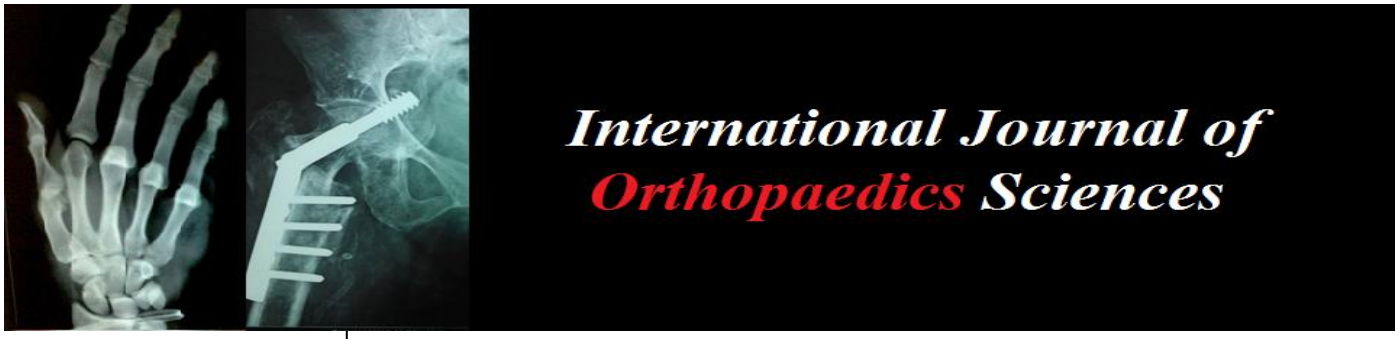

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2024; 10(4): 22-28

www.orthopaper.com
Received: 09-07-2024
Accepted: 12-08-2024

Ahmed Kamel Hadi
Al-Qadisiyah Health Directorate, Al-Qadisiyah, Iraq

Sami Salman Shahabg
Collage of Medicine, University of Baghdad, Baghdad, Iraq

Corresponding Author:
Ahmed Kamel Hadi
Al-Qadisiyah Health Directorate, Al-Qadisiyah, Iraq

Shoulder involvement in ankylosing spondylitis and the measures of disability in a sample of Iraqi patients in a single center study

Ahmed Kamel Hadi and Sami Salman Shahabg

DOI: https://doi.org/10.22271/ortho.2024.v10.i4a.3618

Abstract
Background: Ankylosing spondylitis is a chronic progressive rheumatic disorder with various prevalence rates. Patients with ankylosing spondylitis commonly present with shoulder pain.
Aim of the study: It is to study the prevalence of shoulder pain in patients with ankylosing spondylitis and its relation to standardized disability measures.
Patients and Methods: A descriptive cross-sectional study conducted in the Inpatient Clinic of Rheumatology Unit-Baghdad Teaching Hospital/Medical Complex in Baghdad City-Iraq for the period of six months from1st of December, 2021 till 31st of May, 2022. On a sample of 150 patients with ankylosing spondylitis. The ankylosing spondylitis was diagnosed according to modified New York criteria, and the shoulder pain was diagnosed according to diagnostic criteria for disorders of the shoulder-the Southampton examination schedule.
Results: The shoulder pain was present in 53 of ankylosing spondylitis patients (35.3%), mainly bilateral in 25 patients (47.2%) and less common right side shoulder pain in 20 patients (37.7%). There was a highly significant association between a longer duration of ankylosing spondylitis and shoulder pain (P=0.001). A highly significant association was observed between high erythrocyte sedimentation rate and shoulder pain (p<0.001). There was a highly significant association between the involvement of other peripheral joints and shoulder pain (p<0.001). The means of BASDAI and BASFI scores were significantly higher among ankylosing spondylitis patients with shoulder pain compared to those without shoulder pain (p<0.001).
Conclusions: The prevalence of shoulder pain in Iraqi patients with ankylosing spondylitis was high. BASDAI and BASFI scores were significantly higher among AS patients with shoulder pain. A special attention to the shoulder joint is warranted during the clinical assessment of patients with this disease.

