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Original Research Article

Study on Role of Hematological and Inflammatory Marker in Granulomatous Compared to Non-Granulomatous Lymphadenitis

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Abstract

Background: An increase in lymphocytes in the lymph node brought on by a variety of diseases, including TB, and lymphoproliferative disorders can cause lymphadenopathy. A basic hemogram using TLC and DLC, as well as ratios obtained from it such as NLR (Neutrophil Lymphocyte Ratio) and PLR (Platelet Lymphocyte Ratio), can be used to evaluate the rise in inflammatory biomarkers caused by granulomatous lymphadenitis. Aim of this study to establish the role of hematological and inflammatory biomarkers in granulomatous and nongranulomatous lymphadenitis.

Methods: The study was conducted in Department of Pathology, JLNMCH, Bhagalpur, Bihar from February 2025 to July 2025. The study included 150 patients with neck mass taking inclusion and exclusion criteria into account. Cytologically proven cases were categorised into granulomatous and non-granulomatous cases depending on cytological evaluation. Different laboratory parameters like TLC, DLC, ESR, CRP, NLR, and PLR were used to compare granulomatous lymphadenitis to non-granulomatous.

Result: In the studied population there were 92(61.3%) females and 58(38.7%) males but when compared to the non-granulomatous lymphadenitis group, females predominated by 70.7% hematological markers like NLR, PLR, and CRP in the granulomatous lymphadenitis group was significantly higher. The mean Neutrophil was considerably higher among granulomatous lymphadenitis but in non-granulomatous lymphadenitis, the group showed considerably greater mean lymphocytes.

Conclusion: In this area, the most common clinical condition associated with cervical lymphadenopathy is tuberculosis. Women are involved most of the time. The existence of granulomatous and non-granulomatous lymphadenitis can be indicated by hematological and biochemical indicators such as NLR, PLR, and CRP prior to FNAC. Particularly at the primary care level, it will assist the treating physician in considering early case identification methodically and preventing diagnostic delays in cases such as tuberculosis.

Keywords: Granulomatous, Non granulomatous, Lymphadenitis, Neutrophil.

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Introduction

In both local and systemic infectious situations, lymphadenopathy is the result of lymph node enlargement. The term "lymphadenopathy" refers to the growth of the lymph glands that results in malignant, metastatic, and non-malignant diseases. Non-neoplastic lymphadenopathies mostly include granulomatous lymphadenitis, follicular hyperplasia, and other causes of reactive lymph node enlargement.

An enlarged cervical lymph node is a typical finding in clinical examinations performed in medical practices. Lymphoproliferative disorder or an infection may cause lymphocytes that are intrinsic to the lymph node to proliferate, causing the lymph node to swell. Lymph node harbors various kinds of lymphoid cells which are physiologically in direct connection with bone marrow and peripheral blood. In pathological terms, such diseases are hematolymphoid pathologies. Granulomatous lymphadenitis can be due to various etiologies for example tuberculosis, leprosy, sarcoidosis, autoimmune inflammation, fungal infection, protozoal infection, some neoplasm and even due to reaction against any foreign bodies.

Epithelioid cell granulomas are a collection of modified macrophages under the influence of interleukin 2 and interferon-gamma secreted by TH-1 cells along with some intermingled lymphocytes and fibroblasts at the periphery.[1]

Granulomatous lymphadenitis is most frequently brought on by tuberculosis in underdeveloped nations like India.[2] Epithelioid cell granulomas can be caseating or non-caseating depending upon etiology. Tubercular granulomas are mostly caseating type.[3] TBL is difficult to identify and frequently occurs in conjunction with other chronic diseases that provide erratic physical and laboratory results. Diagnostic imaging and cytological/histological examination of cervical lymph nodes need to be excised on the path of conclusion.

