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Ratios of neutrophils to lymphocytes and platelets to lymphocytes in ankylosing spondylitis with disease activity relationship

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Abstract

Background and objectives: Ankylosing spondylitis impacts the fibers and synovial tissues of the sacroiliac and spinal joint and is most noticeable commencement occurs in males. This study aimed to evaluate the correlation between ratios of neutrophils to lymphocytes and platelets to lymphocytes in patients with ankylosing spondylitis.

Methods: This was a case control study performed at Rheumatology units of Erbil and Rizgari teaching hospitals between January 2022 and March 2023. Inclusion criteria involved patients with ankylosing spondylitis based on the criteria developed by Bath Ankylosing Spondylitis Disease Activity Index score. Neutrophil / lymphocyte and platelet / lymphocyte ratio has been calculated manually from the laboratory results.

Results: Disease activity evaluated based on Bath Ankylosing Spondylitis Disease Activity Index Score. Patients with active disease had higher Neutrophil / lymphocyte ratio than inactive and control group with a value of 2.27 ± 0.34, 2.03 ± 0.58, and 1.92 ± 0.93 for the three groups respectively; this difference was statistically significant. The same correlation was found in terms of platelet to lymphocyte ratio with values of 149.92 ± 31.13 for active group and 126.88± 58.38 and 129.74 ± 63.16 for inactive and control group respectively. There was a weak negative and not significant correlation between both Neutrophil / lymphocyte and platelet / lymphocyte ratio and Bath Ankylosing Spondylitis Disease Activity Index Score.

Conclusion: Potential indicators of the activity of ankylosing spondylitis include the neutrophil to lymphocyte ratio and the platelet to lymphocyte ratio.

Keywords: Ankylosing spondylitis, Neutrophile to lymphocyte ratio, Platelet to lymphocyte ratio.

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Introduction

Having an incidence ranged around 0.07% and 0.31% in the world's inhabitants, ankylosing spondylitis (AS), a type of spondylarthritis (SpA), impacts the fibers and synovial tissues of the sacroiliac and spinal joint.[1] The illness's most noticeable commencement occurs in males between the ages of 20 and 30; roughly speaking, men and women are impacted at an incidence rate of 3:1.[2,3] Patients with AS endure reduced mobility, an important decline in job performance, and a poor standard lifestyle at this time after illness start, which typically happens before the age of 45, when individuals are in their best functional years. Ankylosing spondylitis AS is a significant social and medical issue.[4,5] Both extra-articular and articular features of ankylosing spondylitis are clinically evident. Peripheral oligoarthritis is present in certain individuals, and the majority of the articular symptoms affect the vertebral column, appearing as painful backache. The extra-articular manifestations encompass eye inflammation, inflammation of the digestive tract, and dactylitis.[6,7] In clinical practice, existing criterion set are routinely employed to aid in diagnosis. The modified New York (mNY) criterion have become one of the most commonly used diagnostic categorization for AS. An individual has to fulfill a minimum of 1 subjective criterion and the imaging confirmation of AS in the aforementioned system of classification. European Spondyloarthropathy Study Group (ESSG) criteria are also used to diagnose AS.[8] The pathology of ankylosing spondylitis is still not completely clarified currently yet. Previous work has demonstrated that's ankylosing spondylitis is caused by environmental as well as genetic variables, having HLA-B27 coming to the forefront of study upon the revelation that it exists in up to ninety percent of those with the disease.[9] The precise causes are intricate and multifaceted, and the investigation objective keeps evolving. Addressing potential risk variables in addition to genotype-gene and interactions between genes and the environment, may provide essential knowledge on the root cause of AS along with major consequences for the identification and care of the disorder.[10,11] In addition to medical care and physical therapy, various anti-tumor necrosis factor (TNF) medications are utilized as well in the control of this long-term illness. Although advances in the identification and treatment of this illness, modifications are necessary since these medications have a significant risk of undesirable or even fatal adverse effects as a result of an absence of selectivity and are pricy.[12] The notion that inflammatory response plays a significant role in the development of AS is currently readily accepted. The neutrophil/lymphocyte ratio (NLR) and platelet/lymphocyte ratio (PLR) represent the ratios of the total neutrophil number and number of platelets, correspondingly, to the number of lymphocytes and are determined from a standard complete blood count (CBC) test. greater NLR and PLR levels indicate greater inflammatory processes.[13,14] Due to their characteristics of simple identification, straightforward procedure, and inexpensive expenditures they have come to be widely utilized in the initial identification and prognostic evaluation of numerous diseases.[15,16] Considering the performance of NLR and PLR in inflammation, we speculate that these 2 indexes may be potential novel biomarkers for AS. In the present study, we evaluated the correlation between NLR, PLR in patients with AS and their relation to disease activity, aiming to provide a basis for clinical assessment and treatment.

