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Original Research Article

Histopathological Study of Granulomatous Dermatoses - A 2 Year Study at a Tertiary Hospital

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ABSTRACT

Granulomatous inflammation is a type of chronic inflammation that has distinctive pattern of presentation with wide etiology and can involve any organ. Pathologists come across this lesion frequently and through knowledge of granulomatous lesions are very much essential to discriminate them from other lesions in the skin as they closely mimic each other.
The aim of the present study is know the types of dermal granulomas, their prevalence, age and sex distribution, modes of presentation and histopathological spectrum.
This prospective study was undertaken at Osmania General Hospital, Hyderabad from June 2012 to May 2014. A total of 620 skin biopsies were received at the Department of Pathology, histopathological sections of all the cases were critically analyzed and were classified on a "pattern based" approach according to Rabinowitz and Zaim et al. 172 cases were categorized histopathologically as granulomatous dermatoses.
Granulomatous dermatoses were more common in males and the peak age of incidence was in 3rd decade. Incidence of Granulomatous dermatoses was 27.7% which was comparable with available literature. In the present study we found that Infections form an important cause of granulomatous dermatoses with majority of cases being leprosy followed by cutaneous tuberculosis and foreign body granulomas. The least common granuloma was actinomycosis.
To conclude adequate clinical data and workup in combination with pathological resources can help in elucidation of specific aetiology and good clinico-pathologic correlation is needed to reach a specific diagnosis. This percentage can be further escalated if microbial culture, serological investigations and ancillary techniques like PCR are done. Bacteriological index appears more useful for accurate typing of leprosy along with clinic-pathological correlation.

Key words: Granuloma, Leprosy, Tuberculosis, Fungal, Foreign body.

INTRODUCTION

Granulomatous inflammation was recognized as a distinct entity in the early 19th century and has been of continuing interest because it forms a common and intriguing problem clinically and pathologically. Arriving at a proper diagnosis is mandatory so that appropriate treatment can be meted out. The term 'Granuloma' was first coined by Virchow in 1864. It is derived from a Latin "granulum" referring to small particle or grain.

'Granuloma' is defined as a focal chronic inflammatory response to tissue injury and granuloma formation is a cellular attempt to contain an offending agent that is difficult to eradicate. Granulomatous inflammation is a pattern of reaction to

various organic and inorganic, insoluble non degradable antigens with varied incidence. [1] It is characterized 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'. Activated histiocytes are macrophage derived cells that a play role in antigen presentation and processing. Some of these histiocytes become enlarged with eosinophilic cytoplasm resembling epithelial cells referred to as epithelioid histiocytes and some fuse to form multinucleated 'giant cells'. Transformed macrophages give granulomatous inflammation its distinctive behavior and light microscopic features. As they transform, they replace phagocytic activity with secretory function, thus recruiting additional macrophages.

Granulomatous dermatoses often poses a diagnostic challenge to pathologists as an identical histologic picture is produced by several causes and conversely, a single cause may produce varied histologic patterns. [2] Thus reaching a diagnosis in these cases demands a clinico-pathological correlation. Histopathology remains gold standard for establishing a correct diagnosis, hence carrying out skin biopsies and microscopic study with routine haematoxylin and eosin (H&E) as well as special stains are must in these disorders so that the type and etiologic agent of the granulomas are properly identified. Besides, follow up, biopsies after the commencement of treatment help in evaluation of the response to therapy.

Cutaneous granulomas can be caused by leprosy, tuberculosis, sarcoidosis Granuloma annulare, foreign body reactions, numerous infectious diseases and by a large group of rare or poorly defined disorders. These disorders may be difficult clinically because the cutaneous reaction pattern and the histology can also be nonspecific. Fungal and bacterial cultures and stains, special stains and phase contrast microscopy may be helpful in determining definitive diagnosis.

The prime reason for undertaking this study is the presence of wide variety of quite common granulomatous dermatoses that are purely inflammatory conditions and are readily managed with appropriate treatment which require a definitive diagnosis. There is lot of overlap of clinical symptoms of various dermal granulomas and the corresponding histological appearances and it is difficult to diagnose them most accurately. So in every Granulomatous lesion, clinical, histopathological and therapeutic response of appropriate treatment should be correlated. Hence, Granulomatous dermatosis is a diagnostic challenge.

MATERIALS AND METHODS

The study was undertaken in the Upgraded Department of Pathology, Osmania Medical College, Hyderabad. Skin biopsies obtained from patients clinically diagnosed as various cutaneous granulomatous lesions at Osmania general hospital for a period of 2 years from June 2012 to May 2014. The histopathological diagnosis was based on the clinical parameters and histopathological patterns.