Keywords: Ankylosing spondylitis, shoulder pain, disability measures

Introduction
Ankylosing spondylitis (AS) is a chronic, progressive, inflammatory rheumatic disease classified within the group of spondyloarthropathies (SpA). AS predominantly affects the sacroiliac joints and spine, occasionally extending to peripheral joints and extra-articular sites such as the eyes and gastrointestinal tract. The condition can lead to significant functional impairment, spinal fusion (resembling a “bamboo” spine), and disability, with extra-articular manifestations like anterior uveitis and inflammatory bowel disease (IBD) [1, 2]. Genetic predisposition, particularly the presence of the HLA-B27 gene, plays a critical role, as up to 95% of AS patients are HLA-B27 positive [3]. In Iraq, the prevalence of AS is approximately 0.9%, with a male-to-female ratio of 9:1 [4]. The etiology of AS involves a complex interaction of genetic, immunological, microbial, and possibly endocrinal factors. HLA-B27 is the most significant genetic factor, and microbial agents, including *Klebsiella pneumoniae*, have been proposed to trigger or exacerbate AS [5]. Immune system dysregulation, particularly involving TH17 cells and cytokines like IL-17, IL-6, and TNF-α, also contributes to AS pathogenesis [6]. Clinically, AS is characterized by inflammatory back pain, peripheral joint involvement, and enthesitis. Back pain typically starts in the lower back or sacroiliac joints and is associated with morning stiffness, which improves with exercise [7].

Enthesitis, inflammation at tendon or ligament insertions, is a hallmark feature, often affecting the Achilles tendon, knees, and possibly shoulders [8, 9]. Extra-skeletal manifestations, such as anterior uveitis, occur in up to 30% of AS patients [10]. Treatment strategies include non-pharmacological approaches such as regular exercise and maintaining good posture, alongside pharmacological options. NSAIDs are the first-line pharmacological treatment, followed by biologic DMARDs like TNF inhibitors [11, 12]. While bDMARDs are effective, they are costly, leading to the widespread use of alternatives such as sulfasalazine in underdeveloped regions [13]. Imaging, including MRI and ultrasound, plays a key role in early diagnosis and monitoring disease progression [14]. Purpose of the investigation is to investigate the relationship between disability measures and shoulder discomfort in patients with ankylosing spondylitis.

Methods

This descriptive cross-sectional study was conducted in the Inpatient Clinic of the Rheumatology Unit at Baghdad Teaching Hospital/Medical Complex in Baghdad, Iraq, from December 1, 2021, to May 31, 2022. The study aimed to investigate shoulder involvement in patients with ankylosing spondylitis (AS) diagnosed based on the modified New York criteria [15]. The study population included all adult patients (aged ≥ 18 years) with AS who visited the Rheumatology Unit during the study period. Inclusion criteria included an AS diagnosis, adequate cognitive status, and consent to participate. Exclusion criteria included pregnancy, malignant diseases, recent shoulder trauma, diabetes mellitus, cervical radiculopathy, or refusal to participate. A total of 150 AS patients were selected consecutively based on these criteria. Data collection was conducted through direct interviews using a questionnaire designed by the researcher and supervisor. Collected data included demographic information (age, gender), clinical characteristics (BMI, residence, smoking status), and specific details about AS, such as disease duration, Erythrocyte Sedimentation Rate (ESR), and clinical features of shoulder involvement (pain location, SPADI pain scale) [16]. Additional assessments included other peripheral joint involvement, BASDAI scores [17], BASFI scores [18], and HLA-B27 status. The prescription of anti-TNF-α therapy followed standardized criteria for patients with active disease (BASDAI ≥ 4) despite adequate NSAID trials. Shoulder pain was defined based on clinical criteria, including a complaint of pain for at least one month, assessed using the Southampton Examination Schedule [19]. The SPADI questionnaire, a validated tool for assessing shoulder pain and disability, was used to quantify the severity of shoulder involvement [20]. The Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Bath Ankylosing Spondylitis Functional Index (BASFI) were used to evaluate disease activity and functional limitation, respectively [17, 18]. Ethical approval was obtained from the Iraqi Board for Medical Specializations, and patient confidentiality was ensured. Oral informed consent was secured from all participants. Statistical analysis was performed using SPSS version 22. Descriptive statistics were presented as mean ± standard deviation and frequencies. The Chi-square test (or Fisher's exact test, when necessary) was used for categorical variables, and an independent t-test was used to compare means. A p-value of < 0.05 was considered significant, and results were presented as tables or graphs.

