cases were found Wade-Fite Stain positive. Out of total 57 cases of tuberculosis, 31 (54.38%) cases were found Acid-Fast Bacillus (AFB) positive.

**Conclusion:** Authors concluded that major cause of granulomatous dermatoses in developing countries is still infectious, tuberculosis and leprosy being the leading causes. Histopathology is gold standard for diagnosis and categorisation of granulomatous dermatoses. Special stains are useful in cases of any dilemma.

**Keywords:** Dermatoses, Epithelioid granuloma, Histiocytic granuloma, Lupus vulgaris

## INTRODUCTION

Granulomatous inflammation was recognised as a distinct entity in the early 19<sup>th</sup> century and has been of continuing interest because it forms a common and intriguing problem clinically and pathologically [1]. According to Dorland, the term 'granulomatous' was expressed initially by Virchow to describe a tumour like mass or nodule of granulation tissue [2]. The occurrence of different types of granulomatous lesions of skin varies according to the geographical location and the pattern varies from one country to another and across different parts within same country. Granulomatous skin lesions arise due to chronic inflammatory response against various organic and inorganic antigens [3]. The provocative agents of granulomatous inflammation are non degradable by both neutrophils and non activated macrophages.

The polymorphonuclear leukocytes and non activated macrophages are unable to digest and eradicate completely the offending agents, which results in activation of cell mediated type IV hypersensitivity reaction, activation of macrophages, T and B lymphocytes cells response with release of chemical mediators of inflammation mainly cytokines and leads to granuloma formation [4,5]. The granulomatous reaction is defined as a distinctive inflammatory pattern characterised by collection of activated histiocytes, epithelioid cells and multinucleate giant cells that may or may not be rimmed by lymphocytes and/or show central necrosis [1]. Granulomatous lesions of the skin are very common in our country and some may show overlapping histological features, for which special stains were done in this study. Therefore, this study was done to study the histomorphological spectrum of granulomatous lesions of skin and

to study the aetiology of granulomatous lesions using special stains for tuberculosis and leprosy as and when required.

## MATERIALS AND METHODS

This hospital based cross-sectional study was conducted in Department of Pathology, Sarojini Naidu Medical College Agra, Uttar Pradesh, India, over a period of two years (from September 2018 to September 2020). Ethical approval was obtained from Institute Ethical Committee (IEC/2021/12). All the biopsies received in histology laboratory of the Department of Pathology from Department of Dermatology revealing granulomas were studied.

**Inclusion and Exclusion criteria:** All skin biopsies coming during two-year study period from September 2018 to September 2020 revealing granulomas on histological examination were included in this study and inadequate biopsies were excluded from this study.

## Methodology

The biopsy sample taken from clinically diagnosed granulomatous lesions of skin were transported immediately to histology laboratory in 10% formalin. Sample was fixed in 10% neutral buffered formalin for duration of 12 to 24 hours. Paraffin wax blocks were made and 3-4 micrometer sections were taken and stained with H&E. Special stains were done as and when required. Acid-Fast Bacteria (AFB)-Ziehl-Neelsen staining for Mycobacterium tuberculosis, AFB- Fite's acid fast staining for leprosy, Periodic Acid-Schiff (PAS) staining for fungal infection, Brown Hoops modified gram staining for cat scratch disease, CD68 immunohistochemical staining for giant cell tumour of skin was done.

The standard enumeration of leprosy bacilli in lesions, the Bacterial Index (BI), was done according to standardised Ridley's logarithmic scale (which applies to both skin biopsies and slit skin smears) [6].

- BI=0: no bacilli observed
- BI=1: 1 to 10 bacilli in 10 to 100 hpf\*
- BI=2: 1 to 10 bacilli in 1 to 10 hpf\*
- BI=3: 1 to 10 bacilli per hpf\*
- BI=4: 10 to 100 bacilli per hpf\*
- BI=5: 100 to 1,000 bacilli per hpf\*
- BI=6: >1,000 bacilli per hpf\*

\*hpf= Oil emersion

## STATISTICAL ANALYSIS

Data was entered in MS Excel and descriptive data was obtained.