Patients and methods

This was a case control study that was performed at Rheumatology units of Erbil and Rizgari teaching hospitals. This study has

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been conducted between January 2022 and March 2023 and participants had been selected from the outpatient's clinic. AS patients answer six questions, and their responses are scaled from 0 to 10. Patients are asked the degree of fatigue/tiredness experienced; AS-related pain in the neck, back, or hip; pain or swelling in other joints; discomfort from any areas tender to touch, pressure and discomfort from the time they wake up; and lastly, how long their morning stiffness lasts from the time they wake up. Inclusion criteria involved those patients diagnosed with ankylosing spondylitis based on the criteria developed by Bath Ankylosing Spondylitis Disease Activity Index score BASDAI. Those with active infection, malignancy, diabetes, other autoimmune diseases, or on long term steroid has been excluded from the study. Basic demographic data such as age and gender plus medical history including visual analogue scale for pain, number of tender tendons and swollen joints has been obtained from participants. Hematological tests have been obtained from all participant including c-reactive protein. Erythrocyte sedimentation rate, complete blood count, and NLR plus PLR has been calculated manually from the laboratory results. The participant had been divided into two groups; those with no disease activity had a disease activity score BASDAI score below 4 and those with active disease who had a score of 4 or above. Data analysis was performed through the Statistical Package for the Social Sciences (SPSS) version 26. Quantitative continuous variables were presented as mean, median, and standard deviation. Categorical nominal and ordinal variables were introduced in the form of frequencies and percentages. According to the Declaration of Helsinki, the study methodology was approved by the Kurdistan Higher Council for Medical Specializations, and we obtained the patients' authorization or informed consent before reviewing their medical records.

Results

One hundred eighteen participants have been included in this case control study; 58 of them had ankylosing spondylitis while the other sixteen were the control group.The mean age of AS group was 34.18 ± 7.2 while the control group was 36.29 ± 6.8 with no statistical difference between the two groups as the p value was 0.388. In terms of gender; 99 males and 19 females had participated in this study with no statistical significance among the two groups as illustrated in Table (1). These findings elaborate that both groups were well matched. The duration of AS among AS participants was 8.55 ± 9.2 years.

Table (1): Demographic data of study groups.

		AS participants (n=58)	Control (n=60)	p value*
Age(years)		34.18 ± 7.2	36.29 ± 6.8	0.388
Gender, n(%)	Male	50	49	0.761
	Female	8	11	0.482
Duration of AS (years)		8.55 ± 9.2		

The BADSAI score of disease activity among the case group had a mean of 4.29 ± 1.89 as shown in Table (2). In terms laboratory results; the lymphocyte, neutrophil and platelet count were higher in case group with a mean of 3.28 ± 1.12, 5.16 ± 1.91 and 252.17 ± 99.2 while it was 2.78 ± 1.49, 4.98 ± 1.2, and 246.48± 109.6 in the control group. This difference was not statistically significant as the p value was more than 0.05. in terms of NLR and PLR; again, it was higher in the case groups but this difference was of no statistical significance.

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Table (2): Clinical and Laboratory features of the study groups.

