ORIGINAL RESEARCH

Cytomorphological Pattern of Tuberculous Lymphadenitis and Correlation with AFB Positivity

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ABSTRACT

Objective: This study aims to comprehensively investigate the cytomorphological spectrum of tuberculous lymphadenitis and establish a robust correlation with Acid-Fast Bacilli (AFB) positivity. **Methods:** The study was conducted in the Department of Pathology at GMC Jammu, involving 130 clinically suspected patients of tubercular lymphadenitis. The study spanned from March 2021 to February 2022, during which fine needle aspiration cytology (FNAC) was performed on enlarged lymph nodes after obtaining informed consent from each patient. Detailed clinical history was documented, and palpable nodes were aspirated. Smears were stained with FNAC, and one slide was left unstained in each case for Ziehl-Neelsen staining. Out of the 130 cases, 90 exhibited cytological features indicative of granulomatous lymphadenitis.**Results:** The predominant age group affected was 21-30 years (37.8%), with a mean age of 32.8±7.54 years. Females constituted 52.2% of the cohort. Fever (72.2%) emerged as the most common symptom. Cervical lymph nodes were predominantly involved (82.2%), with "Pattern B" being the most prevalent cytological pattern (51.11%). Correlation analysis demonstrated that "Pattern C" (Necrosis only) exhibited the highest AFB positivity rate (36%), followed by "Pattern B" (17.4%) and "Pattern A" (5.3%). The overall AFB positivity rate was 20.0%. **Conclusion:** The study provides valuable insights into the cytomorphological spectrum of tuberculous lymphadenitis and establishes a significant correlation with AFB positivity. The findings contribute to refining diagnostic approaches and improving the overall management of this extrapulmonary manifestation of tuberculosis. Further research may elucidate additional nuances, aiding clinicians in more accurate and timely diagnoses.

Keywords: Tuberculous, lymphadenitis; Ziehl–Neelsen stain; Acid-fast, bacilli; Epithelioid, granuloma; FNAC lymph node; Extrapulmonary tuberculosis

INTRODUCTION

Tuberculosis remains a widespread infectious disease, particularly prevalent in developing and underdeveloped countries. Given India's status as one of the most populous nations, it significantly contributes to the global incidence of tuberculosis, representing approximately one-fifth of reported cases worldwide.[1] In 2015 alone, India documented 2.8 million cases out of the total 10.4 million reported globally.[2] Within the spectrum of tuberculosis manifestations, lymphadenitis stands out as one of the most common extrapulmonary presentations, accounting for nearly 35% of all extrapulmonary tuberculosis cases.[3]In the context of patients with human immunodeficiency virus (HIV) infection, the prevalence of extrapulmonary tuberculosis (TB) assumes heightened significance, comprising a substantial proportion ranging from 53% to 62% of all tuberculosis cases.[4,5]

Various diagnostic approaches have been recommended for the confirmation of tubercular lymphadenitis, encompassing techniques such as fine needle aspiration cytology (FNAC), culture, polymerase chain reaction (PCR), and histopathological examination of excised lymph nodes.[6]These methods collectively offer a diverse array of tools to ensure accurate and comprehensive diagnosis, allowing for a multifaceted assessment of tubercular lymphadenitis. The choice of diagnostic modality often depends on clinical context, available resources, and the specific information sought in the diagnostic process. However; Fine Needle Aspiration Cytology (FNAC) stands as a routinely employed technique in the diagnostic landscape of tuberculous lymphadenitis.[7]This well-established method serves as a valuable diagnostic tool, facilitating the accurate and minimally invasive assessment of lymph node abnormalities associated with tuberculosis. FNAC

plays a pivotal role in obtaining cellular material from affected lymph nodes, enabling pathologists to scrutinize cytological patterns and make informed diagnostic decisions. Furthermore, fine-needle aspiration cytology (FNAC) presents notable advantages in terms of both cost-effectiveness and speed when compared to conventional culture studies, which are regarded as gold standards but are time-consuming and demand a high level of expertise.[5] Additionally, FNAC offers a practical alternative to polymerase chain reaction (PCR) techniques, which, while highly sensitive, can be expensive and require specialized training for proficiency.[7] This underscores the practical utility of FNAC as a rapid and cost-efficient diagnostic tool in relevant clinical settings. It is considered a highly reliable investigation, especially when combined with Ziehl–Neelsen staining for detecting acid-fast bacilli in resource-limited countries like India. The objective of this study is to describe the cytomorphological patterns of tuberculous lymphadenitis and their correlation with acid-fast bacilli (AFB) positivity. Additionally, the study aims to provide a detailed description of the various morphological features observed on cytological smears of tuberculous lymphadenitis.

