

**Role of FNAC in the Diagnostic Evaluation of Lymphadenopathy****Rakesh Kumar Khunte<sup>1</sup>, Megha Gajendra<sup>2</sup>, Reena Naik<sup>3</sup>, Manoj Kumar Minj<sup>4</sup>,  
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**Abstract:****Background:** Lymphadenopathy is a common clinical presentation manifesting as the enlargement of lymph nodes due to a spectrum of etiologies ranging from benign inflammatory conditions to malignant neoplasms. In developing regions like India, and specifically in tribal belts of Chhattisgarh, distinguishing between tuberculous lymphadenitis and neoplastic causes is critical for timely management. Fine Needle Aspiration Cytology (FNAC) serves as a rapid, cost-effective, and minimally invasive first-line diagnostic tool.**Objective:** The primary objective of this study was to assess the cytomorphological spectrum of lymphadenopathy cases presenting to a tertiary care center and to evaluate the diagnostic utility of FNAC in differentiating inflammatory, granulomatous, and neoplastic lesions to facilitate early therapeutic intervention.**Methods:** A retrospective observational study was conducted at the Department of Pathology, Late Shri Lakhiram Agarwal Government Medical College, Raigarh, Chhattisgarh. The study analyzed data from 150 patients who presented with palpable lymphadenopathy between January 2024 and October 2025. Clinical details, aspiration findings, and cytomorphological patterns were evaluated comprehensively.**Results:** The analysis revealed a slight female preponderance with a male-to-female ratio of 1:1.1. The cervical region was the most frequently involved site (72%), followed by axillary and inguinal regions. Benign lesions constituted the majority of cases (84%), with Tuberculous Lymphadenitis being the single most common etiology (42%), followed by Reactive Lymphoid Hyperplasia (34%). Malignant lesions were observed in 16% of cases, with Metastatic Squamous Cell Carcinoma being the predominant malignancy.**Conclusion:** FNAC demonstrated high utility in the diagnostic evaluation of lymphadenopathy. It effectively triages patients into those requiring conservative management (reactive), specific medical therapy (tuberculosis), or surgical/oncological intervention (malignancy). In resource-limited settings like Raigarh, FNAC remains an indispensable diagnostic modality.

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**Introduction**

Lymphadenopathy, defined as an abnormality in the size, consistency, or number of lymph nodes, is one of the most frequent clinical presentations encountered in outpatient departments. It poses a significant diagnostic challenge to clinicians because the underlying etiology can range from self-limiting viral infections and reactive conditions to serious chronic infections like tuberculosis (TB) and life-threatening malignancies such as lymphoma or metastatic carcinoma [1]. The lymphoreticular system acts as a biological sieve, and its enlargement

is often the first indication of a local or systemic pathological process.

**Global and Regional Burden:** In developing countries, the burden of infectious lymphadenopathy is significantly higher than in the developed world. India, bearing a substantial portion of the global tuberculosis burden, frequently sees tuberculous lymphadenitis as the leading cause of persistent lymphadenopathy [2]. The World Health Organization (WHO) consistently highlights the

prevalence of extrapulmonary tuberculosis in Southeast Asia, with lymph node involvement being the most common form [3]. In the state of Chhattisgarh, which has a significant tribal and rural population, the epidemiological landscape often presents a complex mix of nutritional deficiencies, chronic infections, and delayed presentations of malignancies. Late Shri Lakhiram Agarwal Government Medical College in Raigarh serves as a pivotal tertiary care center for this demographic, making the diagnostic accuracy of accessible tools like FNAC critical for patient outcomes.

**The Diagnostic Dilemma:** The enlarged lymph node is often the only clinical sign of a systemic disease. While histopathological examination via excision biopsy remains the gold standard for diagnosis, it is an invasive surgical procedure. It requires anesthesia, incision, and a longer turnaround time for results, often burdening the surgical infrastructure. It also carries risks of scarring and complications, such as nerve damage or poor wound healing, which may be unnecessary for benign conditions that constitute the majority of cases [4]. Furthermore, in cases of metastatic malignancy, surgical intervention without a prior diagnosis can sometimes disrupt tissue planes or delay neoadjuvant therapies. Therefore, a triage tool is essential to filter cases requiring surgery from those manageable medically.