## RESULTS

A total of 124 cases were included in this study, youngest patient encountered was six years of age and oldest patient encountered was 70 years of age. The maximum patients 34 (27.41%) were of 11-20 years age group, followed by 28 (22.58%) cases in 21-30 years of age group. Minimum number of cases was found below ten and above 60 years of age accounting seven (5.64%) and nine (7.26%) cases, respectively. Males 72 (58.06%) were more commonly affected than females 52 (41.94%).

In this study, out of total 124 cases, the most common site involved was trunk in 36 (29.03%) cases followed by lower limb in 32 (25.81%) cases. In tubercular granulomatous dermatoses, out of 57 cases the most common site involved was lower limb in 21 (36.84%) cases. In leprosy, out of 40 cases the most common site involved was trunk in 18 (45%) cases. In non infectious granulomatous dermatoses, out of 23 cases the most common site involved was head and neck region in eight (34.78%) cases [Table/Fig-1].

Cases	Head and neck	Upper limb	Lower limb	Trunk	Total number
<b>Infectious</b>	19	24	27	31	101
Tuberculosis	12	12	21	12	57
Leprosy	6	10	6	18	40
Other infectious	1	2	0	1	4
<b>Non infectious</b>	8	5	5	5	23
Total number (%)	27 (21.77%)	29 (23.39%)	32 (25.81%)	36 (29.03%)	124 (100%)

[Table/Fig-1]: Showing distribution of cases according to site of lesions.

In this study, out of total 124 cases, the most common type of granuloma found was epithelioid granuloma in 76 (61.29%) cases out of which 27 (35.53%) had caseating necrosis. The second most common type of granuloma found was histiocytic granuloma in 24 (19.35%) cases followed by foreign body granuloma in 12 (9.67%) cases. Out of 124 cases, 31 (25%) cases had necrosis (27 had caseating and four had fibrinoid necrosis) [Table/Fig-2].

Types of granuloma	With necrosis	Without necrosis	Total (%)
Epithelioid	27	49	76 (61.29%)
Histiocytic	0	24	24 (19.35%)
Foreign body granuloma	0	12	12 (9.67%)
Sarcoidal	0	4	04 (3.23%)
Necrobiotic/Palisading	4	0	04 (3.23%)
Mixed Inflammatory/Miscellaneous	0	4	04 (3.23%)

[Table/Fig-2]: Frequency of various morphological types of granulomas.

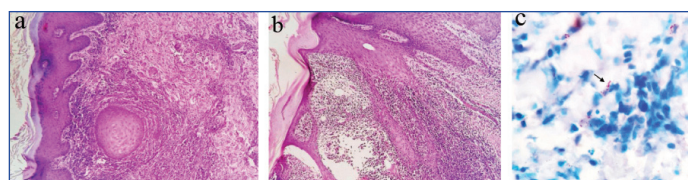
In this study, out of total 124 cases, infectious granulomatous dermatoses were seen in 101 (81.45%) cases and non infectious

in 23 (18.55%) cases. In infectious granulomatous dermatoses the most common histological diagnosis was tubercular granulomatous dermatoses followed by leprosy while in non infectious category the epidermoid cyst was the most common histological diagnosis.

Out of total 101 cases of infectious granulomatous dermatoses, the most common histological diagnosis was tubercular granulomatous dermatoses in 57 (56.44%) cases followed by leprosy in 40 (39.60%) cases. In tubercular granulomatous dermatoses, out of 57 cases, the most common was lupus vulgaris [Table/Fig-3]. Out of total 57 cases of tubercular granulomatous dermatoses, 31 (54.38%) cases were found AFB positive [Table/Fig-4a, b, c and 5].

