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Association between Disease Activity and C-Reactive Protein to Serum Albumin Ratio in Patients with Ankylosing Spondylitis

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Abstract

Background: Ankylosing spondylitis (AS) is a persistent inflammatory rheumatic condition that predominantly affects the axial skeleton, resulting in inflammatory back pain, stiffness, and reduced mobility of the spine. The C-reactive protein/albumin ratio (CAR) has recently gained recognition as a new inflammatory biomarker. This research aims to assess the correlation between disease activity and the C-reactive protein to serum albumin ratio among individuals diagnosed with ankylosing spondylitis.

Materials And Methods: The present cross-sectional study was conducted on 100 patients suffering from ankylosing spondylitis in Sulaymaniyah Shahid Hemn teaching hospital from December 2022 to August 2023. Required data were gathered from the patients' medical files and by assessing the disease activity through ankylosing spondylitis disease activity score (ASDAS) and bath ankylosing spondylitis disease activity index (BASDAI). Moreover, the patients were examined to collect data on their C-reactive protein to albumin ratio, ESR, and HLA B27. The collected data were analyzed through Statistical Package for Social Sciences (SPSS, version 24.0).

Results: The patients' age ranged from 20 to 60 years, and most of them (70%) were males. C-reactive protein-to-serum albumin ratio was normal (≤1.6) in most of the patients (64%). BASDAI scores were low and high in 38% and 37% of the patients, respectively. According to ASDAS scores, the disease activity was found to be high in 45% of the patients, low in 24% of them, and very high in 18%. The results revealed that peripheral arthritis, dactylitis, sacroiliitis, uveitis, inflammatory bowel disease, enthesitis, and HLAB27 were positive in 37%, 20%, 100%, 21%, 12%, 39%, and 62 of the patients, respectively. C-reactive protein-to-serum albumin ratio was found significantly associated with BASDAI score (p-value=0.008) and ASDAS score (p-value=0.017), but not with HLAB27 or treatment (p-value>0.05).

Conclusion: C-reactive protein to serum albumin ratio is a reliable index for disease activity for patients with ankylosing spondylitis.

Keywords: C-reactive protein, serum albumin, disease activity, ankylosing spondylitis

Introduction

Ankylosing spondylitis (AS) is a chronic inflammatory rheumatic disease that primarily impacts the axial skeleton, leading to inflammatory back pain, stiffness, and a decline in spinal mobility. It is estimated to affect approximately 0.1-1.4% of the global population, with a higher prevalence observed among young males [1]. The precise pathogenesis of AS remains uncertain; however, a key feature is inflammation occurring at the enthesis, which refers to the sites where tendons and ligaments insert into the bone. Prolonged inflammation can result in the development of new bone and eventual fusion of the spine [2].

Effective management of AS relies on monitoring disease activity to control inflammation, minimize structural damage, and enhance physical function. However, assessing disease activity **poses** challenges. Patient-reported outcomes, such as the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), provide insight into symptoms but are inherently subjective. On the other hand, conventional inflammatory markers like C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) lack sensitivity and specificity when it comes to detecting active AS. Consequently, there has been a research focus on exploring alternative biomarkers that may offer a more accurate reflection of inflammation and disease activity [3].

The CRP to albumin ratio (CAR) is an experimental biomarker that has garnered attention. CRP as an acute phase reactant produced by the liver in response to cytokines like interleukin-6 increases in the presence of inflammation. Conversely, albumin levels decrease as a negative acute phase reactant. Consequently, CAR serves as a comprehensive indicator of the acute phase response. CAR has demonstrated prognostic significance in predicting mortality and complications in various inflammatory disorders, including cardiovascular disease, stroke, and cancer [4].

Several recent studies have conducted assessments on the utilization of CRP to albumin ratio (CAR) in individuals with AS. Notably, two independent research groups discovered a positive association between CAR and clinical disease activity scores such as bath ankylosing spondylitis disease activity index (BASDAI) and ankylosing spondylitis disease activity score (ASDAS) functional impairment indicated by bath ankylosing spondylitis functional index (BASFI), and conventional inflammatory markers. In addition, CAR levels were higher in AS patients compared to healthy individuals. These initial findings suggest that CAR has the potential to serve as a cost-effective and widely accessible biomarker for evaluating inflammation and aiding treatment decisions in AS [5,6].

Despite recent advancements in understanding the role of CRP to albumin ratio (CAR) in AS, significant knowledge gaps persist. Published studies, which mostly encompassed small sample sizes of fewer than 200 patients and were conducted in single centers, highlight the need for larger multi-center cohort studies. Additionally, existing research has primarily been cross-sectional in nature, providing only a momentary snapshot of CAR's association with AS disease activity [7]. Longitudinal studies are imperative to determine whether changes in CAR align with disease flare-

ups and remission. Finally, there is limited knowledge concerning the comparative efficacy of CAR compared to conventional inflammatory markers like CRP and ESR [8].

