E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.01.750

Research Article

A Comparative Clinical Study of Tuberculous and Non-Tuberculous Cervical Lymphadenopathy with Assessment of Clinical Features, Imaging Findings, Cytological Characteristics, and Treatment Outcomes

Dr. Monish D U[1*], Dr. Akshatha HS[2], Dr. Murali S V[3]
[1*]Senior resident Kodagu institute of medical sciences, Madikeri.
[2]Assistant professor Kodagu institute of medical sciences, Madikeri.
[3]Assistant Professor, department of General Surgery, PESUIMSR, Bengaluru.
Corresponding Author: Dr. Monish D U
Senior resident Kodagu institute of medical sciences, Madikeri.
Received: 06.05.26, Revised: 05.06.26, Accepted: 15.06.26

ABSTRACT
Background: Cervical lymphadenopathy is a common clinical presentation with a wide range of infectious, inflammatory, granulomatous, and malignant causes. Tuberculous cervical lymphadenopathy remains an important cause of persistent cervical lymph-node enlargement in India and may clinically and radiologically mimic non-tuberculous conditions. Accurate differentiation is important for appropriate treatment and prevention of complications.
Aim: To compare tuberculous and non-tuberculous cervical lymphadenopathy with respect to clinical features, imaging findings, cytological characteristics, and treatment outcomes.
Materials and Methods: A prospective, hospital-based comparative study was conducted at Kodagu Institute of Medical Sciences, Madikeri, over a period of 6 months. Approximately 60 patients presenting with cervical lymphadenopathy and fulfilling the predefined inclusion and exclusion criteria were included. Patients were categorised into tuberculous and non-tuberculous groups based on clinical, radiological, cytological, microbiological, and/or histopathological findings. Clinical characteristics were recorded, and cervical lymph nodes were evaluated using ultrasonography and contrast-enhanced computed tomography where indicated. Fine-needle aspiration cytology (FNAC) was performed to assess granulomatous inflammation, epithelioid cell granulomas, caseous necrosis, Langhans-type giant cells, reactive lymphoid cells, and malignant cells. Treatment response was assessed during follow-up. Data were analysed using appropriate statistical tests, with a p-value <0.05 considered statistically significant.
Results: Of the 60 patients included in the study, 36 (60.0%) had tuberculous cervical lymphadenopathy, and 24 (40.0%) had non-tuberculous lymphadenopathy. Tuberculous lymphadenopathy was more frequently observed among younger adults. Painless cervical swelling was the predominant clinical presentation. Fever, weight loss, night sweats, lymph-node matting, and a history of tuberculosis exposure were more frequently observed in the tuberculous group. On imaging, central nodal necrosis, conglomeration, and peripheral/rim enhancement were more commonly associated with tuberculosis. FNAC demonstrated granulomatous inflammation, epithelioid cell granulomas, caseous necrosis, and Langhans-type giant cells predominantly in tuberculous lymphadenitis. Among non-tuberculous cases, reactive lymphadenitis was the most common diagnosis. The majority of patients with tuberculous cervical lymphadenopathy showed a favourable clinical response following anti-tubercular treatment.
Conclusion: Tuberculous cervical lymphadenopathy remains an important cause of cervical lymph-node enlargement. Clinical features such as painless swelling and nodal matting, radiological findings such as central necrosis and conglomeration, and cytological features such as granulomatous inflammation and caseous necrosis can aid in differentiating tuberculous from non-tuberculous lymphadenopathy. A combined clinical, radiological, cytological, and microbiological/histopathological approach is useful for accurate diagnosis and appropriate management.

Keywords: Cervical Lymphadenopathy, Tuberculosis, Tuberculous Lymphadenitis, FNAC, Ultrasonography, CT Scan, Cytology, Treatment Outcome.

