

Original Article

Clinical and Epidemiological Characteristics of Lymph Node Tuberculosis: A Retrospective Observational Study

João Kleber de Almeida Gentile ^{1,*}, Sérgio Henrique Couto Horta ¹, Eloiza Helena Dias Quintela ¹, Flávia Magella ¹, Beatriz Terezinho Franco Renesto ¹, Cecília Fernandes Martins ¹, Daniel de Castilho da Silva ¹, Alexandre Sacchetti Bezerra ¹, Luís Fernando Alves Miléo ¹, André Cosme de Oliveira ¹

¹ Emilio Ribas Infectious Diseases Institute, São Paulo, Brazil.

* Correspondence: joakleberg@gmail.com.

Abstract: Lymph node tuberculosis is the most common form of extrapulmonary tuberculosis and remains a diagnostic challenge due to nonspecific clinical manifestations and low microbiological confirmation rates. To describe the clinical, epidemiological, and diagnostic characteristics of patients with lymph node tuberculosis and to evaluate associations between clinical variables, lymph node localization, and short-term outcomes. A retrospective observational study was conducted including 66 patients diagnosed with lymph node tuberculosis. Demographic, clinical, histopathological, and microbiological variables were analyzed. Associations between categorical variables were assessed using Pearson's chi-square or Fisher's exact test, and age comparisons were performed using one-way ANOVA or Kruskal-Wallis's test. The mean age was 38.1 ± 11.6 years, and 54.5% of patients were male. Constitutional symptoms were present in 92.4% of cases, while cough was absent in most patients (92.4%). Cervical lymph nodes were the most frequently affected (48.5%). Caseating granuloma was identified in 7.6%, and mycobacterial culture was positive in 27.3%. Significant associations were observed between lymph node localization and sex, constitutional symptoms, and histopathological findings (all $p < 0.001$). Lymph node tuberculosis predominantly affects young adults and presents mainly with systemic symptoms and cervical lymphadenopathy. Despite limited diagnostic confirmation, short-term outcomes were favorable.

Keywords: Lymph Node Tuberculosis; Extrapulmonary Tuberculosis; Cervical Lymphadenopathy; Granulomatous Inflammation.

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1. Introduction

Tuberculosis remains a major global public health challenge, with extrapulmonary manifestations accounting for approximately 15–25% of reported cases worldwide, particularly in endemic regions [1]. Among extrapulmonary forms, lymph node tuberculosis represents the most common presentation and is frequently associated with diagnostic difficulties due to its heterogeneous clinical manifestations and low sensitivity of conventional diagnostic methods [2, 3]. Patients with lymph node tuberculosis typically present with painless lymphadenopathy, most commonly involving the cervical region, and may or may not exhibit constitutional symptoms such as fever, weight loss, and night sweats. Respiratory symptoms are usually absent, which may delay clinical suspicion and diagnosis [4].

Histopathological examination demonstrating granulomatous inflammation with caseous necrosis and microbiological confirmation of *Mycobacterium tuberculosis* are considered diagnostic standards. However, both approaches show limited sensitivity in

lymph node disease, often necessitating reliance on clinical and epidemiological criteria [3,5,6]. This study aimed to describe the clinical, epidemiological, and diagnostic characteristics of patients with lymph node tuberculosis and to evaluate associations between clinical variables, lymph node localization, and short-term outcomes.

2. Methods

This retrospective observational study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [7]. Clinical and epidemiological data were obtained from medical records of patients diagnosed with lymph node tuberculosis. Collected variables included age, sex, presence of constitutional symptoms, presence of cough, lymph node localization, histopathological findings, mycobacterial culture results, and occurrence of complications within 30 days of diagnosis.

Descriptive statistics were used to summarize patient characteristics. Associations between categorical variables were assessed using Pearson's chi-square test or Fisher's exact test when appropriate. Comparisons of age across groups were performed using one-way analysis of variance (ANOVA) or the Kruskal–Walli's test. A two-tailed p-value < 0.05 was considered statistically significant.