There is a growing interest in utilizing composite measures that amalgamate multiple parameters of disease activity, such as the CRP/albumin ratio. This ratio has emerged as a potential composite marker in inflammatory conditions like rheumatoid arthritis (RA) and inflammatory bowel disease (IBD). While albumin levels alone reflect systemic inflammation and nutritional status, CRP provides a specific indicator of inflammatory activity. The CRP/albumin ratio may offer additional insights compared to each parameter assessed individually [9]. In the case of RA, higher ratios are associated with more active disease and unfavorable outcomes. Similarly, in IBD, elevated ratios are predictive of relapse and the necessity for intensified treatment. However, the utility of the CRP/albumin ratio in ankylosing spondylitis (AS) has been inadequately investigated. Understanding the correlation between this composite marker and validated measures of AS disease activity, such as the BASDAI, could provide valuable insights into the role of systemic inflammation in AS [10]. Consequently, the objective of this study is to evaluate the association between disease activity and the C-reactive protein to serum albumin ratio in patients diagnosed with ankylosing spondylitis.

Materials and Methods

Study design and setting: The present cross-sectional study was carried out in Sulaymaniyah Shahid Hemn teaching hospital, Kurdistan region, Iraq from December 2022 to August 2023.

Study sample and sampling method: The study sample consisted of 100 patients with ankylosing spondylitis. The inclusion criteria were AS diagnosed by modified **New York** criteria, age of 20 to 60 of years, and patients who gave informed consent. The exclusion criteria were age of below 20 and above 60 years, patients who refused to give informed consent, patients with cardiac, liver, and renal failure.

Data collection and analysis: The patients' medical files were used to collect required data. The disease activity was assessed using ASDAS and BASDAI, and the patients were sent for investigations including C reactive protein to albumin ratio, ESR, and HLA B27. Statistical Package for Social Sciences (SPSS, version 24.0) was used to analyze the collected data. For this purpose, both descriptive and inferential statistics tests were employed.

Ethical considerations: The study's protocol was approved by the Ethics Committee of Kurdistan Board for Medical Specialty. Moreover, informed consent was obtained from the participants.

According to the results, C-reactive protein-to-serum albumin ratio (CRP/serum albumin) was normal (≤1.6) in most of the patients (64%), mild (1.6 - 5) in 27% of them, moderate (5.1 - 17) in 8% of them, and high (>17) in 1% of them (See Figure 1).

