Dicle Tıp Dergisi / Dicle Med J (2025) 52 (3) : 431-441

www.diclemedj.org

Original Article / Özgün Araştırma

Clinically detectable impairments in patients with subacromial pain syndrome: A case-control study

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Received: 30.01.2025; Revised: 21.07.2025; Accepted: 22.07.2025

Abstract

Objective: This study aimed to clearly identify systemic problems, functional impairments, psychological status, and quality of life differences between patients with subacromial pain syndrome (SAPS) and asymptomatic controls, to support the development of multidimensional rehabilitation programs. Additionally, the determinants of symptom severity in SAPS patients were investigated.

Methods: This case-control study included 80 participants (40 SAPS patients and 40 controls). The assessments included the prevalence of metabolic syndrome, NSAID consumption, pain severity, upper extremity function, elbow function, wrist-hand function, grip strength, psychological status (kinesiophobia, anxiety, depression, and pain catastrophising), and quality of life.

Results: Patients with SAPS showed higher pain levels, DASH scores, NSAID consumption, and prevalence of metabolic syndrome compared to the control group ($p<0.05$). Functional impairments were detected in scapular upward rotation (90° flexion), elbow flexion strength, wrist-hand function, grip strength, and quality of life ($p<0.05$). Kinesiophobia and pain catastrophising scores were significantly higher in SAPS patients ($p<0.05$). Finally, activity-related pain ($p=0.017$), depression ($p=0.015$), and grip strength ($p<0.001$) were identified as significant and independent predictors of disability severity (DASH score), explaining 45.3% of its variance.

Conclusion: Clinical impairments in SAPS patients are multidimensional, highlighting the potential benefit of biopsychosocial and multidisciplinary rehabilitation approaches.

Keywords: Pain, shoulder, biopsychosocial, subacromial pain syndrome

DOI: 10.5798/dicletip.1784782

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Subakromial ağrı sendromu olan hastalarda klinik olarak saptanabilen bozukluklar: Bir vaka-kontrol çalışması

Öz

Amaç: Bu çalışmanın amacı, çok boyutlu rehabilitasyon programlarının geliştirilmesini desteklemek için subakromiyal ağrı sendromlu (SAPS) hastalar ile asemptomatik kontroller arasındaki sistemik sorunları, fonksiyonel bozuklukları, psikolojik durumu ve yaşam kalitesi farklılıklarını net bir şekilde tanımlamaktır. Ayrıca, SAPS hastalarında semptom şiddetinin belirleyicileri araştırılmıştır.

Yöntemler: Bu vaka-kontrol çalışmasına 80 katılımcı (40 SAPS hastası ve 40 kontrol) dahil edilmiştir. Değerlendirmeler metabolik sendrom prevalansı, NSAID tüketimi, ağrı şiddeti, üst ekstremite fonksiyonu, dirsek fonksiyonu, bilek-el fonksiyonu, kavrama gücü, psikolojik durum (kinezyofobi, anksiyete, depresyon ve ağrı katastrofisi) ve yaşam kalitesini içermektedir.

Bulgular: SAPS' lı hastalarda kontrol grubuna kıyasla daha yüksek ağrı seviyeleri, DASH skorları, NSAID tüketimi ve metabolik sendrom prevalansı bulundu ($p<0,05$). Skapular yukarı rotasyon (90° fleksiyon), dirsek fleksiyon kas kuvveti, el bileği-el fonksiyonu, kavrama gücü ve yaşam kalitesinde fonksiyonel bozukluklar tespit edildi ($p<0,05$). SAPS hastalarında kinezyofobi ve ağrı katastrofizasyonu skorları anlamlı derecede yüksekti ($p<0,05$). Son olarak, aktivite ile ilişkili ağrı ($p=0,017$), depresyon ($p=0,015$) ve kavrama gücü ($p<0,001$), engellilik şiddetinin (DASH skoru) anlamlı ve bağımsız belirleyicileri olarak tespit edilmiş ve varyansın %45,3'ünü açıklamıştır.

