Original Research

CLINICOPATHOLOGICAL PROFILE OF SIGNIFICANT CERVICULAR LYMPHADENOPATHY IN CHILDREN AGED 1-12 YEARS: A PROSPECTIVE ANALYSIS

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ABSTRACT

Background: In Enlarged cervical lymph nodes represent a frequently encountered condition in pediatric healthcare settings, presenting diagnostic challenges due to diverse underlying causes from minor infections to serious systemic disorders. **Objective:** This investigation aimed to evaluate the clinical and pathological characteristics of notable cervical lymphadenopathy in pediatric patients and identify predominant causative factors. **Methods:** We conducted a prospective observational analysis involving 70 children aged 1-12 years presenting with cervical lymph nodes exceeding 1 cm. Comprehensive assessment included detailed clinical history, physical examination, hematological parameters, inflammatory markers, tuberculin testing, cytological evaluation, and microbial cultures. **Results:** The study population showed male predominance [60%] with highest frequency in the 4-8 years age group [45.7%]. Primary clinical manifestations included neck swelling [90%], febrile episodes [85.7%], and respiratory symptoms [49.7%]. Regional infections [51.4%] and mycobacterial infections [21.75%] constituted the majority of diagnosed cases. Cytological examination demonstrated reactive patterns in 72.8% and granulomatous inflammation in 17.1% of specimens. FNAC demonstrated 80% sensitivity for tuberculous lymphadenitis. Persistent lymph node enlargement beyond six weeks showed significant correlation with systemic conditions including tuberculosis and HIV infection. **Conclusion:** Pediatric cervical lymphadenopathy primarily stems from localized infections and mycobacterial disease. Fine needle aspiration cytology presents as a secure, efficient, and dependable initial investigative modality, particularly when integrated with tuberculin testing and inflammatory markers.

Keywords: Cervical lymph node enlargement, pediatric population, fine needle aspiration, mycobacterial lymphadenitis, reactive lymphoid hyperplasia, childhood infections.

INTRODUCTION

Cervical lymph node enlargement, characterized by abnormal swelling of neck lymph nodes, constitutes a predominant clinical finding in pediatric medical practice [1]. As essential components of the immunological defense network, lymph nodes typically undergo enlargement following antigenic exposure, with most instances representing benign, self-resolving processes secondary to common infectious agents affecting upper respiratory structures, auditory canals, or cutaneous surfaces [2].

The epidemiological relevance of this condition is emphasized by research demonstrating palpable cervical lymph nodes in approximately 90% of children between 4-8 years of age [3]. While majority cases demonstrate transient and insignificant characteristics, the clinical difficulty involves distinguishing this commonplace reactive enlargement from more severe pathological conditions. The differential diagnostic considerations include an extensive array of disorders comprising chronic infections, autoimmune phenomena, metabolic storage diseases, and neoplastic conditions including lymphoproliferative malignancies [4,5].

Within developing nations including India, the causative pattern reveals substantial prevalence of infectious disorders. Tuberculous lymph node inflammation persists as a principal cause of prolonged cervical lymphadenopathy, representing significant proportions in various documented series and presenting considerable diagnostic complexities [6,7]. Additionally, the elevated prevalence of immunodeficiency viruses in specific geographical areas has contributed to the reemergence of lymph node enlargement as a frequent clinical observation [8].

The clinical challenge focuses on detecting the minority of pediatric patients with significant pathologies among the majority with benign conditions. An excessively intensive diagnostic methodology may result in unnecessary interventions and psychological distress, while a conservative approach risks overlooking potentially serious but treatable disorders [9]. This necessitates an organized, sequential diagnostic strategy. While surgical lymph node excision historically represented the definitive investigative procedure, fine needle aspiration cytology has emerged as a minimally invasive, economically feasible, rapid, and trustworthy primary diagnostic technique, particularly appropriate for pediatric age groups [10,11]. Its application proves especially valuable in diagnosing mycobacterial lymph node inflammation and in selecting cases requiring more invasive procedures [12].