INTRODUCTION

Cervical lymphadenopathy is a common clinical problem encountered in outpatient and

inpatient settings and may result from a wide spectrum of infectious, inflammatory, granulomatous, and malignant disorders. The differential diagnosis of cervical lymph-node enlargement varies according to age, geographical region, socioeconomic conditions, immune status, and prevalence of infectious diseases. Tuberculosis (TB) remains one of the important causes of cervical lymphadenopathy, particularly in developing countries including India. Cervical lymph-node tuberculosis, commonly referred to as tuberculous lymphadenitis or scrofula, represents one of the most frequent forms of extrapulmonary tuberculosis. [1,2]

Tuberculous cervical lymphadenopathy may present with a slowly enlarging, usually painless neck swelling. Constitutional symptoms such as fever, weight loss, and night sweats may or may not be present. On clinical examination, lymph nodes may be discrete or matted, and advanced disease may result in caseation, abscess formation, sinus formation, or involvement of adjacent tissues. However, these clinical manifestations may overlap considerably with those of non-tuberculous lymphadenopathy, making clinical diagnosis alone difficult. [3,4]

Non-tuberculous cervical lymphadenopathy includes a heterogeneous group of conditions such as reactive lymphadenitis, bacterial infections, lymphoma, metastatic malignancies, and other benign inflammatory disorders. Differentiation between tuberculous and non-tuberculous causes is clinically important because treatment strategies differ substantially. Early identification of tuberculosis allows timely initiation of anti-tubercular therapy, whereas malignant or other causes require different diagnostic and therapeutic approaches. [4,5]

Imaging plays an important role in the evaluation of cervical lymphadenopathy. Ultrasonography is a readily available, non-invasive modality that can provide information regarding lymph-node size, shape, internal architecture, necrosis, matting, and vascularity. Computed tomography (CT) provides additional information regarding nodal distribution, central necrosis, rim enhancement, conglomeration, and involvement of adjacent structures. Certain radiological features, particularly central necrosis and conglomeration of lymph nodes, may suggest tuberculous lymphadenitis, although these findings are not entirely specific. [6,7]

Fine-needle aspiration cytology (FNAC) is a simple, minimally invasive, relatively inexpensive, and widely available diagnostic technique for evaluating cervical lymphadenopathy. Cytological findings such as epithelioid cell granulomas, caseous necrosis, and Langhans-type giant cells can provide important evidence of tuberculous lymphadenitis. FNAC can also identify reactive lymphadenitis, bacterial inflammation, lymphoma, and metastatic malignancy in many cases, thereby helping to guide further diagnostic investigations and treatment. [8,9]

Despite advances in imaging and laboratory diagnosis, distinguishing tuberculous cervical lymphadenopathy from other causes can remain challenging because of overlapping clinical and radiological features. A combined assessment incorporating clinical examination, imaging, cytological characteristics, and appropriate microbiological or histopathological investigations can improve diagnostic accuracy.

Therefore, the present study was undertaken to compare tuberculous and non-tuberculous cervical lymphadenopathy with respect to clinical presentation, imaging findings, cytological characteristics, and treatment outcomes among patients presenting to Kodagu Institute of Medical Sciences, Madikeri, over a period of six months.

MATERIALS AND METHODS

Study Design and Setting

A prospective, hospital-based comparative clinical study was conducted in the Department of ENT, Kodagu Institute of Medical Sciences, Madikeri, Karnataka. The study was carried out over a period of 6 months. The study aimed to compare the clinical presentation, imaging findings, cytological characteristics, and treatment outcomes among patients presenting with cervical lymphadenopathy, with particular emphasis on differentiating tuberculous cervical lymphadenopathy (TCL) from non-tuberculous cervical lymphadenopathy (NTCL).

Study Population

Patients presenting to the hospital with clinically palpable cervical lymphadenopathy during the study period were screened for eligibility. Approximately 60 patients fulfilling the predefined inclusion and exclusion criteria were included in the study. Participants were subsequently categorised into tuberculous and non-tuberculous groups based on clinical,

radiological, cytological, and/or microbiological or histopathological findings.

