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Diagnostic Utility of Fine-Needle Aspiration Cytology (FNAC) in Lymphadenopathy: A Study from a Rural Tertiary Care Centre in Faridabad, Haryana

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Abstract: ***Fine-needle aspiration cytology (FNAC) is a minimally invasive and cost-effective diagnostic tool for evaluating lymphadenopathy. This study examines 138 cases at a rural tertiary care centre in Faridabad, Haryana, analysing the cytomorphological spectrum of lymph node lesions. Tubercular lymphadenitis was the most common finding (47.10%), followed by reactive hyperplasia (34.78%). The study highlights FNAC's utility in diagnosing both neoplastic and non-neoplastic conditions, particularly in resource-limited settings, reinforcing its role as a reliable first-line diagnostic modality.***

Keywords: Fine-Needle Aspiration Cytology, Lymphadenopathy, Cytomorphology, Tubercular Lymphadenitis, FNAC Diagnosis

1. Introduction

Fine-needle aspiration cytology (FNAC) is a clinical technique used to obtain cells, tissues, and/or fluid through a thin needle attached to a disposable syringe for diagnosing masses [1]. This study is significant in highlighting FNAC as a primary diagnostic tool for lymphadenopathy, particularly in resource-constrained rural settings, aiding early diagnosis and management. Lymphadenopathy is one of the most common clinical presentations of patients attending the outpatient department. Lymphadenopathy can be incidental or indicate underlying neoplastic or non-neoplastic disease [2]. Lymph node aspiration is of great value in diagnosing lymphadenitis, lymphomas, and metastatic carcinoma [3]. In 1847, Kun pioneered the first reported use of aspiration biopsy.

Fine-needle aspiration cytology (FNAC) as the first line of investigation has assumed importance in diagnosing a variety of disease processes as it is rapid, simple, reliable, minimally invasive, and cost-effective procedure which can be used in outpatient setting [4]. The etiology varies from an inflammatory process to a malignant condition. The knowledge of the pattern of lymphadenopathy in each geographical region is essential for making a confident diagnosis or suspecting a disease [5].

FNAC has an important role in the evaluation of peripheral lymphadenopathy, and it can be used as a safe alternative to excision biopsy [6]. FNAC has been used extensively for the diagnosis of primary and secondary lymphadenopathy. The present study was undertaken to determine the role of FNAC in the evaluation of cytomorphological features of various lymph node lesions. Our experience of the diagnostic utility of FNAC in the assessment of lymphadenopathy is presented. The study highlights the epidemiological patterns and cytomorphological spectrum of lymph node lesions in this rural region with emphasis on cytological spectrum in diagnosis of pattern of tuberculosis, also providing details about burden of disease in this region.

Objectives

1) To evaluate the role of FNAC in patients presenting with lymph node enlargement.
2) To find out the frequency of lymphadenopathy in different age groups.
3) To analyse the utility and diagnostic importance of FNAC in lymph node diseases.

Inclusion Criteria

All patients presenting with lymph node enlargement were included in the study.

Exclusion Criteria

Those patients with aspirated material were either inadequate or smears were unsatisfactory for evaluation.

2. Materials and Methods

A retrospective study of 138 cases of lymphadenopathy presenting to the Department of Pathology for 12 Months from January 2024 to December 2024 was taken up for our study. After obtaining the Ethical Committee Clearance from our institution and informed consent from the patients, FNAC was performed using a 22–24-gauge needle and 10 ml syringe. Two of the prepared smears were fixed in alcohol and stained with haematoxylin and eosin and Papanicolaou stain. Two smears were air-dried, one was stained with Leishman stain and the other kept unstained to be used for Ziehl–Neilsen (ZN) staining whenever a cytological diagnosis of granulomatous disease was made and in cases with abundant necrosis and suppuration. In cases where fluid was aspirated, the fluid was centrifuged and smears were made from the sediment, followed by the above staining methods.

