

Original Research Article

A PROSPECTIVE STUDY OF DIAGNOSTIC EVALUATION OF LYMPH NODE LESIONS BY FINE NEEDLE ASPIRATION CYTOLOGY IN A SOUTH INDIAN TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Lymphadenopathy is a common clinical presentation with a wide range of underlying causes, including infections, reactive conditions, and malignancies. Fine Needle Aspiration Cytology (FNAC) has proven to be a simple, rapid, and reliable diagnostic modality for evaluating lymph node lesions, particularly in resource-constrained settings. **Aim:** To assess the diagnostic utility of FNAC in lymphadenopathy and to analyze the cytomorphological patterns of various lymph node lesions in a tertiary care hospital in South India.

Materials and Methods: A prospective study was conducted over one year in the Department of Pathology. FNAC was performed on 209 patients with palpable lymphadenopathy. Aspirated smears were stained with Hematoxylin & Eosin, Giemsa, Papanicolaou, and Ziehl-Neelsen stains. Cytological diagnoses were categorized, and correlations were made with age, anatomical location, and AFB positivity in suspected tubercular cases.

Results: The most commonly affected age group was 21–40 years (61.24%). The most frequent cytological diagnosis was tubercular lymphadenitis (44.98%), followed by reactive hyperplasia (16.75%) and granulomatous lymphadenitis (13.88%). Metastatic carcinoma accounted for 13.40% of cases. Among 104 tubercular cases, AFB positivity was highest (61.67%) in smears showing caseous necrosis without granulomas. Lymphomas constituted 1.92% of all cases.

Conclusion: FNAC remains a highly effective diagnostic tool in evaluating lymphadenopathy. It enables rapid and accurate diagnosis, particularly in differentiating infectious, reactive, and malignant lesions. The technique's utility is further enhanced when combined with ancillary stains such as Ziehl-Neelsen. In areas with high tuberculosis prevalence, FNAC plays a vital role in early detection and management.

Keywords: Fine Needle Aspiration Cytology (FNAC), Lymphadenopathy, Tubercular Lymphadenitis, Cytomorphology, Granulomatous Lymphadenitis, Metastatic Carcinoma, AFB Positivity.

INTRODUCTION

Lymph nodes are bean-shaped, encapsulated structures composed of lymphoreticular tissue, situated consistently along the course of lymphatic vessels. They are most commonly found in the

cervical, axillary, mediastinal, retroperitoneal, iliac, and inguinal regions. Lymphadenopathy—referring to the enlargement of lymph nodes—is one of the most frequent clinical findings in outpatient departments and can stem from a wide range of underlying causes, from benign inflammatory conditions to malignancies.^[1]

In regions like India, the most common cause of peripheral lymphadenopathy is inflammation secondary to microbial infection, followed by lymphomas and metastatic malignancies. The etiology of lymphadenopathy is typically classified into three major categories: reactive, tuberculous, and malignant. Among these, infectious causes—particularly tuberculosis—are predominant. Mycobacterium tuberculosis is the leading cause of granulomatous lymphadenitis in India.^[2-4]

Fine Needle Aspiration Cytology (FNAC) is a simple, rapid, and cost-effective diagnostic procedure used to extract cellular material from masses using a thin needle attached to a syringe.^[5] It plays a crucial role in diagnosing lymphadenitis, lymphomas, and metastatic cancers involving lymph nodes.^[6] The use of aspiration techniques dates back to 1904 when Grier and Gray first aspirated lymph nodes in patients with sleeping sickness,^[7] and by 1927, Dudgeon and Patrick utilized FNAC to diagnose tuberculous lymphadenitis.^[9]

De May famously summarized the benefits of FNAC with the acronym “SAFE”—Simple, Accurate, Fast, and Economical.^[10] The diagnostic efficacy of FNAC can be further enhanced when combined with radiological modalities such as ultrasound and CT imaging.^[11] Although FNAC has stood the test of time as a frontline diagnostic method, limitations do exist, including sampling errors, partial involvement of lymph nodes, and challenges posed by small or deep-seated nodes.^[6]

Aims and Objectives

Aim

To evaluate the diagnostic utility of Fine Needle Aspiration Cytology (FNAC) in the assessment of lymphadenopathy and to analyze the spectrum of cytomorphological patterns in various lymph node lesions.