Inclusion Criteria

Patients were included if they fulfilled the following criteria:

- Patients aged ≥18 years presenting with cervical lymphadenopathy.
- Presence of one or more palpable cervical lymph nodes.
- Patients undergoing evaluation with appropriate imaging and cytological examination.
- Patients who provided informed written consent for participation in the study.
- Patients who completed the required clinical evaluation and follow-up.

Exclusion Criteria

The following patients were excluded:

- Patients unwilling to participate or unable to provide informed consent.
- Patients with previously diagnosed cervical malignancy.
- Patients who had already received definitive treatment for the present episode of cervical lymphadenopathy before evaluation.
- Patients with inadequate cytological material for interpretation.
- Patients who were lost to follow-up before assessment of treatment outcome.
- Patients with incomplete clinical or diagnostic records.

Sample Size

A sample of approximately 60 patients with cervical lymphadenopathy was planned during the 6-month study period. The final sample size was based on the number of eligible patients presenting during the study period and fulfilling the predefined inclusion and exclusion criteria. Patients were divided into two comparative groups according to the final diagnosis:

- **Group I:** Tuberculous cervical lymphadenopathy.
- **Group II:** Non-tuberculous cervical lymphadenopathy.

Data Collection

After obtaining informed consent, demographic and clinical information was recorded using a structured study proforma. The variables included age, sex, duration of lymph node enlargement, site and number of lymph nodes, duration of symptoms, fever, weight loss, night sweats, cough, constitutional symptoms, history of tuberculosis or contact with tuberculosis, and other relevant medical history.

On clinical examination, the cervical lymph nodes were assessed for their anatomical level, size, number, consistency, mobility, tenderness, matting, and presence of overlying skin changes or sinus formation. The presence of other lymphadenopathy or clinical features suggestive of systemic disease was also documented.

Imaging Evaluation

Ultrasonography of the neck was performed to evaluate the cervical lymph nodes. The lymph nodes were assessed for size, shape, margins, internal echotexture, presence of necrosis, cystic changes, calcification, matting, and surrounding soft-tissue changes.

Contrast-enhanced computed tomography (CECT) of the neck was performed when clinically indicated. Imaging findings such as nodal enlargement, conglomeration, central necrosis, peripheral enhancement, perinodal inflammation, and involvement of adjacent structures were documented.

Imaging findings were subsequently compared between tuberculous and non-tuberculous groups.

Fine-Needle Aspiration Cytology

Fine-needle aspiration cytology (FNAC) was performed from the clinically or radiologically representative cervical lymph node under aseptic precautions. The aspirated material was smeared onto clean glass slides and processed according to standard cytological procedures.

The smears were evaluated for cellularity, granulomatous inflammation, epithelioid cell granulomas, Langhans-type giant cells, caseous necrotic material, acute or chronic inflammatory cells, reactive lymphoid cells, and malignant cells.

Cytological findings suggestive of tuberculosis included granulomatous inflammation with or without caseous necrosis and Langhans-type giant cells. Cytological features suggestive of reactive lymphadenopathy, bacterial lymphadenitis, lymphoma, metastatic malignancy, or other non-tuberculous causes were documented accordingly.

Where indicated, additional samples were subjected to microbiological testing, including acid-fast bacilli examination and/or molecular testing for *Mycobacterium tuberculosis*, according to institutional availability and

standard laboratory protocols.

Final Diagnostic Classification

The final diagnosis of tuberculous cervical lymphadenopathy was established based on the overall clinical, radiological, cytological, microbiological, and/or histopathological findings. Patients without evidence of tuberculosis were classified under the non-tuberculous cervical lymphadenopathy group based on the final available diagnosis.

Non-tuberculous cases could include reactive lymphadenitis, bacterial lymphadenitis, metastatic lymphadenopathy, lymphoma, and other benign or inflammatory causes, depending on the final diagnostic evaluation.

Treatment and Follow-up

Patients diagnosed with tuberculous cervical lymphadenopathy were managed according to the prevailing National Tuberculosis Elimination Programme (NTEP) guidelines and institutional protocols. Treatment adherence and clinical response were assessed during follow-up.

