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Original Research Article

Spectrum of Cytomorphological Patterns in Enlarged Lymph Nodes: A Tertiary Care Center

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Abstract:

Background: Lymphadenopathy, which is defined as the swelling of lymph nodes, is a frequent clinical presentation with a wide differential diagnosis that includes both cancers and benign reactive processes. Fine needle aspiration cytology (FNAC) is a less invasive, economical diagnostic method for assessing lymphadenopathy, facilitating the identification of various causes.

Objective: The objective of this study was to evaluate the cytomorphological spectrum of enlarged lymph nodes in patients at a tertiary healthcare facility, emphasizing the incidence of neoplastic and non-neoplastic lesions and their distribution across various age groups and genders.

Methodology: A cross-sectional research was performed in the Department of Pathology at Darbhanga Medical College and Hospital, Bihar, India. Seventy-four individuals exhibiting lymphadenopathy received fine needle aspiration cytology (FNAC). Aspirates were processed and stained with conventional cytological methodologies, including Hematoxylin & Eosin, Papanicolaou, Giemsa, and Ziehl-Neelsen stains. Cytological diagnosis were classified into non-neoplastic and neoplastic lesions, with additional sub classification as warranted.

Results: The largest prevalence of lymphadenopathy occurred in the 21–30 years age range (20.3%), with a male preponderance (56.8%). The cervical region was the most often impacted area (54.1%). Non-neoplastic lesions comprised 70.2% of cases, with reactive lymphoid hyperplasia (32.4%) and tuberculous lymphadenitis (27.0%) as the most prevalent. Neoplastic lesions constituted 29.8% of patients, with metastatic carcinoma (13.5%) being the most prevalent, followed by Non-Hodgkin's lymphoma (6.7%) and Hodgkin's lymphoma (5.4%).

Conclusion: FNAC serves as an efficient preliminary diagnostic tool for assessing lymphadenopathy, offering significant insights into the underlying disease. The research indicates an increased occurrence of non-neoplastic diseases, including reactive hyperplasia and TB, among the examined group. The prevalence of metastatic carcinoma highlights the necessity of evaluating secondary malignancies in differential diagnosis, particularly in elderly individuals.

Keywords: Cytomorphological Spectrum, Fine-Needle Aspiration Cytology (FNAC), Lymphadenopathy, Metastatic Carcinoma, Tuberculous Lymphadenitis

Introduction

Lymph nodes are essential structural components of the immune system, functioning as filters for lymph and locations for antigen processing [1,2]. They are dispersed in clusters throughout the body, where they gather lymph via the lymphatic channels. A lymph node is composed of an outer cortex and an interior medulla, both contributing to humoral immune responses [3]. The paracortex contains the bulk of T-cells, and the morphological characteristics of the lymphoid follicles fluctuate with antigenic stimulation [4].

The dimensions of lymph nodes and their therapeutic relevance differ according to their anatomical position. In the cervical and axillary areas, lymph nodes over 1 cm are deemed important, but in the epitrochlear and inguinal regions, the criteria are 0.5 cm and 1.5 cm, respectively [5]. Nodes less than 1 cm are seldom carcinogenic, but bigger nodes typically suggest disease, such as reactive hyperplasia, metastatic malignancy, or lymphoma [6]. Superficial lymphadenopathy frequently occurs in clinical practice and may result from infections, autoimmune disorders, or

neoplasms. Axillary and cervical lymph nodes are commonly assessed in systemic lymphadenopathy, although inguinal nodes are typically excluded due to persistent inflammatory alterations [7].

Lymphadenopathy may be categorized as neoplastic or non-neoplastic. Non-neoplastic etiologies including infections (e.g., TB, viral diseases, toxoplasmosis), autoimmune conditions (e.g., rheumatoid arthritis), and reactive lymphoid hyperplasia. Neoplastic disorders encompass primary malignancies, including Hodgkin's and Non-Hodgkin's lymphoma, and secondary involvement from metastatic cancers [8]. Lymph node neoplasia constitutes about 1.1% of biopsies in regular medical practice, although its frequency escalates to 60% in specialist institutes [9]. Age is a significant factor, since the majority of childhood lymphadenopathies are benign, but the likelihood of malignancy escalates in adulthood.

