

Histopathological Profile and Clinical Correlates of Lymphadenopathy in A Tertiary Care Centre

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ABSTRACT

In the present cross-sectional study, a total of 200 lymph node biopsy specimens were evaluated histopathologically to determine the spectrum of lymph node lesions and their clinicopathological correlations. Reactive hyperplasia was the most common diagnosis, accounting for 68 cases (34%), followed by granulomatous lymphadenitis, predominantly tuberculous in nature, observed in 56 cases (28%). Malignant lesions constituted a substantial proportion of cases, with metastatic deposits identified in 44 biopsies (22%) and lymphomas diagnosed in 32 cases (16%). Analysis of age distribution revealed that benign lesions, particularly reactive hyperplasia and granulomatous lymphadenitis, were more frequently encountered in younger individuals, whereas malignant lesions were significantly more common among older patients. Cervical lymph nodes represented the most frequent site of involvement overall, especially in reactive and granulomatous lesions. In contrast, supraclavicular lymphadenopathy demonstrated a strong association with malignancy, particularly metastatic disease. Node size also showed significant correlation with histopathological diagnosis, with larger lymph nodes more frequently harboring malignant pathology. Similarly, lymph nodes with a longer duration of enlargement prior to presentation were significantly associated with metastatic and lymphomatous lesions compared with reactive and infective conditions. Statistical analysis using chi-square testing demonstrated significant associations between histological diagnosis and clinical variables including patient age, lymph node site, node size, and duration of lymphadenopathy ($p < 0.05$). The findings highlight the diverse pathological spectrum of lymphadenopathy and emphasize the importance of integrating clinical characteristics with histopathological examination. Histopathology proved invaluable in distinguishing benign from malignant conditions and provided definitive diagnostic information necessary for appropriate patient management and therapeutic decision-making.

KEYWORDS: Lymph node; Histopathology; Lymphadenopathy; Tuberculosis; Metastasis; Lymphoma.

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INTRODUCTION

Lymphadenopathy is one of the most common clinical findings encountered in medical practice and represents a significant diagnostic challenge due to its broad etiological spectrum. Enlargement of lymph nodes may result from a wide variety of pathological processes, ranging from benign reactive changes and infectious diseases to primary and secondary malignancies. The differential diagnosis varies according to patient age, geographical region, socioeconomic conditions, and the prevalence of infectious and neoplastic diseases. Consequently, accurate diagnosis is essential for determining appropriate treatment strategies and predicting patient outcomes [1]. In developing countries, infectious causes continue to account for a substantial proportion of lymphadenopathy cases. Among these, tuberculosis remains a major public health problem and an important cause of granulomatous lymphadenitis. Tuberculous lymphadenitis frequently presents as persistent cervical lymph node enlargement and may clinically mimic both reactive and malignant conditions. Other infectious etiologies, including bacterial, viral, and fungal infections, can also produce significant lymph node enlargement, emphasizing the need for definitive diagnostic evaluation [2]. Histopathological examination of lymph node tissue obtained through biopsy or excision remains the gold standard for diagnosis. Histopathology provides detailed architectural and cytological assessment, enabling differentiation between reactive hyperplasia, granulomatous inflammation, metastatic malignancy, and lymphoproliferative disorders such as lymphoma. In addition to establishing a definitive diagnosis, histopathological analysis assists in disease classification, prognostication, and therapeutic planning, thereby playing a pivotal role in patient management [3]. Clinical assessment remains an important component of the diagnostic process. Factors such as patient age, anatomical site of lymph node involvement, node size, consistency, and duration of enlargement influence the likelihood of underlying malignancy and guide the selection of diagnostic investigations. Supraclavicular lymphadenopathy, larger node size, and prolonged duration are particularly associated with a higher risk of malignant disease, whereas reactive and infective causes are more common among younger individuals [4,5]. Understanding the local histopathological spectrum of lymph node lesions and their clinicopathological correlations is essential for developing effective diagnostic algorithms and optimizing healthcare resource utilization. Such information facilitates age- and site-specific clinical evaluation and contributes to improved patient care. Therefore, the present cross-sectional study was undertaken to describe the histopathological spectrum of lymph node lesions and to evaluate their correlation with relevant clinical features in patients presenting to a tertiary care center [6].

Aim: To describe the histopathological spectrum and clinicopathological correlation of lymph node lesions.

Primary objective: To determine the distribution of histopathological diagnoses of lymph node lesions.

Secondary objectives: (i) To correlate diagnoses with age, site, size, and duration; (ii) to characterise malignant lesions.