Objectives

1. To determine the frequency and distribution of different cytological diagnoses in patients presenting with lymphadenopathy.
2. To assess the age-wise and site-wise distribution of lymph node involvement.
3. To identify the most common etiological patterns—reactive, infective (particularly tubercular), and malignant.

4. To correlate cytomorphological features with Acid-Fast Bacilli (AFB) positivity in suspected tuberculous lymphadenitis.
5. To evaluate the role of FNAC as a rapid, reliable, and minimally invasive diagnostic tool for early diagnosis and categorization of lymph node lesions.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of Pathology at Government Medical College, Nandyal, over a one-year period from October 2024 to September 2025.

Sample Size and Selection Criteria

A total of 209 patients, from all age groups, presenting with palpable lymph node enlargement, were included. Patients were excluded if the aspirated material was inadequate, smears were unsatisfactory for interpretation, or if there was a prior confirmed diagnosis of malignancy.

Sample Collection and Procedure

Ethical clearance was obtained prior to the commencement of the study. Each patient's demographic details and relevant clinical history, including the duration and site of lymphadenopathy, were recorded. FNAC was performed using a 5–10 mL disposable syringe with a 22–24 gauge needle after informed consent was obtained. Two to three needle passes were made, and four smears were prepared for each site aspirated.

Two smears were fixed in isopropyl alcohol and stained using Papanicolaou (Pap) and Hematoxylin & Eosin (H&E) stains. The other two air-dried smears were stained with Giemsa, and where tuberculosis was suspected, Ziehl-Neelsen (ZN) staining was performed. Smears were evaluated under low, high, and oil immersion objectives for cytomorphological features such as cell population, necrosis, and architectural patterns.

Statistical Analysis

Data were analyzed using SPSS version 17.0. Results were expressed in absolute numbers and percentages for categorical variables.

Age Group Distribution (N = 209)

Age Group (years)	Number of Cases	Percentage (%)
0–10	22	10.53%
21–40	128	61.24%
41–80	59	28.23%
Total	209	100.00%

The data reveals that the 21–40 years age group accounted for the majority of lymph node FNAC cases (61.24%), indicating that young adults are most commonly affected by lymphadenopathy in this cohort. This may reflect a higher incidence of infectious and reactive causes, such as tubercular lymphadenitis, in this age group.

The 41–80 years age group contributed to 29.19% of the cases, suggesting that lymphadenopathy is also relatively common in older adults, potentially due to chronic infections or neoplastic conditions.

The 0–10 years pediatric group accounted for 9.57% of cases, indicating a lower prevalence in children, which could be due to both lower disease burden

and possibly reduced use of FNAC in pediatric patients.

Overall, the distribution emphasizes that young to middle-aged adults represent the most affected demographic, aligning with trends reported in similar regional and national studies.

This pattern suggests that reactive and infectious causes of lymphadenopathy, particularly tubercular lymphadenitis, may be more prevalent in the productive age group. The findings are consistent with earlier studies that report a similar age-wise trend in lymph node cytology.

In the present study, patients' ages ranged from 1 to 80 years. The highest number of lymph node FNACs were observed in the 21–40 year age group, comprising 128 cases (60.95%), followed by the 41–80 year group with 60 cases (28.57%), and the 0–10 year group with 22 cases (10.48%). This age distribution indicates a higher prevalence of lymphadenopathy among young and middle-aged adults, which may be attributed to increased exposure to infectious agents, higher immunological activity, and greater healthcare-seeking behavior in this age range.