**Role of Fine Needle Aspiration Cytology (FNAC):** Fine Needle Aspiration Cytology (FNAC) has emerged as the procedure of choice for the initial assessment of superficial lymphadenopathy. It is a simple, rapid, cost-effective, and minimally invasive technique with high patient acceptance [5]. The procedure allows for the cytomorphological evaluation of cells aspirated from the lymph node, enabling the pathologist to categorize the lesion into inflammatory (acute/chronic), granulomatous (specific/non-specific), or neoplastic (benign/malignant).

Recent studies have highlighted the high sensitivity and specificity of FNAC, particularly in diagnosing tuberculous lymphadenitis and metastatic carcinomas [6]. Orell and Sterrett, in their seminal work on cytopathology, emphasize that the pattern recognition on FNAC can often obviate the need for biopsy in clearly benign or clearly metastatic settings [7]. However, challenges remain, particularly in the sub-classification of lymphomas and the diagnosis of lesions with low cellularity. Despite these limitations, the ability of FNAC to provide a diagnosis within hours makes it an invaluable tool in a tertiary care setting, facilitating early initiation of treatment—a factor of paramount importance in conditions like tuberculosis and cancer.

This retrospective study aims to evaluate the diagnostic utility and cytomorphological spectrum of lymphadenopathy cases presenting to a tertiary care hospital in Raigarh, Chhattisgarh, over a period of 22 months.

## Materials and Methods

**Study Design and Setting:** This research was designed as a retrospective observational analysis and was carried out within the Department of Pathology at Late Shri Lakhiram Agarwal Government Medical College, Raigarh, Chhattisgarh. As a tertiary care government facility, this institution caters to a diverse patient population from the Raigarh district as well as referrals from adjacent rural and tribal belts. The study utilized archival data from the cytopathology laboratory records, ensuring a comprehensive review of cases handled by the department.

**Study Duration and Patient Selection:** The observational period spanned twenty-two months, commencing in January 2024 and concluding in October 2025. A total sample size of 150 patients was established for this analysis. The study population was inclusive of individuals across all age groups and genders who presented to the outpatient or inpatient departments with palpable lymphadenopathy and were subsequently referred for FNAC. Stringent selection criteria were applied to ensure data integrity; specifically, only those cases where the aspiration yielded adequate cellular material for a definitive cytological opinion were included. Conversely, cases were excluded if the aspirates were essentially acellular, comprised only of blood (hemorrhagic), or if the patient had a pre-established diagnosis of hematological malignancy and was merely undergoing follow-up, as the focus was on primary diagnostic evaluation. Furthermore, deep-seated retroperitoneal or abdominal nodes requiring image guidance were excluded to maintain homogeneity in the sampling technique of superficial nodes.

**Methodology of FNAC and Staining:** The cytological procedure followed a standardized protocol to ensure consistency in sample quality. The aspiration was performed using a 22 to 24-gauge disposable needle attached to a 10ml syringe, often employing a syringe pistol holder to facilitate single-hand manipulation. For palpable, superficial nodes, the pathologist immobilized the target lesion with one hand while introducing the needle with the other. Depending on the consistency of the node, either a standard aspiration technique with negative pressure or a non-aspiration technique (fine needle capillary sampling) was utilized to minimize blood admixture, particularly in vascular thyroid or lymph node lesions. Multiple passes were made within the node to sample different areas, ensuring representative material was obtained.