Sonuç: SAPS hastalarındaki klinik bozukluklar çok boyutludur ve biyopsikososyal ve multidisipliner rehabilitasyon yaklaşımlarının potansiyel faydasını vurgulamaktadır.

Anahtar kelimeler: Ağrı, omuz, biyopsikososyal, subakromial ağrı sendromu.

INTRODUCTION

Shoulder pain is a prevalent musculoskeletal disorder associated with both physical and psychological factors[1]. Subacromial pain syndrome (SAPS) is a broad term describing non-traumatic, unilateral shoulder pain, encompassing various conditions such as subacromial bursitis, biceps tendinopathy, supraspinatus tendinopathy, calcific tendinitis, and partial rotator cuff tears[2]. The potential contributing factors to SAPS include altered scapular kinematics, abnormal electromyographic activity of the shoulder girdle and cervical muscles, imbalances in muscle force couples, and tightness of the posterior capsule[3].

Despite the rising prevalence of SAPS, treatment satisfaction remains suboptimal, with approximately one-third of patients reporting persistent pain, functional disability, and psychological distress even after one year of treatment[4]. The long-term consequences of SAPS may disrupt musculoskeletal function and lead to chronic pain cycles[5]. These persistent symptoms indicate that difficulties in identifying the underlying impairments of SAPS patients may limit treatment effectiveness[6]. To optimize rehabilitation strategies, it is essential for clinicians to achieve a clear and comprehensive understanding of the musculoskeletal and biopsychosocial characteristics of SAPS patients in comparison with asymptomatic individuals[7]. The evidence from the limited literature on this topic suggests that SAPS may be associated with not only shoulder problems but also systemic problems[8], deterioration in general physical function of the upper extremity, including elbow[9], grip strength[10], and impaired psychosocial status, etc.[11].

Considering the scarce number of studies in the literature, this study aimed to clearly identify systemic problems, functional impairments,

psychological status, and quality of life differences between patients with subacromial pain syndrome (SAPS) and asymptomatic controls, to support the development of multidimensional rehabilitation programs. Additionally, determinants of symptom severity in SAPS patients were investigated.

METHODS

A total of 80 participants with (n=40) and without (n=40) SAPS were included in this case-control study. SAPS diagnosis was based on a previous procedure performed by an orthopaedic surgeon[3]. All participants were assessed by an experienced physiotherapist according to the standardized study protocol. The present study was approved by the local ethics committee (decision number: 2023/674, date: 12/07/2023). All participants provided written and verbal consent.

Participants

Eligibility criteria included patients with SAPS lasting at least 3 months, with full passive range of glenohumeral movement, and a positive painful arch. The MRIs were evaluated by an experienced orthopaedic surgeon, blinded to the study protocol. Acromion type (I, II, III, IV), acromioclavicular joint osteoarthritis, subacromial-subdeltoid bursitis, tendinosis-partial tear or calcification in one or more rotator cuff tendons were assessed using MRI[3]. They were excluded if they had a full-thickness rotator cuff tear, labral tear, glenohumeral instability, rheumatic disease, cervical radiculopathy, and previous shoulder surgery[3].

Age, height, weight, and sex-matched asymptomatic volunteers were selected from relatives of patients and university staff for asymptomatic controls. Participants with a history of shoulder injury requiring surgery or experiencing shoulder pain were excluded from the control group. Each control participant was individually matched (1:1) with a SAPS case based on age (within five years), height (within 5 cm), weight (within 3 kg), and sex (1:1)[12].

Outcome measurements

The demographic characteristics of the participants, including age, sex, and body mass index, were recorded. The biopsychosocial assessment of the participants was carried out according to the recommendations of Wijma et al.[13].

Metabolic syndrome was defined in accordance with the Consensus Statement of the US National Heart, Lung and Blood Institute and the American Heart Association. The presence of metabolic syndrome and the use of non-steroidal anti-inflammatory drugs (NSAIDs) were recorded.

The following reliable and valid tests and questionnaires were additionally used to assess all participants:

Pain severity: Visual Analog Scale (VAS) was used[14].