Table 1: Cytological Diagnosis of Lymphadenopathy (Total cases = 209)

Cytologic Diagnosis	Number of Cases	Percentage (%)
Tubercular lymphadenitis	94	(44.98%)
Reactive hyperplasia	35	(16.75%)
Granulomatous lymphadenitis	29	(13.88%)
Metastatic carcinoma	28	(13.40%)
Non-specific lymphadenitis	9	(4.31%)
Suppurative lymphadenitis	8	(3.83%)
Hodgkins lymphoma	3	(1.44%)
Non-Hodgkins lymphoma	1	(0.48%)
Unsatisfactory	2	(0.96%)
Total	209	(100.00%)

In the present study, tubercular lymphadenitis was the most commonly diagnosed lesion, accounting for 94 cases (44.98%). This high prevalence underscores the ongoing burden of tuberculosis in the population and highlights the diagnostic utility of FNAC in identifying tubercular lymphadenopathy.

The second most frequent diagnosis was reactive hyperplasia, seen in 35 cases (16.75%), suggesting a significant proportion of benign, non-specific immune responses among the study population. Granulomatous lymphadenitis was noted in 29 cases

(13.88%), which may represent early or healed tuberculosis or other granulomatous conditions.

Metastatic carcinoma was observed in 28 cases (13.40%), indicating that secondary malignancy to lymph nodes remains an important consideration, especially in older individuals. Other less common findings included non-specific lymphadenitis (4.31%), suppurative lymphadenitis (3.83%), and lymphomas, including Hodgkin's (1.44%) and Non-Hodgkin's lymphoma (0.48%). Only 2 cases (0.96%) were deemed unsatisfactory due to inadequate material.

Table 2: Cytomorphological Features in TB Lymphadenitis with AFB Positivity (Total TB cases = 104)

Cytomorphological Features	Number of Cases	Percentage (%)	AFB Positivity
Epithelioid granulomas without caseous necrosis	29	(27.88%)	9
Epithelioid granulomas with caseous necrosis	61	(58.65%)	13
Caseous necrosis without granulomas	14	(13.46%)	40
Total	104	(100.00%)	62

Among the 104 cases of tubercular lymphadenitis, the most common cytomorphological pattern was epithelioid granulomas with caseous necrosis, seen in 61 cases (58.65%), followed by epithelioid granulomas without necrosis (29 cases; 27.88%), and caseous necrosis without granulomas (14 cases; 13.46%).

AFB positivity was highest in smears showing caseous necrosis without granulomas (40 cases),

indicating that necrotic material alone may still yield positive Ziehl-Neelsen staining. In contrast, granulomas with caseous necrosis showed 13 AFB-positive cases, and granulomas without necrosis showed positivity in 9 cases. These findings suggest that AFB positivity correlates more strongly with necrotic cytomorphology than with the presence of granulomas alone.

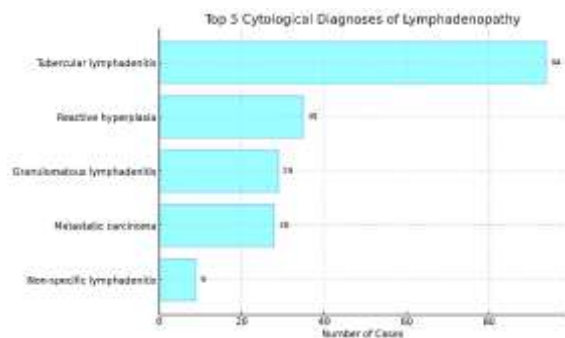


Figure 1: Distribution of Top 5 Cytological Diagnoses in Lymph Node FNAC Cases

DISCUSSION

Fine Needle Aspiration Cytology (FNAC) serves as a vital, minimally invasive, and cost-effective diagnostic tool in evaluating lymphadenopathy—one of the most common clinical manifestations of various underlying pathologies. This study was conducted to assess the relative frequency of different etiologies of lymphadenopathy across various age groups and to analyze the cytomorphological patterns associated with these lesions.