Results

This study included 150 patients with ankylosing spondylitis (AS) who presented with a mean age of 35.3±9.1 years and a range of (18-55 years); 30% of AS patients were in age group < 30 years, 39.3% of them were in the age group 30-39 years, 20% of them were in the age group 40-49 years and 10.7% of AS patients were in the age of 50 years and above. Male AS patients were more than females, with a male to female ratio of 9.7:1, (Table 1).

Table 1: Demographic characteristics of AS patients

Variable	No.	%
Age mean ± SD (35.3±9.1 years)		
<30 years	45	30.0
30-39 years	59	39.3
40-49 years	30	20.0
≥50 years	16	10.7
Total	150	100.0
Gender		
Male	136	90.7
Female	14	9.3
Total	150	100.0

No=Number. SD=Standard Deviation

The mean BMI of AS patients was (26.9 Kg/m^2) two AS patients were underweight, 35.3% of them had normal BMI, 36.7% of them were overweight, and 26.7% of them were obese. Most AS patients had an urban residence, and only 10% of them had a rural residence. More than two-thirds (74.7%) of AS patients were married, while 24% of them were single and 1.3% of them were divorced. No exercise was reported for 42.7% of AS patients, while half of them had irregular exercise and 37% of AS patients had regular exercise. Current smoking was presented by 37.3% of AS patients, while half of the patients had no smoking history and 12.75% of them had ex-smoking history (Table 2).

Table 2: Social and clinical characteristics of AS patients

Variable	No	%
Body mass index mean ± SD (26.9±4.9 Kg/m^2)		
Underweight	2	1.3
Normal	53	35.3
Overweight	55	36.7
Obese	40	26.7
Total	150	100.0
Residence		
Urban	135	90.0
Rural	15	10.0
Total	150	100.0
Marital status		
Married	112	74.7
Single	36	24.0
Divorced	2	1.3
Total	150	100.0
Exercise habit		
No	64	42.7
Irregular	75	50.0
Regular	11	7.3
Total	150	100.0
Smoking		
Current smoking	56	37.3
No smoking	75	50.0
Ex-smoking	19	12.7
Total	150	100.0

No=Number, SD=Standard Deviation

The mean duration of AS disease was (5.9 years) 14.7% of AS patients had a disease duration of less than one year, 46% of patients had a disease duration of 1-5 years, 22% of patients had a disease duration of 6-10 years and 17.3% of them had disease duration of more than ten years. Mean ESR of AS patients was (19.7 mm/hr.) 56% of patients had high ESR. (Table 3).

Table 3: AS disease characteristics

Variable	No.	%
AS duration mean ± SD (5.9±6.1 years)		
<1 year	22	14.7
1-5 years	69	46.0
6-10 years	33	22.0
>10 years	26	17.3
Total	150	100.0
ESR level mean ± SD (19.7±4.3 mm/hr.)		
Normal	66	44.0
High	84	56.0
Total	150	100.0

No=Number, SD=Standard Deviation, ESR=Erythrocytes Sedimentation Rate

The shoulder pain was present in (35.3%) of AS patients, mainly bilateral (47.2%) and less common right-side shoulder pain (37.7%). The mean duration of shoulder pain was (3.9 years); 7.5% of AS patients with shoulder pain had a pain duration of less than one year, 71.7% of them had a pain duration of 1-5 years, 17% of them had pain duration of 6-10 years and 3.8% of them had pain duration of more than ten years. The mean current SPADI pain scale was (56.7%), while the mean disability scale was (42.7%) and the total SPADI scale of AS patients with shoulder pain was (48.6%); 43.4% of patients had < 50% total SPADI, 47.2% of patients had 50-70% total SPADI and 9.4% of patients had more than 70% total SPADI. The common shoulder pain treatment was NSAIDs (50.9%), followed by; ETN (26.4%), Infliximab (5.7%), Adalimumab (3.8%), NSAIDS & conventional DMARDs (3.8%), NSAIDs & ETN (3.8%), Infliximab & NSAID (1.9%) & Local Glucocorticoid injection (1.9%). (Table 4).