	AS participants (n=58)	Control (n=60)	p value*
BASDAI score	4.29 ± 1.89		
Lymphocyte count	3.28 ± 1.12	2.78 ± 1.49	0.277
Neutrophil count	5.16 ± 1.91	4.98 ± 1.2	0.082
Platelet count	252.17 ± 99.2	246.48± 109.6	0.084
NLR	2.01 ± 0.62	1.92 ± 0.93	0.26
PLR	133.4 ± 44.87	129.74 ± 63.16	0.29

Regarding the laboratory findings among the three groups; the lymphocyte count was higher in both active and inactive cases of ankylosing spondylitis than the control group, but this difference among all the groups was not significant as the p value was higher than 0.05 as shown in Table (3).

Table (3): Laboratory features among active, inactive and control groups

	Active disease (n=28)	Inactive disease (n=30)	Control (n=60)	p value* P1/P2/P3**
Lymphocyte count	3.41 ± 1.85	3.15± 1.03	2.78 ± 1.49	0.337, P1: 0.31, P2: 0.95, P3: 0.57
Neutrophil count	5.72 ± 1.3	4.6 ± 1.19	4.98 ± 1.2	0.007, P1: 0.99, P2: 0.009, P3: 0.025
Platelet count	262.91 ± 72.2	230.5 ± 99.69	252.17 ± 109.6	0.881, P1: 0.99, P2: 0.9, P3: 0.89
NLR	2.27 ± 0.34	2.03 ± 0.58	1.92 ± 0.93	0.004, P1: 0.67, P2: 0.01, P3: 0.005
PLR	149.92 ± 31.13	126.88± 58.38	129.74 ± 63.16	0.005, P1: 0.64, P2: 0.019 P3: 0.006

*One way ANOVA test had been conducted to evaluated the p value

** A post hoc turkey test had been used to conduct the p value

P1: Control vs Inactive. P2: Control vs Active. P3: Active vs Inactive

In terms of neutrophil count, the difference among the three groups was statistically significant as the p value is 0.007; the difference between active vs the control and inactive was statistically significant as the p value was 0.009 and 0.025 respectively. With respect to platelet count, it was lower in the inactive group with a mean of 230.5 ± 99.69. The difference between all groups, control versus active, control versus inactive and active versus inactive was not statistically significant as the p value was more than 0.05. Regarding Neutrophil / lymphocyte ratio, it is higher in patients with AS group with active disease than the other two groups and this difference between the three groups is significant as the p value is 0.004 as illustrated in Table (3), Figure (1) and (2). The difference between the control versus active / active versus inactive is also significant with a p value of 0.01 and 0.005 respectively, while the difference between control and inactive groups is not significant with a p value of 0.67.