In the present study, the patient age ranged from 1 to 80 years, with a predominance in the 21–40-year age group (60.95%), which is consistent with findings reported by Shrestha et al,^[2] Pandav et al,^[3] and Kochhar et al.^[13] A male predominance was noted in our study, similar to observations by Hirachand et al,^[7] and Roy et al,^[1] the latter reporting a male-to-female ratio of 1.61.

Cervical lymph nodes were the most commonly aspirated group, which aligns with several studies including Roy et al,^[1] (72.9%), Nikethan et al,^[11] (80%), and Hirachand et al,^[7] (50.76%). This pattern suggests that cervical lymphadenopathy is frequently associated with both infectious and neoplastic conditions, making FNAC particularly valuable in this region.

In our cohort, tubercular lymphadenitis was the most common diagnosis (44.98%), consistent with reports by Khajuria et al,^[8] Pandav et al,^[3] and Nikethan et al.^[11] The predominant cytomorphological pattern was epithelioid cell granulomas with caseous necrosis (58.65%), similar to findings by Goswami et al.^[9] Moreover, AFB positivity was highest in cases showing caseous necrosis without granulomas (61.67%), supporting previous evidence that necrosis-rich aspirates are more likely to be ZN-positive. Similar findings were noted in Muyanjan et al,^[5] who reported a sensitivity of 93.1% and specificity of 100% for tuberculosis among HIV-positive patients.

Reactive hyperplasia (16.75%) and granulomatous lymphadenitis (13.88%) were the next most common findings. These are comparable to those reported by Kochhar et al,^[13] and Hirachand et al,^[7] respectively. The findings by Hirachand et al.

indicate a higher rate of reactive hyperplasia (41.55%) and a lower rate of granulomatous lymphadenitis (9.2%), highlighting geographical and institutional variability. Granulomatous lymphadenitis may be due to infectious causes such as tuberculosis, cat scratch disease, tularemia, toxoplasmosis, and syphilis, or non-infectious causes such as sarcoidosis and sarcoid-like reactions.^[10]

Metastatic carcinoma accounted for 13.40% of cases in our study, closely paralleling results from Nikethan et al,^[11] and Hirachand et al.^[7] Roy et al,^[1] further reported that L5 (malignant) lesions accounted for 28.29% of all FNAC diagnoses, with metastatic squamous cell carcinoma being the most frequent. Notably, Hafez et al,^[4] demonstrated that FNAC had 100% sensitivity and specificity in identifying metastatic carcinoma, confirming its utility in early and definitive diagnosis of malignancy.

Lymphoma was diagnosed in four cases (1.92%) in our study, in agreement with reports by Roy et al,^[1] and Khan et al.^[14] Hafez et al,^[4] reported diagnostic accuracies of 77.8% for Hodgkin lymphoma and 75% for Non-Hodgkin lymphoma, supporting FNAC as a reliable first-line test, although confirmatory histopathology and immunophenotyping are essential.

In pediatric patients, FNAC is particularly helpful due to its non-invasive nature. Lee et al,^[6] demonstrated a diagnostic accuracy of 94.5% and a sensitivity of 100% for FNAC in children under 12 years of age presenting with cervical lymphadenopathy. This underlines the importance of FNAC in evaluating younger patients, where biopsy might be more challenging.

Despite its advantages, FNAC has certain limitations, including sampling errors and interpretational challenges in low-cellularity or necrotic smears. Hafez et al,^[4] reported an overall diagnostic accuracy of 82.2% and a discordance rate of 17.8%, emphasizing the need for correlation with clinical, radiologic, and histologic findings when results are inconclusive.