Hypotheses: This descriptive study had no formal hypothesis; clinicopathological associations were examined.

MATERIALS AND METHODS

2.1 Study Design and Setting

This cross-sectional observational study was conducted in the Department of Pathology at [Institution Name], a tertiary care teaching hospital, over a study period of [study period]. The study aimed to evaluate the histopathological spectrum of lymph node lesions and correlate the findings with relevant clinical characteristics. All lymph node biopsy and excision specimens received during the study period were reviewed. Histopathological examination was performed using standard laboratory procedures, and clinical information was obtained from pathology requisition forms and patient records. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies.

2.2 Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee. Written informed consent was obtained from patients undergoing biopsy procedures. For archival specimens and retrospective data collection, the requirement for consent was waived by the Ethics Committee where applicable. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and maintained strict confidentiality of patient information throughout the investigation.

2.3 Study Material

The study included all lymph node biopsy and excision specimens submitted to the Department of Pathology during the study period and containing adequate tissue for definitive histopathological diagnosis. Specimens with insufficient tissue, extensive autolysis, poor preservation, or inconclusive findings were excluded. Repeat biopsy specimens from the same patient were also excluded to avoid duplication of data. A total of 200 eligible lymph node specimens fulfilled the inclusion criteria and were included in the final analysis.

2.4 Histopathological Methods

All specimens were fixed in 10% neutral buffered formalin, processed routinely, embedded in paraffin wax, sectioned at 4–5 µm thickness, and stained with haematoxylin and eosin (H&E). Histopathological examination was performed by experienced pathologists using light microscopy. Special stains, including Ziehl–Neelsen staining for acid-fast bacilli, Periodic Acid–Schiff stain, and immunohistochemistry panels, were employed whenever clinically indicated to establish specific diagnoses. Based on microscopic findings, lesions were classified into four major categories: reactive hyperplasia, granulomatous lymphadenitis, metastatic malignancy, and lymphoma. Clinical parameters including patient age, sex, anatomical site of lymph node involvement, lymph node size, and duration of lymphadenopathy were recorded and correlated with histopathological diagnoses.

2.5 Sample Size Determination

The sample size was calculated to estimate the prevalence of the most common histopathological category with adequate precision. Assuming an expected prevalence of 30%, a 95% confidence level, and a confidence interval half-width of 6.5%, the minimum required sample size was approximately 195 specimens. To account for potential exclusions and improve statistical reliability, 200 lymph node specimens were included in the study.

2.6 Statistical Analysis

Data were entered into Microsoft Excel and analysed using **SPSS version 26.0** (IBM Corp., Armonk, NY, USA) [or R version ____]. Continuous variables were summarized as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on data distribution. Categorical variables were presented as frequencies and percentages. Associations between histopathological diagnosis and clinical variables such as age group, lymph node site, size, and duration were evaluated using the chi-square test or Fisher's exact test where appropriate. A two-sided p-value of less than 0.05 was considered statistically significant. Results were presented using tables and figures to illustrate the distribution and clinicopathological correlations of lymph node lesions.

RESULTS

3.1 Histopathological spectrum

A total of 200 lymph node biopsy specimens were included in the study. The mean age of the patients was **38 ± 18 years**, with ages ranging from childhood to elderly individuals. There were **108 (54%) males** and **92 (46%) females**, resulting in a slight male predominance. Histopathological examination revealed a wide spectrum of lymph node lesions comprising both benign and malignant conditions. Benign lesions accounted for **124 cases (62%)**, while malignant lesions constituted **76 cases (38%)**. Among the benign lesions, **reactive hyperplasia** was the most frequent diagnosis, identified in **68 cases (34%)**, followed by **granulomatous lymphadenitis** in **56 cases (28%)**. Most granulomatous lesions demonstrated histomorphological features consistent with tuberculous lymphadenitis, including epithelioid cell granulomas, Langhans giant cells, and varying degrees of caseous necrosis. Reactive hyperplasia showed preserved nodal architecture with prominent follicular hyperplasia and paracortical expansion. Malignant lesions comprised **44 cases (22%)** of metastatic carcinoma and **32 cases (16%)** of lymphoma, including both Hodgkin and non-Hodgkin lymphoma subtypes. Metastatic carcinoma represented the most common malignant

diagnosis, characterized by infiltration of lymph node tissue by malignant epithelial cells. Lymphomatous lesions demonstrated partial or complete effacement of nodal architecture by atypical lymphoid proliferation. The overall distribution of histopathological diagnoses is presented in **Table 1** and illustrated in **Figure 1**. These findings indicate that reactive and infective conditions remain the predominant causes of lymphadenopathy in the study population, although a substantial proportion of cases were attributable to malignant disease.