Upon withdrawal of the needle, the aspirated material was immediately expelled onto clean, labeled glass slides. The smearing technique involved using a second spreader slide to create a thin, uniform monolayer of cells, preventing crushing artifacts which can distort nuclear morphology. Half of the prepared smears were immediately wet-fixed in 95% ethyl alcohol for a minimum of 20 minutes; these were subsequently stained using the Papanicolaou (Pap) stain or Hematoxylin and Eosin (H&E) stain, which are superior for visualizing nuclear details and keratinization. The remaining slides were air-dried and stained with May-Grünwald-Giemsa (MGG) stain, which is excellent for highlighting cytoplasmic details and background ground substance. In cases where the cytomorphology revealed granulomas or necrotic debris raising the suspicion of tuberculosis, additional smears were utilized for Ziehl-Neelsen (ZN) staining to detect Acid-Fast Bacilli (AFB).

**Data Collection and Analysis:** Comprehensive data regarding patient demographics, including age and gender, duration of symptoms, site of lymphadenopathy, and clinical presentation, were systematically retrieved from the laboratory requisition forms and registers. The cytological

diagnoses were reviewed and classified based on standard reporting categories. These were broadly divided into non-neoplastic entities, such as reactive lymphoid hyperplasia and granulomatous lymphadenitis, and neoplastic entities, including metastatic carcinomas and lymphomas. The compiled data was entered into Microsoft Excel for processing. Descriptive statistical methods were employed to calculate frequencies and percentages, providing a clear quantitative overview of the disease spectrum in the region.

**Results**

**Demographic Distribution:** The analysis of the 150 cases revealed a broad age distribution, ranging from pediatric patients as young as 4 years to elderly patients up to 78 years of age. A detailed breakdown indicated that the incidence of lymphadenopathy was not uniform across age groups. The condition was most frequently observed in the second and third decades of life, a trend likely associated with the higher exposure of young adults to infectious agents. In terms of gender distribution, the study population demonstrated a slight female preponderance. Specifically, there were 79 female patients (52.7%) compared to 71 male patients (47.3%), resulting in a male-to-female ratio of 1:1.1.

**Table 1: Age and Gender Distribution of the Study Population**

Age Group (Years)	Male (n)	Female (n)	Total Cases (n)	Percentage (%)
0 – 10	12	8	20	13.3%
11 – 20	18	15	33	22.0%
21 – 30	15	22	37	24.7%
31 – 40	10	14	24	16.0%
41 – 50	8	10	18	12.0%
51 – 60	5	6	11	7.3%
> 60	3	4	7	4.7%
<b>Total</b>	<b>71</b>	<b>79</b>	<b>150</b>	<b>100%</b>

**Anatomical Distribution:** When analyzing the anatomical location of the enlarged lymph nodes, the cervical region was overwhelmingly the most common site of involvement. This region accounted for 108 cases, representing 72% of the total sample size. The prominence of cervical lymphadenopathy reflects the drainage patterns of the head and neck,

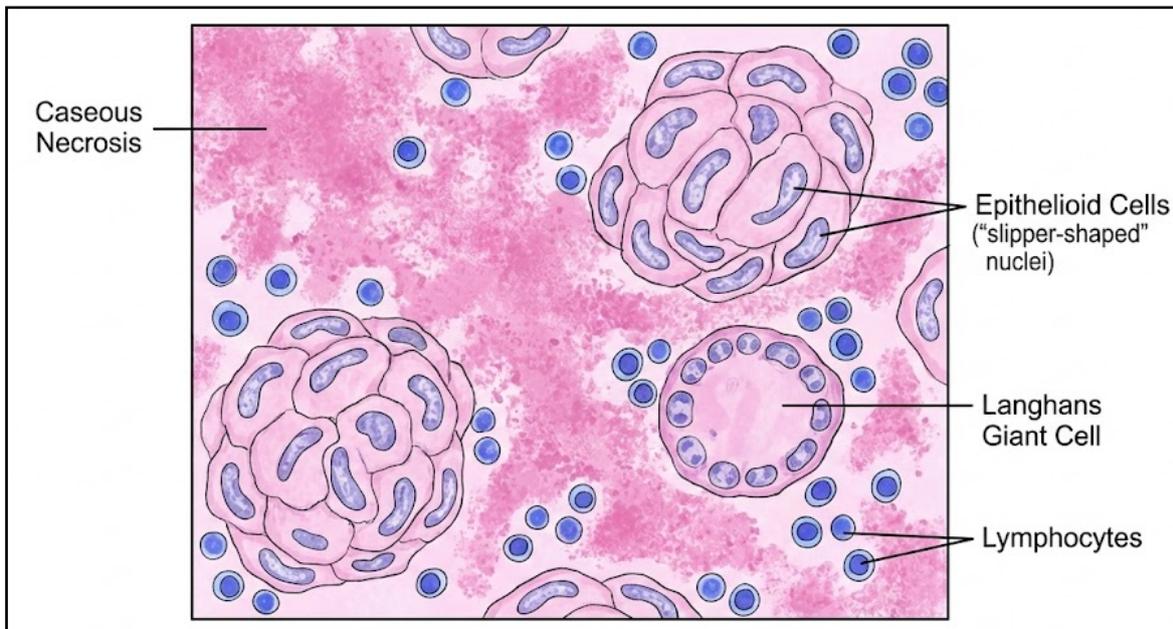
which are frequent sites for both infections and primary malignancies. The axillary group was the second most common site, followed by the inguinal group. A small minority of cases involved other sites such as the submandibular, supraclavicular, or post-auricular regions.