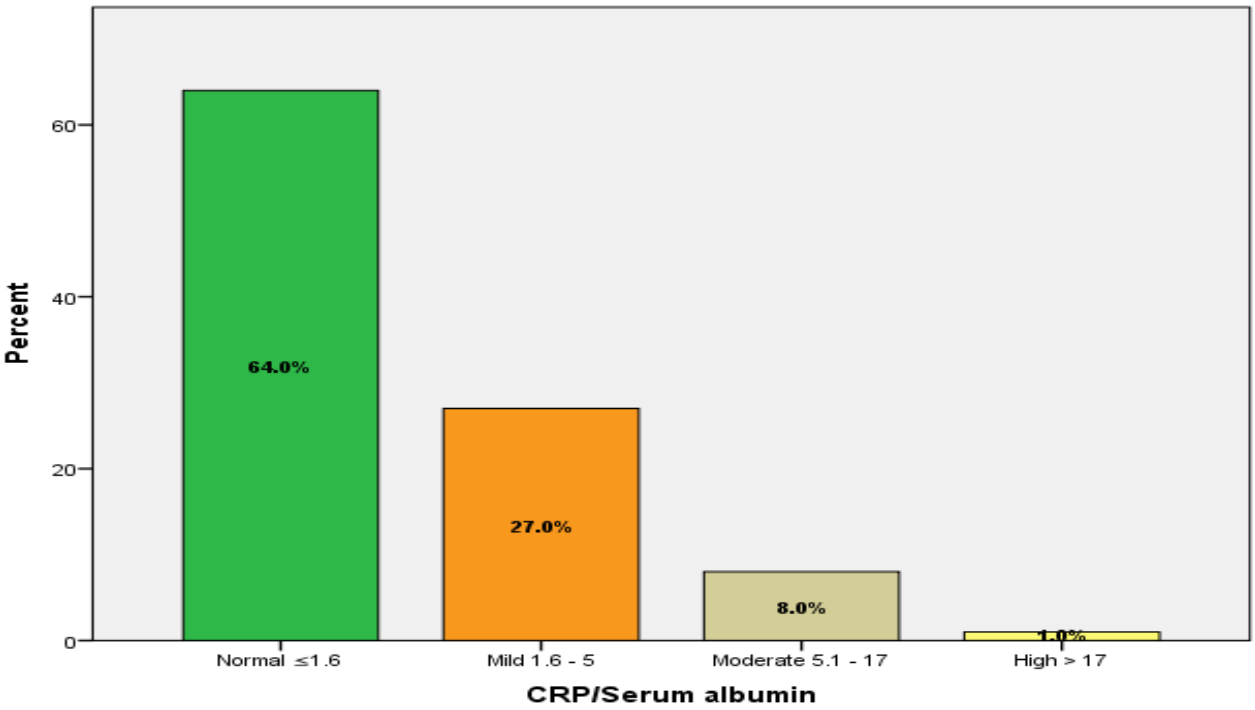


Figure (1) . CRP/serum albumin ratio among the patients

The results indicated that the patients' BASDAI scores were low (<2) in 38% of the cases, moderate (≥2 - <4) in 21% of the cases, high (≥4 - ≤6) in 37% of the cases, and very high (>6) in 4% of the cases (See Figure 2).

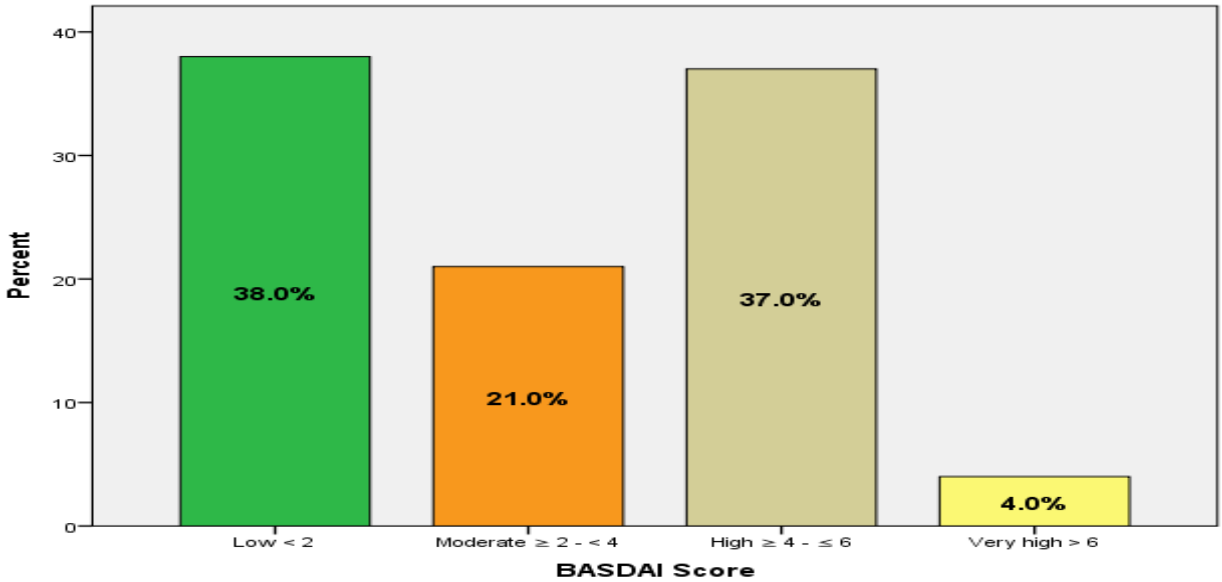
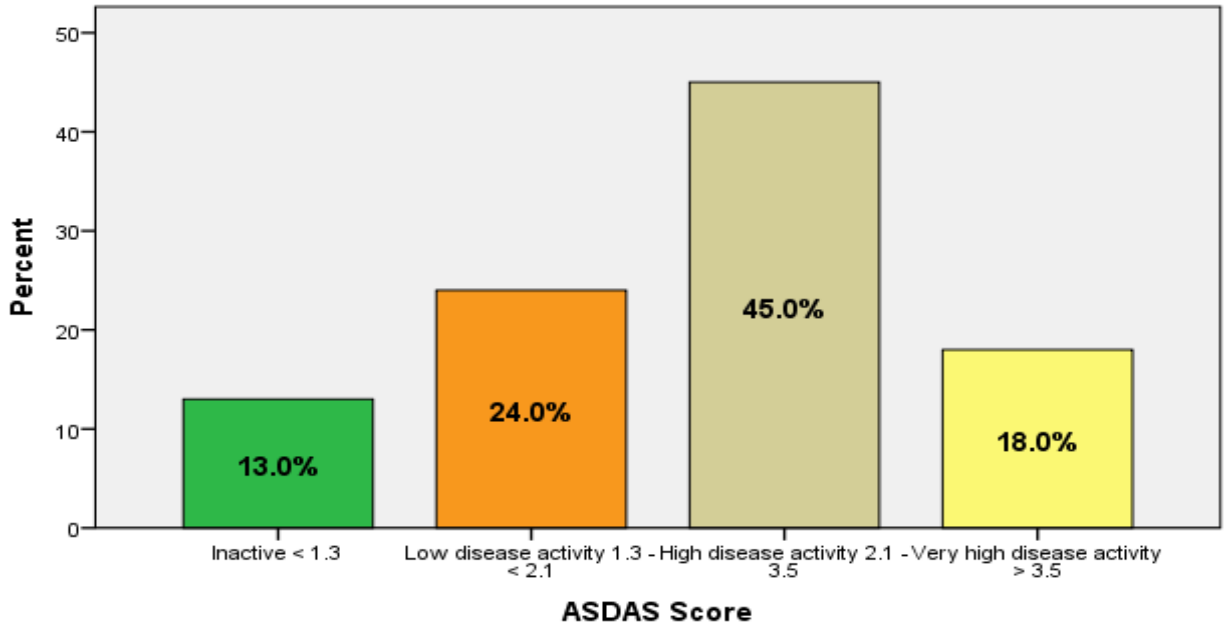