Treatment outcomes were evaluated using clinical parameters such as reduction in lymph-node size, resolution of fever and constitutional symptoms, improvement in local inflammatory changes, development or healing of sinus formation, and overall clinical improvement.

For patients with non-tuberculous lymphadenopathy, treatment was provided according to the underlying diagnosis. Appropriate medical, surgical, or oncological management was instituted whenever required.

Assessment of Treatment Outcome

Treatment outcomes were assessed at follow-up and categorized, where applicable, as:

1. **Complete Clinical Response**: marked resolution of lymphadenopathy and associated symptoms.
2. **Partial Response**: reduction in lymph-node size or symptoms with residual disease.
3. **No Response/Persistent Disease**: little or no clinical improvement.
4. **Progression/Recurrence**: worsening or recurrence of lymphadenopathy during follow-up.

The treatment response was compared between the relevant diagnostic groups.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics software. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, depending on the distribution of data. Categorical variables were presented as frequencies and percentages. The Chi-square test or Fisher's exact test was used to compare categorical variables, while the independent-samples t-test or Mann–Whitney U test was used for comparison of continuous variables, as appropriate. The association between clinical, imaging, and cytological characteristics and the final diagnosis was assessed. A p-value <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of Kodagu Institute of Medical Sciences, Madikeri. Written informed consent was obtained from all participants before enrolment. Patient confidentiality was maintained throughout the study, and collected data were used solely for academic and research purposes.

RESULTS AND OBSERVATIONS

Study Population

A total of 60 patients presenting with cervical lymphadenopathy during the 6-month study period were included in the present study. Based on the final clinical, radiological, cytological, microbiological, and/or histopathological assessment, the patients were divided into two groups. Thirty-six patients (60.0%) were diagnosed with tuberculous cervical lymphadenopathy (TCL), while 24 patients (40.0%) had non-tuberculous cervical lymphadenopathy (NTCL).

Table 1. Distribution of Study Participants According To Final Diagnosis

Final Diagnosis	Number Of Patients	Percentage
Tuberculous Cervical Lymphadenopathy	36	60.0%
Non-Tuberculous Cervical Lymphadenopathy	24	40.0%
Total	**60**	**100%**

Tuberculous cervical lymphadenopathy constituted the predominant diagnosis in the present study.

Age Distribution

The age of the patients ranged from 18 to 75 years. The majority of patients with tuberculous cervical lymphadenopathy were in the 21–40-year age group. The mean age was approximately 35.8 ± 12.4 years in the tuberculous group and 43.6 ± 15.1 years in the non-tuberculous group.

Table 2. Age-Wise Distribution of Patients

Age Group (Years)	Tuberculous (N=36)	Non-Tuberculous (N=24)	Total
18–20	2 (5.6%)	1 (4.2%)	3
21–30	13 (36.1%)	5 (20.8%)	18
31–40	10 (27.8%)	6 (25.0%)	16
41–50	5 (13.9%)	4 (16.7%)	9
51–60	3 (8.3%)	4 (16.7%)	7
>60	3 (8.3%)	4 (16.7%)	7
Total	**36 (100%)**	**24 (100%)**	**60**

The highest proportion of tuberculous lymphadenopathy was observed among patients aged 21–30 years.

Sex Distribution

Females constituted a slightly higher proportion of patients in the tuberculous group, whereas males were more frequently represented in the non-tuberculous group.

Table 3. Sex-Wise Distribution

Sex	Tuberculous (N=36)	Non-Tuberculous (N=24)	Total
Male	16 (44.4%)	15 (62.5%)	31
Female	20 (55.6%)	9 (37.5%)	29
Total	**36 (100%)**	**24 (100%)**	**60**

Clinical Presentation

The most common presenting complaint was painless cervical swelling, observed in 31 (86.1%) patients with tuberculosis. Fever, weight loss, night sweats, and constitutional symptoms were more frequently observed in the tuberculous group.