METHODS

The study was conducted in the Department of Pathology at GMC Jammu, involving 130 clinically suspected patients of tubercular lymphadenitis. The study spanned from March 2021 to February 2022, during which fine needle aspiration cytology (FNAC) was performed on enlarged lymph nodes after obtaining informed consent from each patient. Detailed clinical history was documented, and palpable nodes were aspirated. Smears were stained with H&E, and one slide was left unstained in each case for Ziehl-Neelsen staining. Out of the 130 cases, 90 exhibited cytological features indicative of granulomatous lymphadenitis.

STATISTICAL METHODS

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages.

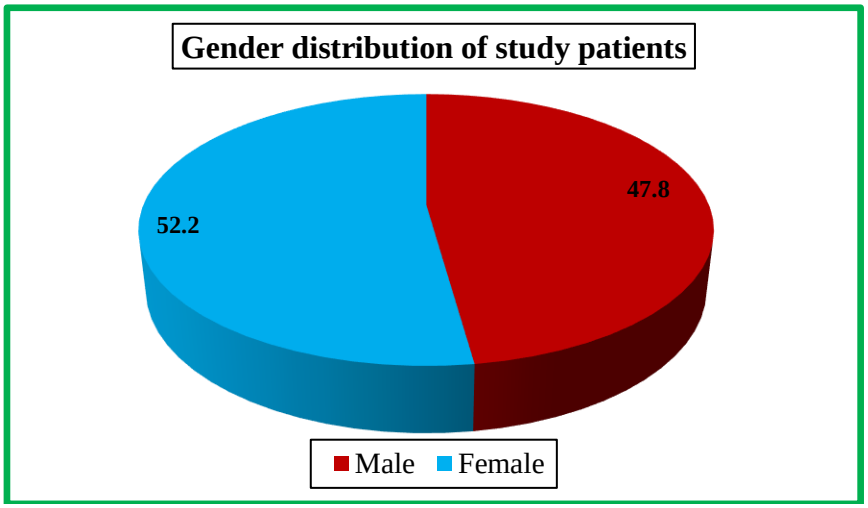
RESULTS

In this section, the results of the study will be described:

Table 1: Age distribution of study patients

Age (Years)	Number	Percentage
≤ 20	12	13.3
21-30	34	37.8
31-40	23	25.6
41-50	9	10.0
51-60	5	5.6
> 60	7	7.8
Total	90	100
Mean±SD (Range)=32.8±7.54 (6-70 Years)		

Table 1 illustrates the age distribution of the study participants, categorizing them into distinct groups. The majority of patients (37.8%) fell within the age range 21-30 years, followed by (25.6%) belonging to the age group of 31-40 years. The mean age of studied patients was 32.8±7.54 years, with a range from 6 to 70 years.



Of the total 90 study patients, 43 were identified as male, comprising 47.8% of the population. Meanwhile, the female contingent comprised 47 patients, slightly outnumbering the males and representing 52.2% of the overall sample.

Table 3: Clinical presentation of study patients		
Clinical features	**Number**	**Percentage**
Fever	65	72.2
Cough	32	35.6
Loss of appetite and weight	23	25.6
Features of pulmonary tuberculosis	19	21.1
Dyspnoea	5	5.6
Pleural effusion	2	2.2