Table 4: Clinical characteristics of shoulder involvement

Variable	No	%
Side of shoulder pain		
Right	20	37.7
Left	8	15.1
Bilateral	25	47.2
Total	53	100.0
Duration of shoulder pain mean ± SD (3.9±3.5 years)		
<1 year	4	7.5
1-5 years	38	71.7
6-10 years	9	17.0
>10 years	2	3.8
Total	53	100.0
Current SPADI pain scale mean ± SD (56.7±21.1%)		
Disability scale mean ± SD (42.7±21.8%)		
Total SPADI scale mean ± SD (48.6±19.6%)		
<50%	23	43.4
50-70%	25	47.2
>70%	5	9.4

No=Number, SD=Standard Deviation, SPDAI=Shoulder Pain and Disability Index, NSAID=Nonsteroidal Anti-Inflammatory Drugs, ETN=Etanercept, csDMARD=Conventional Synthetic Disease-Modifying Antirheumatic Drugs.

Involvement of other peripheral joints was reported by 37.3% of AS patients. Mean BASDAI score of AS patients was (3.26) and the mean BASFI score of AS patients was (3.72). The common current AS treatment of studied patients was ETN (64%), followed by Infliximab (11.3%), Adalimumab (9.3%), Golimumab (6%), NSAIDs (5.3%), Physiotherapy (2%), Infliximab & csDMARD (1.3%) & ETN & csDMARD (0.7%). The mean treatment duration for AS was (3.1 years); 60.7% of AS patients had a treatment duration of 1-5 years. Tissue typing for HLAB27 was done on 51 of patients studied which was positive in 30 patients (20%) and negative in 21 patients (14%), (Table 5).

Table 5: Other characteristics of AS disease

Variable	No	%
Other peripheral joint involvement		
Yes	56	37.3
No	94	62.7
Total	150	100.0
BASDAI score mean ± SD (3.26±1.91)		
BASFI score mean ± SD (3.72±3.6)		
HLAB27		
Positive	30	20.0
Negative	21	14.0
Not done	99	66.0
Total	150	100.0
AS current treatment		
NSAIDS	8	5.3
ETN	96	64.0
Infliximab	17	11.3
Adalimumab	14	9.3
Golimumab	9	6.0
Physiotherapy	3	2.0
Infliximab & csDMARD	2	1.3
ETN & csDMARD	1	0.7
Total	150	100.0
AS treatment duration mean ± SD (3.1±3.4 years)		
<1 year	37	24.7
1-5 years	91	60.7
>5 years	22	14.7
Total	150	100.0

No=Number, BASDAI=Bath Ankylosing Spondylitis Disease Activity Index, SD=Standard Deviation, BASFI=Bath Ankylosing Spondylitis Functional Index HLAB27=Human leukocyte antigen-B27. NSAID=Nonsteroidal Anti-Inflammatory Drugs. ETN= Etanercept, csDMARD=Conventional Synthetic Disease-Modifying Antirheumatic Drugs

The mean age of AS patients with shoulder pain was significantly older (P=0.02). There was a significant association between female AS patients and development of shoulder pain (P=0.003). No significant differences were observed between AS patients with shoulder pain and AS patients without shoulder pain regarding BMI (P=0.63), residence (P=0.45), marital status (P=0.73), and smoking history (P=0.7). There was a significant association between AS patients who complained shoulder pain and no exercises (P=0.02). There was a highly significant association between a longer duration of AS disease and shoulder pain (P=0.001). A highly significant association was observed between the high ESR of AS patients and shoulder pain (p<0.001), (Table 6).

