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THE RELATIONSHIP BETWEEN NEUTROPHIL TO LYMPHOCYTE RATIO AND GLYCEMIC CONTROL DEGREE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Background: Type 2 diabetes mellitus(T2DM) is considered nowadays as one of the most important chronic disease, low grade inflammation is a common feature in subjects with T2DM. Neutrophil to lymphocyte ratio(NLR) may be indicative of an underlying inflammatory state which may attribute to the progression of insulin resistance. **Objective:** The present study aims to assess the association between NLR and the degree of glycemic control(HbA1C) in T2DM patients. **Materials and Methods:** This is Cross- sectional study conducted in the Department of Endocrinology in Tishreen University Hospital-Lattakia -Syria from October 2019 to October 2020. The study included 120 patients with T2DM and 120 matched age and sex controls. **Results:** The patients (45 males and 75 females) had a mean age 0f 55.04±8.04 years, disease duration 5.7±3.8 years. The NLR was significantly increased in T2DM patients(2.98±0.6) compared to the control(1.50±0.2) (p:0.0001). NLR was found to be higher in patients with HbA1C >9%(3.68±0.2) compared to patients with HbA1C<7%(2.29±0.2) (p:0.0001), and in patients with duration of disease >10 year(3.29±0.4) compared to patients with duration <5 year(2.86±0.6) (p:0.01) . Using Pearson's correlation coefficient, NLR was found to increase significantly with increase in HbA1C(r:0.97 ,p:0.0001), and duration of disease(r:0.4,p:0.001) without significant correlation with body mass index(BMI)and age group. **Conclusion**: Our results suggest that NLR is associated with HbA1C and duration of disease. It is an easily accessible and useful marker for monitoring diabetes mellitus patients in clinical practice.

KEYWORDS: Type 2 diabetes mellitus, Neutrophil to lymphocyte ratio (NLR), HbA1C, BMI.

INTRODUCTION

Type 2 diabetes mellitus(T2DM) is a chronic metabolic condition characterized by insulin resistance and insufficient pancreatic insulin production resulting in hyperglycemia.[1,2] T2DM is the predominant form of diabetes worldwide, accounting for 90% of cases globally.[3] It is associated with long term microvascular and macrovascular complications together with reduced quality of life and life expectancy.[4] Growing evidence suggests a close link between inflammation and many chronic diseases such as cardiovascular disease, cancer, and diabetes mellitus.[5] The neutrophil to lymphocyte ratio(NLR), is a biomarker which reflects the balance between two aspects of the immune system: acute and chronic inflammation(as indicated by neutrophil count) and adaptive immunity(lymphocyte count).[6] NLR has been extensively evaluated and shown to be associated with outcome and predict disease course among patients with a variety of medical conditions.[7] However, little is known about the association between NLR and HbA1C in patients with T2DM. Therefore, the aim of the present study was to determine whether NLR is associated with the degree of glycemic control.

MATERIALS AND METHODS

Study design and data collection

We studied patients with T2DM who presented to the Department of Endocrinology in Tishreen University Hospital –Lattakia-Syria from October 2019 to October 2020. Demographic data including age, sex, duration of disease and BMI were recorded.

Blood specimens were collected as part of physical examinations , WBCs were measured and then calculated the NLR as the ratio of the derived neutrophil and lymphocyte counts. Exclusion criteria were patients with one of the following: recent infection, (heart, kidney, liver) failure, autoimmune disease, pregnancy, solid tumors, treatment with (NSAIDS, steroids, aspirin, lithium).

Statistical Analysis

Statistical analysis was performed by using IBM SPSS version20. Basic Descriptive statistics included means, standard deviations(SD), Frequency and percentages.

Independent t student test was used to compare 2 independent groups and one way Anova to compare between the three groups. Pearson's correlation coefficient is used to measure the association between quantitative variables. Statistical significance was accepted at a p value of <0.05.

RESULTS

The baseline demographics of the participants for this study are shown in Table 1. Patients included were of age 40 to 70 years, The mean age was 55.04±8.04, 62.5% were female. There were significant differences between the two groups in regard to body mass index (BMI): 31.18±5.05 in group 1 vs. 25.21±4.2 in group 2, p:0.001 and NLR: 2.98±0.6 vs. 1.50±0.2, p: 0.0001.

Table 1: Demographic characteristics and laboratory findings of the study population.