Histopathological diagnosis	Total number of cases	Percentage
<b>Tuberculosis</b>	57	56.44%
a. Lupus vulgaris	25	24.75%
b. Tuberculosis verrucosa cutis	17	16.83%
c. Lichen scrofulosorum	1	0.99%
d. Unclassified	14	13.86%
<b>Leprosy</b>	40	39.60%
a. Tuberculoid leprosy	6	5.94%
b. Borderline tuberculoid leprosy	13	12.87%
c. Mid borderline leprosy	5	4.95%
d. Borderline lepromatous leprosy	7	6.93%
e. Lepromatous leprosy	7	6.93%
f. Indeterminate leprosy	2	1.98%
<b>Fungal infection</b>	1	0.99%
Histoplasmosis	1	0.99%
<b>Other infectious</b>	3	2.97%
a. Cutaneous leishmaniasis	1	0.99%
b. Cat scratch disease	1	0.99%
c. Granulomatous lesion (infectious unclassified)	1	0.99%
<b>Total</b>	<b>101</b>	<b>100%</b>

[Table/Fig-3]: Histopathological diagnosis of infectious granulomatous dermatoses.



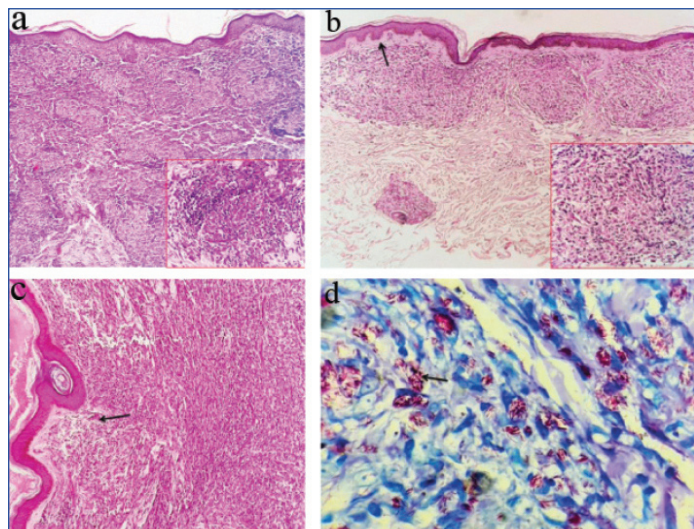
[Table/Fig-4]: a) Showing epithelioid granulomatous inflammation along with lymphocytes in dermis; Lupus vulgaris (H&E, 10X). b) Showing hyperkeratosis, pseudoepitheliomatous hyperplasia and inflammatory cell infiltrate in dermis; Tuberculosis verrucosa cutis (H&E, 10X). c) Showing Acid-Fast Bacilli (Z-N Stain, 100X).

Type tubercular granulomatous dermatoses	Total number of cases	No. of positive cases	Percentage
Lupus vulgaris	25	12	48%
Tuberculosis verrucosa cutis	17	11	64.71%
Lichen scrofulosorum	01	0	0
Unclassified	14	08	57.14%
<b>Total</b>	<b>57</b>	<b>31</b>	<b>54.38%</b>

[Table/Fig-5]: Table showing Acid Fast positivity in tubercular granulomatous dermatoses.

In leprosy, out of 40 cases, the most common was borderline tuberculoid leprosy in 13 (32.50%) cases followed by borderline lepromatous leprosy and lepromatous leprosy 7 (17.50%) cases each, tuberculoid leprosy 6 (15%) cases, mid borderline leprosy 5 (12.50%) cases and Indeterminate leprosy in 2 (5%) cases. According to Ridley Jopling classification [6] of leprosy, out of 40 cases, 17 (42.50%) cases were found Wade-Fite stain positive. Out of 17 cases, one cases of borderline tuberculoid leprosy, two cases of mid borderline leprosy and seven cases each of borderline lepromatous leprosy and

lepromatous leprosy were positive [Table/Fig-6a-d,7]. One (0.99%) case each of Histoplasmosis, cutaneous leishmaniasis, cat scratch disease and granulomatous dermatoses (infectious-unclassified) was also encountered.