**Table 2: Anatomical Site Distribution of Lymphadenopathy**

Site of Lymph Node	Number of Cases (n)	Percentage (%)
Cervical	108	72.0%
Axillary	18	12.0%
Inguinal	12	8.0%
Supraclavicular	5	3.3%
Submandibular	4	2.7%
Others (e.g., post-auricular)	3	2.0%
<b>Total</b>	<b>150</b>	<b>100%</b>

**Cytomorphological Patterns:** The cytological evaluation allowed for the categorization of the 150 cases into distinct pathological entities. The vast majority of cases, totaling 126 (84%), were classified as non-neoplastic lesions. Within this category, Tuberculous Lymphadenitis was the most frequently diagnosed specific pathology, comprising 42% of the total cases. The cytological features in

these cases typically included epithelioid cell granulomas, lymphocytes, and a background of caseous necrosis. Reactive Lymphoid Hyperplasia was the second most common benign finding, seen in 34% of cases, often characterized by a polymorphic population of lymphoid cells. Acute Suppurative Lymphadenitis accounted for a smaller fraction, showing abundant neutrophils.



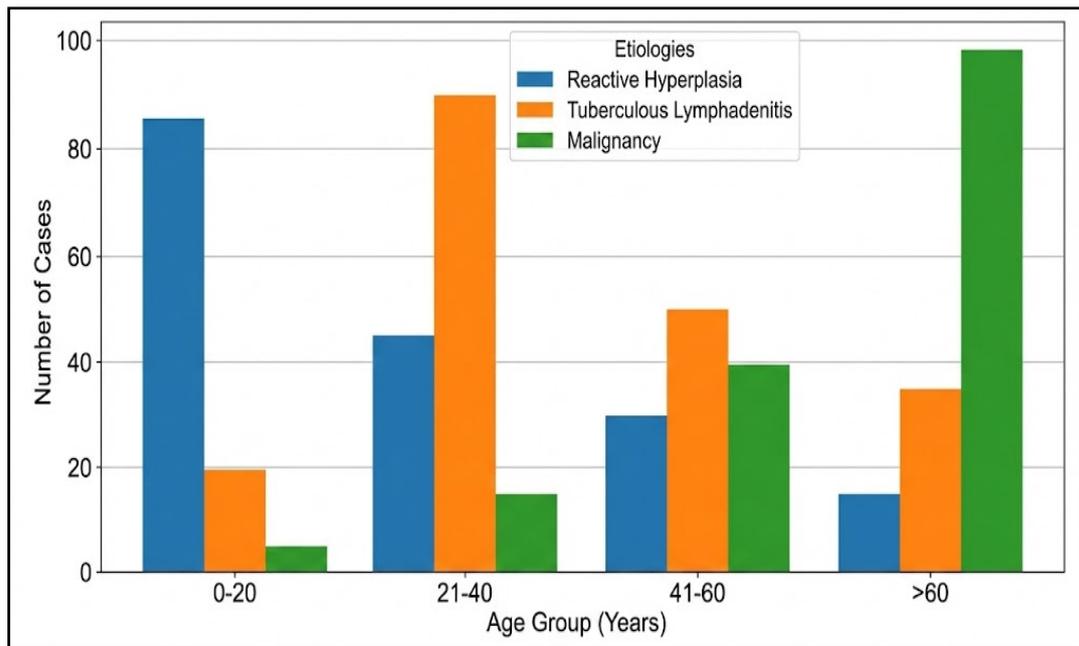
**Figure 1: Cytomorphological features of Tuberculous Lymphadenitis.**