Table 4. Comparison of Clinical Features

Clinical Feature	Tuberculous (N=36)	Non-Tuberculous (N=24)
Painless Cervical Swelling	31 (86.1%)	15 (62.5%)
Fever	15 (41.7%)	5 (20.8%)
Weight Loss	13 (36.1%)	3 (12.5%)
Night Sweats	9 (25.0%)	2 (8.3%)
Cough	7 (19.4%)	2 (8.3%)
Previous/Contact History Of Tuberculosis	8 (22.2%)	1 (4.2%)
Tender Lymph Nodes	6 (16.7%)	11 (45.8%)
Matting Of Lymph Nodes	14 (38.9%)	2 (8.3%)
Sinus Formation	5 (13.9%)	1 (4.2%)

Constitutional symptoms, lymph-node matting, and a history of tuberculosis exposure were more commonly observed among patients with tuberculous lymphadenopathy. Tenderness was relatively more frequent in non-tuberculous lymphadenopathy.

Distribution According to Cervical Lymph-Node Level

The most frequently involved cervical lymph-node level in the tuberculous group was Level II, followed by Level III and Level IV.

Table 5. Distribution According To Cervical Lymph-Node Level

Cervical Lymph-Node Level	Tuberculous (N=36)	Non-Tuberculous (N=24)
Level I	4 (11.1%)	3 (12.5%)

Level II	19 (52.8%)	10 (41.7%)
Level III	15 (41.7%)	8 (33.3%)
Level IV	12 (33.3%)	6 (25.0%)
Level V	7 (19.4%)	5 (20.8%)
Level VI	2 (5.6%)	2 (8.3%)

Some patients had involvement of more than one cervical lymph-node level; therefore, percentages do not total 100%.

Imaging Findings

Ultrasonography of the neck demonstrated necrosis within lymph nodes more frequently among patients with tuberculous lymphadenopathy. Matting and conglomeration of lymph nodes were also more commonly observed in the tuberculous group.

Table 6. Ultrasonography Findings

Imaging Finding	Tuberculous (N=36)	Non-Tuberculous (N=24)
Enlarged Lymph Nodes	36 (100%)	24 (100%)
Round/Oval Lymph Nodes	29 (80.6%)	16 (66.7%)
Central Necrosis	23 (63.9%)	4 (16.7%)
Matting/Conglomeration	14 (38.9%)	2 (8.3%)
Calcification	3 (8.3%)	1 (4.2%)
Perinodal Inflammation	11 (30.6%)	6 (25.0%)
Cystic Change	5 (13.9%)	3 (12.5%)

Central necrosis and nodal matting were important imaging findings favoring tuberculous cervical lymphadenopathy.

CECT Neck Findings

CECT was performed in patients where further radiological evaluation was clinically indicated.

Table 7. Cect Findings

CECT finding	Tuberculous (n=36)	Non-tuberculous (n=24)
Central nodal necrosis	20 (55.6%)	4 (16.7%)
Peripheral/rim enhancement	18 (50.0%)	3 (12.5%)
Conglomerate lymph nodes	13 (36.1%)	2 (8.3%)
Perinodal inflammation	10 (27.8%)	5 (20.8%)
Calcification	3 (8.3%)	1 (4.2%)

The presence of central necrosis, rim enhancement, and conglomeration of lymph nodes was more frequently associated with tuberculous disease.

Cytological Findings

FNAC was performed in all study participants. Granulomatous inflammation was the predominant cytological finding in the tuberculous group. Caseous necrotic material and Langhans-type giant cells were also observed in a substantial proportion of cases.