Fine needle aspiration cytology (FNAC) is a crucial, less invasive diagnostic method for assessing lymphadenopathy. It offers quick, economical evaluation and assists in distinguishing between benign and malignant disorders [10]. In instances when FNAC yields equivocal results, a lymph node biopsy is considered the gold standard for a definite diagnosis, especially in the categorization of lymphoma. This study is to assess the cytomorphological diversity of enlarged lymph nodes in a tertiary healthcare environment. The study aims to ascertain the prevalence of neoplastic and non-neoplastic lymphadenopathy and examine their distribution among various age groups and genders. Comprehending the range of lymph node diseases is essential for timely diagnosis and effective clinical therapy, especially in basic healthcare settings.

Methodology

Study Design: This cross-sectional study was performed in the Department of Pathology at Darbhanga Medical College and Hospital, located in Laheriasarai, Darbhanga, Bihar, India for one year. The study sought to examine the cytomorphological spectrum of enlarged lymph nodes in patients receiving fine-needle aspiration cytology (FNAC)

Sample Size and Patient Selection Criteria: The study comprised a total of 74 individuals with enlarged lymph nodes. Clinical history, demographic information, and pertinent medical data were documented for each patient. Patients with accessible lymphadenopathy who underwent FNAC were deemed eligible for inclusion, but those with inconclusive FNAC results necessitating further histological assessment were excluded.

Fine Needle Aspiration Cytology Procedure: Fine Needle Aspiration Cytology (FNAC) was conducted under aseptic circumstances with a 23-gauge needle connected to a 10 ml syringe. Both aspiration and non-aspiration methods were utilized to get sufficient cellular material. The gathered samples were applied onto glass slides to create streaks. Smears were either air-dried or alcohol-fixed, contingent upon the staining procedure employed.

Staining Techniques: The obtained smears were stained with conventional cytological stains to enhance morphological assessment.

- Hematoxylin and Eosin (H&E) stain - for comprehensive cytomorphological evaluation.
- Papanicolaou stain - for comprehensive analysis of nuclear and cytoplasmic structures.
- Giemsa stain - for assessing cellular morphology and background components.
- Ziehl-Neelsen stain is used for the identification of acid-fast bacilli (AFB) in suspected TB patients.

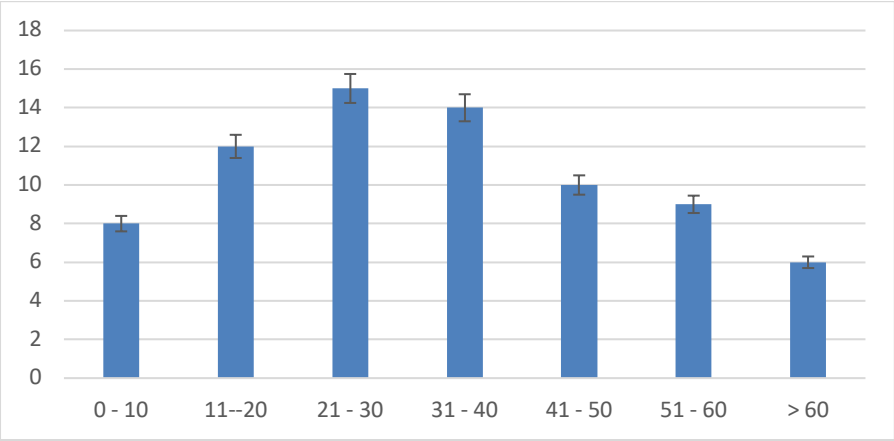
Cytomorphological Assessment: Experienced pathologists analyzed the stained slides using a light microscope. The cytological characteristics were classified into neoplastic and non-neoplastic lesions. Neoplastic patients were categorized into primary lymphoid malignancies (Hodgkin's and Non-Hodgkin's lymphoma) and secondary metastatic deposits. Non-neoplastic instances comprised reactive lymphoid hyperplasia, granulomatous lymphadenitis, and other benign inflammatory diseases.

Data Analysis: The results were examined to ascertain the prevalence and distribution of neoplastic and non-neoplastic diseases. Cases were also categorized according to age, gender, and lymph node location. The FNAC data were linked with clinical history and further pertinent tests to guarantee diagnostic precision.

Results

Table 1 indicates that the largest prevalence of lymphadenopathy occurred in the 21–30 years age group (20.3%), followed by the 31–40 years age group (18.9%). A progressive decrease in prevalence was observed in older age cohorts, with the minimal occurrence (8.1%) documented in those over 60 years of age. The data indicate that lymphadenopathy is more prevalent in younger persons, perhaps due to increased exposure to infections and reactive hyperplasia, while malignancies are more common in older patients.