The surgical biopsy specimens with histopathological diagnosis of granulomatous dermatoses were included in the present study. All the cases were of benign etiology. The biopsy specimens with histopathological diagnosis other than granulomatous dermatoses and all skin biopsies that didn't show any definite signs of any specific pathology or inadequate were excluded.

Skin biopsies were obtained by incisional biopsy performed by the Dermatologist at the Department of Dermatology under local anesthesia and were sent to the Department of Pathology in 10% Formalin. After adequate fixation for about 8-12 hours, the biopsies were submitted for routine processing, following which the paraffin embedded sections were stained with Haematoxylin & Eosin. Multiple sections were studied. Special stains like Fite Faraco (FF), Ziehl Neelsen

(ZN) stain, Periodic Acid Schiff (PAS), Gomori Methenamine Silver (GMS) stain and Alcian blue were used where ever necessary.

RESULTS

A total of 620 skin biopsies were received at the Upgraded Department of Pathology, Osmania General Hospital, Hyderabad from June 2012 to May 2014. Amongst these biopsies 172 lesions turned out to be granulomatous dermatoses. These lesions were analyzed based on the pattern recognition method. Of the 620 skin biopsies, the granulomatous dermatoses constituted 172 cases with an incidence of 27.7%.The age ranged from 4 years to 70 years. The granulomatous dermatoses were more common in the 3rd decade, followed by 4th and 2nd decades (Table 1). The incidence was less in the 1st, 6th and 7th decades. The incidence was more in men (61%) than in women (39%) with male to female ratio 1.5: 1.

Table 1: Age Incidence of Granulomatous Dermatoses

Age in Years	No of Cases
0-10	13 (7.5 %)
11-20	30 (17.6 %)
21-30	53 (31.2 %)
31-40	36 (21.2 %)
41-50	25 (14.3%)
51-60	10 (5.2 %)
61-70	05 (3.0 %)
Total	172 (100 %)

There were 136/172 cases of leprosy with an incidence of 78.8 % and it was the commonest granulomatous lesion in the present study. Followed by cutaneous tuberculosis 18/172 (10.5%), foreign body granuloma 6/172 (3.7%), fungal granuloma and granulomatous vasculitis 4/172 (2.4%) and granuloma annulare 3/172 (1.8%) were less common. The least common granulomatous lesion was actinomycosis 1/172 (0.4%). (Table 2)

Table 2: Incidence of Various Granulomatous Dermatoses

Lesion	No. of cases	Percentage amongst GD – 172	Percentage amongst TSB – 620
Leprosy	136	78.8 %	21.8 %
Cutaneous Tuberculosis	18	10.5 %	2.9 %
Foreign body granulomas	6	3.7 %	0.9 %
Fungal granulomas	4	2.4 %	0.5%
Granulomatous vasculitis	4	2.4 %	0.5 %
Granuloma annulare	3	1.8 %	0.4 %
Actinomycosis	1	0.4 %	0.1 %

GD – Granulomatous dermatoses, TSB - Total skin biopsies

Table 3: Incidence of Various types of Granulomas

Type of granuloma	No of cases / 172 (100%)
Epithelioid / Tuberculoid granulomas	154 (89.5%)
Necrobiotic granulomas	3 (1.8%)
Foreign body granulomas	6 (3.5%)
Suppurative granulomas	5 (2.9%)
Miscellaneous	4 (2.3%)

Table 4: Histological types of Leprosy and Its Incidence

Type	No. of cases	Percentage
Borderline Tuberculoid (BT)	33 /136	24.2 %
Indeterminate leprosy (IL)	32/136	23.5 %
Tuberculoid leprosy (TT)	25/136	18.3 %
Lepromatous leprosy (LL)	18/136	13.2 %
Borderline leprosy (BL)	15/136	11.0 %
ENL reaction	10/136	7.4 %
Histoid Leprosy (HL)	3/136	2.4 %

Based on 'pattern recognition method', in the present study we encountered 154 cases (89.5%) of epithelioid / tuberculoid granulomas, followed by foreign body granulomas 6 cases (3.5%), and necrobiotic granulomas 3 cases (1.8%). (Table 3)

Leprosy / Hansen's disease

Leprosy comprised of largest sub group of granulomatous dermatoses with 136/172 cases and an incidence of 78.8 %. Of these there were 86 (63.2%) male patients and 50 (36.8%) female patients. The male to female ratio was 1.75:1 with male preponderance. The age ranged from 4 - 70 years. The youngest child was a 4 year old male child, who presented with hypopigmented patches and painful nodules over the body and the oldest case was a 70 year old male. The peak incidence (30%) with 41/136 cases was noted in the 3rd decade and maximum cases occurred in the 3rd and 4th decades. Very few cases were seen in the 6th (4.5%) and 7th (3.8%)

decades. Borderline tuberculoid leprosy (BT) was the most common entity in the present study followed by tuberculoid leprosy and lepromatous leprosy (Figure 1). Incidence of various types of leprosy is shown in Table 4.