**[Table/Fig-6]:** a) Showing epithelioid granulomatous infiltrate in whole dermis, inset showing epithelioid granuloma with lymphocytes; Borderline tuberculoid leprosy (H&E, 10X). b) Showing Grenz zone (Arrow) and granulomatous inflammation in upper and mid dermis, inset showing histiocytic granuloma with lymphocytes; Borderline lepromatous leprosy (H&E, 10X). c) Showing Grenz zone (Arrow) and histiocytic infiltrate in whole dermis; Lepromatous leprosy (H&E, 10X). d) Showing macrophages containing Acid-Fast Bacilli; BI=6 (Wade-Fite Stain, 100X).

the whole dermis in 74 (59.68%) cases, followed by upper and mid dermis in 35 (28.22%) cases, mid and deep dermis in 10 (8.06%) cases, deep dermis in 3 (2.42%) cases and each 1 (0.81%) case involving upper dermis and upper and deep dermis. In tuberculosis and leprosy mostly lesions were found to involve whole dermis followed by upper and mid dermis. In noninfectious granulomatous dermatoses, mostly lesions were found to involve the whole dermis followed by mid and deep dermis [Table/Fig-9].

In this study, on histological examination authors found one case of cat scratch disease (Brown hoops modified gram stain positive), one of giant cell tumour of skin (CD68 positive), one of Histoplasmosis (PAS positive) and one case of granulomatous dermatoses (infectious unclassified) (both PAS and AFB negative) [Table/Fig-10,11 a,b,12].

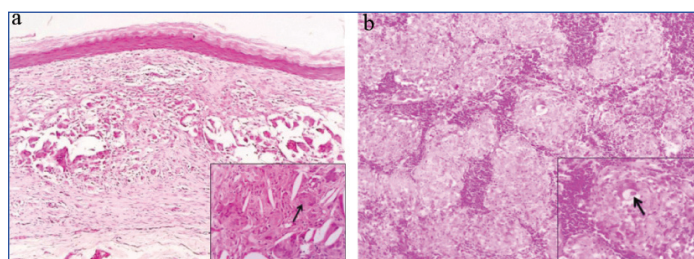
## DISCUSSION

The distribution of granulomatous dermatoses varies widely according to geographic location [7]. The granulomatous lesions of skin are a common and intriguing problem in developing countries and a diagnostic challenge to Dermatopathologists, since an identical histological pattern may be produced by several causes, and a single cause may produce several histological patterns [8]. Various infectious and noninfectious granulomatous dermatoses are frequent among the population of western part of India [9]. Granulomas usually form as a result of the persistence of a non degradable product or as the result of hypersensitivity response [4]. They have considerable variation in microscopic appearance producing different pictures with in the same biopsy or from one lesion to another [10]. The granulomatous

Type of leprosy	No. of cases	Bacillary index						
		Pauci-Bacillary (Pb)	Multibacillary (MB)					
			1+ (n,%)	2+ (n,%)	3+ (n,%)	4+ (n,%)	5+ (n,%)	6+ (n,%)
Tuberculoid leprosy	06	6 100%	-	-	-	-	-	-
Borderline tuberculoid leprosy	13	12, 92.30%	1, 7.70%	-	-	-	-	-
Mid borderline	05	3, 60%	2, 40%	-	-	-	-	-
Borderline lepromatous leprosy	07	-	2, 28.57%	3, 42.86%	2, 28.57%	-	-	-
Lepromatous leprosy	07	-	-	-	1, 14.28%	3, 42.86%	1, 14.28%	2, 28.57%
Early indeterminate leprosy	02	2, 100%	-	-	-	-	-	-

**[Table/Fig-7]:** Table showing bacillary index of different types of leprosy cases.

Out of 23 (18.55%) cases of non infectious granulomatous dermatoses, the most common histologic diagnosis was epidermoid cyst in 5 (21.74%) cases followed by sarcoidosis and Calcinosis cutis in 4 (17.39%) cases each, dermoid cyst and erythema nodosum in 3 (13.04%) cases each and 1 (4.34%) case each of actinic granuloma, granuloma annulare, rheumatoid nodule and giant cell tumour of skin [Table/Fig-8a,b].



**[Table/Fig-8]:** a) Showing epidermis and diffuse foreign body granuloma with giant cells in dermis, inset showing foreign body giant cells (Arrow) along with cholesterol crystals; Epidermoid cyst (H&E, 10X). b) Showing confluent granulomas with mild lymphocytic infiltrate in dermis, inset showing schaumann body (Arrow); Sarcoidosis (H&E 10X).