Table 1. Histopathological diagnoses of lymph node lesions (n = 200).

Diagnosis	n (%)
Reactive hyperplasia	68 (34)
Granulomatous (tuberculous) lymphadenitis	56 (28)
Metastatic carcinoma	44 (22)
Lymphoma (Hodgkin/non-Hodgkin)	32 (16)

3.2 Clinicopathological correlation

Significant associations were observed between histopathological diagnosis and several clinical characteristics. Benign lesions, including reactive hyperplasia and granulomatous lymphadenitis, were more frequently encountered among younger patients, whereas the prevalence of malignant lesions increased progressively with advancing age. Patients aged more than 40 years constituted **52 (68%)** of malignant cases compared with **38 (31%)** of benign cases ($p < 0.001$), indicating a strong age-related association with malignancy.

The anatomical site of lymph node involvement also showed significant diagnostic relevance. While cervical lymph nodes were commonly affected in benign conditions, **supraclavicular lymphadenopathy** was significantly more frequent among malignant lesions, occurring in **27 (36%)** malignant cases compared with **14 (11%)** benign cases ($p < 0.001$). Similarly, lymph node size was strongly associated with histopathological outcome. Nodes measuring **greater than 2 cm** were observed in **53 (70%)** malignant lesions compared with **40 (32%)** benign lesions ($p < 0.001$). Duration of lymphadenopathy also differed significantly between the groups. Enlargement persisting for **more than four weeks** was documented in **58 (76%)** malignant cases versus **56 (45%)** benign cases ($p < 0.001$). These findings demonstrate that older age, supraclavicular location, larger lymph node size, and prolonged duration of enlargement are important clinical predictors of malignancy. The detailed clinicopathological correlations are summarized in **Table 2** and illustrated in **Figure 2**. Collectively, the results emphasize the value of integrating clinical assessment with histopathological examination for accurate diagnosis and timely management of lymphadenopathy.

Table 2. Clinical associations of malignant versus benign lesions.

Feature	Benign (n = 124)	Malignant (n = 76)	p
Age >40 years, n (%)	38 (31)	52 (68)	<0.001
Supraclavicular site, n (%)	14 (11)	27 (36)	<0.001
Node size >2 cm, n (%)	40 (32)	53 (70)	<0.001
Duration >4 weeks, n (%)	56 (45)	58 (76)	<0.001

Figure 1. Histopathological spectrum of lymph node lesions

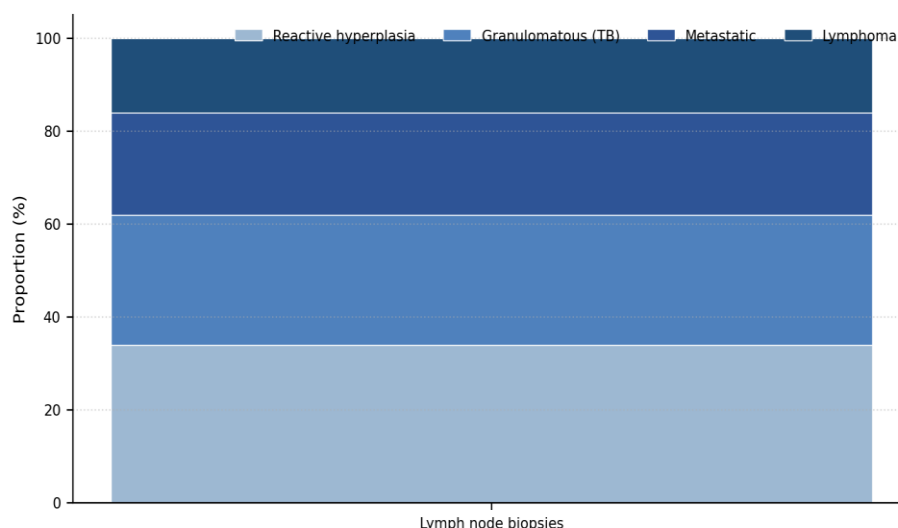
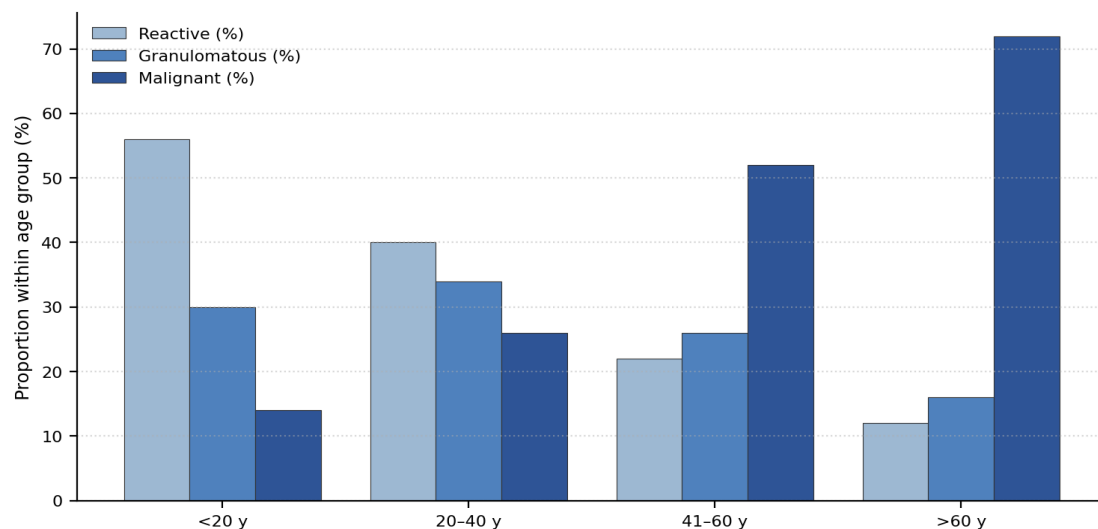