Table 5: Comparison of the types of granulomas in different studies

	Tuberculoid	Sarcoidal	Foreign body	Suppurative	Necrobiotic	Miscellaneous
DharS et al [4]	77.3%	13.7%	-	9%	-	-
Bal A et al [1]	87.7%	2.6%	2.6%	2.9%	2.7%	2.4%
Zafar et al [8]	92.7%	1.6%	3.3%	1.6%	0.8%	-
Gautam K et al [5]	68.9%	1.9%	18.9%	2.8%	3.7%	3.7%
Present study	89.5%	-	3.5%	2.9%	1.8%	2.3%

Table 6: Comparison of Studies showing Incidence of Granulomatous Dermatoses

Lesion	Bal A et al [1]	Dhar S et al [4]	Zafar et al [8]	Present study
Leprosy	373(72.4%)	9(40.9%)	17(13.8%)	136(78.8%)
Cutaneous TB	119(23.1%)	8(36.3%)	97 (78.8%)	18(10.5 %)
Foreign body granulomas	-	-	4(3.2%)	6 (3.7 %)
Fungal granulomas	17(3.3%)	2(9%)	2(1.6)	4(2.4 %)
Granuloma annulare	-	-	1(0.8%)	3 (1.8 %)
Actinomycosis	-	-	-	1(0.5 %)
Post Kala azar	6(1.16%)	-	-	-
Sarcoidosis	-	3(13.6%)	2(1.6%)	-

Table 7: Comparison of Studies showing Incidence of Fite Faraco

Fite Faraco stain	Nayak SV et al [9]	Harish S Premi et al [10]	Present study
Positive	25 (44.64%)	09 (25.7%)	23 (16.9%)
Negative	31 (55.36%)	26 (74.28%)	113 (83.1%)
Total	**56**	**35**	**136**

Table 8: Comparison of Studies showing Incidence of Histological types of Leprosy

	TT	BT	BB	BL	LL	IL	Histoid	ENL
BalA et al [1]	7.2%	55.2%	-	15%	17.9%	-	-	2.1%
DharS et al [4]	-	66.6%	-	22.2%	-	-	11.2%	-
Rakesh Mehar et al [11]	45.6%	6.6%	-	2.2%	45.6%	-	-	-
Veena et al [12]	1.5%	72.5%	2.5%	0.5%	5.5%	7.5%	-	-
Suri SK et al [13]	2%	42%	2%	11%	18%	18%	7%	-
Present Study	18.3%	24.2%	-	11.0%	13.2%	23.5%	2.4%	7.4%

Cutaneous Tuberculosis

The second commonest granulomatous dermatosis in the present study was cutaneous tuberculosis (Figure 2). The clinical features and histopathological patterns were analyzed. Out of 18 patients, 10 patients (55.6%) were males and 8 (44.4%) were females with slight male predominance and the male to female ratio was 1.2:1. The commonest variety was lupus vulgaris comprising of 61.1% (11 cases). Others included tuberculosis verrucosa cutis with 5 cases constituting 27.8% (5 cases) and Lichen scrofulosorum comprised 11.1% (2 cases) of the total case load. Out of 18 patients, 10 patients (55.6%) were males and 8 (44.4%) were females with slight male predominance and the male to female ratio was 1.2:1.

Foreign Body Granulomas

We encountered 6 cases of foreign body granulomas (Figure 3) in the present study with an incidence of 3.7%. Three cases belonged to calcinosis cutis and two were of keratinous cysts with granulomas. One was a case of suture granuloma which developed at the site of ileostomy stump. There were 4 males and 2 females with their age ranging from 10 years to 40 years. The lesions presented with swelling in the gluteal region, on the extremities and as scrotal nodules and one case presented as postoperative non healing ulcer. The median time of appearance of the nodules was variable.

Fungal Granulomas

In the present study fungal granulomas were demonstrated in 4 cases with an incidence of 2.4%. Ages of these cases ranged from 17 years to 55 years. Clinical presentation was chronic multiple discharging sinuses of the foot of more than one year duration. In the present study fungal granulomas of Aspergillosis (Figure:

4) were demonstrated in 2 cases and two cases Pityriasis versicolour. Histopathologically suppurative granulomas observed. Special stains were done to confirm the diagnosis.

Granuloma annulare (GA)

There were 3 cases of GA constituting 1.8 % of granulomatous dermatoses and 0.4% of all skin biopsy specimens. Their ages ranged from 19 years to 45 years and included 2 males and 1 female. All the cases presented with multiple skin colored to erythematous, annular firm papules over extremities, trunk and face. Distribution was symmetrical. Histologically these lesions showed ill-defined palisading granuloma in the upper dermis. The sections showed an infiltrate of histiocytes and a sparse infiltrate of lymphocytes around an area of degenerated collagen.