Figure (2). The patients' BASDAI scores

Regarding disease activity, ASDAS scores revealed that 45% of the patients had a high level of disease activity (2.1 - 3.5), 24% had a low level of disease activity (1.3 - <2.1), 18% had a very high level of disease activity (>3.5), and the level of the disease was inactive in 13% of the patients (See Figure 3).



Figur(3). The level of disease activity among the patients

The results demonstrated that anti-TNF alpha was used as the treatment for all of the patients of whom 21% and 6% received NSAID and DMARD along with anti-TNF alpha respectively (See Figure 4).

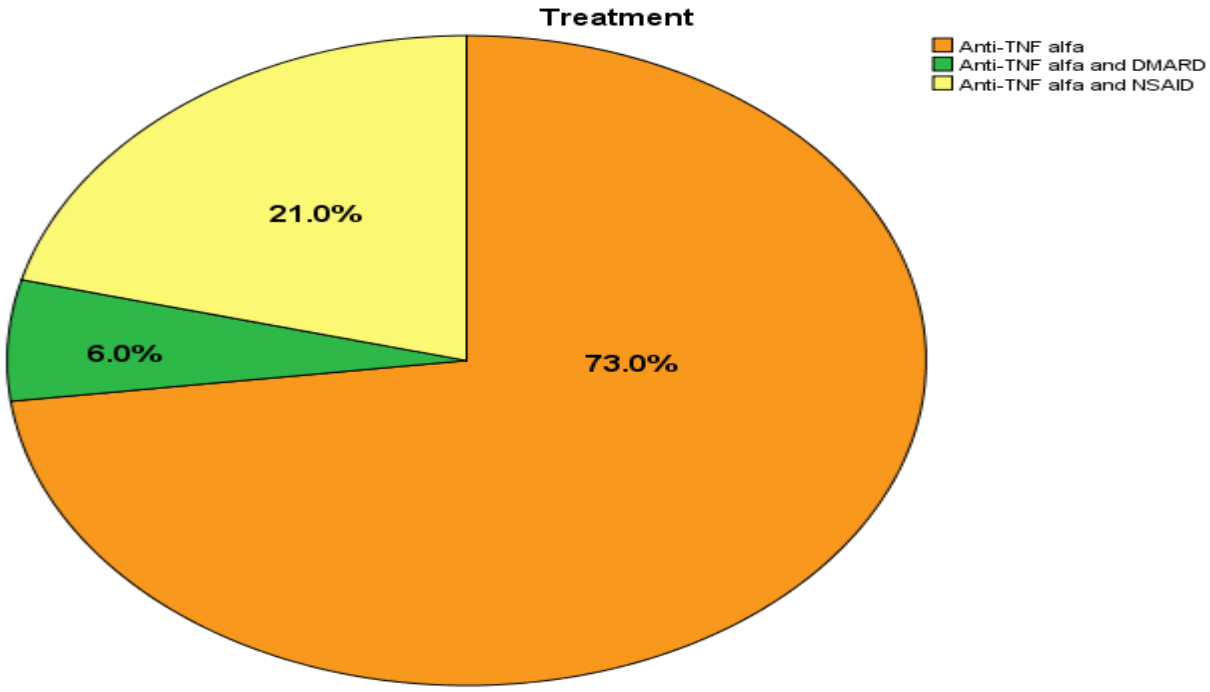


Figure (4). The treatments the patients received

According to the patients' sociodemographics, their age ranged from 20 to 60 years. 26 patients (26%) aged 20 to 30 years, 34% aged 31 to 40, 31% aged 41 to 50, and 9% aged 51 to 60. Regarding their sex, the results showed that most of them (70%) were males, and the rest (30%) were females. The results also showed that most of them (75%) were married, 22% were single, and 3% were divorced. Most of the patients (60%) were found to be unemployed, and 63% were educated. Regarding their economic status, most of them (91%) belonged to the middle class. Moreover, 90% of them lived in the city. Also, 60% had never smoked, 33% were smokers, and 7% used to smoke before. It was concluded that most of them (96%) had never drunk, and only 4% were alcohol drinkers. Most of the patients (60%) did not have a family history of the disease, while 40% did. The previous history of the disease was negative for most of them (96%). Regarding their BMI, 36% had a normal weight (18.5-24.9), 34% were overweight (25-29.9), 18% had obesity class I, 9% had obesity class II, and 3% were underweight. The results also showed that 62% of the patients had positive HLAB27 (See Table 1).

Table(1). The patients' sociodemographic information

	Frequency (N)	Percentage (%)
Age Group		
20 - 30	**26**	**26.0**
31 - 40	**34**	**34.0**
41 - 50	**31**	**31.0**
51 - 60	**9**	**9.0**
Total	**100**	**100.0**
Gender		
Male	**70**	**70.0**
Female	**30**	**30.0**
Total	**100**	**100.0**
Marital Status		
Single	**22**	**22.0**
Married	**75**	**75.0**
Divorced	**3**	**3.0**
Total	**100**	**100.0**
Occupation		
Employed	**40**	**40.0**
Unemployed	**60**	**60.0**
Total	**100**	**100.0**
Education		
Educated	**63**	**63.0**
Illiterate	**37**	**37.0**
Total	**100**	**100.0**
Economic State		
Low	**9**	**9.0**

Mild	**91**	**91.0**
Total	**100**	**100.0**
Residence		
Urban	**90**	**90.0**
Rural	**10**	**10.0**
Total	**100**	**100.0**
Smoking History		
Current	**33**	**33.0**
Ex-Smoker	**7**	**7.0**
Never	**60**	**60.0**
Total	**100**	**100.0**
History Of Alcoholic		
Current	**4**	**4.0**
Never	**96**	**96.0**
Total	**100**	**100.0**
Family History		
Yes	**40**	**40.0**
No	**60**	**60.0**
Total	**100**	**100.0**
Comorbidity		
Positive	**4**	**4.0**
Negative	**96**	**96.0**
Total	**100**	**100.0**
BMI		
Underweight <18.5	**3**	**3.0**
Normal Weight (18.5-24.9)	**36**	**36.0**
Overweight (25.0-29.9)	**34**	**34.0**
Obesity Class I	**18**	**18.0**
Obesity Class II	**9**	**9.0**
Total	**100**	**100.0**

According to the results, 37% of the patients had peripheral arthritis, 20% had dactylitis, 100% had sacroiliitis, 21% had uveitis, 12% had inflammatory bowel disease, 39% had enthesitis, and 62% had positive HLAB27 (See Table 2).

Table (2). The patients' medical profile

	Frequency (N)	Percentage (%)
Peripheral Arthritis		
Positive	**37**	**37.0**
Negative	**63**	**63.0**
Total	**100**	**100.0**
Dactylitis		
Positive	**20**	**20.0**
Negative	**80**	**80.0**
Total	**100**	**100.0**
Sacroiliitis		
Positive	**100**	**100.0**
Negative	**0.00**	**0.00**
Total	**100**	**100.0**
Uveitis		
Positive	**21**	**21.0**
Negative	**79**	**79.0**
Total	**100**	**100.0**
Inflammatory Bowel Disease		
Positive	**12**	**12.0**
Negative	**88**	**88.0**
Total	**100**	**100.0**
Enthesitis		
Positive	**39**	**39.0**
Negative	**61**	**61.0**
Total	**100**	**100.0**
HLAB27		
Positive	**62**	**62.0**
Negative	**38**	**38.0**
Total	**100**	**100.0**

The results indicated that 38% of the patients had a low score of BASDAI (<2), 21% had a moderate score (≥2 - <4), 37% had a high score (≥4 - ≤6), and 4% had a very high score (>6). Regarding disease activity, ASDAS scores indicated a high level of disease activity (2.1 - 3.5) among 45% of the patients, a low level of disease activity (1.3 - <2.1) among 24% of them, and a very high level of disease activity (>3.5) among 18% of them, while the level of the disease was inactive in 13% of the patients (See Table 3).

