

A new perspective to a timeworn malady – the immunological role of Neutrophil Lymphocyte Ratio in recurrence of tonsillitis

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Abstract

Background: The neutrophil -lymphocyte ratio (NLR) is an upcoming predictive factor in inflammation and infections. The present study was done to elucidate the correlation of NLR to chronic and recurrent tonsillitis.

Aim: To determine if Neutrophil -Lymphocyte Ratio can be used as indicators for recurrence in chronic tonsillitis

Materials and Methodology: A 1 -year observational study was conducted and 100 patients with chronic, recurrent tonsillitis were included. Neutrophil Lymphocyte Ratio was estimated using the CBC. Then using Spearman’s and Pearson’s correlation Coefficients detailed statistical analysis was done to look for

correlation between recurrence and the above parameters and their relevance as predictive indicators was assessed.

Results: NLR was raised in 86% of the study population. There was a raised NLR in those with low serum zinc and a significant positive correlation between recurrent tonsillitis and raised NLR, the Spearman’s correlation coefficient r value was 0.824 and the p value was less than 0.05.

Conclusion: In order to plan the treatment of tonsillitis and predict the prognosis accurately we need to assess the patient’s immune status, for which NLR can be used. The NLR is a novel and economical prognostic biomarker which can be embraced in the modern, evidence-based practice of otorhinolaryngology.

Keywords: Neutrophil Lymphocyte Ratio, Recurrent Tonsillitis; Chronic Tonsillitis, Predictive value of NLR, Chronic infections, Immunology of tonsillitis

Introduction

In the practice of Otolaryngology and Head and Neck surgery, we most commonly encounter infectious and hypertrophic pathologies of the palatine tonsils in the form of recurrent tonsillitis or tonsillar hypertrophy.¹The palatine tonsils are a part of the Waldeyer's ring which is constituted by specialized lymphoid organs located in the upper respiratory tract, at the level of the nasopharynx.¹Recurrent tonsillitis is defined as presence of more than 7 episodes of tonsillitis in 1 year or more than 5 episodes in a year for 2 consecutive years or more than 3 episodes of tonsillitis a year for 3 consecutive years; and these episodes are disabling and prevent routine normal functioning.² Neutrophil -lymphocyte ratio is a newly used predictive factor for chronic infections as well as inflammatory conditions.³The neutrophil lymphocyte ratio is a relatively newer variable that is now being assessed in several studies as it is now known to be an indicator of bacteremia, infection, sepsis and even metastasis in carcinomas^{4,5}. The neutrophil -lymphocyte ratio is calculated as the term suggests as a ratio between the neutrophils and the lymphocytes, it has been found to be higher especially in bacteriemia^{1,2}. The concept is that during infection due to excessive demand and use of lymphocytes both B and T cells which then deplete by apoptosis following release of mediators and phagocytosis there is lymphopenia, likewise during the acute phase of infections and in even in cases of chronic infections, there is a milieu of neutropenia by bone marrow activation of the precursors of neutrophils, in this manner the value of this NLR ratio is higher in these conditions^{2,5}. This is a time saving and cost-effective

investigation, which can be used as a diagnostic indicator in infections, alongside or even instead of those such as CRP, ESR, procalcitonin which are more complex tests and more time consuming not to fort get expensive.^{5,6} In our study we wanted to see its relevance in a very common infection we encounter in our practice that is tonsillitis, in order to include this NLR as a tool for assessment in our daily practice for ensuring better outcome and patient care.

Aim

To determine if neutrophil lymphocyte ratio can be used as an indicator of recurrent infection in cases of acute on chronic tonsillitis.

Materials and Methodology

An observational study was conducted at the department of Otorhinolaryngology and Head and Neck surgery at our tertiary care hospital and research Centre, during the time period of 1 year. A total of 100 Patients coming to the otorhinolaryngology and head and neck surgery outpatient department with acute or chronic tonsillitis, following informed written consent and based on the inclusion and exclusion criteria were included in the study. Inclusion criteria were all patients from the age of 6yrs to 50 yrs. presenting with acute and recurrent tonsillitis were included in the study. Recurrent tonsillitis was defined as presence of more than 7 episodes of tonsillitis in 1 year or more than 5 episodes in a year for 2 consecutive years or more than 3 episodes of tonsillitis a year for 3 consecutive years. Exclusion criteria was patients with HIV or other Immune compromised patients and Patients with diabetes mellitus or those on steroid medications or those having complications such as peri-tonsillar abscess or DNSI. Detailed history was taken to ascertain recurrent case of tonsillitis, number of episodes, absenteeism from work

or school and clinical examination was done to assess the grade of the tonsillar hypertrophy (figure 1) and lymph node involvement and presence of any complications of tonsillitis to state a few, following which blood samples were collected and further the NLR was calculated using complete blood count.

Results

Data contains measurements on 100 subjects whose age ranged from 5 years to 50 years with mean age 19.47 ± 11.45 years. Out of 100 subjects, 63% were males and 37% were females with gender ratio of 1.7:1. The neutrophil lymphocyte ratio was calculated for all 100 cases which were included in the study and correlation factor “r” was calculated. By using Spearman’s correlation coefficient for correlation of NLR with recurrence of tonsillitis, the r value was of 0.824 and the p value was less than 0.05 and as well as Pearson’s correlation coefficient tr value was 0.4253 and p value less than 0.05, we found that there was a highly significant correlation between a high neutrophil - lymphocyte ratio and recurrent tonsillitis and also with a positive correlation with respect to degree of tonsillar hypertrophy.