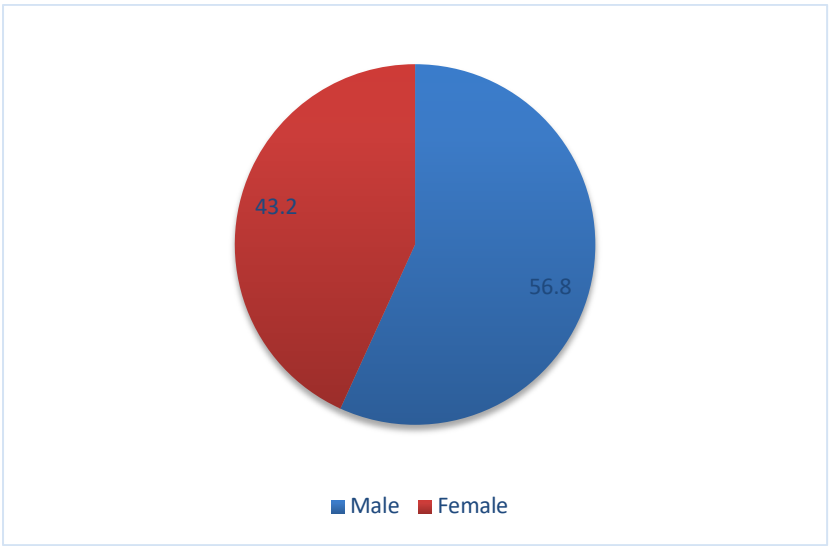
Table 1: Age-wise Distribution of Patients with Enlarged Lymph Nodes		
Age Group (Years)	**Number of Cases (n=74)**	**Percentage (%)**
0 - 10	8	10.8
11 - 20	12	16.2
21 - 30	15	20.3
31 - 40	14	18.9
41 - 50	10	13.5
51 - 60	9	12.2
> 60	6	8.1
Total	74	100



Graph 1: Age-wise Distribution of Patients with Enlarged Lymph Nodes

Table 2 indicates a greater incidence of lymphadenopathy in males (56.8%) than in females (43.2%). The male preponderance may be ascribed to heightened occupational and environmental exposure to infections, together with a greater incidence of TB, a major contributor to lymphadenopathy in endemic areas. The gender imbalance may also indicate differences in healthcare-seeking habits, since males are more often subjected to diagnostic evaluations at tertiary care facilities.

Table 2: Gender-wise Distribution of Patients		
Gender	**Number of Cases (n=74)**	**Percentage (%)**
Male	42	56.8
Female	32	43.2
Total	74	100