Upper extremity and elbow-wrist function: Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH)[15], Patient-Rated Wrist Evaluation Questionnaire (PRWE)[16] were used. In addition, the Push-Pull Dynamometer (New York, USA) for measuring muscle strength in elbow flexion and elbow extension.

Hand function and grip strength: Michigan Hand Outcomes Questionnaire (MHQ)[17] and digital hand dynamometer (Baseline®)[18] were used.

Psychosocial outcomes: Tampa-Scale of Kinesiophobia (TSK)[19], Hospital Anxiety and Depression Scale (HADS)[20], Pain Catastrophizing Scale[21], and 12-Item Short-Form Health Survey (SF-12)[22] were used for kinesiophobia, anxiety, depression, catastrophizing, and quality of life.

The Push-Pull dynamometer was positioned at a 90° elbow flexion and 0° elbow extension. The patient was instructed to reach maximum

contraction and hold the position for 5 seconds. Two assessments were carried out, and their average was calculated[18]. Grip strength was measured by asking participants to apply their maximum grip force for 6 seconds on each of three trials, and the results were averaged[18].

Additionally, measurements were taken of the distance between the inferior angle of the scapula-T7 spinous process, midpoint of the medial border-spinous process, and superior angle of the scapula-T2 spinous process. Scapular upward rotation was measured for all participants using two inclinometers, according to the procedure of Watson et al.[23]. Scapular rotation measurements were taken at shoulder abduction angles of 0, 30, and 90 degrees, as well as at shoulder flexion angles of 30 and 90 degrees[23].

Sample size

The sample size was estimated using grip strength data obtained from a preliminary pilot analysis conducted with a total of 20 participants (10 SAPS patients and 10 asymptomatic controls). Based on this pilot data, the minimum required sample size was calculated using G*Power Software® to detect a significant between-group difference. An anticipated effect size of 0.63, with a significance level of 0.05 and power of 80%, indicated the need for at least 40 participants per group, resulting in a total sample size of 80.

Statistical Analysis

The IBM® SPSS® Statistics for Windows software (ver. 22.0; IBM Corp., NY, USA) was used. Mean ± standard deviation (mean ± SD) and ratios (%) were used for descriptive statistics of the continuous variables and categorical variables, respectively[3]. The demographic characteristics of the groups were analysed with the independent samples t-test with Cohen's d effect size and the $\chi 2$ test with Cramer's V effect size. Multivariate analysis of variance (MANOVA) with Bonferroni adjustment was used to examine the differences in the continuous variables between patients with SAPS and asymptomatic controls. The calculation of partial eta-square ($\eta p2$) was performed in order to classify the effect size according to the previous procedure[24]. $\chi 2$ test with Cramer's V effect size was used to evaluate categorical variables[25].

The study predicted the SAPS severity using linear regression. The correlations between variables were tested using Pearson correlation coefficients. Correlation coefficients were reported as strong (>0.5), moderate (0.3 to 0.5) and weak (0.2 to 0.3)[26]. The present study used stepwise multiple linear regression analysis to determine the variables associated with SAPS severity, as assessed by the DASH score. Prior to regression analysis, variables significantly correlated with the DASH score were included in the regression model. Regression equation formula was calculated. Outliers were identified and treated using Cook's distance and centred leverage value. Beta coefficient values for variables and R2 were interpreted [26]. The level of significance was set at $p<0.05$.

RESULTS

The study included 80 participants, 40 of whom were SAPS (56.23 ± 10.77 years, 27 females) and 40 were asymptomatic controls (54.48 ± 13.04 years, 27 females), aged between 18 and 65. Table 1 presents the demographic data of the participants. There were no statistically significant differences between the groups in terms of demographic data (Table 1).