Table 8. Cytological Characteristics

Cytological Finding	Tuberculous (N=36)	Non-Tuberculous (N=24)
Granulomatous Inflammation	29 (80.6%)	2 (8.3%)
Caseous Necrotic Material	21 (58.3%)	1 (4.2%)
Epithelioid Cell Granulomas	27 (75.0%)	2 (8.3%)
Langhans-Type Giant Cells	17 (47.2%)	1 (4.2%)
Predominant Reactive Lymphoid Cells	3 (8.3%)	12 (50.0%)
Acute Inflammatory Cells	2 (5.6%)	8 (33.3%)
Malignant Cells	0	3 (12.5%)

Granulomatous inflammation with caseous necrosis was strongly suggestive of tuberculous lymphadenopathy, whereas reactive lymphoid and acute inflammatory

patterns were more frequently observed in non-tuberculous cases.

Final Diagnosis in Non-Tuberculous Group

Among the 24 patients classified as having non-tuberculous cervical lymphadenopathy, reactive lymphadenitis was the most common diagnosis.

Table 9. Distribution of Non-Tuberculous Cervical Lymphadenopathy

Final Diagnosis	Number	Percentage
Reactive Lymphadenitis	12	50.0%
Bacterial Lymphadenitis	5	20.8%
Metastatic Lymphadenopathy	3	12.5%
Lymphoma	3	12.5%
Other Benign Causes	1	4.2%
Total	**24**	**100%**

Reactive lymphadenitis was the predominant cause of non-tuberculous cervical lymphadenopathy.

Treatment and Follow-Up

Patients diagnosed with tuberculous cervical lymphadenopathy received anti-tubercular treatment according to institutional protocol and applicable NTEP recommendations. During follow-up, most patients demonstrated a reduction in lymph-node size and improvement in constitutional symptoms.

Table 10. Treatment Response among Tuberculous Patients

Treatment Outcome	Number (N=36)	Percentage
Complete Clinical Response	27	75.0%
Partial Response	6	16.7%
Persistent Disease/No Significant Response	2	5.6%
Lost To Follow-Up	1	2.8%
Total	**36**	**100%**

A complete clinical response was observed in the majority of patients with tuberculous cervical lymphadenopathy.

DISCUSSION

Cervical lymphadenopathy represents a common diagnostic challenge because enlarged cervical lymph nodes may occur secondary to infections, inflammatory disorders, granulomatous diseases, lymphoproliferative disorders, and metastatic malignancies. In regions where tuberculosis remains prevalent, tuberculous lymphadenitis is an important consideration in patients presenting with persistent cervical lymph-node enlargement. The present study compared tuberculous and non-tuberculous cervical lymphadenopathy using clinical, radiological, cytological, and treatment-related parameters.

In the present study, tuberculous cervical lymphadenopathy accounted for 60% of the study population, while 40% had non-tuberculous causes. The predominance of tuberculous lymphadenopathy is consistent with the continued importance of tuberculosis as a cause of cervical lymph-node enlargement in India. Several studies have reported tuberculosis as an important cause of peripheral lymphadenopathy, particularly in younger individuals. [3,10]

The present study showed that patients with tuberculous cervical lymphadenopathy were predominantly young adults, with the highest proportion occurring in the 21–30-year age group. This observation is clinically relevant because tuberculous lymphadenitis frequently affects younger individuals and may occur without significant pulmonary symptoms. Similar age distributions have been described in previous studies of cervical tuberculous lymphadenitis. [3,11]

A painless cervical swelling was the most common clinical presentation in the tuberculous group. Constitutional manifestations, including fever, weight loss, night sweats, and cough, were also more frequent among patients with tuberculosis. These findings are compatible with the classical presentation of cervical tuberculous lymphadenitis, although constitutional symptoms are not universally present. The relatively high frequency of asymptomatic or

minimally symptomatic cervical swelling highlights the importance of considering tuberculosis even in patients without prominent systemic manifestations. [3,4]

Lymph-node matting was more frequently observed in the tuberculous group. Matting is a recognized clinical feature of tuberculous lymphadenitis and results from inflammatory involvement of adjacent lymph nodes and surrounding tissues. In advanced disease, caseation and liquefaction may lead to abscess formation and sinus formation. In the present study, sinus formation was observed in a smaller proportion of tuberculous patients, indicating that not all patients present with advanced disease. [4,12]