This investigation was structured to methodically examine the clinicopathological characteristics and causative spectrum of notable cervical lymphadenopathy in children aged 1-12 years within our institutional framework, with specific emphasis on the function of cytological examination in the diagnostic protocol.

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MATERIALS AND METHODS

Investigation Design and Location:
A prospective observational analysis was performed in the Pediatric Department of MNR Medical College and Hospital, Sangareddy, Telangana, between November 2017 and October 2019. This tertiary healthcare academic institution primarily serves semi-urban and rural community populations.

Study Cohort:
The research incorporated 70 pediatric patients presenting with significant cervical lymph node enlargement, identified through convenience sampling from both ambulatory and hospitalized patient services.

Eligibility Criteria:
- Children aged 1-12 years
- Cervical lymph nodes measuring >1 cm in maximum dimension
- Informed consent obtained from parents/legal guardians

Exclusion Parameters:
- Age below 1 year or exceeding 12 years
- Insignificant lymph node enlargement [nodes<1 cm]
- Previously diagnosed malignant conditions or immunodeficiency disorders
- Declined participation

Clinical Assessment:
A standardized documentation format recorded:
- Comprehensive clinical history including swelling characteristics, systemic manifestations, and potential infection sources
- Detailed physical examination focusing on lymph node attributes [dimensions, location, consistency, mobility, tenderness, aggregation] and inspection of drainage regions [scalp, oropharyngeal area, ears, dentition]
- Systemic assessment for hepatosplenic enlargement and other indicators of systemic pathology

Diagnostic Protocol:
All participants underwent:
- Complete hematological profiling with peripheral blood smear examination
- Erythrocyte sedimentation rate determination [Westergren methodology]
- Microbiological cultures from identifiable infection sites [pharyngeal, auditory, cutaneous]
- Fine needle aspiration cytology utilizing 22-23 gauge needles with specialized staining for cellular morphology and acid-fast bacilli detection
- Tuberculin skin testing [5 TU PPD-S, positive interpretation with induration ≥10 mm]
- Thoracic radiological imaging and serological analyses [HIV immunoassay, Leptospira immunoglobulin testing] as clinically warranted

- **Operational Definitions:**
- Acute lymph node enlargement: Duration under 2 weeks
- Subacute lymph node enlargement: Duration 2-6 weeks
- Chronic lymph node enlargement: Duration exceeding 6 weeks
- Reactive hyperplasia: Heterogeneous lymphoid cell population lacking specific granulomatous or malignant features

Statistical Methodology:
Data analysis incorporated descriptive statistics and chi-square examinations using suitable software applications, with statistical significance established at $p<0.05$.

Ethical Considerations:
The research protocol received authorization from the Institutional Ethical Review Board, and written informed consent was acquired from all participants' legal guardians.

RESULTS

Table 1: Demographic and Clinical Presentation [n=70]

Characteristic	Frequency	Percentage
Age Distribution		
1-4 years	13	18.5
4-8 years	32	45.7
8-12 years	25	35.7
Gender Distribution		
Male	49	60.0
Female	21	40.0
Clinical Manifestations		
Cervical swelling	63	90.0
Febrile illness	60	85.7
Respiratory symptoms	30	49.7
Weight reduction	25	35.5

Analysis: The condition demonstrated highest occurrence in preschool and school-aged children, with male preponderance. Systemic manifestations frequently coexisted with cervical swelling.

Table 2: Lymph Node Morphological Features

Characteristic	Frequency	Percentage
Dimension		
1-2 cm	36	51.4
2-4 cm	34	48.6
Texture		
Firm	66	94.2
Soft	3	4.3
Hard	1	1.4
Mobility Characteristics		
Discrete	59	85.5
Matted	11	15.9

Analysis: Most lymph nodes demonstrated firm consistency and discrete mobility, typical of reactive enlargement. Node aggregation suggested granulomatous pathol-

Table 3: Cytological Diagnosis Distribution

Cytological Pattern	Frequency	Percentage
Reactive hyperplasia	51	72.8
Granulomatous inflammation	12	17.1
Suppurative inflammation	3	4.3
Lymphoproliferative disorder	1	1.4
Inadequate sampling	3	4.3

Analysis: FNAC showed elevated diagnostic adequacy [95.7%], with reactive hyperplasia representing the predominant pattern.