Granulomatous vasculitis

In the present study there were 4 cases of granulomatous vasculitis. Their ages ranged from 22 years to 60 years with equal incidence in males and females. There were no specific signs and symptoms of Wegener's granulomatosis, lymphomatoid granulomatosis, and Churg-Strauss granulomatosis. These patients lost further follow up.

Actinomycosis

There was one case of actinomycosis (Figure: 5) in the present study. This was a 25 year old female who presented with multiple discharging sinuses over the foot. Commonest sites mentioned in the literature are cervicofacial, thoracic, ileocecal and pelvis. Mycetomas are common on the foot. The classical sites are uncommon now days because of wide use of antibiotics.

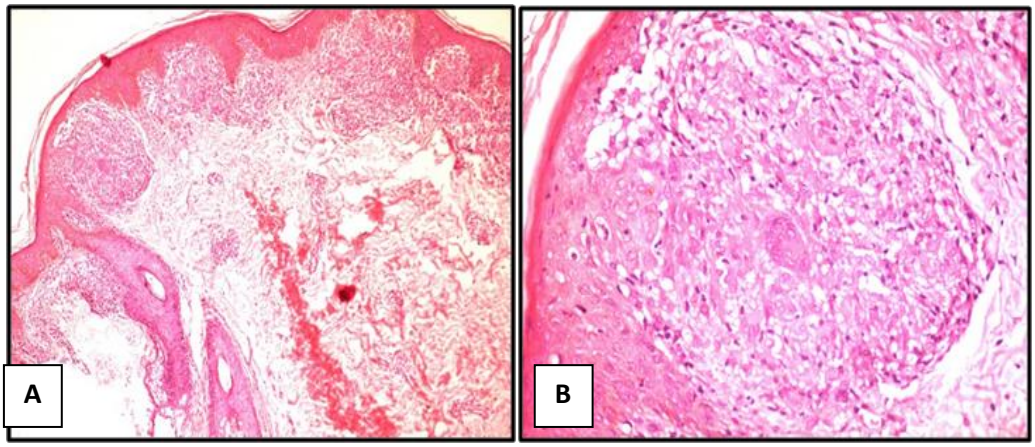

Figure 1: Tuberculoid Leprosy A (10x): Shows large epithelioid cells collections arranged in compact granulomas involving the upper dermis and epidermis. B (40x): Compact granuloma with dense lymphocytic accumulation and giant cells.

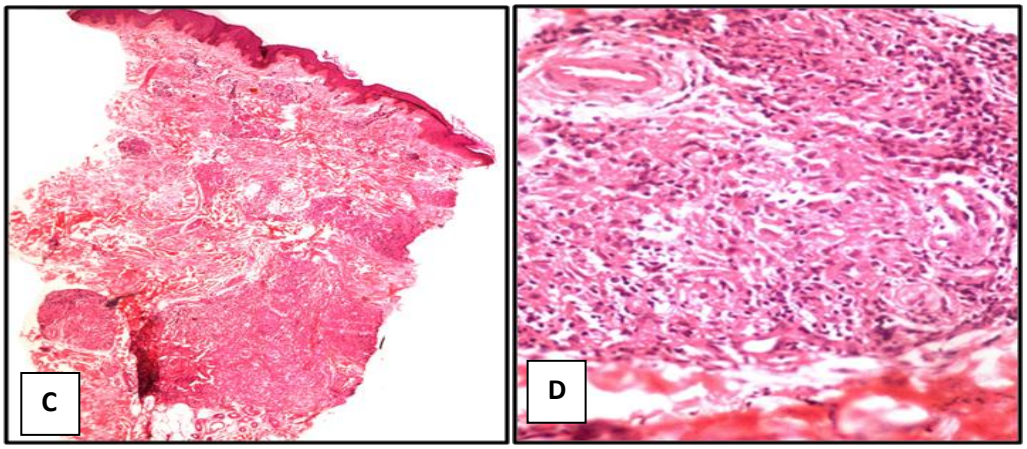

Figure 1: Borderline Tuberculoid Leprosy C (10x): Granulomas with perivascular and periadnexal infiltrates seen sparing the epidermis. D (40x): Compact granuloma with dense perivascular and periadnexal lymphocytic accumulation and occasional giant cells.

