

**Original article:**

**Analysis of FNAC Findings in Paediatric Patients Aged 1-10 Years Presenting with Cervical Lymphadenopathy: An Institutional Based Study**

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**Abstract**

**Background:** Cervical lymphadenopathy is a common clinical presentation in children and may result from reactive, infective, granulomatous, or rarely malignant conditions. Fine needle aspiration cytology is a simple, rapid, minimally invasive, and cost-effective diagnostic method for evaluating enlarged cervical lymph nodes. It helps in differentiating benign inflammatory lesions from conditions requiring further investigation or treatment.

**Aim:** To analyze FNAC findings in paediatric patients aged 1-10 years presenting with cervical lymphadenopathy.

**Materials and Methods:** This hospital-based observational study included 72 pediatric patients aged 1–10 years with clinically palpable cervical lymphadenopathy. Detailed clinical history and examination findings were recorded, including age, sex, site, laterality, number of lymph nodes, tenderness, mobility, and matting. Fine needle aspiration cytology was performed under aseptic precautions using a 22–24 gauge needle attached to a 10 mL syringe. Smears were prepared, stained with routine cytological stains, and examined microscopically. Ziehl–Neelsen staining was performed wherever granulomatous or tuberculous lymphadenitis was suspected. Data were analyzed using descriptive statistics, and associations between FNAC diagnosis with age and sex were assessed.

**Results:** The highest number of cases was observed in the 4–6 years age group, comprising 31 patients (43.06%), followed by 1–3 years with 25 cases (34.72%) and 7–10 years with 16 cases (22.22%). Males were slightly more commonly affected, with 38 cases (52.78%), compared to females with 34 cases (47.22%). Unilateral lymphadenopathy was seen in 46 cases (63.89%), while bilateral involvement was present in 26 cases (36.11%). Multiple lymph node involvement was observed in 43 cases (59.72%). Reactive lymphadenitis was the most common FNAC diagnosis, seen in 41 cases (56.94%), followed by acute suppurative lymphadenitis and granulomatous/tuberculous lymphadenitis, each seen in 12 cases (16.67%). Chronic nonspecific lymphadenitis was found in 5 cases (6.94%), while malignant lesions were rare, seen in 2 cases (2.78%). No statistically significant association was found between FNAC diagnosis and age group ( $p = 0.92$ ) or sex ( $p = 0.93$ ).

**Conclusion:** FNAC is a safe, rapid, and reliable first-line diagnostic tool for cervical lymphadenopathy in children. Most cases in this study were benign, with reactive lymphadenitis being the commonest finding.

**Key words:** Cervical Lymphadenopathy, FNAC, Children, Reactive Lymphadenitis, Tuberculous Lymphadenitis.

**INTRODUCTION**

Cervical lymphadenopathy is one of the most frequent clinical presentations in childhood and is a

common reason for referral to pediatric, otorhinolaryngology, and pathology departments. In children aged 1–10 years, enlargement of

cervical lymph nodes is often related to the active immunological response of lymphoid tissue to repeated exposure to viral, bacterial, and other infective agents. The cervical region contains a rich lymphatic network draining the scalp, face, oral cavity, pharynx, tonsils, ear, nose, and upper respiratory tract; therefore, even minor infections in these areas may produce palpable lymph node enlargement. Although most cases are benign and self-limiting, persistent or clinically significant cervical lymphadenopathy requires careful evaluation to distinguish reactive and infective lesions from granulomatous disease, lymphoma, and metastatic malignancy.<sup>1</sup> The clinical assessment of cervical lymphadenopathy in children begins with detailed history taking and physical examination. Important clinical parameters include age, duration of swelling, site of lymph node involvement, unilateral or bilateral distribution, number of nodes, size, tenderness, mobility, consistency, matting, overlying skin changes, fever, weight loss, night sweats, cough, sore throat, dental infection, ear discharge, contact with tuberculosis, and prior treatment. In pediatric practice, cervical lymph node enlargement may create anxiety among parents because of concern regarding tuberculosis or malignancy. However, clinical examination alone may not reliably determine the exact etiology, especially when lymph nodes are persistent, multiple, matted, progressively enlarging, or associated with systemic symptoms.<sup>2</sup> The causes of cervical lymphadenopathy in children are broad and include reactive lymphoid hyperplasia, acute suppurative lymphadenitis, chronic nonspecific lymphadenitis, granulomatous lymphadenitis, tuberculous lymphadenitis, atypical mycobacterial infection, lymphoma, leukemia, and metastatic tumors. Reactive lymphadenitis commonly follows infections of the upper respiratory tract, tonsils,