Table I: Participant characteristics

Demographics	SAPS (n=40)	Control (n=40)	p	Effect size
Age (years)	56.23 ± 10.77	54.48 ± 13.04	0.51	d= 0.14
Sex (Female: Male)	27: 13	27: 13	1.00	V= 0.00
Body mass index (kg/m^2)	30.16 ± 5.37	28.38 ± 4.68	0.12	d= 0.35
Dominant side (Right: Left)	39 : 1	38 : 2	0.55	V= 0.06
Injured side (Right: Left)	34 : 6	-	-	-
Education level				
Primary school	23 (57.5%)	23 (57.5%)		
Secondary school	0 (0.0%)	3 (7.5%)	0.23	
High school	5 (12.5%)	2 (5.0%)		V= 0.23
University	12 (30.0%)	12 (30.0%)		

Mean ± SD values for the continuous variables. P-values for differences in means between groups calculated using independent t-test or Mann-Whitney U test based on normal distributions, and χ2 was used for categorical variables.

Comparison of outcome measures in patients with and without SAPS

There were statistically significant differences between SAPS patients and asymptomatic controls in all pain parameters and in upper extremity function, with large to very large effect sizes. Specifically, patients with SAPS reported higher pain intensity at rest (VAS-rest: 3.71 ± 2.91 vs. 0.00; $p < 0.001$; $\eta^2p = 0.456$), during activity (VAS-activity: 6.56 ± 2.37 vs. 0.00; $p < 0.001$; $\eta^2p = 0.797$), and at night (VAS-night: 6.53 ± 2.78 vs. 0.00; $p < 0.001$; $\eta^2p = 0.738$). Likewise, the DASH score was markedly higher in the SAPS group compared to controls (75.94 ± 24.89 vs. 4.48 ± 5.60; $p < 0.001$; $\eta^2p = 0.801$), indicating a very large effect size.

There was a significant difference in pain and DASH scores between the participants with large effect sizes in favor of the SAPS group because the comparison was made between the patient population and the asymptomatic population (p<0.001; η2p range=0.456-0.801, Table 2).

The presence of metabolic syndrome (p=0.043, V=0.226) and the use of NSAIDs (p=0.011, V=0.284) were higher in the SAPS group, with strong to very strong effect sizes. Scapular upward rotation was higher in asymptomatic controls at 90 degrees of shoulder flexion, with large effect size (p<0.001; η2p=0.160, Table 2).

There was a significant difference in elbow flexion muscle strength between the participants, with medium effect size in favor of the asymptomatic controls (p=0.022; η2p=0.066). There was a significant deterioration in wrist functional status as measured by the PRWE in patients with SAPS, with large effect size (p<0.001; η2p=0.625, Table 2).

Regarding Michigan hand score, the asymptomatic control group had higher scores for overall hand function (p=0.003; η2p=0.111), activities of daily living (p=0.001; η2p=0.137), and work performance (p<0.001; η2p=0.377), with moderate and large effect sizes. There was a significant difference in grip strength between the participants, with small effect size in favor of the asymptomatic controls (p=0.045; η2p=0.049, Table 2).