On histopathological examination, in our study the granulomatous dermatoses lesion of skin involved different part of dermis. Out of total 124 cases, most commonly the lesions were found to involve

inflammation is a type IV hypersensitivity reaction to an antigen and is defined as a special variety of chronic inflammation in which the mononuclear phagocytic cells take the form of macrophages, epithelioid cells and multinucleated giant cells admixed with other cells especially lymphocytes and plasma cells [9,11]. The epithelioid cells defined as mononuclear cells with ill-defined cell boundaries, oval to spindle nuclei with vesicular chromatin and finely granular eosinophilic cytoplasm are hallmark of delayed hypersensitivity granuloma. The multinucleated giant cells are a regular feature of granulomatous inflammation produced by fusion of macrophages [11]. The complex interaction between invading organism or antigen, drug or other irritant, extended antigenaemia, macrophage activity, B cells over activity, TH1 cell response, circulating immune system and biological mediators results in granuloma [11]. Different types of granulomas are found- sarcoidal granulomas, epithelioid granulomas, suppurative granulomas, palisading granulomas, foreign body granulomas and mixed cell granulomas [12].

Granulomatous dermatoses can be classified broadly into infectious and noninfectious categories. Infectious granulomatous dermatoses are further sub classified on the basis of morphology of granuloma and identification of infectious agents with the help of special stains [10]. Histopathological examination is considered to be important tool in accurate diagnosis and classification of granulomatous dermatoses

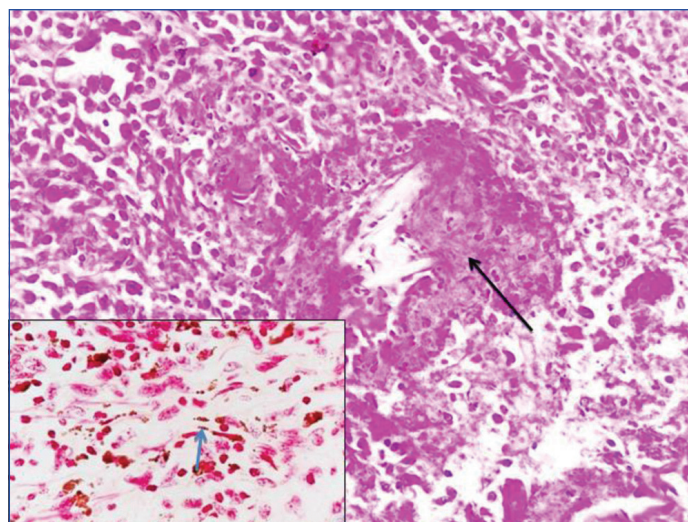
Histopathological diagnosis		Granulomatous skin lesions involving different parts of dermis						Total No.
		Upper dermis	Upper and mid dermis	Upper and deep dermis	Mid and deep dermis	Deep dermis	Whole dermis	
Infectious	<b>Infectious</b>	01	33	01	01	02	63	101
	<b>Tuberculosis</b>	01	20	00	00	00	36	57
	Lupus vulgaris	00	12	00	00	00	13	25
	Tuberculosis verrucosa cutis	00	07	00	00	00	10	17
	Lichen scrofulosorum	01	00	00	00	00	00	01
	Unclassified	00	01	00	00	00	13	14
	<b>Leprosy</b>	00	13	01	01	02	23	40
	Tuberculoid leprosy	00	03	00	00	00	03	06
	Borderline tuberculoid leprosy	00	03	01	01	00	08	13
	Mid borderline leprosy	00	00	00	00	02	03	05
	Borderline lepromatous leprosy	00	03	00	00	00	04	07
	Lepromatous leprosy	00	02	00	00	00	05	07
	Indeterminate leprosy	00	02	00	00	00	00	02
	<b>Fungal infection</b>							
	Histoplasmosis	00	00	00	00	00	01	01
	Cutaneous leishmaniasis	00	00	00	00	00	01	01
Cat scratch disease	00	00	00	00	00	01	01	
Granulomatous lesion (Infectious unclassified)	00	00	00	00	00	01	01	
Noninfectious	<b>Noninfectious</b>	00	02	00	09	01	11	23
	Epidermoid cyst	00	01	00	01	00	03	05
	Calcinosis cutis	00	00	00	02	00	02	04
	Dermoid cyst	00	00	00	02	00	01	03
	Sarcoidosis	00	00	00	02	01	01	04
	Erythema nodosum	00	00	00	00	00	03	03
	Actinic granuloma	00	01	00	00	00	00	01
	Granuloma annulare	00	00	00	01	00	00	01
	Rheumatoid nodule	00	00	00	01	00	00	01
	Giant cell tumour of skin	00	00	00	00	00	01	01
Total number (%)	01, 0.81%	35, 28.22%	01, 0.81%	10, 8.06%	03, 2.42%	74, 59.68%	124, 100%	