3. Results

A total of 138 cases of lymphadenopathy were obtained in the cytopathology section over a period of 12 months from January 2024 to December 2024. Among the 138 cases, FNAC was inconclusive in 5 (3.62%) due to unsatisfactory smears. **Table 1** shows the cytological diagnosis in 138 patients with lymphadenopathy. Most common lesion found in our study was tubercular lymphadenitis in 65 cases (47.10%), followed by reactive hyperplasia in 48 cases (34.78%), chronic granulomatous inflammation in 6 cases (4.34%), acute suppurative lymphadenitis in 7 cases (5.07%), Non- Hodgkin's lymphoma in 2 cases (1.44%), Hodgkin's lymphoma in 3 cases (2.17%) and suspicious malignancy in 2 cases (1.44%). The age and sex distribution of the patients with lymphadenopathy are shown in **Table 2 and 3**. Age of the patients ranged from 6 to 77 years while maximum patients were in the age group of 21-30 years.

Table 1

Cytopathology	No. of Cases	% (out of 138)
Chronic Granulomatous Inflammation with Necrosis Suggesting Tuberculosis	65	47.10%
Reactive Lymphoid Hyperplasia	48	34.78%
Chronic Granulomatous Inflammation	06	4.34%
Hodgkin's Lymphoma	03	2.17%
Suspicious Malignancy	02	1.44%
Non-Hodgkin's Lymphoma	02	1.44%
Acute Suppurative Lymphadenitis	07	5.07%
Unsatisfactory	05	3.62%

Table 2

Sex/Gender	No. of Patients	% (out of 138)
Males	80	57.97%
Females	58	42.02%

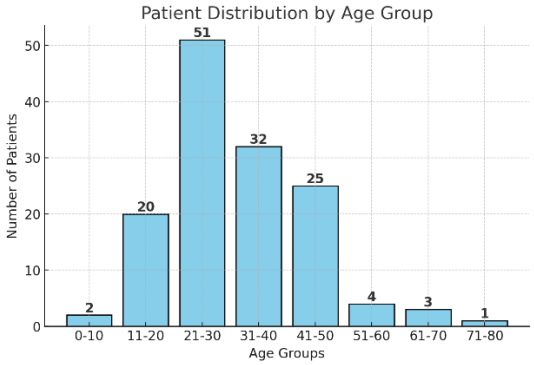
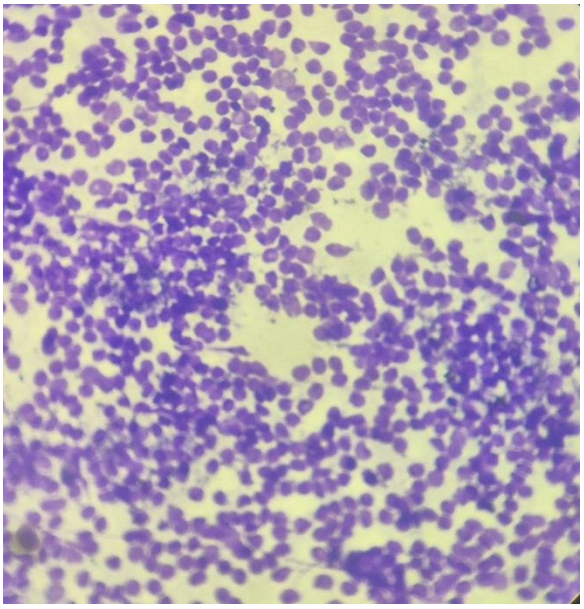


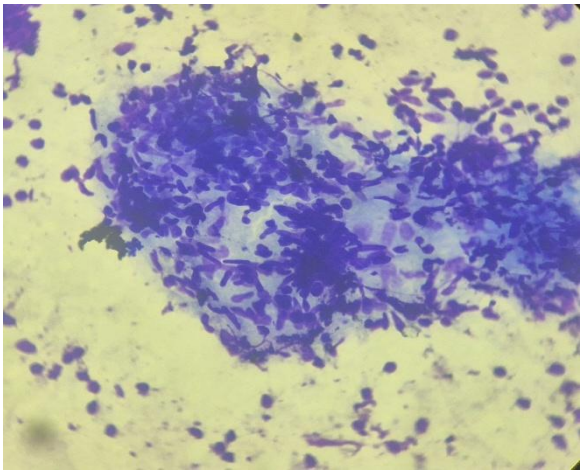
Table 3

Chronic granulomatous inflammation with necrosis was the most common finding in our study. ZN stain was done in all these cases with chronic granulomatous inflammation with necrosis suggesting tuberculosis (65 cases) out of which 35 were found positive. We observed various cytomorphological patterns of lymphadenitis. However, in regions where tuberculosis is very common, granulomatous lymphadenitis should be treated as due to tuberculosis if not otherwise specified.