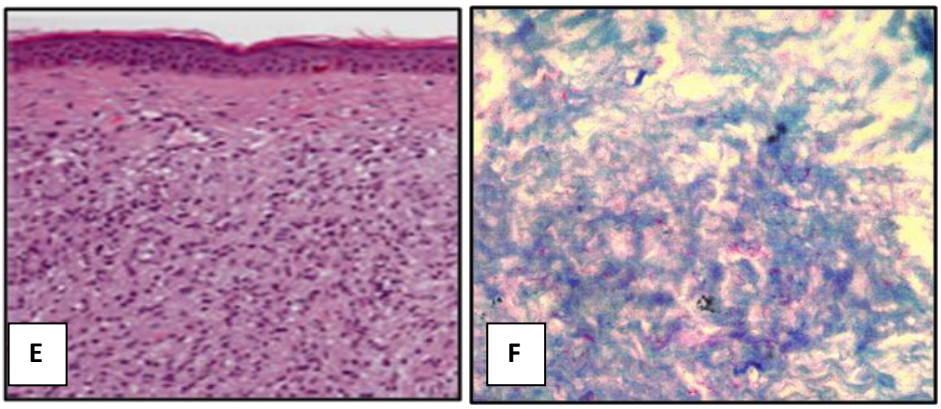

Figure 1: Lepromatous Leprosy E (10x): Flattened epidermis with a clear Grenz zone and dense collections of inflammatory cells. No granuloma formation. F (100x): Fite Faraco stain showing numerous lepra bacilli.

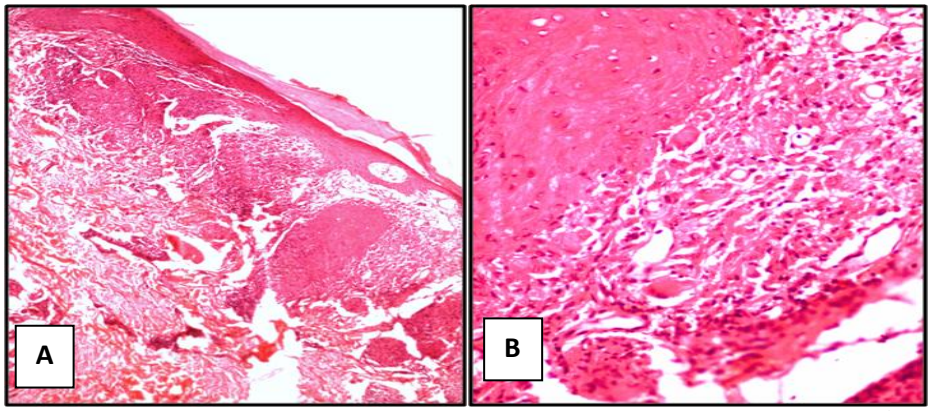

Figure 2: Tuberculosis verrucosa cutis A (10x): Shows hyperkeratosis, acanthosis and subepidermal collections of acute inflammatory cells. Also seen are epithelioid granulomas with central caseation. B (40x): An epithelioid granuloma with caseation and many giant cells.

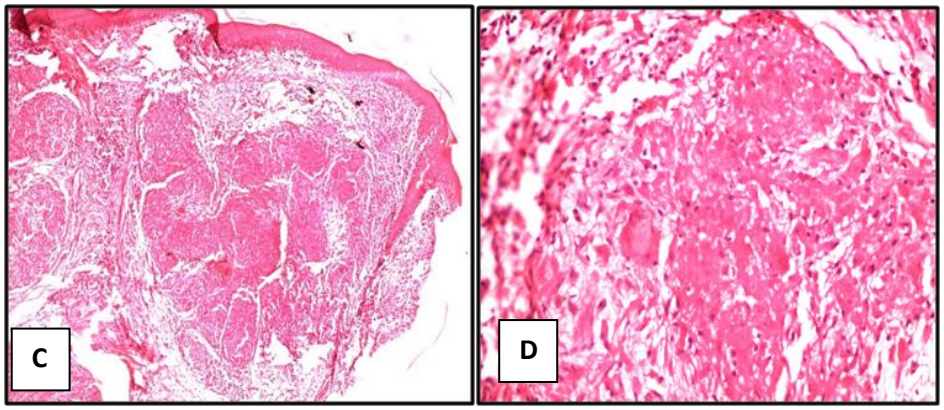

Figure 2: Lupus Vulgaris C (10x): Shows near confluent epithelioid granulomas with minimal caseation. D (40x): An epithelioid granuloma with central acute inflammation and many giant cells (mixed granuloma).