Table 6: Distribution of demographic characteristics of AS patients according to shoulder pain. Distribution of social and clinical characteristics of AS patients in relation to shoulder pain. Distribution of AS disease characteristics of AS patients according to shoulder pain

Variable	Shoulder pain				P
	Yes		No		
	No	%	No	%	
Age					
< 30 years	12	22.6	33	34.0	0.2*NS
30-39 years	20	37.7	39	40.2	
40-49 years	15	28.3	15	15.5	
≥ 50 years	6	11.3	10	10.3	
Mean ± SD (years)	37.4±8.3		34±9.3		0.02**S
Gender					
Male	43	81.1	93	95.9	0.003***S
Female	10	18.9	4	4.1	
Shoulder pain					
Variable	Yes	%	No	%	P
	No	%	No	%	
Body mass index					
Underweight	1	1.9	1	1.0	0.63*NS
Normal	16	30.2	37	38.1	
Overweight	19	35.8	36	37.1	
Obese	17	32.1	23	23.7	
Residence					
Urban	49	92.5	86	88.7	0.45**NS
Rural	4	7.5	11	11.3	
Marital status					
Married	41	77.4	71	73.2	0.73*NS
Single	11	20.8	25	25.8	
Divorced	1	1.9	1	1.0	
Exercise habit					
No	27	50.9	37	38.1	0.02**S
Irregular	26	49.1	49	50.5	
Regular	0	-	11	11.3	
		Smoking			
Current smoking	20	37.7	36	37.1	0.7**NS
No smoking	25	47.2	50	51.5	
Ex-smoking	8	15.1	11	11.3	
Variable	**Shoulder pain**				**P**
	Yes		**No**		
	No	**%**	**No**	**%**	
AS duration					
<1 year	7	13.2	15	15.5	0.001*S
1-5 years	16	30.2	53	54.6	
6-10 years	12	22.6	21	21.6	
>10 years	18	34.0	8	8.2	
ESR					
Normal	10	18.9	56	57.7	< 0.001*S
High	43	81.1	41	42.3	

Table 7: Distribution of other AS disease characteristics according to shoulder pain

Variable	Shoulder pain				P
	Yes		No		
	No	%	No	%	
Other peripheral joint					
Yes	44	83.0	12	12.4	<0.001*S
No	9	17.0	85	87.6	
BASDAI score					
Mean ± SD	4.5±1.8		2.5±1.5		< 0.001**S
BASFI score					
Mean ± SD	5.7±4.9		2.6±1.8		< 0.001**S
HLAB27					
Positive	13	24.5	17	17.5	0.07*NS
Negative	3	5.7	18	18.6	
Not done	37	69.8	62	63.9	
AS current treatment					
NSAIDS	1	1.9	7	7.2	0.001***S
ETN	25	47.2	71	73.2	
Infliximab	11	20.8	6	6.2	
Adalimumab	6	11.3	8	8.2	
Golimumab	5	9.4	4	4.1	
Physiotherapy	3	5.7	0	-	
Infliximab & cDMARD	2	3.8	0	-	
ETN & cDMARD	0	-	1	1.0	
Treatment duration					
<1 year	10	18.9	27	27.8	0.45*NS
1-5 years	34	64.2	57	58.8	
>5 years	9	17.0	13	13.4	

There was a highly significant association between the involvement of other peripheral joints and shoulder pain (p<0.001). The means of BASDAI and BASFI scores were significantly higher among AS patients with shoulder pain as compared to BASDAI and BASFI scores for AS patients without shoulder pain (p<0.001). No significant differences were observed between AS patients with shoulder pain and AS patients without shoulder pain regarding HLAB27 (P=0.07) and treatment duration (P=0.45). A significant association was observed between ETN use by AS patients and a lower prevalence of shoulder pain (P=0.001), (Table 7).