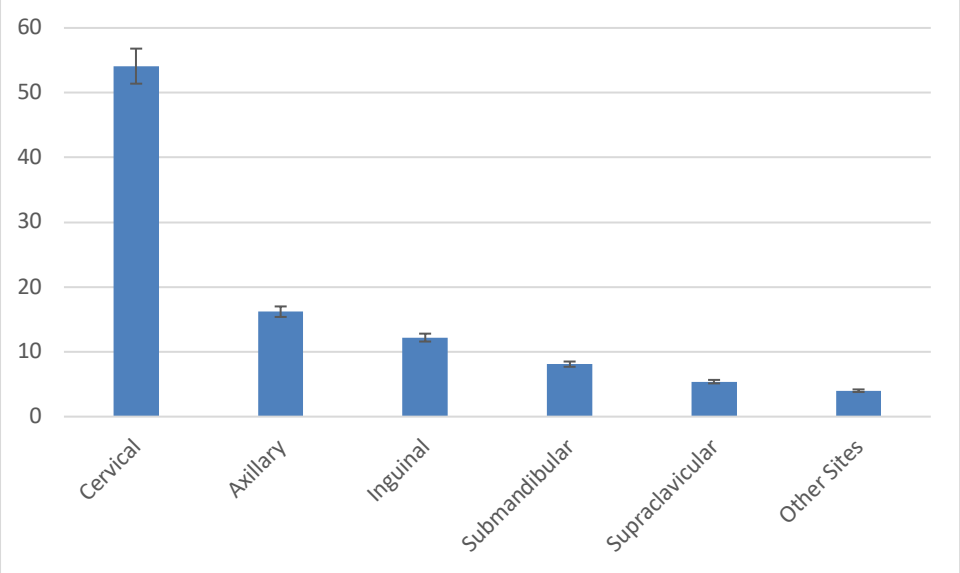


Graph 2: Gender-wise Distribution of Patients

Table 3 illustrates the anatomical distribution of lymphadenopathy, with a preponderance of cervical lymph node involvement (54.1%), succeeded by axillary (16.2%) and inguinal (12.2%) areas. Cervical lymphadenopathy is prevalent, consistent with worldwide epidemiological statistics, where TB, reactive hyperplasia, and metastatic cancer commonly present in cervical nodes. Additional sites, such as submandibular (8.1%), supraclavicular (5.4%), and various other regions (4.0%), represented a lesser percentage of instances. Supraclavicular lymphadenopathy, although very uncommon, is frequently seen as clinically relevant because it correlates with malignancies.

Table 3: Distribution of Lymphadenopathy Based on Site of Involvement

Lymph Node Site	Number of Cases (n=74)	Percentage (%)
Cervical	40	54.1
Axillary	12	16.2
Inguinal	9	12.2
Submandibular	6	8.1
Supraclavicular	4	5.4
Other Sites	3	4
Total	74	100

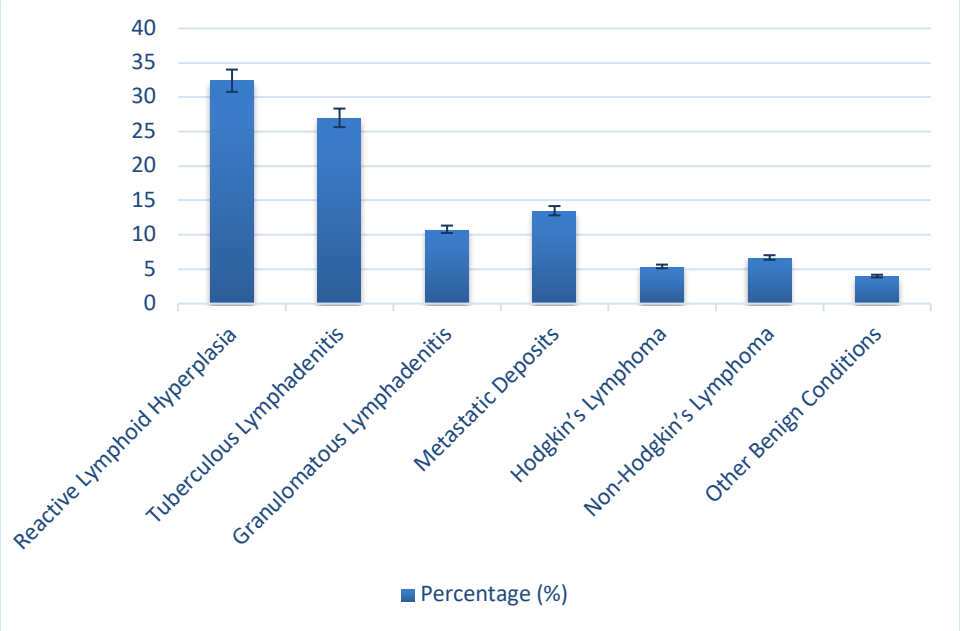


Graph 3: Distribution of Lymphadenopathy Based on Site of Involvement

Table 4 revealed that the most common diagnosis was reactive lymphoid hyperplasia, accounting for 32.4% (24 cases). This was followed by tuberculous lymphadenitis at 27% (20 cases), granulomatous lymphadenitis at 10.8% (8 cases), and metastatic deposits at 13.5% (10 cases). Additionally, Hodgkin's lymphoma constituted 5.4% (4 cases), non-Hodgkin's lymphoma 6.7% (5 cases), and other benign conditions made up 4% (3 cases). These findings highlight that reactive and infectious etiologies, particularly tuberculous lymphadenitis, are predominant causes of lymphadenopathy, while malignant conditions such as metastatic deposits and lymphomas are less frequent.

Table 4: Cytological Diagnosis of Lymphadenopathy Cases

Diagnosis	Number of Cases (n=74)	Percentage (%)
Reactive Lymphoid Hyperplasia	24	32.4
Tuberculous Lymphadenitis	20	27
Granulomatous Lymphadenitis	8	10.8
Metastatic Deposits	10	13.5
Hodgkin’s Lymphoma	4	5.4
Non-Hodgkin’s Lymphoma	5	6.7
Other Benign Conditions	3	4
Total	74	100



Graph 4: Cytological Diagnosis of Lymphadenopathy Cases

Discussion

The study offers a thorough examination of lymphadenopathy patients, emphasizing age and gender distribution, anatomical location involvement, and cytological diagnosis. The results provide significant insights into the epidemiology and causation of lymphadenopathy in the examined population.