Table 4: Etiological Categorization

Etiology	Frequency	Percentage
Regional infections	36	51.4
Mycobacterial infection	15	21.75
Immunodeficiency virus	4	5.8
Non-diagnostic hyperplasia	12	17.1
Miscellaneous*	3	4.3

Includes leptospirosis, measles, lymphoproliferative disorder

Analysis: Regional infections and mycobacterial diseases accounted for nearly three-quarters of diagnosed cases.

Table 5: Diagnostic Parameter Performance in Tuberculosis [n=15]

Investigation	Positive Cases	Percentage
FNAC	12	80.0
Tuberculin testing	13	86.6
Elevated ESR	14	93.3
Abnormal thoracic imaging	9	60.0

Analysis: Combined investigative approach improved diagnostic sensitivity, with inflammatory markers demonstrating highest sensitivity despite limited specificity.

DISCUSSION

This systematic evaluation of 70 pediatric patients with notable cervical lymphadenopathy provides significant insights into demographic distribution, clinical presentation, and causative factors of this common childhood condition. The peak incidence within the 4-8 years age group [45.7%] corresponds with the developmental phase of maximal lymphoid tissue responsiveness and enhanced exposure to infectious pathogens, consistent with previous research findings [13]. The male predilection [60%] concurs with observations from multiple studies, including those by Moore and colleagues [2] and Sheikh and associates [3], though the fundamental explanations remain partially elucidated.

The etiological distribution indicates that localized infections [51.4%] form the most prevalent cause, highlighting the critical importance of thorough examination of anatomical drainage regions. The identification of streptococcal and staphylococcal species as predominant microorganisms in regional infections supports previous research by Dajani and coworkers [4] and Barton and fellow researchers [5], confirming their involvement in pediatric cervical lymph node inflammation.

Mycobacterial infection emerged as the principal specific systemic cause [21.75%], reflecting the ongoing disease burden in developing regions. This prevalence aligns with studies by Reddy and associates [6] and Khan and collaborators [7], emphasizing tuberculosis's substantial contribution to persistent lymphadenopathy in endemic areas. The robust association between prolonged lymph node enlargement [exceeding six weeks duration] and significant systemic conditions including tuberculosis and immunodeficiency virus infection reinforces the clinical relevance of this temporal parameter as an alerting sign, consistent with previous medical literature [13,14].

Cytological examination demonstrated exceptional usefulness as a primary diagnostic instrument, with high specimen adequacy [95.7%] and absence of complications, supporting its safety and practicality in pediatric healthcare. The 80% sensitivity for mycobacterial lymph node inflammation falls within the broad spectrum [16.5-100%] documented in medical literature [7,15]. The combination of cytological analysis with tuberculin testing and inflammatory markers substantially enhanced diagnostic accuracy, consistent with earlier recommendations by Lau and colleagues [8]. Nevertheless, the considerable proportion of non-diagnostic hyperplasia [17.1%] indicates limitations of conventional diagnostic methods and suggests potential roles for undetected viral pathogens or the requirement for advanced molecular techniques in persistent cases.

CONCLUSION

This Pediatric cervical lymph node enlargement primarily originates from localized infections and mycobacterial disease. A systematic diagnostic approach incorporating comprehensive clinical assessment and cytological examination facilitates accurate diagnosis and appropriate clinical management. Fine needle aspiration cytology represents a secure, reliable, and economically viable initial investigative method, particularly beneficial in resource-constrained environments. Clinical indicators including prolonged duration, lymph node aggregation, and organ enlargement should alert healthcare providers to the possibility of significant systemic conditions including tuberculosis and HIV infection, warranting thorough evaluation.

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