Discussion

Regular assessment of ankylosing spondylitis (AS) is crucial for early detection of complications and timely management to prevent disease progression and facilitate rehabilitation51. The current study found that the prevalence of shoulder pain in AS patients was 35.3%. This prevalence is lower than that reported by Abed *et al*. [21] in Iraq, where shoulder pain was observed in 51.8% of AS patients. Similarly, it is lower than the 50% prevalence reported by Ali Ou Alla *et al*. [22] in a case-control study conducted in Morocco. However, the shoulder pain prevalence in this study is higher than the 10.6% reported by Ines *et al*. [23] in Tunisia. Another study by Lambert *et al*. [24] in Canada found a shoulder pain prevalence of 3.5% in registry records and 24.7% when clinically assessed. These variations may be attributed to differences in patient demographics, disease severity, sample size, methodology, and clinical evaluation approaches across different studies. Nevertheless, the shoulder pain prevalence observed in this study aligns with the range reported by several authors, ranging from 3.5% to 33% [25]. In this study, shoulder pain was predominantly bilateral (47.2%), with right-sided pain less common (37.7%). This finding is consistent with Ali Ou Alla *et al*. [22], who also reported that shoulder pain in AS patients was often bilateral. The mean duration of shoulder pain was 3.9 years, with 71.7% of patients reporting pain lasting 1-5 years. These results are comparable to those of Ines *et al*. [23] in Tunisia. The mean SPADI pain scale score in AS patients was 56.7%, with a mean disability score of 42.7% and a total SPADI score of 48.6%, with 47.2% of patients scoring between 50-70%. These findings align with those of Eksioglu *et al*. [26] in Turkey. In this study, NSAIDs were the most common treatment for shoulder pain (50.9%), followed by Etanercept (26.4%), Infliximab (5.7%), and Adalimumab (3.8%), consistent with Akhtar *et al*. [27] in Pakistan, who confirmed the effectiveness of NSAIDs in managing shoulder pain. The mean age of AS patients with shoulder pain was significantly older (P=0.02), a finding consistent with Djade *et al*. [28], who noted that shoulder pain incidence increases in patients over 40 years old, particularly when combined with chronic inflammatory disorders. A significant association between female gender and shoulder pain (P=0.003) was also observed, in line with Ali Hu, *et al*. 58 and Rusman *et al*. [29], who reported that although AS predominantly affects men, women with AS experience higher disease burden and shoulder pain perception. Khosravi *et al*. [30] in Iran similarly found a higher prevalence of shoulder pain in middle-aged women compared to men. This study also found a significant association between lack of exercise and shoulder pain (P=0.02), consistent with findings from Regnaux *et al*. [31], who demonstrated that regular exercise reduces the risk of shoulder pain in AS patients. Additionally, there was a strong association between longer AS disease duration and shoulder pain (P=0.001), as observed in other studies by Ali Ou Alla *et al*. [22] and Eksioglu *et al*. [26], which linked prolonged AS with increased shoulder pain risk. Pradeep *et al*. [32] similarly reported that long-standing AS is associated with poor outcomes and complications. A highly significant association between elevated ESR levels and shoulder pain (p<0.001) was also noted, consistent with Kim *et al*. [33] in South Korea, who found that higher ESR levels correlated with increased shoulder pain in AS patients. Moreover, a significant association between peripheral joint involvement and shoulder pain (p<0.001) was observed, consistent with Will *et al*. [34], who reported a similar relationship in UK patients. Additionally, higher BASDAI and BASFI scores were significantly associated with shoulder pain (p<0.001), supporting findings by Soker *et al*. [35] and Moshrif *et al*. [36], who noted that increased AS activity correlates with greater shoulder pain prevalence. However, Ines *et al*. [23] found no significant relationship between shoulder pain and BASDAI or BASFI scores, likely due to the smaller sample size in their study. Finally, Etanercept use was significantly associated with a lower prevalence of shoulder pain (P=0.001), consistent with studies by Mohammed ha al. [37], Song *et al*. [38], and Colina *et al*. [39], all of which reported that Etanercept effectively reduces shoulder pain in AS patients. There were no significant associations between HLA-B27 positivity, smoking, and shoulder pain, consistent with Eksioglu *et al*. [26] and Ines, *et al*. [23].

Conclusion

In Iraqi patients with ankylosing spondylitis, shoulder discomfort was prevalent, typically bilateral, and had a duration of 1-5 years. The disability scales were also high. In patients with ankylosing spondylitis, shoulder discomfort is frequently associated with the following risk factors: Older age, female gender, lack of exercise, prolonged duration of ankylosing spondylitis, active inflammation, involvement of other peripheral joints, and increased disease activity. The incidence of shoulder discomfort is effectively reduced by the use of etanercept by patients with ankylosing spondylitis.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Hamilton L, Barkham N, Bhalla A, *et al*. BSR, and BHPR guideline for the treatment of axial spondyloarthritis (including ankylosing spondylitis) with biologics. J Rheumatol. 2016;56(2):313-316.
2. Wang C-R, Wang C-T, Lee CT, *et al*. Rare occurrence of inflammatory bowel disease in a cohort of Han Chinese ankylosing spondylitis patients: A single institute study. Sci Rep. 2017;7:13165-13165.
3. Reveille JD. The genetic basis of spondyloarthritis. Ann Rheum Dis. 2011;70(1).
4. Al-Bedri KZ. Prevalence, Clinical Features, and Radiological Features of Iraqi Patients with Ankylosing Spondylitis. JNSR. 2014;4(24):2224-2253.
5. Zhang L, Zhang Y, Chen J, *et al*. The association of