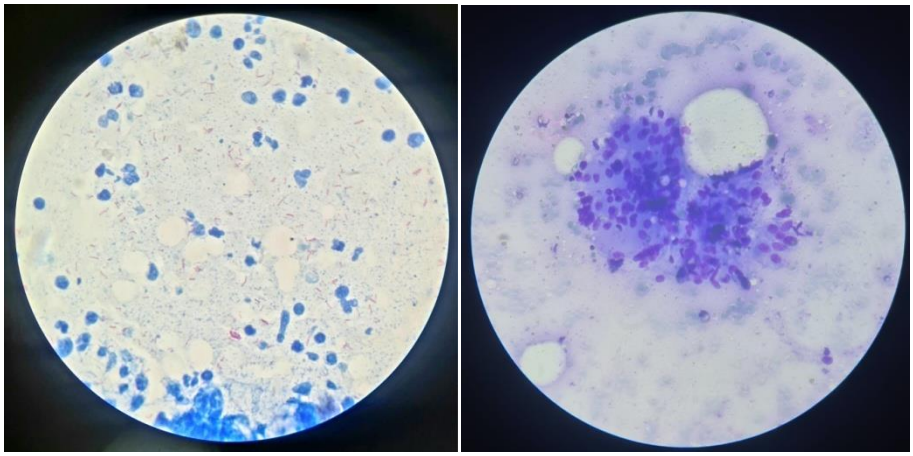
In the present study, fever emerged as the most frequently reported symptom, with 65 individuals, constituting 72.2% of the total study population. Cough was another prevalent symptom, affecting 32 participants, representing 35.6% of the cohort. Loss of appetite and weight was observed in 23 individuals, accounting for 25.6% of the study group. Additionally, features indicative of pulmonary tuberculosis were present in 19 patients, making up 21.1% of the total. Dyspnoea, characterized by difficulty in breathing, was reported by 5 individuals, contributing to 5.6% of the study population. The least common clinical feature was pleural effusion, noted in 2 participants, or 2.2% of the cohort.

Table 4: Distribution of lymph node involvement		
Lymph node involved	**Number**	**Percentage**
Cervical	74	82.2
Axillary	14	15.6
Inguinal	2	2.2
Total	90	100

The assessment of lymph node involvement revealed that the cervical region was the most commonly affected, with 74 individuals (82.2% of the total study population) demonstrating involvement in cervical lymph nodes. Additionally, 14 participants (15.6%) exhibited involvement of axillary lymph nodes, while lymph node involvement in the inguinal region was observed in two individuals, constituting 2.2% of the study cohort.

Table 5: Correlation between cytological pattern and smear AFB positivity			
Type of pattern	**No. of cases**	**AFB positive cases**	**Percentage (%)**
A: Granuloma only	19	1	5.3
B: Granuoma with necrosis	46	8	17.4
C: Necrosis only	25	9	36.0
Total	90	18	20.0

Table 5 elucidates the correlation between cytological patterns and the presence of Acid-Fast Bacilli (AFB) in the studied cases, shedding light on the relationship between these variables. In cases characterized by Type A cytological pattern, where granuloma formation was observed without necrosis, 19 instances were identified. Among these, only one case tested positive for AFB, reflecting a positivity rate of 5.3%. For Type B cytological pattern, characterized by granuloma with necrosis, 46 cases were observed, with eight cases testing positive for AFB, resulting in a positivity rate of 17.4%. Notably, Type C cytological pattern, indicating necrosis without granuloma formation, was associated with 25 cases, out of which nine were AFB positive, representing a higher positivity rate of 36.0%. Overall, when considering all cytological patterns collectively, out of the total 90 cases, 18 were AFB positive, yielding an overall positivity rate of 20.0%.



DISCUSSION

The rationale behind the undertaken study lay in the imperative need to comprehensively explore the cytomorphological spectrum of tuberculous lymphadenitis and establish a robust correlation with AFB (acid-fast bacilli) positivity. Tuberculous lymphadenitis, a prevalent manifestation of extrapulmonary tuberculosis, demanded a meticulous examination of its cytological features to enhance diagnostic accuracy and facilitate timely intervention. In the current study a predominant proportion of patients (37.8%) fell within the age range of 21-30 years, with a subsequent (25.6%) comprising the age group of 31-40 years. The mean age of the studied patients was 32.8±7.54 years, ranging from 6 to 70 years. These demographic findings align with the observations of Choudhary S et al, where the highest incidence of cases occurred in the age group of 21-30 years, followed by the age groups of 11-20 years and 31-40 years. In our study, a total of 90 participants were analyzed, with 43 identified as male, constituting 47.8% of the cohort.[8]Concurrently, the female cohort comprised 47 participants, slightly outnumbering the males and representing 52.2% of the overall sample. This gender distribution aligns with findings observed in studies conducted by Pamra et al and Choudhary S et al, wherein a female preponderance of cases was reported.[8,9]Consistent with broader literature, our results reinforce the prevailing trend of tuberculous lymphadenitis being more commonly reported among women compared to men, with a composite ratio of 1.4:1. This gender-based pattern differs from pulmonary tuberculosis, where the disease is more commonly observed among men.[10]