The greatest prevalence of lymphadenopathy was noted in the 21–30 years age cohort (20.3%), closely followed by the 31–40 years cohort (18.9%). A progressive decrease in prevalence was observed in older age cohorts, with a minimal occurrence (8.1%) documented in those over 60 years of age. This pattern indicates that lymphadenopathy is more prevalent in younger persons, perhaps attributable to increased exposure to infections and reactive hyperplasia, while malignancies are more common in elderly patients. These discoveries correspond with the findings of research by Gupta et al., which indicated a greater frequency of lymphadenopathy in younger demographics, attributing it to reactive and infectious etiologies [11]. Research by Patel MM et al. similarly revealed that most occurrences of lymphadenopathy were observed in those under 40 years of age, with a notable decrease in older demographics [12].

Lymphadenopathy was more prevalent in males (56.8%) than in females (43.2%). The male preponderance may be ascribed to heightened occupational and environmental exposure to infections, together with a greater incidence of TB, a notable cause of lymphadenopathy in endemic areas. The gender imbalance may also indicate differences in healthcare-seeking habits since males are more often subjected to diagnostic evaluations at tertiary care facilities. Comparable gender distribution trends have been documented in another research. Research by Mulki et al. indicated a male predominance in lymphadenopathy patients, indicating that occupational exposure may be a contributing factor [13]. In contrast, several investigations, like that by Patel MM et al., indicated a minor female predominance, underscoring the heterogeneity in gender distribution among diverse communities [12].

The anatomical distribution of lymphadenopathy revealed a preponderance of cervical lymph node involvement (54.1%), followed by axillary (16.2%) and inguinal (12.2%) areas. Cervical lymphadenopathy is prevalent, consistent with worldwide epidemiological statistics, where TB, reactive hyperplasia, and metastatic cancer are commonly present in cervical nodes. Additional sites, such as submandibular (8.1%), supraclavicular (5.4%), and various places (4.0%), represented a lesser percentage of instances. Supraclavicular lymphadenopathy, although uncommon, is regarded as clinically relevant due to its correlation with malignancies. The results align with those presented by Gupta et al., who identified cervical lymph nodes as the most frequently affected areas in instances with lymphadenopathy [11].

The cytological examination of lymphadenopathy in our investigation indicated that non-neoplastic diseases comprised the majority of cases (70.2%), with reactive lymphoid hyperplasia (32.4%) identified as the predominant diagnosis. Tuberculous lymphadenitis constituted 27.0% of cases, whereas neoplastic diseases comprised 29.8%, with metastatic carcinoma being the predominant malignancy at 13.5%. These findings

correspond with several research in the literature, however discrepancies are evident among various groups and countries. Research by Anchal et al. similarly revealed that non-neoplastic etiologies comprised 85% of cervical lymphadenopathy patients, with TB being the predominant cause (55%), succeeded by reactive lymphadenitis. Metastatic tumors were the most prevalent neoplastic etiology, seen in 13% of patients [14].

In separate research, non-neoplastic lesions comprised 91.22% of head and neck lymph node lesions, whereas neoplastic tumors represented 8.77%. Metastatic carcinoma was the predominant diagnosis among neoplastic patients [15].

The cytological findings of our investigation indicated that tuberculous lymphadenitis (27.0%) was the second most prevalent diagnosis among lymphadenopathy patients, highlighting the ongoing public health issue presented by TB, especially in endemic areas. Furthermore, granulomatous lymphadenitis (10.8%), potentially indicative of TB, sarcoidosis, or other persistent diseases, constituted a substantial proportion of patients. These observations align with certain research, although others indicate differing prevalence rates. Numerous investigations have indicated a significant frequency of tuberculous lymphadenitis among instances of lymphadenopathy. Research in India revealed that tuberculous lymphadenitis constituted 60% of lymph node swellings, whereas reactive lymphadenitis represented 30% [16]. Research examining cytomorphological patterns revealed that tuberculous lymphadenitis is the predominant type of extrapulmonary TB, highlighting its ubiquity [17].