Variables	**Group1(patients)** n=120	**Group2(controls)** n= 120	**p-value**
Age(year)	55.04±8.04	53.09±8.2	0.06
Sex			
Male	45(37.5%)	49(40.8%)	0.5
Female	75(62.5%)	71(59.2%)	
BMI	31.18±5.05	25.21±4.2	0.001
Laboratory findings			
HbA1C	8±1.4	-------	------
Neutrophils	6.28±1.1	3.63±0.6	0.0001
Lymphocyte	2.11±0.1	2.42±0.2	0.001
NLR	2.98±0.6	1.50±0.2	0.0001

The mean values of NLR between the two groups are represented in the figure 1.

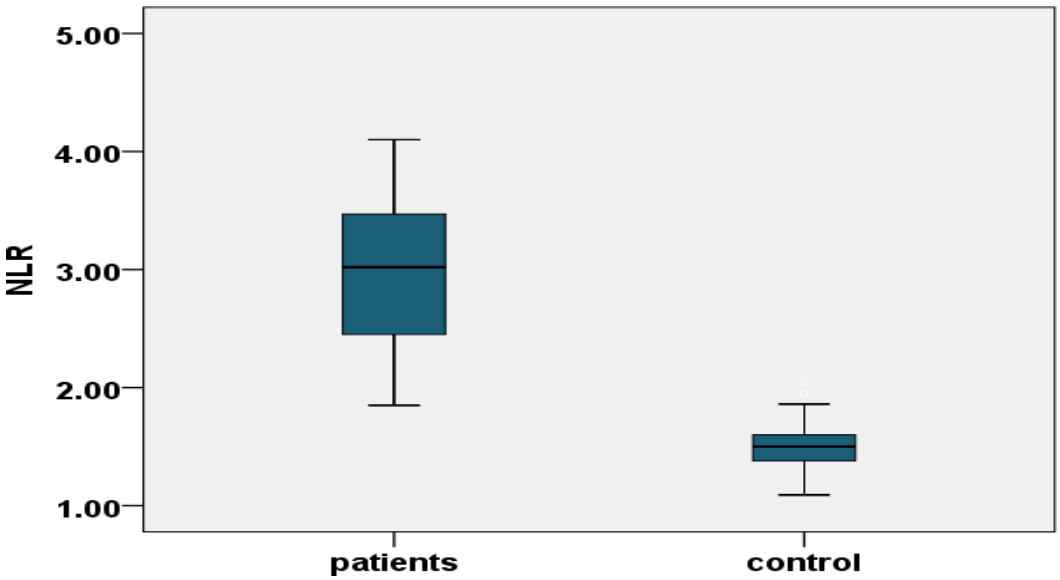

Figure 1 Comparison of NLR value among the two groups (patients, control).

As shown below, there were significant differences in the mean values of NLR according to the duration of disease and HbA1C(p<0.05), in which increased with increasing in HbA1C and duration of the disease.

Table 2: NLR values in patients sample according to the demographic characteristics and HbA1C.

Variable	N (%)	NLR Mean ±SD	p- value
Age group(years)			
40-50	36(30%)	2.90±0.6	
50-60	45(37.5%)	3.01±0.6	0.6
≥60	39(32.5%)	3.03±0.6	
Duration of disease (years)			
0-5	60(50%)	2.86±0.6	
6-10	35(29.2%)	2.95±0.6	0.01
>10	25(20.8%)	3.29±0.4	
BMI			
Normal	11(9.2%)	3.11±0.6	
Overweight	41(34.2%)	2.98±0.4	0.2
Obesity	68(56.7%)	2.90±0.6	
HbA1C			
<7	38(31.7%)	2.29±0.2	
7-9	45(37.5%)	2.98±0.3	0.0001
>9	37(30.8%)	3.68±0.2	

The NLR showed positive correlation with HbA1C (r = 0.97 , p:0.0001), Figure2.