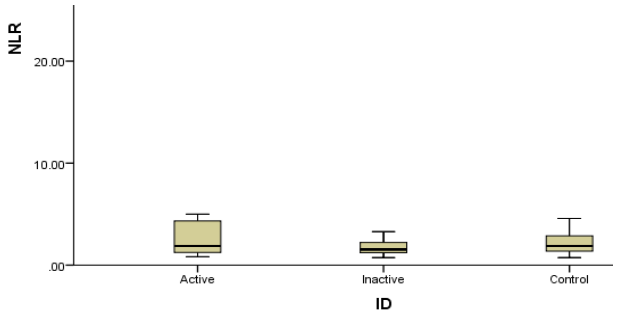

Figure (1): Neutrophil / Lymphocyte ratio

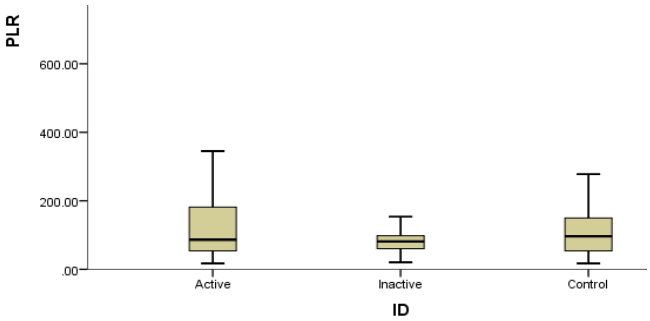

Figure (2): Neutrophil / Lymphocyte ratio

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The platelet / lymphocyte ratio has a mean of 149.92 ± 31.13 in active groups which is much higher than the inactive and control group in which they had a mean of 126.88± 58.38 and 129.74 ± 63.16 respectively. This difference is statistically significant with a p value of 0.005. when comparing the control versus the inactive group alone; the difference is of no significant value but the opposite is true when comparing the control versus the active group and the active versus the inactive group with a p value of 0.019 and 0.006 respectively. Figure (3), (4), (5) and (6) shows the correlation between NLR/PLR with BASDAI score. There is a negative but not significant correlation between BADASAI and NLR in both active and inactive group as Pearson correlation score is -0.83 and -0.162 for both groups respectively. In terms of platelet / lymphocyte ratio and BASDAI score, the correlation is negative for both groups with Pearson Correlation score of -0145 and 0.016 for both Active and inactive groups respectively. This correlation is of no statistical significance with a p value of 0.463 and 0.932 for the active and inactive groups.