Figure 1. Histopathological spectrum of lymph node lesions.

Figure 2. Predominant diagnosis by age group**Figure 2. Predominant diagnosis by age group.**

DISCUSSION

In the present cross-sectional study, histopathological examination of 200 lymph node biopsy specimens revealed a broad spectrum of lesions, ranging from reactive and infective conditions to malignant neoplasms. Reactive hyperplasia was the most common diagnosis, followed closely by granulomatous lymphadenitis, while metastatic carcinoma and lymphoma constituted the major malignant lesions. These findings highlight the heterogeneous nature of lymphadenopathy and reaffirm the indispensable role of histopathological evaluation in establishing a definitive diagnosis. The predominance of reactive hyperplasia and granulomatous lymphadenitis among younger patients is consistent with previous reports from developing countries, where infectious and inflammatory conditions remain major causes of lymph node enlargement. In particular, the high prevalence of tuberculous lymphadenitis reflects the continuing public health burden of tuberculosis in many regions and underscores its importance in the differential diagnosis of persistent lymphadenopathy [7]. The study also demonstrated a clear age-related pattern in the distribution of lymph node lesions. Benign lesions predominated among younger individuals, whereas malignant conditions, including metastatic carcinoma and lymphoma, were significantly more common in older patients. This observation is biologically plausible, as the incidence of malignant disease generally increases with age due to cumulative genetic alterations, environmental exposures, and declining immune surveillance. Similar age-related trends have been documented in previous clinicopathological studies of lymphadenopathy [8,9]. An important finding of the present study was the significant association between malignancy and specific clinical characteristics. Patients with malignant lymph node lesions were more likely to be older than 40 years, have supraclavicular lymphadenopathy, possess lymph nodes larger than 2 cm, and present with a longer duration of swelling. These associations are well recognized in clinical practice and are considered important predictors of underlying malignancy. Supraclavicular lymph nodes, in particular, have long been regarded as highly suspicious for metastatic disease because of their anatomical drainage patterns and proximity to thoracic and abdominal malignancies. Likewise, larger lymph node size and persistent enlargement often reflect progressive neoplastic infiltration rather than transient reactive processes. The strong clinicopathological correlations observed in this study support the continued use of these clinical parameters for risk stratification and prioritization of diagnostic investigations [10,11]. The findings have important clinical implications. They emphasize the need for a structured, age- and site-based approach to evaluating lymphadenopathy. While many cases in younger patients may be attributable to reactive or infective causes, persistent, large, or supraclavicular lymphadenopathy—particularly in older individuals—should prompt early tissue diagnosis. Histopathological examination remains the gold standard and should be complemented by ancillary techniques such as special stains and immunohistochemistry whenever required to achieve diagnostic precision. Such an approach facilitates timely initiation of appropriate therapy and improves patient outcomes [12,13]. The study possesses several strengths. All specimens underwent systematic histopathological evaluation using standardized criteria, and ancillary diagnostic techniques were employed when indicated. Furthermore, clinicopathological correlations were examined comprehensively, enabling assessment of clinically relevant predictors of malignancy. Nevertheless, certain limitations should be acknowledged. The study was conducted at a single tertiary care center, and the biopsy-based design may have introduced referral bias, potentially overrepresenting clinically significant lesions. In addition, immunohistochemical analysis was not uniformly available for all cases, which may have limited the detailed subclassification of some lymphoid neoplasms. Clinical information for a subset of patients was obtained retrospectively from records, introducing the possibility of incomplete data collection.