**[Table/Fig-9]:** Showing histopathological diagnosis and involvement of different part of dermis by granulomatous lesions.

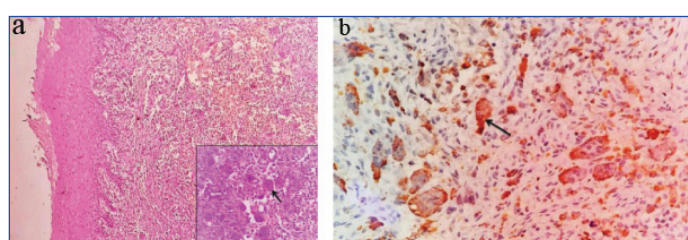
and still remains the gold standard. Good clinical history, a close histological examination and a clinicopathological correlation are essential in making a final diagnosis so that the appropriate treatment can be met. Special stains in conjunction with histology may also be required to reach an aetiological diagnosis [13].

In this study, maximum numbers of case were found in 11-20 years age group (27.41%, cases) followed by 21-30 years age group (22.58%, cases) which is comparable with Chakrabarti S et al., and Zafar MNU et al., who also encountered maximum cases in 11-20 years of age group [3,14], while some studies found maximum number of cases in 21-30 years age group [1,5,7,9,15].

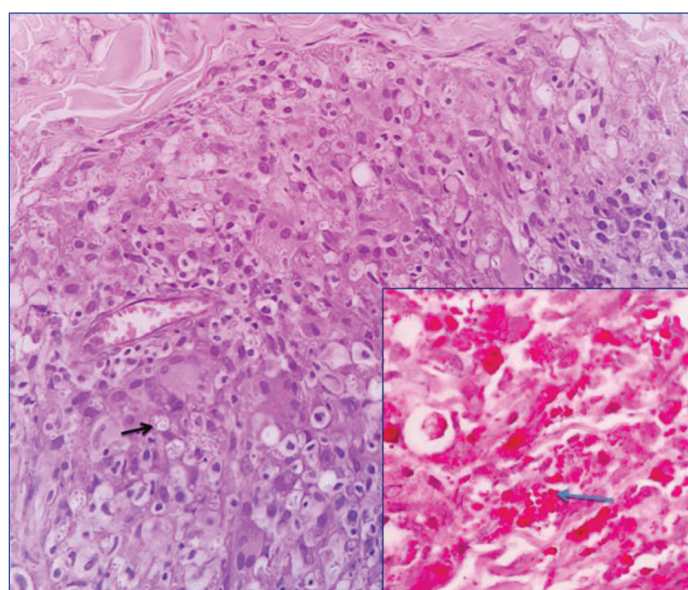
In this study, granulomatous dermatoses showed male predominance with male to female ratio 1.39:1. The present study was found concordant with Kumar VN et al., Chakrabarti S et al., Gulia SP et al., Ahmad F et al., Gupta K et al., Bal A et al., Pawale J et al., Gautam K et al., Singh R et al., Jayawardhana MPGN et al., and Makwana V et al., [1,3,5,7,9,10,15,16,17,18,19]. The present study



**[Table/Fig-10]:** Showing necrobiotic foci (Black arrow) surrounded by palisading epithelioid cells, lymphocytes and plasma cells; inset Showing Bartonella henselae (Blue arrow) on Brown Hoops modified gram stain; Cat scratch disease (H&E, 40X).