oral cavity, or scalp. Acute suppurative lymphadenitis is usually associated with bacterial infection and may present with pain, tenderness, fever, and erythema. Granulomatous and tuberculous lymphadenitis remain important diagnostic possibilities in regions where tuberculosis is prevalent. Malignant lesions are uncommon in children but must be considered when lymph nodes are hard, fixed, supraclavicular, progressively enlarging, or associated with constitutional symptoms.<sup>3</sup> Fine needle aspiration cytology is a simple, rapid, minimally invasive, and cost-effective diagnostic procedure for evaluating palpable lymph nodes. It can be performed as an outpatient procedure and is generally well tolerated by children. Compared with open biopsy, FNAC avoids surgical incision, suturing, hospitalization, and the risks associated with anesthesia. It provides early cytological diagnosis and helps clinicians decide whether conservative treatment, antimicrobial therapy, antitubercular treatment, further laboratory workup, imaging, or excision biopsy is required. FNAC is particularly useful in tertiary care hospitals where a large number of pediatric patients present with cervical lymphadenopathy and where early triage is important for appropriate management.<sup>4</sup> The diagnostic value of FNAC depends on adequate sampling, proper smear preparation, appropriate staining, and careful cytomorphological interpretation. Smears may reveal polymorph-rich suppurative inflammation, mixed lymphoid cells in reactive hyperplasia, epithelioid cell granulomas, multinucleated giant cells, caseous necrosis, atypical lymphoid cells, or malignant epithelial cells. Special stains such as Ziehl–Neelsen stain may be used when tuberculous lymphadenitis is suspected. FNAC also guides the need for additional tests such as microbiological culture, cartridge-based molecular testing,

immunocytochemistry, flow cytometry, or histopathological confirmation, especially in suspected lymphoma or poorly differentiated malignancy.<sup>5</sup> In children aged 1–10 years, FNAC has special relevance because this age group frequently presents with inflammatory and infective lymph node enlargement, while invasive diagnostic procedures may be difficult to perform because of fear, poor cooperation, and parental concern. A cytological diagnosis can often reduce unnecessary surgical biopsy in benign lesions and can identify cases requiring urgent referral. The technique is also useful for follow-up evaluation in recurrent or persistent lymphadenopathy. In settings with a high burden of tuberculosis, FNAC can provide early evidence of granulomatous or necrotizing lymphadenitis and can help initiate timely management when correlated with clinical and laboratory findings.<sup>6</sup>

## **MATERIALS & METHODS**

This study was designed as a hospital-based observational study conducted to analyze FNAC findings in paediatric patients aged 1-10 years presenting with cervical lymphadenopathy. A total of 72 pediatric patients with clinically palpable cervical lymph nodes were included in the study. Both male and female children were included. Patients were selected based on clinical presentation, physical examination findings, and suitability for FNAC evaluation.

### **Inclusion Criteria**

Children aged 1–10 years with palpable cervical lymphadenopathy were included in the study. Patients with unilateral or bilateral cervical lymph node enlargement, irrespective of the duration of swelling, tenderness, or associated constitutional symptoms, were considered eligible. Only those patients whose parents or guardians provided consent for the FNAC procedure were included.

### **Exclusion Criteria**

Children below 1 year or above 10 years of age were excluded from the study. Patients with bleeding disorders, severe uncooperative behavior where FNAC could not be safely performed, previously diagnosed and treated cases of cervical lymphadenopathy, and cases with inadequate or unsatisfactory cytological smears were excluded from the final analysis.

### **Methodology**

A detailed clinical history was obtained from the parents or guardians of each patient. Relevant parameters such as age, sex, site of lymph node enlargement, laterality, number of lymph nodes involved, size of the lymph node, consistency, mobility, tenderness, matting, overlying skin changes, fever, weight loss, cough, sore throat, dental infection, ear infection, and history suggestive of tuberculosis were recorded. General physical examination and local examination of the cervical region were performed in all cases.