TBL has been connected to altered levels of many cytokines, interleukin 1 and 17 mediators in serum or plasma.[4,5] Neopterin, C reactive protein (CRP), and beta 2 macroglobulin are just a few of the biochemical parameters that have been employed to evaluate therapeutic monitoring, find persistent culture positivity, diagnose radiological problems, find disseminated mycobacterial disease, and more definitely, to distinguish tuberculosis from cancer.6 Necrotizing non-granulomatous lymphadenitis is a symptom of several illnesses. Inappropriate therapy that might have negative consequences on the patient could result from incorrect understanding of this pathological phrase.

Systemic lupus erythematosus (SLE/lupus lymphadenitis) and other infections are prominent prevalent infectious and inflammatory disorders that produce necrotizing lymphadenitis, which excludes mycobacterial infections like tuberculosis (TB). Numerous studies on chronic inflammatory diseases, including tuberculosis (TB), have concentrated on white blood cell (WBC) count, platelets, and various relative ratios of different blood's white cells can be identified by their monocyte/lymphocyte ratio (MLR), neutrophil/lymphocyte ratio (NLR), and platelet/lymphocyte ratio (PLR). Elevated MLR in peripheral blood was described as indicator of TB progression in newborns and adults who are HIV-positive. The NLR ratio was antiquated and shown to predict possibility of TB in persons with HIV as well as aid to distinguish between pulmonary TB and bacterial community-acquired pneumonia.[7]

Neutrophil to lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) rates calculated according to hemogram data in patients with a white blood cell count within the normal range can be used to evaluate systemic inflammation.Patients with autoimmune diseases, rheumatic disorders, malignancies, and diabetes have a higher PLR. Neutrophil to lymphocyte ratio (NLR) is a straightforward marker of the systemic inflammatory response in intensive care patients.

It has also been identified as an unrelated prognostic factor for non-infectious disorders, such as acute myocardial infarction, stroke, and a variety of malignancies.[8–10]

Additionally, NLR has been demonstrated to be self-sufficient predictor of both short as well as long term death in critically sick patients.[11]

Materials and Methods

This clinical prospective study was conducted in the Department of Pathology, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar from February 2025 to July 2025. The data utilized in this study has been anonymized to protect the identities of the individuals involved.

The study comprised a total of 150 neck mass cases. Research participants were categorized as granulomatous and reactive lymphadenitis according to their cytological report.

A comparison of different laboratory parameters was performed among these 2 categories CBC and CRP was measured on a semi-automated analyzer, and ESR by the Westergren method. We studied parameters such as TLC (Total leucocyte count), DLC (Differential Leucocyte Count), NLR (Neutrophil Lymphocyte Ratio), PLR (Platelet Lymphocyte Ratio), ESR (Erythrocyte Sedimentation Rate), and CRP(C - reactive protein).

Result

In our study, out of a total of 150 cases, 75 were classified as granulomatous and 75 cases as reactive lymphadenitis. In the studied population, there were 70.7% females and 44% males. As indicated in Table 1, our study found a female preponderance in both study groups as indicated in Table 1. The average age of the study group was 27.55±0.91 in granulomatous lymphadenitis and 26.32±16.60 in non-granulomatous.

All laboratory parameters in the two groups of lymphadenitis are shown in Table 1 indicating differences in their mean values. Hematological parameters such as NLR, PLR and CRP were significantly increased in patients of granulomatous disease and showed statistical significance with disease severity ($P < 0.001$) whereas other parameters such as TLC, ESR was not significant.

Table 1: Indicating difference between mean values of both groups

	Granulomatous lymphadenitis	Non-granulomatous lymphadenitis	P-value
Age	27.55±0.91	26.32±16.60	0.614
Sex Male Female	 29.3% 70.7%	 48% 52%	0.019
TLC	13158.01±603.1	11667.73±1248.1	0.353
ESR	22.48±5.63	22.72±7.22	0.821
NLR	6.15±3.17	3.76±2.64	0.001
PLR	$(1.74\pm0.63)\times10^4$	$(1.30\pm0.73)\times10^4$	0.001
CRP	11.71±19.69	2.97±4.07	0.001

Discussion

The mean age of the groups with granulomatous lymphadenitis (27.55 years ±12.91 SD) and non-granulomatous lymphadenitis (26.32 years ±16.60 SD) did not differ significantly. The results showed that 23.4%, 65.2%, and 11.3% of the study participants were under the age of 14, 15–59 years, and 60 years old, respectively, with an overall mean age of 29.04±19.14 years.