We assessed the variable of NLR overall based on the absenteeism from school and work as we know that recurrent tonsillitis leads to DALY and we found results as shown in the figure, almost more than 50% of patients had work and school absenteeism, all of whom had a raised NLR. (figure 2)

We also found that the recurrence of 3 or more than 3 episodes a year was maximum of 70% in patients with a raised neutrophil lymphocyte ratio.



Figure 1: Clinical examination showing the grades of tonsillar hypertrophy

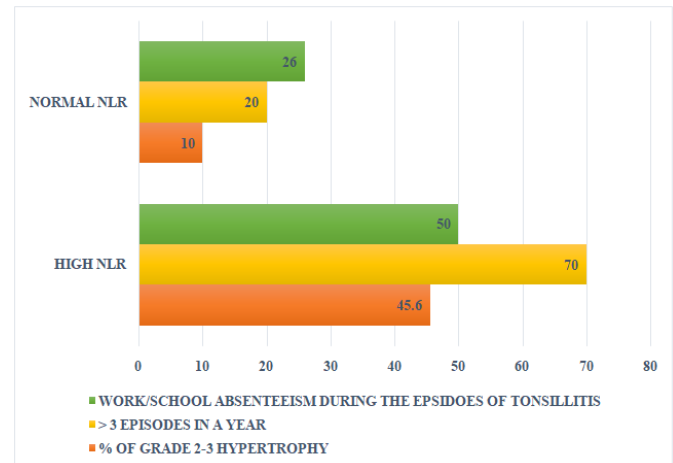


Figure 2: Assessment of NLR with respect to grade of tonsillar hypertrophy, number of episodes of tonsillitis and work/school absenteeism

Discussion

The neutrophil lymphocyte ratio is a new addition to the spectrum of markers of chronic infection being used in modern medicine today. Some of the initial studies done such as that by Cogan et al with regards to the neutrophil lymphocyte ratio were among patients of infective endocarditis and they concluded that the patients with bacterial endocarditis^{7,8} showed a higher NLR as compared to those without infection, it also showed that patients with blocks in the coronary circulation who were at higher risk of developing infective endocarditis had correspondingly higher levels of the NLR. Tekin Baglan et al¹ later studied the NLR to look for its predictive value in cases of deep neck space infections (DNSI) which had occurred secondary to acute bacterial

tonsillitis and they observed that all those with deep neck space infection secondary to tonsillitis had a higher NLR with a high positive as well as negative predictive value. In this manner several studies have indicated that the NLR is raised among those with chronic infection and even inflammation^{2,3}.

The study done by Y. Jin et al has tried to assess the predictive value of neutrophil-lymphocyte ratio in the survival of patients of metastatic nasopharyngeal carcinomas⁵. Studies have also been done in cases of psoriasis by B.B. Sen et al wherein they have spoken about the use of neutrophil lymphocyte ratio as a marker of systemic inflammation in these cases of patients with psoriasis⁹. Raymond Farah et al were also among the first few to study the relation and utility of NLR to gastritis in patients with H pylori infection, and they found that the NLR was significantly raised in cases with the acute or active infection and recurrence as against those with gastritis without H pylori¹⁰. There have been other studies to compare association of the NLR with the severity of infection in cases of appendicitis where in patients with gangrenous appendicitis had a very high and significant NLR as well as those who underwent emergency appendicectomy for the same^{11,12} though the NLR hasn't been used in tonsillitis before its applicability in several other infections shows that it can be a useful indicator for prediction of the chronicity and severity of infection and hence its chance to recur in cases of tonsillitis.

We, in our study have applied this concept of NLR to one of the oldest maladies in ENT to aid us in preempting recurrence and accordingly manage the patients. At the same time, it is important to understand that there still isn't a universal normal range for NLR, given by any standard guidelines, it is being followed based on previous studies which have been done on

large sample sizes of healthy individuals and analyzed in detail. If this were to come into practice as a routine testing modality then it will require larger cohorts to deduce the normal range and for standardization of the values. The study by Fatma et al has shown that neutrophil lymphocyte ratio is positively correlated to the prognosis of patients with odontogenic infections, where in there was an increase in the dose and duration of antibiotics as well as prolongation of the hospital stay, and they concluded that in this manner NLR is a prognostic indicator for such infections of the oral cavity.¹³

Yakup Yegin et al in their recent study have assessed the relationship between the tonsillar size and the neutrophil lymphocyte ratio among post tonsillectomy patients and have concluded that the higher the grade of hypertrophy of tonsils being an indicator of chronic infection, there seems to be a higher level of NLR a finding similar to our study where in higher grades of tonsillar hypertrophy and a greater number of episodes of tonsillitis were associated with higher levels of NLR.¹⁴ Surajeet et al 2018 have concluded that NLR value can be as useful in monitoring surgical management of chronic tonsillitis cases as those patients undergoing tonsillectomy operations among their study group had higher levels of NLR as against those who improved with medical management alone.¹⁵ This is one of the first few studies to our knowledge to assess the correlation of NLR and recurrent tonsillitis and use this biomarker for indication of prognosis of tonsillitis.

Conclusion

In this modern era of practice of medicine, we have several facets of treatment to consider among them time and cost are two very important ones. Tonsillitis is one of the commonest infections we come across in day-to-

day practice of otorhinolaryngology among which most cases are acute or acute on chronic bacterial tonsillitis. As seen in our study we conclude that NLR is significantly high in cases of recurrent tonsillitis and thus NLR is also an indicator of recurrence. Keeping this in mind we can evaluate NLR in all patients and use it as a prognostic marker to plan our treatment with regards to risk recurrence as to medical or surgical and thus reduce the risks and further complications of tonsillitis. The neutrophil lymphocyte ratio being very easy to procure and cost effective can be thus inculcated in our regular panel of investigations to use as a predictive indicator.

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