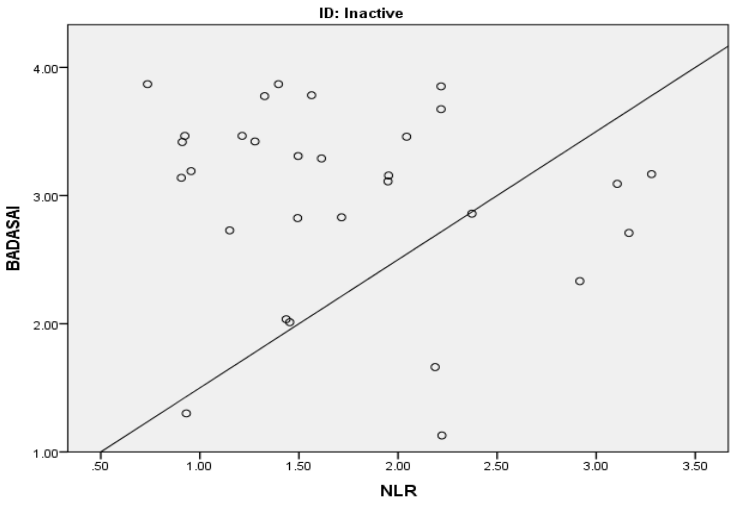

Figure (3): NLR in Inactive group

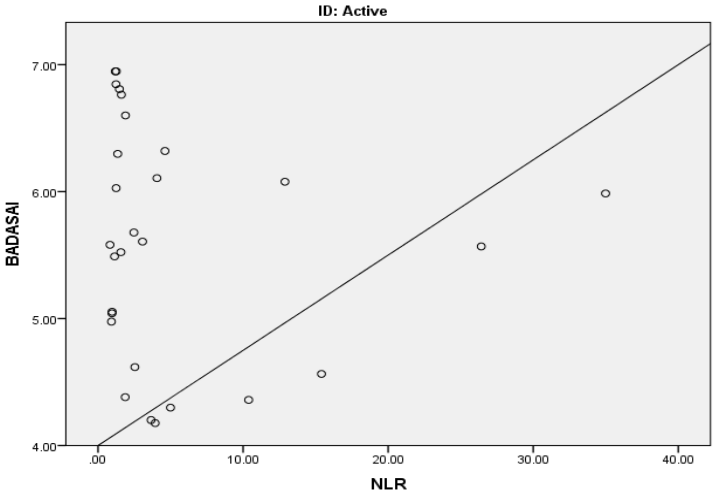

Figure (4): NLR in Active group

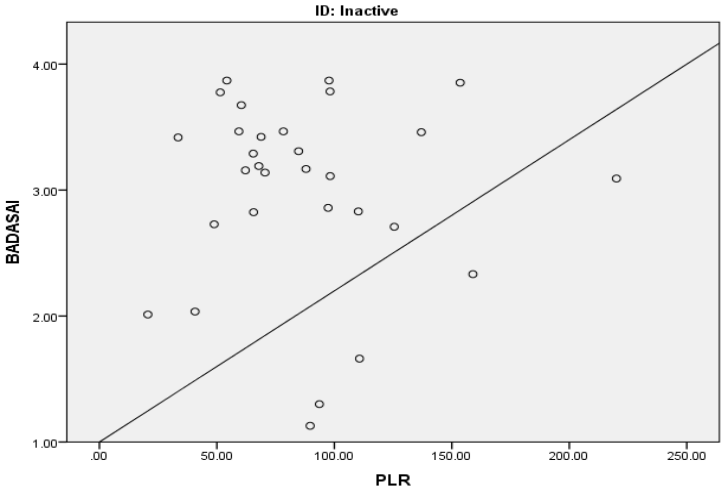

Figure (5): PLR in Inactive group

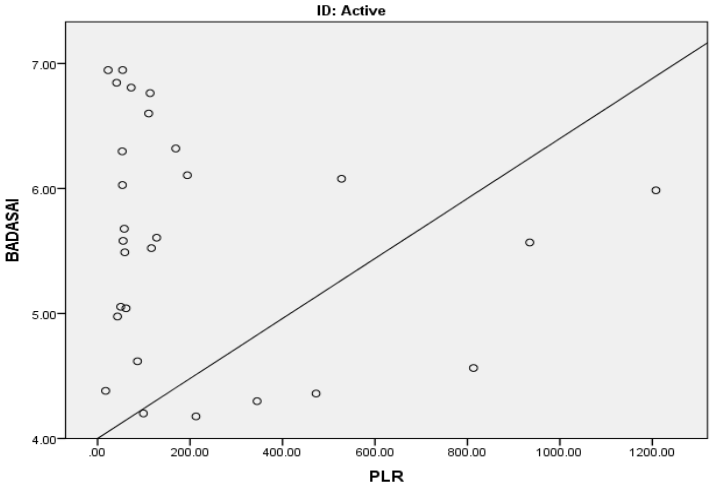

Figure (6): PLR in Active group

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Discussion

This study came up with the results that inflammatory findings such as lymphocyte, neutrophil, platelet count, NLR, and PLR counts had no significant difference when comparing control groups versus ankylosing spondylitis group with both active and inactive disease as a whole but the story has another side when the comparison is done individually between the three groups. This study has shown that neutrophil count among patients with active ankylosing spondylitis are higher and statistically significant difference than both the inactive AS patients and control groups but the difference between the inactive and control group is insignificant. On the other hand, both lymphocyte and platelet counts had no significant difference among the three groups. Both groups were well matched in terms of demographic data including the age and gender variables. For individuals with active ankylosing spondylitis disease, both NLR and PLR counts were higher than inactive and control group which was statistically significant. This correlation does not apply when comparing the inactive and control groups in terms of both variables. Those results agree with the findings of CoSkun et al.[17] and Gokmen et al.[18] in terms of NLR and Boyraz et al.[19] in terms of PLR. On the other hand; Mercan et al.[20], Boyraz et al.[21] and OzSahin et al.[22] results are not consistent with the results of our research in terms on NLR and Bozan et al.[23] on terms of PLR. Although there is a significant difference between NLR/PLR among the groups, but there was a weak negative and not significant correlation between both variables and BADSAI scores. Those results agree with the findings of Kucuk et al.[24] and Esraa et al.[25] In current literature, the neutrophil lymphocyte ratio and platelet lymphocyte ratio has emerged as dependable markers used for diagnosis and staging of multiple inflammatory diseases.[26] NLR is composed of two parts of the immune defense mechanism; Neutrophil is part of the innate immune system while the lymphocyte is representative of the adaptive immune system.[27] Platelet plays a role in regulating the immune system.[27,28] That is why both NLR, and PLR can be considered as important inflammatory marker assessing disease activity.[28] There are several limitations to our study. The small sample size of this study, larger sample size could give a more solid statistical analysis. Secondly, this study did not explore other markers such as C reactive protein or erythrocyte sedimentation rate or other hematological factors to see its impact on disease activity.

Conclusion

Both NLR and PLR are potential markers to assess the activity of ankylosing spondylitis; further studies are required to assert these results.

Conflicts of interest:

There were no conflicts of interest.

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