In the present study, fever emerged as the most frequently reported symptom, with 65 individuals, constituting 72.2% of the total study population. Cough was another prevalent symptom, affecting 32 participants, representing 35.6% of the cohort. Loss of appetite and weight was observed in 23 individuals, accounting for 25.6% of the study group. Additionally, features indicative of pulmonary tuberculosis were present in 19 patients, making up 21.1% of the total. Dyspnea, characterized by difficulty in breathing, was reported by 5 individuals, contributing to 5.6% of the study population. The least common clinical features were Dyspnea, pleural effusion. It has been reported that patients with tuberculosis lymphadenitis are typically adults who present with constitutional symptoms such as fever, fatigue, and weight loss, often accompanied by pulmonary tuberculosis. [11] In another study by Soumya BM et al, fever was a prominent symptom, affecting 69% of cases, while cough (32%), loss of appetite/weight (19%), and a history of tuberculosis and ATT defaulters displayed varying frequencies (53%). These findings align with our observations, underscoring the consistency of reported symptoms across different studies.[12]

The evaluation of lymph node involvement indicated that the cervical region was the most frequently affected, with 74 individuals (82.2% of the total study population) demonstrating involvement in cervical lymph nodes. Furthermore, 14 participants (15.6%) exhibited involvement of axillary lymph nodes, while lymph node engagement in the inguinal region was observed in two individuals, constituting 2.2% of the study cohort. These findings align with previous studies conducted by Rajashekaran et al., Ahamed et al., and Choudhary S et al., which consistently reported a predominant occurrence of affected lymph nodes in the cervical region, followed by axillary nodes.[8, 13,14]In our analysis of 90 patients under study, we noted that the predominant cytological pattern was "Pattern B," accounting for 51.11% of cases, followed by Pattern C at 27.77%, and Pattern A at 21.11%. These observations align with various studies, including those by Khanna et al., Das et al., Soumya BM et al., and LlatJosetal, wherein a consistent pattern emerged.[12,15-17] Specifically, these studies reported that "Pattern B" was the most frequently observed cytological pattern, followed by Pattern C, while Pattern A was consistently identified as the least common cytological pattern. We conducted an analysis to elucidate the correlation between cytological patterns and the presence of Acid-Fast Bacilli (AFB) in the examined cases. Within the subset characterized by Type A cytological pattern, only one case exhibited AFB positivity, resulting in a positivity rate of 5.3%. Type B cytological pattern, marked by granuloma with necrosis, was observed in 46 cases (51.11%), with eight cases testing positive for AFB, yielding a positivity rate of 17.4%. Notably, Type C cytological pattern, indicative of necrosis without granuloma formation, correlated with 25 cases (27.77%), out of which nine demonstrated AFB positivity, reflecting a heightened positivity rate of 36.0%. Significantly, the maximum positivity rate (36%) was associated with Pattern C (Necrosis only), followed by Pattern B (17.4%) and Pattern A (5.3%). In aggregate, when considering all cytological patterns collectively across the entire cohort of 90 cases, 18 cases exhibited AFB positivity, resulting in an overall positivity rate of 20.0%. These findings align consistently with several studies conducted by Hemalatha et al., Paliwal et al., Khana et al., and Soumya et al.[7,12,15,18]They consistently reported that the predominant AFB positivity rate was associated with Type C, followed by Type B and Type A cytological patterns. For instance;, in a study by Soumya et al., the overall AFB positivity rate was 18%, with the highest positivity rate of 34.5% observed in Type C smears, followed by 14.2% associated with Type B and a 4.5% positivity rate associated with Type A.[12] These outcomes closely mirror our own results, providing additional validation and support to the observed patterns in our study.

CONCLUSION

The present study revealed that patients with tuberculous lymphadenitis typically presented with classical constitutional symptoms, with fever being the most frequently reported. An in-depth analysis of lymph node involvement underscored the cervical region as the predominant site of affliction. Cytologically, "Pattern B" emerged as the prevailing morphological pattern. Moreover, the correlation analysis between cytological patterns and Acid-Fast Bacilli (AFB) positivity unveiled significant associations. "Pattern C" (Necrosis only) demonstrated the highest AFB positivity rate, followed by "Pattern B" and "Pattern A." These outcomes carry meaningful implications for the refinement of diagnostic approaches and the enhancement of overall management strategies for this extrapulmonary tuberculosis manifestation. The validation of cytological patterns as indicative markers for AFB positivity emphasizes their utility in clinical decision-making.

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