Table (3). Scores of BASDAI and ASDAS among the patients

	Frequency (%)	Percentage (%)
BASDAI Score		
Low < 2	**38**	**38.0**
Moderate ≥ 2 - < 4	**21**	**21.0**
High ≥ 4 - ≤ 5	**37**	**37.0**
Very High ≥5.1	**4**	**4.0**
Total	**100**	**100.0**
ASDAS Score		
Inactive < 1.3	**13**	**13.0**
Low Disease Activity 1.3 - < 2.1	**24**	**24.0**
High Disease Activity 2.1 - 3.5	**45**	**45.0**
Very High Disease Activity > 3.5	**18**	**18.0**
Total	**100**	**100.0**

As revealed by the results, CRP/serum albumin ratio had a statistically significant relationship with the patients' scores of BASDAI (p-value=0.008) and ASDAS (p-value=0.017). However, no statistically significant relationships were found between CRP/serum albumin ratio and HLAB27 status (p-value=0677) or the type of treatment the patients received (p-value=0.09) (See Table 4).

Table(4). The relationship between CRP/serum albumin ratio and HLAB27, BASDAI score, ASDAS score, and treatment

	CRP/Serum Albumin				Total	P-Value
	Normal ≤1.(	Mild 1.6 - 5	Moderate 5.1 - 17	High > 17		
HLAB27						
Positive	39(60.9)	18(66.7)	5(62.5)	0(0.0)	62(62.0)	0.677
Negative	25(39.1)	9(33.3)	3(37.5)	1(100.0)	38(38.0)	
Total	64(100.0)	27(100.0)	8(100.0)	1(100.0)	100(100.0)	
BASDAI Score						
Low < 2	27(42.2)	9(33.3)	2(25.0)	0(0.0)	38(38.0)	0.008
Moderate ≥ 2 - < 4	8(12.5)	10(37.0)	3(37.5)	0(0.0)	21(21.0)	
High ≥ 4 - ≤ 6	28(43.8)	7(25.9)	2(25.0)	0(0.0)	37(37.0)	
Very High > 6	1(1.6)	1(3.7)	1(12.5)	1(100.0)	4(4.0)	
Total	64(100.0)	27(100.0)	8(100.0)	1(100.0)	100(100.0)	
ASDAS Score						
Inactive < 1.3	12(18.8)	1(3.7)	0(0.0)	0(0.0)	13(13.0)	0.017
Low Disease Activity 1.3 - < 2.1	17(26.6)	7(25.9)	0(0.0)	0(0.0)	24(24.0)	
High Disease Activity 2.1 - 3.5	29(45.3)	12(44.4)	4(50.0)	0(0.0)	45(45.0)	
Very High Disease Activity > 3.5	6(9.4)	7(25.9)	4(50.0)	1(100.0)	18(18.0)	
Total	64(100.0)	27(100.0)	8(100.0)	1(100.0)	100(100.0)	
Treatment						
Anti-TNF Alpha	51(79.7)	17(63.0)	4(50.0)	1(100.0)	73(73.0)	0.09
Anti-TNF Alpha And DMARD	2(3.1)	4(14.8)	0(0.0)	0(0.0)	6(6.0)	
Anti-TNF Alpha And NSAID	11(17.2)	6(22.2)	4(50.0)	0(0.0)	21(21.0)	
Total	64(100.0)	27(100.0)	8(100.0)	1(100.0)	100(100.0)	

Discussion

Our findings demonstrated that the majority of patients exhibited normal or slightly elevated levels of CRP/serum albumin, indicating mild inflammation. However, a small subset of patients displayed moderate or high levels, suggesting varying degrees of inflammation within the studied population. Additionally, the patients exhibited a range of BASDAI scores, with a significant

number experiencing moderate to high levels of disease activity, indicating a substantial inflammatory burden associated with AS. In a recent investigation carried out by Zhong et al. (2021), the C-reactive protein (CRP) to albumin (ALB) ratio (CAR) was identified as a novel biomarker for inflammation. Additionally, CRP demonstrated its reliability and innovation as an indicator for evaluating disease activity in axial spondyloarthritis [11].

A considerable proportion of patients demonstrated elevated or excessively elevated levels of disease activity, indicating suboptimal management of inflammation associated with axial spondyloarthritis (AS) in the majority of cases. Moreover, all patients received anti-tumor necrosis factor alpha (TNF-α) therapy, with a subset also receiving non-steroidal anti-inflammatory drugs (NSAIDs) or disease-modifying antirheumatic drugs (DMARDs), signifying a concerted effort to employ more aggressive treatment strategies for addressing the observed inflammation in individuals with AS. Consistent with the findings of this study, a similar research has shown that the utilization of anti-TNF inhibitors and NSAIDs for a duration of up to 24 weeks can effectively reduce pain and improve joint function. Additionally, this therapeutic approach may increase the likelihood of alleviating symptoms associated with Ankylosing Spondylitis (AS), such as morning stiffness and swelling [12]. Supporting the outcomes of our study, Liu et al. (2016) reported that the introduction of TNF therapy introduces the possibility that adjustments in patient selection may impact the observed risk. Patients who initially receive treatment with anti-TNF agents are likely to present with more severe arthritis, potentially leading to an independent increase in the risk of lymphoma, regardless of the specific treatment administered [13].