HLA-B27 and *Klebsiella pneumoniae* in ankylosing spondylitis: A systematic review. Micro Pathog. 2018;117:49-4.
6. Raychaudhuri SP, Raychaudhuri SK. IL-23/IL-17 axis in spondyloarthritis-bench to bedside. Clin Rheumatol. 2016;35(6):1437-1441.
7. Braun J, Inman R. Clinical significance of inflammatory back pain for diagnosis and screening of patients with axial spondyloarthritis. Ann Rheum Dis. 2010;69(7):1264-1268.
8. Althoff CE, Sieper J, Song IH, *et al*. Active inflammation and structural change in early active axial spondyloarthritis as detected by whole-body MRI. Ann Rheum Dis. 2013;72(6):967-973.
9. McGonagle D, Benjamin M, Marzo-Ortega H, *et al*. Advances in the understanding of entheseal inflammation. Curr Rheumatol Rep. 2002;4(6):500-506.
10. AL-Bedri KZ, Al-Quriashi NK, Gorial FI, *et al*. An observational descriptive cross-sectional study of 200 iraqi adult patients with ankylosing spondylitis: Analysis of Ocular Manifestations. Adv Life Sci Technol. 2016;44:2225-2236.
11. Heijde VDD, Ramiro S, Landewé R, *et al*. 2016 update of the ASAS-EULAR management recommendations for axial spondyloarthritis. Ann Rheum Dis. 2017;76(6):978-991.
12. Ward MM, Deodhar A, Gensler LS, *et al*. 2019 update of the American College of Rheumatology/Spondylitis Association of America/Spondyloarthritis Research and Treatment Network recommendations for the treatment of ankylosing spondylitis and non-radiographic axial spondyloarthritis. Arthritis Care Res. 2019;71(10):1285-1299.
13. Liu YF, Dong H, Tu SH, *et al*. Etanercept in the treatment of ankylosing spondylitis: A systematic review and meta-analysis. Exp Ther Med. 2014;8(5):1585-1582.
14. D'Agostino MA. Ultrasound imaging in spondyloarthropathies. Best Pract Res Clin Rheumatol. 2010;24(5):693-700.
15. Linden VDS, Valkenburg HA, Cats A. Evaluation of diagnostic criteria for ankylosing spondylitis. Arthritis Rheum. 1984;27(4):361-368.
16. Roach KE, Budiman-Mak E, Songsiridej N, *et al*. Development of a shoulder pain and disability index. Arth Care Res. 1991;4(4):143-149.
17. Sieper J, Rudwaleit M, Baraliakos X, *et al*. The Assessment of SpondyloArthritis International Society (ASAS) handbook: A guide to assess spondyloarthritis. Ann Rheum Dis. 2009;68(2).
18. Calin A, Garrett S, Whitelock H, *et al*. A new approach to defining functional ability in ankylosing spondylitis: The development of the Bath Ankylosing Spondylitis Functional Index. *J Rheumatol*. 1994;21(12):2281-2285.
19. Palmer KT. The Southampton Examination Schedule for the diagnosis of musculoskeletal disorders of the upper limb. Med Lav. 2007;98(2):111-117.
20. Roy JS, MacDermid JC, Woodhouse LJ. Measuring shoulder function: Systematic review of four questionnaires. Arthritis Rheum. 2009;61(5):623-632.
21. Abed H, Al-Sarray A, Al Hafidh A. Health Related Quality Of Life Of Patient With Ankylosing Spondylitis Attending Baghdad Teaching Hospital. Ann Trop Med Public Health. 2021;24(5):165-170.
22. Alla AOS, Bahiri R, Amine H, *et al*. Ultrasound features of shoulder involvement in patients with ankylosing spondylitis: A case-control study. BMC Musculoskelet Disord. 2013;14:272-277.
23. Ines C, Ferjani H, Maatallah K, *et al*. Clinical and radiological features of shoulder involvement in spondylarthritis. Ann Rheum Dis. 2021;80:1283.