Females were significantly more among granulomatous lymphadenitis group (70%) compared to nongranulomatous lymphadenitis group (52%). T Sagirgolu et al.[12] and Rohini et al [13] confirmed through a study that mean TLC in cases of lymphadenopathy is higher than in control groups (0.008) but in the present study, there was no significant difference in mean TLC between non-granulomatous lymphadenitis (11667.73±24 8.12) and granulomatous lymphadenitis groups (13158.01±603.56).

The mean Lymphocyte was significantly more among non-granulomatous lymphadenitis (24.37±11.07 vs 16.01±6.83). The mean Neutrophil was significantly more among the granulomatous lymphadenitis group (79.53±8.09 vs 69.03±13.14). This may be due to an equal rise of TLC in cases of granulomatous and reactive lymphadenitis due to superadded infection and it is balanced in both cases or this difference has occurred due to geographical variation in the pattern of disease. It was found in the current research that there was no significant difference in mean ESR between non-granulomatous lymphadenitis (22.72±7.22) and granulomatous lymphadenitis (22.48±5.63) groups and this output does not match with Rohini et al.[13] who assessed hematological parameters in tuberculosis groups versus control.

The result of which stated that there was raised ESR in tubercular groups than in control. This may be due to the small sample size in recent study.

Dirican et al[14] found that NLR is considerably greater in sarcoidosis patients compared to healthy control and also stated that patients with extrapulmonary involvement had higher NLR levels. This study is in accordance with the present study where NLR is remarkably more among granulomatous (6.15±3.17) compared to non-granulomatous lymphadenitis (3.76±2.64) category. Additionally, recognized as a diagnostic indicator of bacterial infection is lymphocytopenia.[15] This study does not match the output of a recent study where the granulomatous lymphadenitis group had increased NLR. Therefore, it is proposed that NLR could be predictive of bacterial infections and stressful situations.

The lack of differences in NLR levels between TB lymphadenitis and controls in our investigation may indicate that parenchymal infiltration is a possible cause of NLR increase. Singh et al.[16] investigated found that hematological changes associated with tuberculosis and found thrombocytosis in cases of pulmonary tuberculosis groups. This means PLR will be more in cases with pulmonary tuberculosis and this research matches result of recent study where PLR was significantly more in cases of granulomatous (1.74±0.63) compared with nongranulomatous (1.30±0.73) lymphadenitis. This probably explains the pulmonary manifestation in our study group of granulomatous lymphadenopathies. In line with the research of Rohini et al.[13] there was a significant difference in mean CRP between the groups with granulomatous lymphadenitis (11.71±19.09) and non-granulomatous lymphadenitis (2.97±4.07)[13] and ¸ Stefanescu et al,[17] where there was continuous elevation of CRP in tuberculosis patients as stated that continuous elevation CRP, is linked with a chronic inflammatory condition.

Conclusion

The usefulness of hematological markers in identifying current TB infections, monitoring treatment response, and forecasting the chance of developing TB sickness has been investigated in a number of trials. The use of traditional blood tests needs to be significantly altered in order to accurately identify active TB. Complete blood count measurements and ratios have been suggested as key markers for infectious or inflammatory disorders such pulmonary tuberculosis. Females are more commonly involved. Important warning signs and symptoms

include organomegaly, consistency, fixed lymph nodes, and B symptoms be taken into account while evaluating lymphadenopathy but hematological parameters like DLC and biochemical parameters like CRP can give us some clue prior to FNAC for the presence of granulomatous and non-granulomatous lymphadenitis.

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