CONCLUSION

Fine Needle Aspiration Cytology (FNAC) continues to be an essential first-line diagnostic modality in the evaluation of lymphadenopathy, particularly in resource-limited settings. In our study, tubercular lymphadenitis emerged as the most prevalent etiology, highlighting the ongoing burden of tuberculosis. Reactive hyperplasia and metastatic carcinoma were also commonly encountered, reinforcing the diverse spectrum of lymph node pathologies. FNAC demonstrated high diagnostic utility, especially when supported by ancillary techniques like Ziehl-Neelsen staining. Despite certain limitations, FNAC remains a rapid, safe, and cost-effective technique that provides valuable

cytomorphological insights, helping to distinguish between benign and malignant causes of lymphadenopathy. Integrating clinical, radiological, and cytological findings is essential to ensure diagnostic accuracy and guide appropriate management.

REFERENCES

- Roy S, Devi J, Kaur D. Reporting of Lymph Node Fine Needle Aspiration Cytology by Application of Sydney System and Assessment of Prevalence of Malignancy. *Ann Pathol Lab Med.* 2024;11(9):A228–35.
- Shrestha D, Thapa P, Dahal M. Tuberculous and Non-tuberculous Cervical Lymphadenitis – A Clinical Review. *Nepalese J ENT Head Neck Surg.* 2010;1(2):12–13.
- Pandav AB, Patil PP, Lanjewar DN. Cervical lymphadenopathy – Diagnosis by FNAC: A study of 219 cases. *Asian J Med Res.* 2012;1(3):79–83.
- Hafez NH, Tahoun NS. Reliability of fine needle aspiration cytology (FNAC) as a diagnostic tool in cases of cervical lymphadenopathy. *J Egypt Natl Canc Inst.* 2011;23(3):105–14.
- Muyanja D, Kalyesubula R, Namukwaya E, Othieno E, Mayanja-Kizza H. Diagnostic accuracy of fine needle aspiration cytology in providing a diagnosis of cervical lymphadenopathy among HIV-infected patients. *Afr Health Sci.* 2015;15(1):107–16.
- Lee DH, Baek HJ, Kook H, Yoon TM, Lee JK, Lim SC. Clinical value of fine needle aspiration cytology in pediatric cervical lymphadenopathy patients under 12-years-of-age. *Int J Pediatr Otorhinolaryngol.* 2014;78(1):79–81.
- Hirachand S, Lakhey M, Akhter J, Thapa B. Evaluation of fine needle aspiration cytology of lymph nodes in Kathmandu Medical College Teaching Hospital. *Kathmandu Univ Med J.* 2009;7(26):139–42.
- Khajuria R, Goswami KC, Singh K, Dubey VK. Pattern of Lymphadenopathy on Fine Needle Aspiration Cytology in Jammu. *J K Sci.* 2006;8(3):157–9.
- Goswami HM, Parikh UR, Barot HP, Vaghela GM, Yadav KS, Vegad MM. Efficacy of Fine Needle Aspiration Cytology, Ziehl-Neelsen Stain and Culture (Bactec) in Diagnosis of Tuberculosis Lymphadenitis. *Int J Microbiol Res.* 2012;4(7):275–8.
- Asano S. Granulomatous lymphadenitis. *J Clin Exp Hematopathol.* 2012;52(1):1–15.
- Nikethan B, Neethu GV, Hiremath SS, Patil SB. Role of fine needle aspiration cytology in the evaluation of the etiology of lymphadenopathy. *Indian J Pathol Oncol.* 2016;3(4):548–51.
- Patel MM, Italiya SL, Dhandha ZB, Dudhat RB, Kaptan KR, Shah MB, et al. Study of metastasis in lymph nodes in FNAC – Our institutional experience. *Int Res Med Sci.* 2013;1(4):451–4.
- Kochhar AK, Duggal G, Singh K, Kochhar SK. Spectrum of cytological findings in patients with lymphadenopathy in rural population of South Haryana, India – Experience in a tertiary care hospital. *Internet J Pathol.* 2012;13(8).
- Khan AH, Hayat AS, Baloch GH, Jaffery MH, Soomro MA, Siddiqui S. Study on the role of fine needle aspiration cytology in cervical lymphadenopathy. *World Appl Sci J.* 2011;12(11):1951–4.