Fine needle aspiration cytology was performed under aseptic precautions using a disposable 22–24 gauge needle attached to a 10 mL syringe. The most prominent or clinically significant cervical lymph node was selected for aspiration. In cases with multiple lymph nodes, the largest or most suspicious node was aspirated. The aspirated material was expressed onto clean glass slides and spread evenly to prepare thin smears. Both air-dried and alcohol-fixed smears were prepared. Air-dried smears were stained with May-Grünwald-Giemsa stain, while alcohol-fixed smears were stained with Papanicolaou stain or hematoxylin and eosin stain, depending on laboratory protocol. Ziehl–Neelsen staining was performed wherever granulomatous lymphadenitis or tuberculous lymphadenitis was suspected, especially in cases showing epithelioid cell granulomas, caseous necrosis, or necrotic background.

All stained smears were examined microscopically. Cytological diagnosis was made based on cellularity, background material, lymphoid cell population, presence of polymorphs, histiocytes, epithelioid cell granulomas, multinucleated giant cells, necrosis, Reed–Sternberg-like cells, atypical lymphoid cells, metastatic deposits, and other relevant cytomorphological features. Cases were categorized into reactive lymphadenitis, acute suppurative lymphadenitis, granulomatous lymphadenitis, tuberculous lymphadenitis, chronic nonspecific lymphadenitis, benign cystic lesions, and malignant lesions wherever applicable.

**Statistical Analysis:** The collected data were entered and analyzed using descriptive statistical methods. Frequencies and percentages were calculated for categorical variables such as sex, site of lymphadenopathy, laterality, and cytological diagnosis. Age distribution and lymph node size were summarized using appropriate descriptive measures. The results were presented in the form of tables, charts, and percentages wherever required.

## RESULTS

The present study included 72 pediatric patients aged between 1 and 10 years presenting with cervical lymphadenopathy. The highest number of cases was observed in the 4–6 years age group, comprising 31 patients (43.06%), indicating that this age group is more commonly affected. This was followed by the 1–3 years group with 25 cases (34.72%), while the least number of cases were seen in the 7–10 years group, accounting for 16 cases (22.22%). Gender-wise distribution showed a slight male predominance with 38 males (52.78%) compared to 34 females (47.22%), resulting in a male-to-female ratio of approximately 1.12:1. (Table 1)

Analysis of clinical characteristics revealed that unilateral cervical lymphadenopathy was more

common, observed in 46 patients (63.89%), whereas bilateral involvement was seen in 26 patients (36.11%). Multiple lymph node involvement was more frequent, seen in 43 cases (59.72%), compared to single lymph node enlargement in 29 cases (40.28%), indicating a tendency toward widespread nodal involvement in children. Regarding physical characteristics, most lymph nodes were non-tender (44 cases; 61.11%), while tenderness was present in 28 cases (38.89%). A large majority of lymph nodes were mobile (58 cases; 80.56%), suggesting a predominantly benign etiology. Matted lymph nodes, often associated with chronic infections like tuberculosis, were observed in 14 cases (19.44%). (Table 2)

Fine needle aspiration cytology findings demonstrated that reactive lymphadenitis was the most common diagnosis, accounting for 41 cases (56.94%). This highlights that the majority of cervical lymphadenopathy cases in this pediatric population were due to reactive or inflammatory causes. Acute suppurative lymphadenitis and granulomatous/tuberculous lymphadenitis were the next most common findings, each seen in 12 cases (16.67%). Chronic nonspecific lymphadenitis was relatively less common, observed in 5 cases (6.94%). Malignant lesions were rare, identified in only 2 cases (2.78%). Overall, benign conditions constituted the overwhelming majority of cases (97.22%), confirming that cervical lymphadenopathy in children is most often non-malignant in nature. (Table 3)

The distribution of FNAC diagnoses across different age groups did not show any statistically significant variation ( $p = 0.92$ ). Reactive lymphadenitis remained the most common diagnosis in all age groups, with the highest number of cases in the 4–6 years group (18 cases), followed by the 1–3 years group (16 cases) and the 7–10 years group (7 cases). Acute suppurative and

granulomatous/tuberculous lymphadenitis were also fairly evenly distributed among the age groups, without any distinct pattern. Malignant lesions were observed only in the older age groups (one case each in 4–6 years and 7–10 years), but the numbers were too small to establish any meaningful trend. (Table 4)

The analysis of FNAC findings with respect to sex also did not reveal any statistically significant association ( $p = 0.93$ ). Reactive lymphadenitis was the most common diagnosis in both males (22 cases) and females (19 cases). Acute suppurative

lymphadenitis was slightly more common in females (7 cases) compared to males (5 cases), while granulomatous/tuberculous lymphadenitis was somewhat more frequent in males (7 cases) than females (5 cases). Chronic nonspecific lymphadenitis and malignant lesions were similarly distributed between both sexes. The near-equal distribution of various diagnoses among males and females, along with the high  $p$ -value, indicates that sex did not significantly affect the pattern of FNAC findings in children with cervical lymphadenopathy. (Table 5)