Neoplastic lesions were identified in 24 cases, representing 16% of the study population. Metastatic carcinoma was the predominant malignancy, accounting for 12% of all cases. Among the metastatic lesions, Squamous Cell

Carcinoma (SCC) was the most common subtype, followed by adenocarcinoma. Primary lymphoproliferative disorders, suggestive of lymphoma (Hodgkin’s or Non-Hodgkin’s), were identified in 4% of the cases.

**Table 3: Distribution of Cytomorphological Diagnoses**

Cytological Diagnosis	Number of Cases (n=150)	Percentage (%)
<b>Non-Neoplastic</b>	<b>126</b>	<b>84.0%</b>
Tuberculous Lymphadenitis	63	42.0%
Reactive Lymphoid Hyperplasia	51	34.0%
Acute Suppurative Lymphadenitis	12	8.0%
<b>Neoplastic</b>	<b>24</b>	<b>16.0%</b>
Metastatic Squamous Cell Carcinoma	14	9.3%
Metastatic Adenocarcinoma	4	2.7%
Lymphoma (HL/NHL)	6	4.0%
<b>Total</b>	<b>150</b>	<b>100%</b>



**Figure 2: Age-wise distribution of cytological diagnoses in lymphadenopathy**

## Discussion

The diagnostic evaluation of lymphadenopathy is a daily routine in pathology practice. This study from Late Shri Lakhiram Agarwal Government Medical College, Raigarh, reinforces the status of FNAC as a robust diagnostic tool.

**Demographic and Clinical Correlations:** In the present study, the peak age of incidence was in the young to middle-aged adult group (20-40 years). This correlates with the high activity and exposure of this age group to infectious agents, particularly *Mycobacterium tuberculosis*. The slight female preponderance (M:F ratio 1:1.1) observed in this study aligns with findings by Jain et al. [1] and other Indian studies which often report a higher incidence of tuberculous lymphadenitis in females. Some researchers suggest hormonal factors or differences in healthcare-seeking behavior may contribute to this distribution [8].

The cervical region was the most common site of involvement (72%). This is consistent with global literature, as cervical nodes drain the head and neck region, which is frequently the site of entry for infections (upper respiratory tract) and a common site for primary malignancies (oral cavity, pharynx) [4]. Similar findings were reported by Malhotra et al., where cervical lymphadenopathy constituted 71.8% of cases [9].

**Tuberculous Lymphadenitis: The Predominant Etiology:** A significant finding of this study was the high prevalence of Tuberculous Lymphadenitis (42%). This is in agreement with studies conducted in similar developing demographics. For instance, a study by Badge et al. in the Bastar district of

Chhattisgarh also reported tuberculosis as the leading cause of lymphadenopathy [10]. The cytological picture of epithelioid granulomas with caseous necrosis is highly specific. However, in the absence of necrosis, the distinction from sarcoidosis or other granulomatous diseases can be challenging, necessitating ZN staining. The high burden of TB in the Raigarh region underscores the importance of FNAC, as it allows for the initiation of Anti-Tubercular Therapy (ATT) without the need for surgical biopsy in most cases. Recent guidelines suggest that FNAC combined with AFB smear or CBNAAT (Cartridge Based Nucleic Acid Amplification Test) is sufficient for commencing treatment in high-prevalence areas [11].