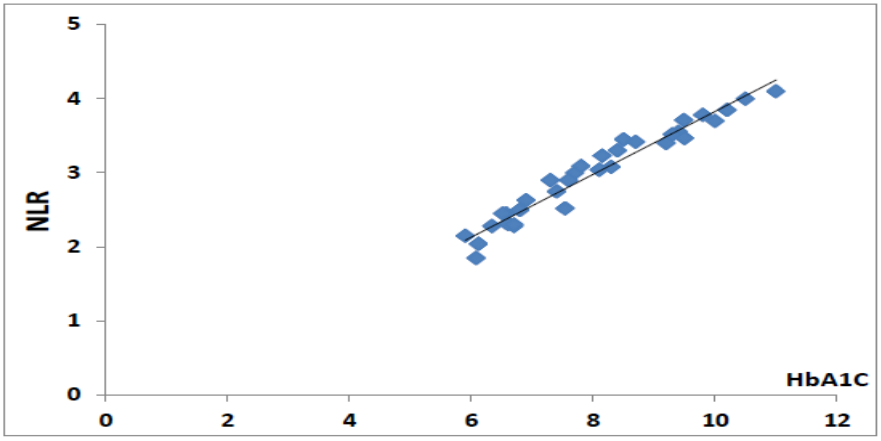

Figure 2: Correlation of NLR with HbA1C.

The NLR showed positive correlation with duration of disease (r = 0.4 , p:0.001) , Figure 3.

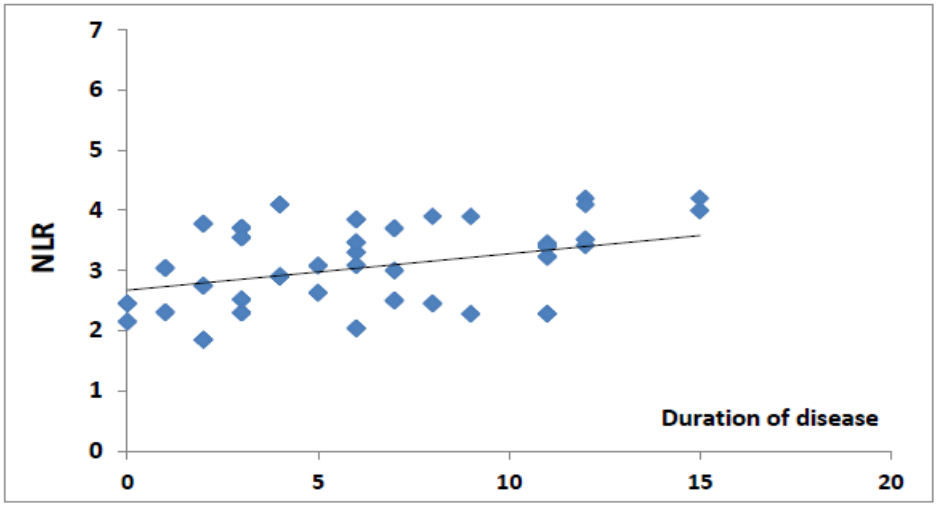

Figure 3: Correlation of NLR with duration of disease.

There was a poor positive correlation between NLR and age(r=0.1, p: 0.6). In addition to, there was a poor negative correlation with BMI (r= -0.2, p: 0.06).

DISCUSSION

In this study, by analysis of 120 patients with T2DM, we found that NLR levels were higher in T2DM patients compared to control group. NLR levels were significantly higher in patients with HbA1C>9% , with duration of disease >10 years, and NLR increased significantly with the increase in HbA1C levels and duration of disease($p<0.05$) without significant correlation with age and BMI.

The exact mechanism responsible for high levels of NLR in patients with uncontrolled T2DM is not fully understood, and there are many supposed mechanisms.[8] Chronic inflammation has been considered the potential pathogenesis responsible for the development of diabetic complications, and NLR combines the negative effects of neutrophils on endothelial damage with the antiatherosclerotic role of lymphocytes.[9,10] Therefore, NLR has been considered a convenient indicator for systemic inflammation. The results of our study are consistent with the results of a previous studies.

Duman *et al*(2019) found that median NLR of T2DM patients was significantly elevated when compared to healthy controls. In addition to, NLR was strongly correlated with HbA1C.[11]

Hussain et al(2017) demonstrated that increased NLR is associated with elevated HbA1C and poor glycemic control in patients of T2DM . It can be used as a disease monitoring tool during the follow up of diabetes patients.[12]

Sefil *et al* (2014) found significant relationship between NLR and blood glucose regulation, and increased NLR may be associated with elevated HbA1C in patients with T2DM. There was no correlation between NLR and BMI.[13]

Devamsh *et al*(2019) also found significant positive correlation between NLR and glycemic control, in which increased NLR is associated with elevated HbA1C and poor glycemic control.[14]

CONCLUSION

NLR is an easy measurable laboratory marker used to evaluate systemic inflammation, and elevated NLR is associated with poor glycemic control.

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