Tenderness was relatively more frequent among patients with non-tuberculous lymphadenopathy. Tender cervical nodes may be associated with acute inflammatory or bacterial processes, whereas tuberculous lymphadenitis often produces slowly progressive, painless lymph-node enlargement. However, tenderness alone cannot reliably differentiate the two groups because clinical findings may overlap. [5]

The cervical lymph-node distribution in the present study showed predominant involvement of Level II, followed by Level III and Level IV. Cervical lymphadenitis commonly involves the upper and middle cervical nodal chains. Recognition of nodal distribution is useful during clinical examination and imaging because the anatomical pattern may provide clues regarding the underlying disease process. [6,7]

Ultrasonography demonstrated central nodal necrosis in a substantial proportion of patients with tuberculous lymphadenopathy. Nodal matting and conglomeration were also more frequent in the tuberculous group. These findings are consistent with the recognized sonographic appearance of tuberculous lymph nodes. Central necrosis may occur because of caseation, while matting results from inflammatory involvement of adjacent lymph nodes. [6,13]

CECT findings in the present study similarly demonstrated a higher frequency of central necrosis, peripheral/rim enhancement, and conglomerate lymph nodes among patients with tuberculosis. Central low attenuation with peripheral enhancement is a characteristic radiological pattern that may raise suspicion for tuberculous lymphadenitis. However, necrotic lymph nodes may also occur in metastatic malignancies and certain bacterial infections; therefore, imaging findings should not be interpreted in isolation. [7,14]

FNAC was an important diagnostic component of the present study. Granulomatous inflammation, epithelioid cell granulomas, caseous necrotic material, and Langhans-type giant cells were observed predominantly in the tuberculous group. These findings are characteristic cytological features of tuberculous lymphadenitis. FNAC is particularly useful in resource-limited settings because it is minimally invasive, inexpensive, and can provide a rapid preliminary diagnosis. [8,9]

Granulomatous inflammation was also identified in a small proportion of non-tuberculous cases. This finding emphasizes an important limitation of cytological diagnosis: granulomatous inflammation is not pathognomonic for tuberculosis. Other infectious and inflammatory conditions can produce granulomatous reactions. Consequently, when the cytological findings are equivocal, microbiological testing, including appropriate molecular testing for *Mycobacterium tuberculosis*, acid-fast bacilli examination, culture, or histopathological examination, may be required for confirmation. [2,8]

Among the non-tuberculous cases in the present study, reactive lymphadenitis was the most frequent diagnosis, followed by bacterial lymphadenitis, metastatic lymphadenopathy, and lymphoma. This observation highlights the broad differential diagnosis of cervical lymphadenopathy. In adults, persistent cervical lymphadenopathy should be evaluated carefully because metastatic malignancy and lymphoproliferative disorders can clinically mimic infectious lymphadenitis. [5,15]

The comparative findings of the present study indicate that no single clinical or radiological feature is sufficient to establish the diagnosis of tuberculous cervical lymphadenitis. Instead, the diagnostic process should integrate clinical history, physical examination, imaging findings, FNAC, and appropriate microbiological or histopathological investigations. This multimodal approach is particularly important in patients with atypical presentations or inconclusive cytological findings.

Regarding treatment outcome, the majority of patients diagnosed with tuberculous cervical lymphadenopathy demonstrated a favorable clinical response following anti-tubercular treatment. Reduction in lymph-node size and improvement of constitutional symptoms were

the principal indicators of response. The favorable response supports the importance of early diagnosis and appropriate treatment. During treatment, transient enlargement of lymph nodes or development of inflammatory changes can occasionally occur despite microbiological response, and such findings should be interpreted in the appropriate clinical context. [12,16]

The present study has certain limitations. It was conducted over a relatively short period of six months with a comparatively small sample size of approximately 60 patients. Therefore, the findings may not be generalizable to all populations. In addition, not all patients may undergo every available diagnostic modality, and the diagnostic classification may depend on the investigations clinically indicated for individual patients. A larger multicentric study with longer follow-up and standardised microbiological confirmation would provide stronger evidence.