Future research should focus on larger multicentre studies incorporating diverse populations to enhance generalizability. Integration of advanced molecular diagnostics, immunophenotyping, and genetic profiling of lymphomas and metastatic tumors may further improve diagnostic accuracy, refine prognostic assessment, and contribute to personalized therapeutic strategies. Such studies would strengthen the evidence base for clinicopathological evaluation of lymphadenopathy and support the development of more effective diagnostic algorithms [14].

CONCLUSION

Lymph node lesions demonstrated a broad histopathological spectrum, encompassing reactive, infective, and malignant conditions. Reactive hyperplasia and granulomatous (predominantly tuberculous) lymphadenitis were the most common diagnoses and occurred mainly in younger patients, whereas metastatic carcinoma and lymphoma were more frequently observed in older individuals. Significant clinicopathological associations were identified between malignancy and advanced age, supraclavicular lymph node involvement, larger nodal size, and prolonged duration of lymphadenopathy. These findings highlight the importance of careful clinical assessment and risk stratification based on patient age and lymph node characteristics. Histopathological examination remains the definitive diagnostic modality for distinguishing benign from malignant lesions and guiding appropriate management. The results support an age- and site-directed approach to the evaluation of lymphadenopathy, complemented by timely biopsy and ancillary investigations when indicated. Larger multicentre studies incorporating advanced immunohistochemical and molecular techniques are warranted to further refine diagnostic accuracy, improve prognostic assessment, and enhance patient care.

REFERENCES

1. Ferrer R. Lymphadenopathy: differential diagnosis and evaluation. *Am Fam Physician*. 1998;58(6):1313–1320.
2. Mohan A, Reddy MK, Phaneendra BV, Chandra A. Aetiology of peripheral lymphadenopathy in adults: analysis of over 1700 cases in a tertiary care hospital. *Natl Med J India*. 2007;20(2):78–80.
3. Ioachim HL, Medeiros LJ. *Ioachim's Lymph Node Pathology*. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2009.
4. Bazemore AW, Smucker DR. Lymphadenopathy and malignancy. *Am Fam Physician*. 2002;66(11):2103–2110.
5. Chau I, Kelleher MT, Cunningham D, et al. Rapid access multidisciplinary lymph node diagnostic clinic: analysis of 550 patients. *Br J Cancer*. 2003;88(3):354–361.
6. Pangalis GA, Vassilakopoulos TP, Boussiotis VA, Fessas P. Clinical approach to lymphadenopathy. *Semin Oncol*. 1993;20(6):570–582.
7. Roy A, Kar R, Basu D, et al. Spectrum of histopathological diagnosis of lymph node biopsies: a descriptive study from a tertiary care centre in South India. *Indian J Pathol Microbiol*. 2013;56(2):103–108.
8. Moore SW, Schneider JW, Schaaf HS. Diagnostic aspects of cervical lymphadenopathy in children in the developing world. *Pediatr Surg Int*. 2003;19(4):240–244.
9. Olu-Eddo AN, Ohanaka CE. Peripheral lymphadenopathy in Nigerian adults. *J Pak Med Assoc*. 2006;56(9):405–408.
10. Reddy DG, Mohan A, et al. Fine needle aspiration cytology and histopathology of lymph node lesions: a correlative study. *J Cytol*. 2012;29(4):241–245.
11. Steel BL, Schwartz MR, Ramzy I. Fine needle aspiration biopsy in the diagnosis of lymphadenopathy in 1,103 patients. *Acta Cytol*. 1995;39(1):76–81.
12. Swerdlow SH, Campo E, Pileri SA, et al. The 2016 revision of the WHO classification of lymphoid neoplasms. *Blood*. 2016;127(20):2375–2390.
13. Vassilakopoulos TP, Pangalis GA. Application of a prediction rule to select which patients presenting with lymphadenopathy should undergo a lymph node biopsy. *Medicine (Baltimore)*. 2000;79(5):338–347.
14. Gaddey HL, Riegel AM. Unexplained lymphadenopathy: evaluation and differential diagnosis. *Am Fam Physician*. 2016;94(11):896–903.