**Reactive and Suppurative Conditions:** Reactive lymphoid hyperplasia (34%) was the second most common finding, predominantly in children and young adults. This diagnosis is often a diagnosis of exclusion and reassures the clinician to adopt a "wait and watch" policy or treat the underlying minor infection. Suppurative lymphadenitis (8%) often correlated with skin infections or dental abscesses, easily treated with antibiotics and drainage if necessary. This aligns with pediatric data from Niedzielska et al., who noted that reactive changes are the most common cause of lymphadenopathy in children under 12 [12].

**Malignancy and Metastasis:** Malignant lesions constituted 16% of the cases. Among these, metastatic squamous cell carcinoma was the most frequent. This reflects the high prevalence of oral and oropharyngeal cancers in India, often associated with tobacco chewing and smoking habits prevalent in the region [13]. FNAC proves critical here; the

detection of keratinized malignant squamous cells in a cervical node often directs the surgeon to search for an occult primary in the oral cavity or larynx.

Lymphomas constituted 4% of cases. While FNAC can suggest a lymphoproliferative disorder, it is widely accepted that histopathology and immunohistochemistry (IHC) are required for definitive sub-typing (WHO classification) [14].

**Comparison with Other Studies:** The results of the current study are comparable with various national and international studies, reinforcing the validity of our local data. Mishra et al. (2024) reported a malignancy rate of 18.8% in lymph node FNACs, which is statistically close to the 16% found in our study, suggesting a consistent burden of neoplastic disease in tertiary settings [2]. Similarly, Jaiswal et al. (2024), working in a comparable tertiary care setting in Central India, found reactive lymphadenitis to be the most common, followed closely by tuberculosis [3]. Our study found TB to be slightly more common than reactive hyperplasia; this variation is likely attributable to the specific endemicity of tuberculosis in the Raigarh tribal belt and the referral bias of a government medical college where more chronic, unresolved cases present. Furthermore, Khatib et al. (2025) highlighted the limitation of bacteriological detection in paucibacillary aspirates, advocating for the combined utility of cytomorphology to maintain high diagnostic sensitivity even in the absence of positive AFB smears [15].

### Limitations

While FNAC is a powerful tool, this study is subject to certain limitations inherent to its retrospective design and the technique itself. The primary limitation is the lack of systematic histopathological correlation for all cases. While positive malignancy cases generally underwent biopsy confirmation, many cases of reactive hyperplasia and tuberculosis were treated clinically based on the FNAC report, meaning a calculation of absolute "false negatives" is difficult. Additionally, the inability to perform immunocytochemistry or flow cytometry on the aspirates limited the specific sub-typing of lymphomas. In cases of Hodgkin's lymphoma, the characteristic Reed-Sternberg cells can be sparse, potentially leading to a misdiagnosis of reactive hyperplasia if the sample is not representative. Finally, the retrospective nature of the study means that clinical follow-up data regarding the response to treatment was not available for all patients, which would have served as a secondary confirmation of the diagnosis.

### Conclusion

The study conducted at Late Shri Lakhiram Agarwal Government Medical College, Raigarh, confirms that FNAC is a highly effective, reliable, and safe

modality for the investigation of lymphadenopathy. The procedure acts as a crucial triage point in the clinical management pathway, effectively distinguishing between inflammatory conditions that require medical therapy and neoplastic conditions that demand surgical or oncological intervention. The data highlights that Tuberculous lymphadenitis remains the single most common cause of pathological lymph node enlargement in this specific demographic, warranting a high index of suspicion in any patient presenting with a neck mass.

Furthermore, the study underscores the value of FNAC in resource-limited settings. By providing a diagnosis of malignancy or tuberculosis within a remarkably short turnaround time, FNAC reduces the burden on surgical theaters and minimizes hospital stays. While histopathology remains the gold standard, particularly for classifying lymphomas, FNAC serves as an indispensable first-line investigation. Future efforts should focus on integrating ancillary techniques like CBNAAT on aspirate material to further enhance the sensitivity of tuberculosis diagnosis in this region.