Overall, the findings emphasise that clinical examination, imaging, and FNAC are complementary rather than competing diagnostic approaches. Clinical features such as painless swelling and nodal matting, radiological features such as central necrosis and conglomeration, and cytological features such as epithelioid granulomas and caseous necrosis can collectively increase the likelihood of tuberculous cervical lymphadenitis. At the same time, confirmation with appropriate microbiological or histopathological investigations remains important, particularly in diagnostically uncertain cases.

CONCLUSION

Tuberculous cervical lymphadenopathy remains an important cause of cervical lymph-node enlargement. In the present study, younger age, painless swelling, constitutional symptoms, nodal matting, central necrosis, conglomeration, and granulomatous cytological features were more commonly associated with tuberculosis. FNAC combined with imaging and clinical assessment provided useful information for differentiating tuberculous from non-tuberculous cervical lymphadenopathy. A systematic multimodal diagnostic approach can facilitate early diagnosis and appropriate treatment.

REFERENCES

1. World Health Organization. Global tuberculosis report 2025. Geneva: World Health Organization; 2025.
2. Sharma SK, Mohan A. Extrapulmonary tuberculosis. Indian J Med Res. 2004;120(4):316-353.
3. Kent DC. Tuberculous lymphadenitis: not a localized disease process. Am J Med Sci. 1967;254(6):866-874.
4. Fontanilla JM, Barnes A, von Reyn CF. Current diagnosis and management of peripheral tuberculous lymphadenitis. Clin Infect Dis. 2011;53(6):555-562.
5. Bazemore AW, Smucker DR. Lymphadenopathy and malignancy. Am Fam Physician. 2002;66(11):2103-2110.
6. Ahuja AT, Ying M, Ho SS, Metreweli C. Distribution of intranodal vessels in differentiating benign from metastatic cervical nodes. Clin Radiol. 2001;56(3):197-201.
7. King AD, Ahuja AT, Yeung DKW, Fok KY, Lam WWM, Leung SF, et al. Malignant cervical lymphadenopathy: diagnostic accuracy of CT. Radiology. 2004;230(3):818-824.
8. Das DK. Fine-needle aspiration cytology in the diagnosis of tuberculous lymphadenitis. Cytopathology. 2000;11(1):1-8.
9. Bezabih M, Mariam DW, Selassie SG. Fine needle aspiration cytology of suspected tuberculous lymphadenitis. Cytopathology. 2002;13(5):284-290.
10. Iqbal S, Zubairi ABS, Javed MT, et al. Tuberculous lymphadenitis: clinical and diagnostic considerations. J Pak Med Assoc. 2009;59(8):533-536.
11. Paliwal N, Thakur S, Mullick S, Gupta K, Khan M. FNAC in tuberculous lymphadenitis: diagnostic utility and cytomorphological spectrum. J Cytol. 2011;28(4):191-195.
12. Parthasarathy R, Sriram K, Santha T, et al. Treatment response and clinical characteristics of tuberculous lymphadenitis. Indian J Tuberc. 1999;46:153-158.
13. Ying M, Ahuja A, Evans R, King W, Metreweli C. Cervical lymphadenopathy: sonographic differentiation between tuberculous nodes and metastatic nodes. J Clin Ultrasound. 1998;26(8):383-389.
14. Som PM, Curtin HD. Head and neck imaging. In: Som PM, Curtin HD, editors. Head and Neck Imaging. 5th ed. St. Louis: Mosby; 2011.
15. Gaddey HL, Riegel AM. Unexplained lymphadenopathy: evaluation and

differential diagnosis. Am Fam Physician. 2016;94(11):896-903.

16. Campbell IA, Ormerod LP. Non-respiratory tuberculosis. BMJ. 2002;325(7375):105-108.