Table II: Comparison of outcome measures in patients with and without SAPS

	SAPS (n=40)	Control (n=40)	p	η^2p or V
VAS rest	3.71±2.91	0	<0.001	0.456
VAS activity	6.56±2.37	0	<0.001	0.797
VAS night	6.53±2.78	0	<0.001	0.738
Metabolic syndrome (yes)	8	2	0.043	0.226
Using of non-steroidal anti-inflammatory drugs	6	0	0.011	0.284
Distance between the inferior angle of the scapula and the spinous process	8.66±1.04	8.47±1.39	0.494	0.006
Distance between the midpoint of the medial border of the scapula and the spinous process	8.65±9.32	6.79±1.15	0.220	0.020
Distance between the superior angle of the scapula and the spinous process	8.07±1.16	7.57±1.18	0.064	0.045
Scapular upward rotation at 0 degree abduction	18.78±4.12	19.00±4.20	0.818	0.001
Scapular upward rotation at 30 degree abduction	22.94±5.10	23.89±4.38	0.381	0.010
Scapular upward rotation at 90 degree abduction	31.17±4.79	31.20±7.70	0.986	0.000
Scapular upward rotation at 30 degree flexion	23.58±4.71	24.71±5.96	0.357	0.011
Scapular upward rotation at 90 degree flexion	30.05±5.75	35.41±6.65	<0.001	0.160
DASH	75.94±24.89	4.48±5.60	<0.001	0.801
Elbow flexion muscle strength	25.41±6.15	28.23±4.53	0.022	0.066
Elbow extension muscle strength	26.44±5.13	27.84±5.82	0.257	0.016
PRWE	56.60±29.76	2.78±2.45	<0.001	0.625
Michigan hand score				
overall hand function	72.94±27.47	88.58±15.85	0.003	0.111
activities of daily living	76.66±26.73	93.46±14.10	0.001	0.137
work performance	52.56±29.51	89.35±16.62	<0.001	0.377
pain	37.69±20.25	40.76±20.44	0.506	0.006
esthetics	80.92±20.47	81.08±25.66	0.976	0.000
patient satisfaction	75.10±28.02	80.76±26.04	0.358	0.011
Handgrip strength	25.12±11.98	31.14±14.41	0.045	0.049
TSK	38.28±8.33	0.28±1.16	<0.001	0.913
HADS anxiety	8.28±4.03	6.76±3.60	0.085	0.039
HADS depression	6.48±3.34	6.07±3.27	0.586	0.004
PCS	15.69±12.45	0.23±1.01	<0.001	0.440
SF-12 physical	44.10±8.35	52.67±3.15	<0.001	0.321
SF-12 mental	39.95±5.42	43.90±4.44	0.001	0.140

VAS: Visual analog scale; DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire; PRWE: Patient-Rated Wrist Evaluation Questionnaire; HADS: Hospital Anxiety and Depression Scale (HADS); PCS: Pain Catastrophizing Scale; TSK: Tampa-Scale of Kinesiophobia; SF-12: 12-Item Short-Form Health Survey; Multivariate analysis of variance (MANOVA) with Bonferroni adjustment was used to examine the differences in the continuous variables between patients with SAPS and asymptomatic controls. Partial eta square was calculated to classify effect size (ηp2) [(ηp2=0.0099, small effect size), (ηp2=0.0588, medium effect size), (ηp2=0.1379, large effect size)]. χ2 test with Cramer's V effect size was used to evaluate categorical variables.

The group of SAPS patients had significantly higher scores for kinesiophobia (p<0.001; η2p=0.913) and catastrophizing (p<0.001; η2p=0.440), with large effect sizes. The quality of life of SAPS patients was lower than that of asymptomatic controls in terms of both physical (p<0.001; η2p=0.321) and mental components (p=0.001; η2p=0.140, Table 2), with large effect sizes.

Determinants of symptom severity in patients with SAPS

There were weak to moderate correlations between DASH scores and activity-related pain (r=0.380, p=0.017), night pain (r=0.383, p=0.016), elbow flexion muscle strength (r=-0.366, p=0.022), wrist functional status (r=0.316, p=0.049), handgrip strength (r=-0.338, p=0.035), kinesiophobia (r=0.374, p=0.019), anxiety (r=0.456, p=0.003), depression (r=0.443, p=0.005), catastrophizing

(r=0.384, p=0.016), and physical component of quality of life (r=-0.487, p=0.002). The regression model included independent variables that correlated with DASH scores in order to examine the determinants of symptom severity in patients with SAPS.

The results of the regression analysis showed that activity-related pain (β=3.303, p=0.017), depression (β=2.445, p=0.015), and grip strength (β=-1.433, p=<0.001) were significant and independent determinants of symptom severity (DASH) in patients with SAPS, explaining 45.3% of the variance (Table 3). Higher activity-related pain, depression, and lower grip strength were associated with symptom severity. The explanatory variables and coefficients were used to calculate the regression equation of the dependent variable.