**Table 1. Age and sex distribution of patients**

Age group	Male, n (%)	Female, n (%)	Total, n (%)
1–3 years	14 (19.44%)	11 (15.28%)	25 (34.72%)
4–6 years	16 (22.22%)	15 (20.83%)	31 (43.06%)
7–10 years	8 (11.11%)	8 (11.11%)	16 (22.22%)
<b>Total</b>	<b>38 (52.78%)</b>	<b>34 (47.22%)</b>	<b>72 (100.00%)</b>

**Table 2. Clinical profile of cervical lymphadenopathy**

Clinical parameter	Number of cases	Percentage
Unilateral lymphadenopathy	46	63.89%
Bilateral lymphadenopathy	26	36.11%
Single lymph node involvement	29	40.28%
Multiple lymph node involvement	43	59.72%
Tender lymph nodes	28	38.89%
Non-tender lymph nodes	44	61.11%
Mobile lymph nodes	58	80.56%
Matted lymph nodes	14	19.44%

**Table 3. Distribution of FNAC findings**

FNAC diagnosis	Number of cases	Percentage
Reactive lymphadenitis	41	56.94%
Acute suppurative lymphadenitis	12	16.67%
Granulomatous/tuberculous lymphadenitis	12	16.67%
Chronic nonspecific lymphadenitis	5	6.94%
Malignant lesion	2	2.78%
<b>Total</b>	<b>72</b>	<b>100.00%</b>

**Table 4. Association between age group and FNAC diagnosis**

FNAC diagnosis	1–3 years	4–6 years	7–10 years	Total	p value
Reactive lymphadenitis	16	18	7	41	
Acute suppurative lymphadenitis	4	5	3	12	
Granulomatous/tuberculous lymphadenitis	3	5	4	12	
Chronic nonspecific lymphadenitis	2	2	1	5	
Malignant lesion	0	1	1	2	
<b>Total</b>	25	31	16	72	0.92

**Table 5. Association between sex and FNAC diagnosis**

FNAC diagnosis	Male	Female	Total	p value
Reactive lymphadenitis	22	19	41	
Acute suppurative lymphadenitis	5	7	12	
Granulomatous/tuberculous lymphadenitis	7	5	12	
Chronic nonspecific lymphadenitis	3	2	5	
Malignant lesion	1	1	2	
<b>Total</b>	38	34	72	0.93

## DISCUSSION

In the present study, the maximum number of cases was observed in the 4–6 years age group, comprising 31 out of 72 patients (43.06%), followed by 25 cases (34.72%) in the 1–3 years age group and 16 cases (22.22%) in the 7–10 years age group. This finding suggests that cervical lymphadenopathy is more frequent in early and middle childhood, probably due to frequent upper respiratory tract infections and reactive lymphoid hyperplasia during this age period. A similar observation was reported by Gupta et al. (2010), who studied 200 children with cervical lymphadenopathy and found that the condition was most prevalent in the 6–10 years age group, showing that childhood cervical lymphadenopathy commonly affects the school-going age group.<sup>7</sup>

The present study showed a slight male predominance, with 38 males (52.78%) and 34 females (47.22%), giving a male-to-female ratio of 1.12:1. This finding is comparable with Gupta et al.

(2010), who reported a stronger male predominance with a male-to-female ratio of 1.68:1 in their study of 200 children with significant cervical lymphadenopathy. The lower male predominance in the present study may be due to the smaller sample size and restriction of the age group to 1–10 years, but both studies indicate that cervical lymphadenopathy is slightly more common among boys.<sup>7</sup>

In the present study, unilateral cervical lymphadenopathy was seen in 46 cases (63.89%), while bilateral lymphadenopathy was seen in 26 cases (36.11%). This is close to the findings of Niedzielska et al. (2007), who studied 87 children with cervical lymphadenopathy and reported reactive inflammatory changes in 50 children (57.5%); among these reactive cases, unilateral lymphadenopathy was present in 35 children (70.0%) and bilateral lymphadenopathy in 15 children (30.0%). Thus, both studies show that unilateral cervical lymphadenopathy is a common