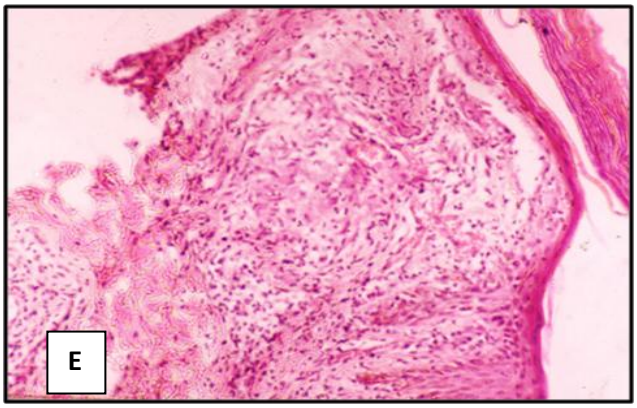

Figure 2: Lichen Scrofulosorum (E): Showing epithelioid cell granuloma in superficial dermis (10x)

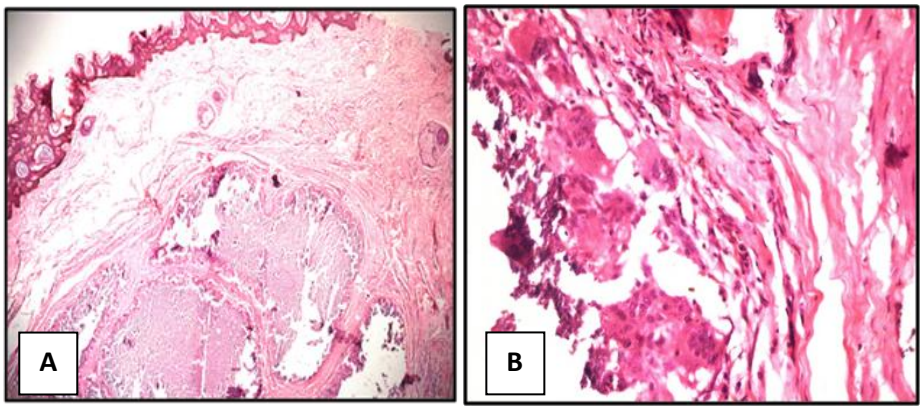

Figure 3: Calcinosis Cutis A (10x): Granules and deposits of calcium are seen in the dermis. B (40x): Foreign-body giant cell reaction surrounding calcium deposits.

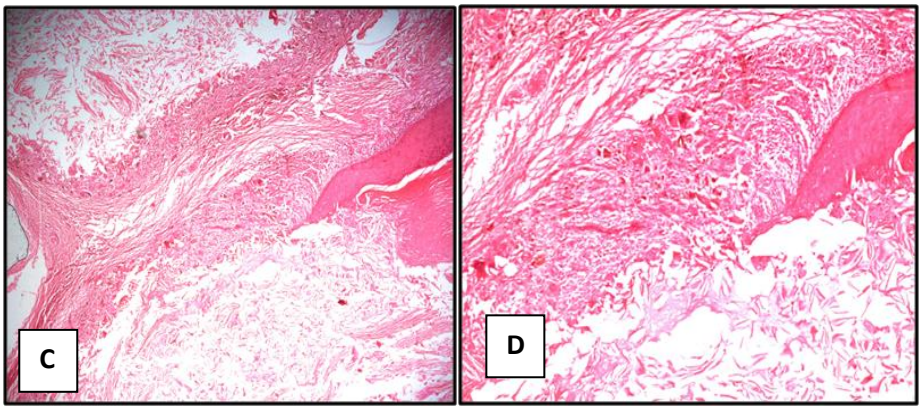

Figure 3: Keratin granuloma C (10x): Epidermal cyst showing deposits of keratin. D (40x): Foreign-body giant cell reaction surrounding lamellated keratin deposits.

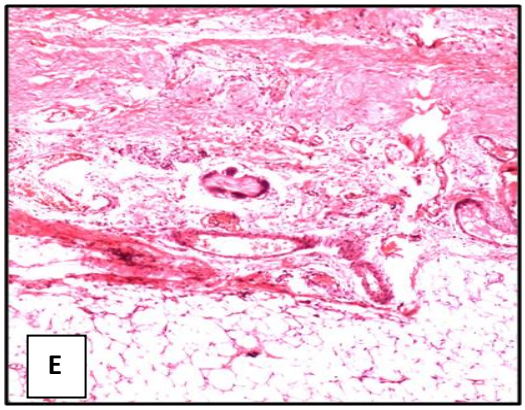

Figure 3: Suture Granuloma (E) Foreign-body giant cell reaction surrounding suture material.

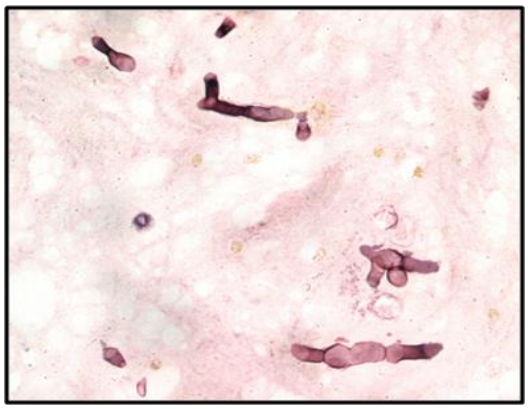

Figure 4: Special Stains A (100x): GMS stain showing spores, septate and acute branching hyphae of Aspergillosis.