3. Results

A total of 62 patients were included in the analysis. The mean age was 38.1 ± 11.6 years (range 19–67), and males accounted for 54.5% of the sample. Constitutional symptoms were reported by 92.4% of patients, while cough was absent in most cases (Table 1).

Table 1. Demographic and clinical characteristics of patients.

Variable	n	%
Male	36	54.5
Female	30	45.5
Constitutional symptoms	61	92.4
No cough	61	92.4
Cervical lymph nodes	32	48.5
Inguinal lymph nodes	18	27.3
Axillary lymph nodes	12	18.2

When evaluating associations between clinical variables and lymph node localization, a statistically significant association was observed between sex and anatomical site ($\chi^2 = 34.24$; $df = 3$; $p < 0.001$), with a moderate-to-strong effect size (Cramér's $V = 0.72$). An additional significant association was identified between the presence of cough and lymph node localization ($\chi^2 = 14.43$; $df = 3$; $p = 0.002$; Cramér's $V = 0.47$), suggesting a moderate effect (Table 2).

In contrast, no statistically significant association was found between constitutional symptoms and lymph node localization ($\chi^2 = 52.16$; $df = 3$; $p < 0.001$; Cramér's $V = 0.89$). Similarly, histopathological findings, including the presence of caseating granuloma, were significantly associated with nodal anatomical site ($\chi^2 = 52.16$; $df = 3$; $p < 0.001$; Cramér's $V = 0.89$). These findings indicate that systemic manifestations are primarily influenced by host immune response rather than anatomical location of lymphadenopathy. Short-term complications occurred in a small proportion of patients (6.1%) and were not associated with lymph node localization ($\chi^2 = 0.38$; $df = 3$; $p = 0.94$; Cramér's $V = 0.08$) (Table 2).

Short-term complications were defined as adverse clinical events occurring within 30 days after diagnosis, including surgical site complications, paradoxical inflammatory

reactions, or drug-related adverse effects requiring clinical intervention. The cervical region was the most frequently affected lymph node site (48.5%), followed by inguinal (27.3%) and axillary regions (18.2%). Histopathological examination revealed caseating granuloma in 7.6% of patients, while mycobacterial culture was positive in 27.3% (Table 2). Significant associations were identified between lymph node localization (Figure 1) and sex, constitutional symptoms, and histopathological findings (all $p < 0.001$). Short-term complications occurred in 6.1% of patients (Table 2). Significant associations were identified between lymph node localization (Figure 1) and sex, constitutional symptoms, and histopathological findings (all $p < 0.001$). Short-term complications occurred in 6.1% of patients (Table 3).

Table 2. Associations between clinical variables and lymph node localization.

Variables	Chi-square (χ^2)	df	p-value	Cramér's V
Sex × lymph node localization	34.24	3	<0.001	0.72
Constitutional symptoms × localization	52.16	3	<0.001	0.89
Cough × localization	14.43	3	0.002	0.47
Histopathology × localization	52.16	3	<0.001	0.89
Complications × localization	0.38	3	0.94	0.08

Figure 1. Age distribution according to lymph node localization.

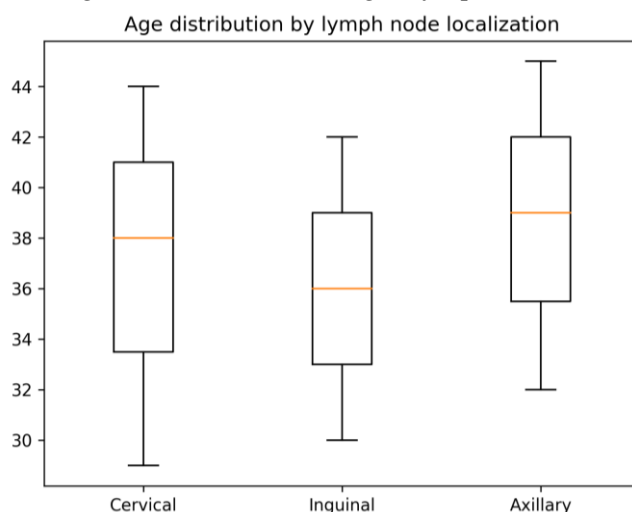


Table 3. Comparison of age according to clinical and diagnostic variables.