presentation in children and is often associated with benign inflammatory or reactive pathology.<sup>8</sup> Multiple lymph node involvement was observed in 43 cases (59.72%) in the present study, while single lymph node enlargement was seen in 29 cases (40.28%). Matted lymph nodes were seen in 14 cases (19.44%). Balaji et al. (2009), in a study on childhood tuberculous lymphadenitis, reported that multiple lymph nodes were present in 52.1% of tuberculous cases and matted lymph nodes in 47.8% of cases. Compared with their findings, the present study had a similar frequency of multiple lymph node involvement but a lower frequency of matted nodes, which may be explained by the lower proportion of granulomatous/tuberculous lymphadenitis in the present study, 12 cases (16.67%).<sup>9</sup> Reactive lymphadenitis was the commonest FNAC finding in the present study, accounting for 41 cases (56.94%). This was very similar to the findings of Byun et al. (2006), who studied 57 pediatric patients with cervical lymphadenopathy and reported reactive cervical lymphadenitis as the most common FNAC diagnosis, comprising 52.5% of cases. The close agreement between the two studies supports the view that reactive lymphadenitis is the predominant cause of cervical lymph node enlargement in children.<sup>10</sup> Acute suppurative lymphadenitis accounted for 12 cases (16.67%) in the present study. This finding indicates that bacterial inflammatory lesions formed an important subgroup of pediatric cervical lymphadenopathy. Niedzielska et al. (2007) reported reactive inflammatory changes of bacterial origin in 50 out of 87 children (57.5%) and fever in 21 cases (24.1%), emphasizing the role of infective and inflammatory causes in childhood cervical lymphadenopathy. Compared with their study, the present study showed a more specific cytological separation of acute suppurative lymphadenitis from

reactive lymphadenitis, but both studies demonstrate that inflammatory lesions form the major diagnostic group.<sup>8</sup>

Granulomatous/ tuberculous lymphadenitis was diagnosed in 12 cases (16.67%) in the present study. This proportion was lower than that reported by Gupta et al. (2010), who found tuberculous lymphadenitis in 80 out of 200 children (40.0%) on FNAC. Similarly, Reddy et al. (2002) reported tubercular lymphadenitis as the commonest treatable cause of pediatric lymphadenopathy, seen in 35% of cases. The lower frequency in the present study may reflect differences in geographic burden of tuberculosis, selection criteria, age range, and referral pattern.<sup>11</sup>

Chronic nonspecific lymphadenitis was found in 5 cases (6.94%) in the present study. Gupta et al. (2010) reported chronic lymphadenitis in 20 out of 200 children (10.0%), which is slightly higher than the present study. This minor difference may be due to differences in case classification, as some cases with nonspecific inflammatory changes may overlap cytologically with reactive lymphadenitis. The relatively low percentage in both studies suggests that most pediatric cervical lymph node aspirates can be classified into reactive, suppurative, tuberculous, or malignant categories on FNAC.<sup>7</sup>

Malignant lesions were rare in the present study and were observed in only 2 cases (2.78%). This finding was lower than that of Byun et al. (2006), who reported malignant disease in 14.0% of pediatric cervical lymphadenopathy cases. Wang et al. (2010) also emphasized that malignancy should be considered in unexplained cervical lymphadenopathy in children, particularly when suspicious clinical predictors are present. The lower malignancy rate in the present study supports that most cervical lymphadenopathy cases in children are benign, but FNAC remains important

for identifying the small proportion of malignant lesions.<sup>12</sup>

In the present study, no statistically significant association was found between age group and FNAC diagnosis ( $p = 0.92$ ) or between sex and FNAC diagnosis ( $p = 0.93$ ). Reactive lymphadenitis remained the most common diagnosis across all age groups and in both sexes, with 22 male and 19 female cases. Van de Schoot et al. (2001) studied FNAC in children with persistent or suspicious lymphadenopathy and reported sensitivity of 86% and specificity of 96%, with most children requiring only FNAC for diagnosis. This supports the usefulness of FNAC as a reliable first-line diagnostic method irrespective

of age or sex distribution, especially when interpreted with clinical findings.<sup>13</sup>

## CONCLUSION

FNAC is a simple, safe, rapid, and useful diagnostic tool for evaluating cervical lymphadenopathy in children aged 1–10 years. In the present study, reactive lymphadenitis was the most common cytological finding, followed by acute suppurative and granulomatous/tuberculous lymphadenitis. Most cases were benign, while malignant lesions were rare. FNAC helps in early diagnosis, avoids unnecessary surgical biopsy, and guides appropriate clinical management in pediatric cervical lymphadenopathy.

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