Our research demonstrated that all participants in the study received treatment with anti-tumor necrosis factor (TNF) alpha therapy. Furthermore, less than 20% of the patients were administered non-steroidal anti-inflammatory drugs (NSAIDs), and there was a minimal occurrence of concurrent usage of disease-modifying antirheumatic drugs (DMARDs) alongside the anti-TNF alpha treatment. In another study conducted by Maxwell et al. (2015), it was reported that there is substantial evidence of moderate to high quality supporting the efficacy of anti-TNF agents in improving clinical symptoms related to ankylosing spondylitis. However, their study found a higher rate of participants discontinuing the treatment due to adverse events in the anti-TNF agent group, although no evidence suggested an increase in severe adverse events. It is important to note that the occurrence of events was infrequent, and the duration of the trials was relatively short. In general, our study emphasizes the consistent application of this therapeutic approach, while Maxwell et al. (2015) presented evidence supporting the efficacy of anti-tumor necrosis factor (TNF) agents and addressing participant attrition and adverse events [14].

The sociodemographic characteristics of the patients examined in this study offer valuable contextual information that enhances our understanding of the obtained results. The majority of patients aged 31 to 50 years, were male, married, unemployed or underemployed, and resided in urban areas. Additionally, most of the patients reported never having smoked, consumed alcohol, or having a family history of the disease. In terms of their health status, the majority of patients had a normal or overweight body mass index (BMI), while over 60% tested positive for HLAB27, a genetic marker commonly associated with ankylosing spondylitis. The distribution of these

patient factors, encompassing age, sex, employment status, geographical location, and biomarkers, presents potential avenues for further exploration into the role of lifestyle, genetics, and environmental factors in the development and progression of the disease. Furthermore, it underscores the importance of implementing targeted interventions and management strategies specifically tailored to address the needs of vulnerable groups represented within this patient cohort. Consistent with the results obtained in the current study, Bowness (2015) documented that HLA-B27 accounts for approximately thirty percent of the genetic predisposition to ankylosing spondylitis. Moreover, HLA-B27 positive individuals exhibit a variable incidence of acute anterior uveitis, ranging from 40 to 82.5%. Notably, this ocular condition can manifest prior to the onset of ankylosing spondylitis by an average duration of approximately three years [15]. A recent study conducted by Braun et al. (2023) presented findings similar to our research, revealing a historical discovery made 50 years ago regarding the association of HLA B27 alleles with axial spondyloarthritis (AS), a heritable disease encompassed within the axial spondyloarthritis spectrum. HLA B27 accounts for less than 30% of the overall genetic burden, with approximately 60%–90% of global axial spondyloarthritis patients carrying this genetic marker. The arthritogenic peptide hypothesis, which suggests the involvement of self-peptides in the pathogenesis of AS, is based on the immune function associated with HLA B27. Furthermore, HLA-B27 plays a significant role in the classification, diagnosis, and severity assessment of axial spondyloarthritis. Comparative analysis of these studies contributes to our comprehension of AS by examining the sociodemographic characteristics and genetic markers associated with the disease. The findings emphasize the importance of considering both sociodemographic and genetic factors in research, diagnosis, and management of AS and axial spondyloarthritis. However, further investigations are necessary in these domains to advance our knowledge of the disease and develop targeted interventions tailored to specific patient subgroups [16].

The findings of our study highlight the importance of acknowledging the heterogeneity in the phenotypic expression of ankylosing spondylitis and comprehending the associations between specific disease characteristics based on genetic and other factors. Furthermore, the results illustrate the variability in clinical manifestations observed among patients. Although all patients exhibited radiographic evidence of sacroiliitis, the prevalence rates of other features such as peripheral arthritis, dactylitis, uveitis, and HLAB27 positivity varied considerably. This heterogeneity has significant implications for disease screening, treatment decision-making, and prognostic counseling, emphasizing the need for personalized approaches in managing ankylosing spondylitis. Similarly, as revealed in the study conducted by de Winter et al. (2016), peripheral manifestations (arthritis, enthesitis, and dactylitis) and extra-articular manifestations (uveitis, psoriasis, and inflammatory bowel disease) are frequently observed in both ankylosing spondylitis (AS) and non-radiographic axial spondyloarthritis (nr-axSpA). Additionally, the prevalence of peripheral and extra-articular manifestations is relatively equal between AS and nr-axSpA, with the exception of uveitis, which exhibits a slightly higher prevalence in ankylosing spondylitis [17]. Furthermore, according to the findings presented by Bae et al. (2017), approximately 5 to 10% of individuals diagnosed with ankylosing spondylitis also experience concurrent inflammatory bowel disease, specifically Crohn's disease or ulcerative colitis. Therefore, there exists a significant

association between inflammatory bowel disease and both ankylosing spondylitis and rheumatoid arthritis, as observed in a large-scale population-based study. These results imply a potential shared etiopathogenesis between inflammatory bowel disease, ankylosing spondylitis, and rheumatoid arthritis [18].