Table III: Regression model for the severity of SAPS.

	r	p
VAS rest	0.145	0.380
VAS activity	0.380	0.017
VAS night	0.383	0.016
Distance between the inferior angle of the scapula and the spinous process	-0.147	0.372
Distance between the midpoint of the medial border of the scapula and the spinous process	-0.189	0.248
Distance between the superior angle of the scapula and the spinous process	-0.187	0.253
Scapular upward rotation at 0 degree abduction	-0.223	0.172
Scapular upward rotation at 30 degree abduction	-0.243	0.136
Scapular upward rotation at 90 degree abduction	-0.098	0.554
Scapular upward rotation at 30 degree flexion	-0.087	0.598
Scapular upward rotation at 90 degree flexion	-0.061	0.714
Elbow flexion muscle strength	-0.366	0.022
Elbow extension muscle strength	-0.149	0.372
PRWE	0.316	0.049
Michigan hand score		
overall hand function	-0.020	0.905
activities of daily living	-0.101	0.540
work performance	-0.102	0.537
pain	-0.150	0.361
esthetics	-0.189	0.250
patient satisfaction	-0.038	0.818
Handgrip strength	-0.338	0.035
TSK	0.374	0.019
HADS anxiety	0.456	0.003
HADS depression	0.443	0.005
PCS	0.384	0.016
SF-12 physical	-0.487	0.002
SF-12 mental	-0.059	0.719
Regression equation formula is: 102.615 + (3.303×VAS activity score) + (2.445×depression score) + (-1.433×grip strength) Dependent variable: DASH, R = 0.705; R^2 = 0.496; adjusted R^2 = 0.453		

VAS: Visual analog scale; DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire; PRWE: Patient-Rated Wrist Evaluation Questionnaire; HADS: Hospital Anxiety and Depression Scale (HADS); PCS: Pain Catastrophizing Scale; TSK: Tampa-Scale of Kinesiophobia; SF-12: 12-Item Short-Form Health Survey; Pearson product-moment correlation coefficients. Correlation coefficients were classified as strong (>0.5), moderate (0.3 to 0.5) and weak (0.2 to 0.3). Stepwise multiple linear regression analysis was used to identify variables that had the most influence on SAPS severity assessed by the DASH score.

Regression equation formula is: 102.615 + (3.303×VAS activity score) + (2.445×depression score) + (-1.433×grip strength), R = 0.705; adjusted R2 = 0.453.

DISCUSSION

This study was designed to determine, using a multidimensional assessment method, whether there are clinical impairments in terms of

systemic problems, functional status, psychological status, and quality of life in patients with SAPS compared with asymptomatic controls. The pain and DASH scores of SAPS patients, as well as their use of NSAIDs, were significantly higher than those of the control group, which is expected due to the presence of the disease. However, it is notable that the percentage of metabolic syndrome was higher in SAPS patients.

The SAPS group exhibited impairments compared to the control group in scapular upward rotation at 90 degrees of shoulder flexion, elbow flexion muscle strength, wrist functional status, hand functional status, and handgrip strength. Similarly, patients with SAPS scored higher on kinesiophobia and catastrophizing, possibly related to the presence of the disease. It was found that the presence of SAPS had a negative impact on quality of life in terms of both physical and mental components. Lastly, higher activity-related pain, the presence of depression, and lower grip strength were found to be associated with SAPS symptom severity. Although the findings need to be validated in long-term follow-up and treatment studies, we believe that these findings may provide a broader understanding of functional limitations beyond shoulder pathology in SAPS patients.

Burne et al. reported an association between metabolic syndrome and SAPS[27]. This association was attributed to various factors, including disturbed glucose metabolism and atherosclerosis[28], hyperglycemia[8], tendon thickening[29], and dysfunction of pain inhibitory mechanisms[30]. In line with the limited literature, we found that the presence of metabolic syndrome was higher in SAPS patients compared to controls. Referring patients from orthopaedic and physiotherapy clinics to other clinics, such as internal medicine or gastroenterology, could benefit SAPS patients in controlling the metabolic syndrome and thereby potentially alleviating SAPS symptoms.