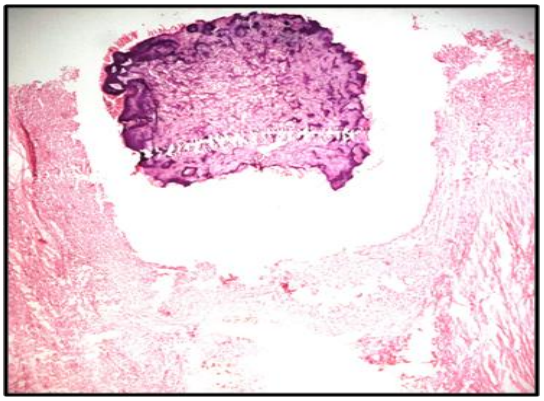

Figure 5: Actinomycosis (40x): Chronic granulomas with fibrous stroma and cyst-like spaces containing characteristic granules. Ray fungus surrounded by polymorphonuclear leucocytes.

DISCUSSION

The cutaneous granulomatous disorders are a diverse group of disorders with wide variety of etiologies and these represent a pattern of reaction to various organic and inorganic antigens. [3] These disorders may be difficult to distinguish clinically because the cutaneous reaction pattern is often nonspecific and a tissue biopsy is necessary for the diagnosis. The histopathological diagnosis of granulomatous dermatoses is greatly assisted by categorizing these lesions into five distinct patters - 'pattern recognition method' according to Rabinowitz and Zaim et al. These categories are based on the presence or absence of necrosis, necrobiosis, vasculitis and the nature of inflammatory cell infiltrate.

The incidence of cutaneous granulomas was more in men than in women with male to female ratio 1.5: 1 which is comparable with Bal A et al, [2] Dhar S et al, [4] Gautam K et al [5] Ramani S Wesley et al [6] and Ramanan et al. [7] The ages in the present study ranged from 4 years to 70 years with a mean age of 29.4 years. The peak incidence was observed in 3rd decade with 53 cases (31.2 %) and 36 cases (21.2 %) in 4th decade. Gautam K et al reported peak incidence in 4th decade. The Histopathological patterns encountered had a higher percentage of tuberculoid / epithelioid granulomas.

In the present study the most common type of granuloma was tuberculoid type comprising of 89.5% which was similar to other studies by Dhar S et al, BalA et al, Zafar et al [8] and Gautam K et al. Among the studies compared the highest incidence was reported by Zafar et al with 92.7% and least by Gautam K et al with 68.9%. (Table 5: Comparison of the types of granulomas in different studies)

In the present study leprosy was the commonest granulomatous lesion encountered with 78.8% followed by cutaneous tuberculosis (10.5%). This finding was similar to other studies by BalA et al and Dhar S et al whereas cutaneous TB was the most common lesion in a study by Zafar et al. In the present study a case of Actinomycosis was encountered which was not encountered in other studies. (Table 6: Comparison of Studies showing Incidence of Granulomatous Dermatoses)

Leprosy is classified as multibacillary leprosy and paucibacillary leprosy based on the bacteriological index using special stains like Fite Faraco. Jopling observed that bacilli are scant or absent in BT, numerous in BL and LL types. It also shows the variation of cell mediated immunity and bacillary load as the spectrum of leprosy moves from tuberculoid pole to lepromatous pole. In the present study Fite Faraco positivity was seen in 16.9%, which was lower than Nayak SV et al [9] and Harish Premi et al. [10] (Table 7: Comparison of Studies showing Incidence of Fite Faraco)

The peak age incidence in the present study was 3rd decade with 41 cases (30.8%) and was comparable with studies by Dhar S et al and Harish Premi et al where they also reported the peak age incidence in 3rd decade. Zafar et al reported peak age incidence in 2nd decade, whereas Rakesh Mehar et al [11] at 4th decade.

In the present study Borderline tuberculoid leprosy was the commonest histological subtype encountered was which was similar to Bal A et al, Dhar S et al, Veena et al [12] and Suri SK et al. [13] Rakesh Mehar et al study reported equal incidence of lepromatous leprosy and tuberculoid leprosy among skin granulomas. In the present study Erythema nodosum leprosum was seen in 7.4% of case when compared to 2.1% of BalA et al. (Table 8 showing incidence of histological types of Leprosy in various studies)

Cutaneous tuberculosis represents 1.5% of extra pulmonary tuberculosis [14] and has varied clinical presentation determined by the route of infection as well as status of cellular immunity of the host. Laennec's description of his own "Procestorwarrts" in 1926 was the first reported example of cutaneous tuberculosis.