In the neoplastic patients (29.8%), metastatic carcinoma (13.5%) was the most often seen malignancy. This discovery validates the documented function of lymph nodes in the metastatic dissemination of cancers, especially from primary tumors of the head, neck, breast, and lungs. Primary lymphoid malignancies were few, with Non-Hodgkin's lymphoma (6.7%) and Hodgkin's lymphoma (5.4%) together comprising 12.1% of cases. The reduced occurrence of primary lymphomas, relative to metastatic cancers, aligns with current literature suggesting that secondary lymph node involvement is more commonly observed at tertiary healthcare facilities.

In contrast, several studies have indicated an increased frequency of primary lymphoid cancers in instances of lymphadenopathy. A clinicopathological investigation of lymphadenopathy revealed that lymphoproliferative diseases, such as Non-Hodgkin's and Hodgkin's lymphomas, constituted a substantial percentage of patients [18].

Conclusion

This study demonstrated that fine-needle aspiration cytology (FNAC) is an efficient, less invasive diagnostic method for assessing lymphadenopathy, enabling the distinction between benign and malignant diseases. The results highlight the significance of FNAC in the early identification and treatment of lymph node disorders, especially in areas with a high incidence of TB. Implementing FNAC in basic healthcare can improve diagnostic precision, facilitating prompt and suitable treatment measures. Additional study with larger sample sizes is advised to corroborate these findings and to investigate the efficacy of FNAC in assessing treatment responses in cases of lymphadenopathy.

References

1. Bujoreanu I, Gupta V. Anatomy, lymph nodes.
2. Toppo SM, Punjaji TM. Spectrum of cytology findings in patients presenting with lymphadenopathy at tertiary health care centre in north Maharashtra region-A 2 year study. Arch CytolHistopathol Res. 2019;4(2):105-9.
3. Van Rooijen N. The "in situ" immune response in lymph nodes: a review. The Anatomical Record. 1987 Aug;218(4):359-64.
4. Warren AL, Yates RM. Structure, Function, and Disorders of Lymphoid Tissue. Schalm's Veterinary Hematology. 2022 Apr 22:402-13.
5. Mashal SB. Clinical Study and Managemant of Cervical Lymphadenopathy (Master's thesis, Rajiv Gandhi University of Health Sciences (India)).
6. Sakai O, Curtin HD, Romo LV, Som PM. Lymph node pathology: benign proliferative, lymphoma, and metastatic disease. Radiologic Clinics of North America. 2000 Sep 1;38(5):979-98.
7. Gaddey HL, Riegel AM. Unexplained lymphadenopathy: evaluation and differential diagnosis. American family physician. 2016 Dec 1;94(11):896-903.
8. Toma P, Granata C, Rossi A, Garaventa A. Multimodality imaging of Hodgkin disease and non-Hodgkin lymphomas in children. Radiographics. 2007 Sep;27(5):1335-54.
9. Shah JP, Medina JE, Shaha AR, Schantz SP, Marti JR. Cervical lymph node metastasis. Current problems in surgery. 1993 Mar 1;30(3):284-335.
10. Prasad BM. Study of fine needle aspiration cytology of lymph node lesions (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).
11. Patro P, Lad P, Hoogar MB, Dhar R, Sahu S, Mithila KB, Naik V. Spectrum of lesions in lymph nodes-a cytological study. Int J Health Sci Res. 2018;8(11):75-81.
12. Florence K, Suresh K, Lavanya K. Cytopathological study of lymph node lesions–A 2 years

retrospective study. Int J Scientific Study. 2018:118-22.
13. Mulki SR. Cardiovascular Manifestations of Hypothyroidism (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).
14. Gupta A, Jamwal PS. A Clinicopathological Study of Cervical Lymphadenopathy.
15. Patil Amruta A, Deshpande Kalpana A, Naik Pooja S, Shinde Aparna G. Neoplastic Lymphadenopathy in Head Neck Region-Cytological Study.
16. Singh S, Arora I, Singh S, Khan DR. Paper Title (Cytological Diagnosis of Lymphadenopathy on FNAC-A Study from Rural Tertiary Care Hospital (Chamba, HP). IOSR J Dentl Med Sc. 2018;17(7):75-83.
17. Venkatraman JB. Cytomorphological patterns of tuberculous lymphadenitis in correlation with AFB positivity. Ind J Pathol: Res Pract. 2017;6(2):250-4.
18. Biswas G, Das A, Haldar D, Mukherjee A, Dutta S, Sinha R. Clinico-pathological correlates of cervical lymphadenopathy: a hospital-based study. Indian Journal of Otolaryngology and Head & Neck Surgery. 2013 Jul; 65:42-7.