The study revealed a clear limitation in scapular upward rotation in patients with SAPS at 90 degrees of shoulder flexion. Kibler et al. indicated that alterations in scapular movement may be associated with the symptom severity of SAPS[31]. Saito et al. reported that patients with SAPS have decreased scapular external rotation, increased or decreased scapular upward rotation, decreased scapular posterior tilt, and altered motor control[32]. They also reported that scapular-focused interventions improve shoulder pain and function in patients with SAPS[32]. In line with the existing evidence to date, we believe that focusing on scapular training in patients with SAPS will be beneficial in terms of functionality.

The study found that patients with SAPS experienced physical impairments not only related to the shoulder, but also to elbow flexion muscle strength, wrist functional status, hand functional status and handgrip strength. Mostafaee et al. suggested that imbalances in shoulder and scapular muscles could potentially lead to imbalances in the shoulder-elbow-wrist-hand kinetic chain, resulting in overloading of the joints and their components in patients with SAPS[33]. Alizadehkhaiyat et al. reported that a hand grip task is associated with increased activation of the supraspinatus and infraspinatus muscles[34]. A positive relationship has been reported between isometric hand grip strength and isokinetic peak torque of the shoulder stabilising muscles[35]. Considering the existing literature and the results of our study, it seems important to evaluate and rehabilitate distal joints and muscles in patients with SAPS to improve functional status as a result of the force transmitted through myofascial pathways.

Kinesiophobia and catastrophizing scores were higher in patients with SAPS. Furthermore, the quality of life in both physical and mental components was lower than that of

asymptomatic controls. Cognitive psychological factors have been reported to be associated with higher levels of kinesiophobia and, consequently, higher prevalence of shoulder pain and disability[3]. Martinez-Calderon et al. suggested that SAPS patients tend to exhibit kinesiophobia in response to pain and have more difficulties with both pain inhibition and movement facilitation[7]. Rehabilitation adherence in SAPS patients may be hindered by kinesiophobia and catastrophizing. However, they are potentially modifiable variables that, when minimised or eliminated, facilitate earlier pain relief and functional recovery. Clinicians should be aware of the presence of kinesiophobia and catastrophizing in their patients before providing any intervention, as these conditions may necessitate a specific and individualised approach compared to routine physiotherapy programs. The findings that SAPS patients have impairments involving many variables in addition to the shoulder joint, compared with asymptomatic controls, also explain the decrease in quality of life in our study. Lastly, previous study has reported an association between depression and prolonged shoulder symptoms, higher levels of shoulder disability and poorer quality of life[11]. Consistent with the literature, our findings indicate that higher level of depression significantly influences the severity of SAPS.

CONCLUSION

In conclusion, this study demonstrated that clinical impairments in patients with SAPS are multidimensional, involving not only shoulder pain and dysfunction, but also impairments in elbow and wrist-hand function, decreased grip strength, and significant psychological distress such as kinesiophobia, depression, and pain catastrophizing. Importantly, activity-related pain, depression, and reduced grip strength were identified as independent predictors of functional disability, together explaining nearly half of the variation in DASH scores. These findings support the need for comprehensive assessment protocols that extend beyond the shoulder joint and include upper extremity function and psychosocial screening. Clinically, implementing individualized treatment plans that incorporate grip strength training, pain education, and psychological support, particularly for depressive symptoms, may enhance rehabilitation outcomes. Moreover, addressing systemic factors such as metabolic syndrome and NSAID overuse should be considered within multidisciplinary care models. The study highlights the importance of adopting a biopsychosocial rehabilitation framework tailored to the specific functional and emotional needs of patients with SAPS.

This study has several limitations that need to be considered. The results of this study cannot determine causality due to its case-control design. It is necessary to follow our sample over time to provide strong evidence for the identified clinical impairments. It would be advisable for future studies to include a more homogeneous sample in terms of sex in order to minimise sex-related differences.

Ethics Committee Approval: The present study was approved by the local ethics committee (decision number: 2023/674, date: 12/07/2023). All participants provided written and verbal consent.

Conflict of Interest: The authors declared no conflicts of interest.

Financial Disclosure: The authors declared that this study has receivet no financial support.

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