The findings of our study demonstrated that a considerable proportion of participants reported moderate to high scores on the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), indicating a significant burden of symptoms. Additionally, the Ankylosing Spondylitis Disease Activity Score (ASDAS) characterized nearly half of the participants as having high disease activity. However, more than one-third of the participants exhibited low or inactive disease levels. This diversity in disease activity levels has important implications for identifying predictors of worsening severity and understanding the variability in treatment response among patients. Consistent with the results obtained in this study, Chen et al. (2022) have extensively employed the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) as an assessment tool to evaluate disease activity in individuals with ankylosing spondylitis. They have established an arbitrary cut-off point of ≥4 on the BASDAI scale to indicate high disease activity and initiate biological therapy [19]. Furthermore, a study conducted by Byravan et al. (2021) reveals a statistically significant correlation between BASDAI scores and active sacroiliitis, with individuals exhibiting higher scores being more likely to have active disease as observed on their magnetic resonance imaging (MRI) scans [20].

The results indicate a notable correlation between the ratio of C-reactive protein (CRP) to albumin and the scores on the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Ankylosing Spondylitis Disease Activity Score (ASDAS). This association provides valuable insights into the assessment of inflammatory disease activity. However, the absence of a relationship with HLAB27 status or treatment type suggests that other factors may independently influence these disease characteristics. Consistent with the outcomes of the present study, Nam et al. (2021) reported BASDAI and ASDAS to be correlated, such that patients who initially had low scores on BASDAI), exhibited high scores on ASDAS after undergoing anti-tumor necrosis factor (TNF) treatment. A significant proportion of these patients also displayed elevated levels of ASDAS-CRP. Notably, this group of patients was more likely to discontinue the treatment due to its perceived low efficacy compared to the low-ASDAS group. The incorporation of ASDAS-CRP, either alone or in conjunction with BASDAI, may enhance the evaluation of ankylosing spondylitis patients who are receiving anti-TNF therapy [21]. Furthermore, in a separate investigation conducted by Sertpoyraz (2020), it was observed that the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) scores tended to be higher in patients who tested positive for HLA-B27, although this difference did not reach statistical significance. Similarly, the levels of ischemia-modified albumin were found to be higher in HLA-B27 positive patients, although this difference was not statistically significant [22].

This study presents a significant association between the C-reactive protein to albumin ratio (CRP/ALB) and disease activity measures, namely BASDAI and ASDAS, in individuals with axial spondyloarthritis (AS). These findings suggest that CRP/ALB ratio holds promise as a valuable

indicator for evaluating inflammatory disease activity. However, the lack of correlation with HLA-B27 status or treatment type indicates the involvement of other independent factors influencing disease characteristics. Future investigations should focus on identifying these factors and further examining the subgroup of AS patients exhibiting high ASDAS scores and elevated ASDAS-CRP levels following anti-tumor necrosis factor (TNF) treatment, as they are more prone to treatment discontinuation.

Conclusion

The findings of this study offer significant insights into the characteristics and treatment of individuals with ankylosing spondylitis (AS). The majority of patients exhibited average or mild levels of inflammation based on the CRP/serum albumin ratio, indicating modest inflammatory activity. Disease activity levels, as measured by BASDAI and ASDAS scores, varied among patients, with more than one-third having high or very high scores. Notably, all patients received anti-tumor necrosis factor (TNF) therapy, highlighting its prominent role in AS treatment. The most prevalent comorbidities observed were peripheral arthritis and enthesitis. The positive correlation between CRP/serum albumin and BASDAI/ASDAS scores further supports the role of CRP/serum albumin as an inflammation marker. However, the lack of association with HLA-B27 status suggests that genetic factors independently influence disease processes. While this study provides valuable insights, it is important to acknowledge its cross-sectional design, limiting the ability to establish causal relationships. Longitudinal studies investigating relationships over time would yield more robust conclusions. Moreover, further research is needed to identify predictors of treatment response and explore new targeted therapies. Overall, these results characterize the AS population and support the use of CRP/serum albumin as a biomarker, informing ongoing efforts to optimize the management of ankylosing spondylitis.

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