**[Table/Fig-11]:** a) Showing epidermis and mononuclear cells admixed with giant cell infiltrate along with hemorrhage in dermis; inset showing round to spindle shaped cells admixed with uniformly scattered osteoclast-like multinucleate giant cells; Giant cell tumour of skin (H&E, 10X). b) Showing cytoplasmic granular CD68 positivity in multinucleate giant cells; Giant cell tumour of skin (CD68 Stain, 40X).



**[Table/Fig-12]:** Showing diffuse histiocytic infiltrate in whole dermis (Black arrow showing Histoplasma capsulatum), inset showing capsular PAS positivity of Histoplasma capsulatum (Blue arrow); Histoplasmosis (H&E 10X, PAS stain 100X).

was nonconcordant with Bhattacharya A et al., and Zafar MNU et al., as they found female predominance [4,14]. In this study, the most common site of lesion was trunk followed by lower limb, while Zafar MNU et al., [14] found head and neck region to be the most common site followed by lower limb and Gupta K et al., [9] found upper limb as the most common site followed by head and neck region. This could be due to the geographical differences of the study place.

In this study, the most common type of granuloma was epithelioid granuloma (61.29%). The present study was found concordant with other studies [1,3,4,9,10,14,16,19]. The second most common type of granuloma was histiocytic which is concordant with Bhattacharya

A et al., [4]. Other authors have reported necrobiotic [3], suppurative [9,10], foreign body type [1,14,16] and miscellaneous [19] as the second most common type of granuloma [Table/Fig-13].

In the present study, Infectious granulomatous dermatoses (81.45%) were more common than noninfectious (18.55%). The similar results were found by other authors [3,4,5,9,10,16,18]. In the present study, tubercular granulomatous dermatoses (45.97%) were found to be the most common type followed by leprosy (32.26%) in infectious granulomatous dermatoses. This study was found concordant with Zafar M et al., and Pawale J et al., [14,15]. However, other authors Kumar VN et al., Chakrabarti S et al., Bhattacharya A et al., Gupta K et al., Bal A et al., Gautam K et al., Singh R et al., Jayawardhana MPGN et al., Bansal C et al., Mohan N et al., Dutta B et al., Khatib Y et al., Kumbar R et al., and Potekar RM. et al., found leprosy to be more common than tubercular granulomatous dermatoses [1,3,4,9,10,16-18, 20-25].

In the present study, lupus vulgaris was the most common type of tubercular granulomatous dermatoses followed by Tuberculosis Verrucosa Cutis. The similar results were found by many other authors [1,3,5,9,10,14,22,23,24,26]. Bhattacharya A et al., found scrofuloderma as the most common type [4]. Jayawardhana MPGN et al., Bansal C et al., Mohan H et al., and Potekar RM et al., found lupus vulgaris cases only [18,20,21,25].

In the present study, most common type of leprosy was borderline tuberculoid leprosy. The similar result was found by other studies [10,21,23,25,27,28], however, Kumar A et al., reported mid borderline as the most common type [29] and Jayawardhana MPGN et al., found tuberculoid leprosy as most common type [Table/Fig-14] [18].

In the present study, foreign body granuloma was most the common type in noninfectious granulomatous dermatoses followed by sarcoidal granuloma. The present study was found compatible with Chakrabarti S et al., Zafar MNU et al., Pawale J et al., Gautam K et al., and Dutta B et al., [3,14,15,16,22]. However, Bhattacharya A et al., and Makwana V et al., [4,19] who found sarcoidosis as the most common histological diagnosis in noninfectious category, while other studies [18,30] found granuloma annulare as the most common type.

In the present study, one case of cat scratch disease of skin was found, which was positive on Brown hoops modified gram stain while Khatib Y et al., also found one case of cat scratch disease of skin [23]. In the present study, one case of giant cell tumour of skin was found, while no other study reported this entity. This tumour was positive for CD68.