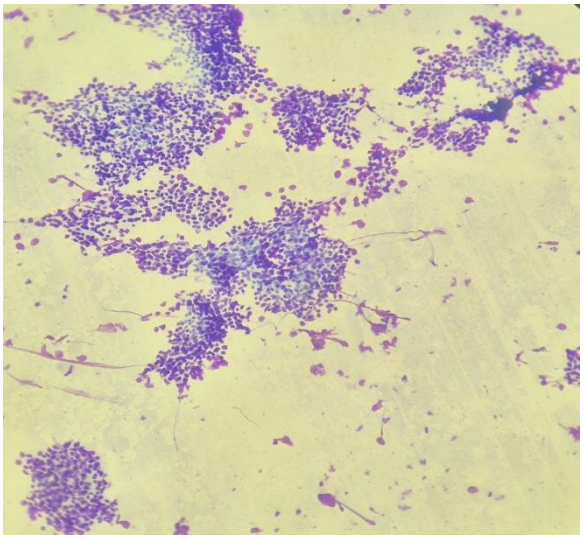
The following images depict cytopathological slides observed during the study, illustrating key microscopic findings relevant to the research.



Smears reveal lymphoid population in varying stages of maturation. [Giemsa Stain 40x]



Smear reveal granuloma formed by epithelioid cells. [Giemsa Stain 40x]



In the above slide, Hypercellular smears reveal monotonous round to oval population of cells with naked nuclei. [Giemsa Stain 10x]

4. Discussion

In the present study, an attempt has been made to study the cytomorphological spectrum and epidemiological pattern of lymph node lesions. Adequate material was obtained in 133 cases which correlated with the study by Hemalatha *et al*. and Gupta *et al* [7, 8]. Aspirates were inconclusive in 5 cases (3.62%) due to unsatisfactory smears. The causes for unsatisfactory smears were scant cellular yield or obscuring blood. In our study, most of the patients were in the age group 21–30 years. This correlated with the study by Chandanwale *et al*., where maximum numbers of cases were seen in the age group of 21–40 years [9]. Tuberculous lymphadenitis was the most common lesion and was reported in 65 cases (47.10%). This correlated with the study by Khajuria *et al*. [10]. In developing countries where mycobacterial infection is prevalent and resources for medical care are limited, FNAC provides a simple, efficient, and cost-effective alternative to diagnose tuberculous lymphadenopathy [11]. In a region where tuberculous infection is common and other granulomatous diseases are rare, the presence of a granulomatous feature in FNAC is highly suggestive of tuberculosis. The literature on the use of FNAC to diagnose tuberculous cervical lesions is mainly from the developing countries where mycobacterial infections are prevalent [12]. Reactive lymphadenopathy was in 48 cases (34.78%). This is like the study by Khan *et al*. and Javed *et al*. [13, 14] Detailed clinical history and other relevant investigations were done to find the etiologies of reactive lymphadenitis.

5. Conclusion

Fine-needle aspiration cytology (FNAC) serves as an excellent first-line investigation for assessing lymph node lesions. It is a rapid, safe, minimally invasive, and reliable diagnostic tool that is well accepted by patients. FNAC is valuable in identifying both neoplastic and non-neoplastic conditions, offering a cost-effective and convenient alternative to open lymph node biopsy. The addition of Ziehl-Neilsen (ZN) staining in cases exhibiting granulomas, necrosis, or suppuration significantly enhances the detection of tuberculosis, making it an essential component of routine diagnostics. Our study highlights the diverse cytomorphological patterns of lymphadenopathy and underscores the substantial burden of tuberculous lymphadenitis in this region.

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Nil.

Conflicts of Interest-
There are no conflicts of interest.

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