With the improvement of living conditions and the introduction of effective treatment, the incidence of cutaneous tuberculosis had fallen from 2% to 0.15%. [15]

In the present study Cutaneous Tuberculosis was seen in 18 cases constituting 10.5% of granulomatous dermatoses and 2.9% of total skin biopsies. Out of them 10 patients (55.6%) were males and 8 (44.4%) were females with slight male predominance (Male to female ratio was 1.2:1) as seen in studies done by Acharya et al [16] Sehgal et al [17] Binodkumar et al [18] and Dwari B C et al. [19]

Of 18 cases of cutaneous tuberculosis, the commonest histological variant of cutaneous TB was lupus vulgaris comprising of 61.1% (11 cases). Similar findings were also given by Bal A et al, Dwari B C et al and Neerja Puri et al. [20] The second commonest clinical type was tuberculosis verrucosa cutis constituting 27.8% (5 cases). Demonstration of acid fast bacilli by ZN stain is specific, however, they are not detected with ease and literature has reported 13 - 15% positivity in lupus vulgaris and up to 50% positivity in scrofuloderma.

Foreign body granuloma represents the response of the body to a foreign body of low solubility and high immunogenicity. [21] Few of the culprits are tattoo, dirt, talc, silica, glass, thorn, insect parts, paraffin, hair, zirconium, beryllium and suture material. Intrinsic materials like calcium, cholesterol, keratin and uric acid can also evoke granuloma formation. Tissue reaction may be a compact granuloma, a necrobiotic granuloma or suppurative granuloma. Calcinosis cutis is a term used to describe a group of disorders in which calcium deposits form in the skin. Virchow initially described calcinosis cutis in 1855. In the present study foreign body granulomas constituted 6 cases (3.7%). Three cases belonged to calcinosis cutis, two were of keratinous cysts and one case of suture granuloma. All the lesions showed granulomas.

Actinomycosis is a rare chronic infection caused by anaerobic, filamentous bacteria in the order Actinomycetes. Its exact incidence is not known. Improved hygiene and widespread use of antibiotics for various infections probably have contributed to the declining incidence of this disease. Actinomycosis generally is a polymicrobial infection, with isolates numbering as many as 5-10 bacterial species [22] and formation of suppurative granuloma. In the present study we encountered a case of actinomycosis in a 21 year old female with multiple discharging sinuses over the foot. Common sites mentioned in the literature are cervicofacial, thoracic, ileocecal and pelvis. The histopathology pattern of actinomycosis is that of suppurative granuloma.

In the present study fungal granulomas of aspergillosis were demonstrated in 2 cases and two cases Pityriasis versicolour. The ages of all the cases ranged from 17 years to 55 years. Histopathologically suppurative granulomas were observed. Their size and the shape and the non-pigmentation of the granules pointed toward the fungi which were confirmed with special stains like PAS, GMS which demonstrated spores, septate and acute branching hyphae of 4-5 µm thick.

In the present study there were 3 cases of Granuloma annulare constituting 1.8 % of granulomatous dermatoses and 0.4% of all skin biopsy specimens. Their ages ranged from 19 years to 45 years and included 2 males and 1 female with male predominance which was similar to the study by Gutte R et al. [23]

Granuloma annulare is a self-limiting disorder occurring primarily in children and young adults. Histologically these lesions showed ill-defined palisading granuloma in the upper dermis. Special stain which are helpful in the diagnosis of GA are Alcian blue and colloidal iron. In The present study mucin deposition was demonstrated using Alcian blue in one case (33.3%) who was a 19 year old female with

a lesion over the face. Yun et al., found mucin deposition in 51 cases (94%). Günes et al., found dermal mucin deposition in 32 (84.2%) specimens.

CONCLUSION

In the present study we found that Infections form an important cause of granulomatous dermatoses with majority of cases being leprosy followed by tuberculosis. Granulomatous dermatoses are more common in males and the peak age incidence is in 3rd decade.

Cutaneous TB sometimes reflects the presence of pulmonary tuberculosis and its incidence should not be ignored. There is a significant overlap in histopathologic picture of different granulomatous reactions. Thus, morphology alone is seldom specific and cannot be used as diagnostic tool for identification of specific diseases.

Adequate clinical data and workup in combination with pathological resources can help in elucidation of specific etiology and good clinico-pathologic correlation to reach a diagnosis. This percentage can be further consolidated, if microbial culture, serological investigations and PCR are done. Bacteriological index appears more useful for accurate typing of leprosy along with clinic-pathological correlation.

Cooperation between the clinician and the pathologist is more important in the field of dermatopathology than in any other field, if the patient is to derive the greatest benefit from the biopsy.

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