In the present study, maximum number of cases 74 (59.68%) were found to involve the whole dermis followed by upper and mid dermis while Kumbar R et al., found upper dermis as the most common site in 83 (60.58%) cases followed by mid dermis [24].

In the present study AFB positivity was seen in 54.38% cases of tubercular granulomatous dermatoses, while other studies found AFB positivity as low as 5.0% [4,10] cases to as high as 22.62% [15]. The present study revealed a much higher incidence of AFB positivity. In the present study, out of 40 cases of leprosy 17 (42.50%) were found Fite stain positive while 23 cases were negative. The present study was found concordant with Gupta K et al., and Suri SK et al., [9,28]. Fite stain positivity in other studies has varied from as low as 16.91% [1] to as high as 56.66% [15]. In the present study, special stains were used in 115 (92.74%) cases and they aided in the correct histological diagnosis.

Authors	Types of granulomas						
	Epithelioid	Sarcoidal	Suppurative	Foreign body	Necrobiotic	Histiocytic	Miscellaneous
Kumar VN et al., [1]	89.5%	--	2.9%	3.5%	1.8%		2.3%
Chakrabarti S et al., [3]	67.74%	1.61%	4.84%	6.45%	12.37%	6.99%	--
Bhattacharya A et al., [4]	81.00%	--	--	2.00%	2.00%	11.00%	4.00%
Gupta K et al., [9]	80%	0.95%	10.5%	0.95%	3.8%	--	3.8%
Bal A et al., [10]	87.7%	2.6%	2.9%	1.7%	2.7%	--	2.4%
Zafar MNU et al., [14]	92.7%	1.6%	1.6%	3.3%	0.8%	--	--
Gautam K et al., [16]	68.9%	1.9%	2.8%	18.9%	3.7%	--	3.7%
Makwana V et al., [19]	56.52%	4.34%	1.44%	1.44%	7.24%	--	28.98%
Present study	61.29%	3.23%	--	9.67%	3.23%	19.35%	3.23%

[Table/Fig-13]: Table showing comparison of different studies with respect to granuloma.

Different studies	Kumar VN et al., [1]	Ahmad F et al., [7]	Bal A et al., [10]	Shivamurthy V et al., [11]	Mohan H et al., [21]	Khatib Y et al., [23]	Potekar RM et al., [25]	Suri SK et al., [28]	Kumar A et al., [29]	Present study
Tuberculoid leprosy	18.3%	19.40%	7.2%	1.5%	7.40%	16.67%	11.11%	2%	18.91%	15%
Borderline tuberculoid leprosy	24.2%	23.88%	55.2%	72.5%	44.44%	31.48%	26.98%	42%	9.45%	32.50%
Mid borderline	--	--	--	2.5%	1.60%	--	--	2%	25.06%	12.50%
Borderline lepromatous leprosy	11.0%	11.94%	15%	10.5%	12.70%	11.11%	4.76%	11%	7.09%	17.50%
Lepromatous leprosy	13.2%	20.89%	17.9%	5.5%	19.05%	5.56%	25.39%	18%	9.92%	17.50%
Early indeterminate leprosy	23.5%	20.89%	--	7.5%	14.82%	12.96%	23.80%	18%	8.04%	5%
Histoid leprosy	2.4%	--	--	--	--	11.11%	--	7%	3.55%	--
Type 1 lepra reaction	--	--	2.4%	--	--	3.70%	--	--	--	--
Type 2 lepra reaction (ENL)	7.4%	2.98%	2.1%	--	--	7.41%	7.93%	--	--	--
Unclassified	--	--	--	--	--	--	--	--	17.96%	--

[Table/Fig-14]: Table showing comparison of different studies with respect to Leprosy [1,7,10,11,21,23,25,28,29].

## Limitation(s)

Limitation of the present study was lack of clinico-histologic correlation and absence of follow-up.

## CONCLUSION(S)

Major cause of granulomatous dermatoses in developing countries is still infectious, tuberculosis and leprosy being the leading cause, unlike the spectrum of developed countries. Since both these entities are curable, early and timely diagnosis is the mainstay of the treatment. H&E along with special stains can help in reaching the accurate diagnosis in majority of cases.

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