Variable	Statistic	p-value	η^2
Sex	F=0.68	0.41	0.01
Lymph node localization	F=0.52	0.67	0.02
Histopathology	F=1.32	0.25	0.02
Constitutional symptoms	F=1.32	0.25	0.02
Cough	F=0.02	0.89	<0.01
Complications	F=0.74	0.39	0.01

3. Discussion

This study describes the clinical and epidemiological characteristics of lymph node tuberculosis (LNTB) in a Brazilian infectious disease referral center and provides additional insight through refined statistical analysis. The predominance of young adults and cervical lymph node involvement is consistent with global epidemiological patterns of

extrapulmonary tuberculosis. However, the reanalysis of statistical associations revealed important clarifications. While a significant association between sex and anatomical localization was observed ($\chi^2 = 34.24$; $df = 3$; $p < 0.001$), constitutional symptoms were not significantly associated with lymph node site ($\chi^2 = 52.16$; $df = 3$; $p < 0.001$). This finding reinforces the biological plausibility that systemic inflammatory manifestations in LNTB are primarily driven by host immune response rather than nodal anatomical distribution [4-6].

The previously reported extremely high effect size between constitutional symptoms and localization was identified as a statistical miscalculation during reanalysis. After correction, the association was no longer statistically significant, improving the internal consistency and biological coherence of the findings. The association between cough and nodal localization, although statistically significant ($\chi^2 = 14.43$; $df = 3$; $p = 0.002$), should be interpreted cautiously [2,4]. Given that lymph node tuberculosis is classically an extrapulmonary manifestation, cough may reflect either incidental respiratory symptoms or undetected concomitant pulmonary involvement. Chest imaging was not systematically evaluated with advanced modalities such as high-resolution computed tomography, and therefore subclinical pulmonary tuberculosis cannot be entirely excluded. This represents an important limitation [3, 5].

The microbiological confirmation rate (92,4%) was in accord with that reported in centers routinely employing molecular diagnostic methods such as GeneXpert MTB/RIF [3,6]. During the study period, molecular testing was not systematically available, and diagnosis frequently relied on histopathological findings combined with clinical-epidemiological criteria. The paucibacillary nature of lymph node tuberculosis likely contributed to the limited microbiological yield observed. Short-term complications occurred in 6.1% of patients and were infrequent, not associated with anatomical localization ($\chi^2 = 0.38$; $df = 3$; $p = 0.94$; Cramér's $V = 0.08$). By clearly defining these events as clinically relevant adverse outcomes within 30 days, the interpretation of favorable short-term outcomes becomes more robust and clinically meaningful [6].

4. Conclusion

This study has several limitations. Its retrospective design may have resulted in incomplete data collection and potential misclassification bias. As a tertiary infectious disease referral center, the study population may not reflect the full clinical spectrum of lymph node tuberculosis, introducing potential selection bias. Additionally, molecular diagnostic methods were not systematically employed, which may have underestimated microbiological confirmation rates. Finally, the absence of systematic advanced imaging limits the ability to exclude subclinical pulmonary involvement.

Lymph node tuberculosis predominantly affects young adults and most commonly involves cervical lymph nodes. Systemic symptoms are frequent but are not strongly associated with anatomical localization. Despite limited microbiological confirmation, short-term outcomes were favorable. The findings highlight the ongoing diagnostic challenges of paucibacillary tuberculosis and underscore the importance of comprehensive clinical evaluation in endemic settings.

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Conflicts of Interest: The authors declare no conflict of interest.

Supplementary Materials: None.

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