24. Lambert RG, Dhillon SS, Jhangri GS, *et al*. High prevalence of symptomatic enthesopathy of the shoulder in ankylosing spondylitis: Deltoid origin involvement constitutes a hallmark of disease. Arthritis Rheum. 2004;51(5):681-690.
25. Huang SW, Wang JY, Lin CL, *et al*. Patients with Axial Spondyloarthritis Are at Risk of Developing Adhesive Capsulitis: Real-World Evidence Database Study in Taiwan. J Clin Med. 2020;9(3):787.
26. Eksioglu E, Bal A, Gulec B, *et al*. Assessment of shoulder involvement and disability in patients with ankylosing spondylitis. Rheumatol Int. 2006;27(2):169-173.
27. Akhtar M, Nadeem RDA, Gillani SFHS, *et al*. Comparison of intra-articular NSAID (ketorolac) injection versus hyaluronic acid injection for the mean decrease of pain score (according to UCLA shoulder rating scale) in the management of adhesive capsulitis. Pak J Pharm Sci. 2019;32(3):953-956.
28. Djade CD, Porgo TV, Zomahoun HTV, *et al*. Incidence of shoulder pain in 40 years old and over and associated factors: A systematic review. Eur J Pain. 2020;24(1):39-50.
29. Rusman T, Vollenhoven VRF, Bruinsma VDHIE. Gender Differences in Axial Spondyloarthritis: Women Are Not So Lucky. Curr Rheumatol Rep. 2018;20(6):35.
30. Khosravi F, Amiri Z, Masouleh NA, *et al*. Shoulder pain prevalence and risk factors in middle-aged women: A cross-sectional study. J Bodyw Mov Ther. 2019;23(4):752-757.
31. Regnaux JP, Davergne T, Palazzo C, *et al*. Exercise programs for ankylosing spondylitis. Cochrane Database Syst Rev. 2019;10(10).
32. Pradeep DJ, Keat A, Gaffney K. Predicting outcome in ankylosing spondylitis. Rheumatology. 2008;47(7):942-945.
33. Kim H, Lee J, Ahn JK, *et al*. Predictive factors of radiographic progression in ankylosing spondylitis. Korean J Intern Med. 2015;30(3):391-397.
34. Will R, Kennedy G, Elswood J, *et al*. Ankylosing spondylitis and the shoulder: Commonly involved but infrequently disabling. J Rheumatol. 2010;27(1):177-182.
35. Soker G, Bozkirli ED, Soker E, *et al*. Magnetic resonance imaging evaluation of shoulder joint in patients with early stage of ankylosing spondylitis: A case-control study. Diagn Interv Imaging. 2016;97(4):419-424.
36. Moshrif A, Mosallam A, Rayan M, *et al*. Characterization of ankylosing spondylitis in Upper Egypt. Int J Clin Rheumatol. 2018;13(1):52-59.
37. Al-Osami MH, Gorial FI, Albeer MR. Etanercept is Effective and Relatively Safe in a Sample of Iraqi Patients with Ankylosing Spondylitis. J Nat Sci Res. 2013;3(14):124-129.
38. Song I, Hermann K, Haibel H. Effects of Etanercept versus sulfasalazine in early axial spondyloarthritis on active inflammatory lesions as detected by whole-body

MRI (ESTHER): A 48-week randomised controlled trial. Ann Rheum Dis. 2011;70(4):590-596.
39. Colina M, Ciancio G, Garavini R, *et al*. Combination treatment with Etanercept and an intensive spa rehabilitation program in active ankylosing spondylitis. Int J Immunopathol Pharmacol. 2009;22(4):1125-1129.

How to Cite This Article
Hadi AK, Shahabg SS. Shoulder involvement in ankylosing spondylitis and the measures of disability in a sample of Iraqi patients in a single center study. International Journal of Orthopaedics Sciences. 2024;10(4):22-28.