### References

1. Kumar Jain V, Tantuway R, Khare V. Study of incidence of tuberculosis in fine needle aspiration cytology of cervical lymph node: a city-based study.
2. Mishra R, Nayak R, Totade S. Cytological Spectrum of Malignant Lesions Of Lymph Node. *International Journal*. 2024.
3. Jaiswal N, Bahadure S, Badge A, Dawande P, Mishra VH. Exploring the Spectrum of Lymphadenopathy: Insights from a Three-Year Fine Needle Aspiration Cytology Study in a Tertiary Care Center. *Cureus*. 2024 Apr 26;16(4).
4. Singh A, Bhambani P, Nema SK. Diagnostic accuracy of FNAC in diagnosis for causes of lymphadenopathy: a hospital-based analysis. *Int J Res Med Sci*. 2013 Aug;1(3):271-77.
5. Wright CA, van der Burg M, Geiger D, Noordzij JG, Burgess SM, Marais BJ. Diagnosing mycobacterial lymphadenitis in children using fine needle aspiration biopsy: cytomorphology, ZN staining and autofluorescence—making more of less. *Diagnostic cytopathology*. 2008 Apr;36(4):245-51.
6. Gupta ML, Singh K. Correlation of fine needle aspiration cytology lymph node with histopathological diagnosis. *Int J Res Med Sci*. 2016 Nov;4(11):4719-23.
7. Orell SR, Sterrett GF, Whitaker D. Fine needle aspiration cytology. (No Title). 2005 Jul 8.
8. Ahmad SS, Akhtar S, Akhtar K, Naseem S, Mansoor T. Study of fine needle aspiration cytology in lymphadenopathy with special

- reference to acid-fast staining in cases of tuberculosis. *JK science*. 2005 Mar;7(1):1-4.
9. Malhotra AS, Lahori M, Nigam A, Khajuria A. Profile of lymphadenopathy: An institutional based cytomorphological study. *International Journal of Applied and Basic Medical Research*. 2017 Apr 1;7(2):100-3.
  10. Badge SA, Ovhal AG, Azad K, Meshram AT. Study of fine-needle aspiration cytology of lymph node in rural area of Bastar District, Chhattisgarh. *Medical Journal of Dr. DY Patil University*. 2017 Mar 1;10(2):143-8.
  11. Sharma SK, Ryan H, Khaparde S, Sachdeva KS, Singh AD, Mohan A, Sarin R, Paramasivan CN, Kumar P, Nischal N, Khatiwada S. Index-TB guidelines: guidelines on extrapulmonary tuberculosis for India. *Indian Journal of Medical Research*. 2017 Apr 1;145(4):448-63.
  12. Niedzielska G, Kotowski M, Niedzielski A, Dybiec E, Wieczorek P. Cervical lymphadenopathy in children—incidence and diagnostic management. *International journal of pediatric otorhinolaryngology*. 2007 Jan 1;71(1):51-6.
  13. Tirkey D, Toppo SM, Xess S, Kulkarni V, Arya RC. Spectrum of Cytomorphological Features In Patients of Lymphadenopathy at A Tertiary Care Center In North Chhattisgarh Region—A 4-Year Study. *Int J Acad Med Pharm*. 2025; 7(5):923-6.
  14. Al Qout MM, Al Hamoud M, AlQahtani MS, Alqahtani AY, Asiri AH, Alshahrani AA, Al Hamoud Sr M, AlQahtani M, Alqahtani A. The diagnostic value of fine-needle aspiration cytology in cervical lymphadenopathy in correlation to postoperative histopathological results in a tertiary care center in Saudi Arabia. *Cureus*. 2023 Sep 29;15(9).
  15. Khatib Y, Sheldon VG, Chaudhari J, Gupte P, Khare M, Sable Y, Patel R, Shah V. Correlation of Cytomorphology Pattern in Tuberculous Lymphadenitis with Microbiological Studies. *The Journal of the Association of Physicians of India*. 2025 Mar;73(3):e1-6.