

Do Shoulder Disability Associate with Shoulder Pain Intensity, Mobility and Fear of Movement in Patients with Shoulder Dysfunction?

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ABSTRACT

Shoulder dysfunction often leads to pain and movement restrictions, interfering with daily activities such as dressing and bathing. These limitations affect the physical, psychological, and social well-being of patients, resulting in shoulder-related disability. Due to inconsistent findings in previous research, this study aimed to investigate the association of shoulder disability with pain intensity, mobility, and fear of movement in individuals with chronic shoulder dysfunction. A cross-sectional study was conducted on 113 participants (both genders), aged 21–65 years, with chronic shoulder dysfunction. The Penn Shoulder Score (PSS) was used to assess shoulder disability. Pain intensity was measured using the Visual Analogue Scale (VAS), range of motion (ROM) was evaluated with goniometry, and fear of movement was assessed using the Fear-Avoidance Belief Questionnaire (FABQ). Spearman's rank correlation and multiple linear regression analyses were performed.

A strong negative correlation was found between shoulder disability and pain intensity ($r = -0.78$). Moderate positive correlations were observed between disability and shoulder ROM: flexion ($r = 0.14$), abduction ($r = 0.32$), external rotation ($r = 0.44$), and internal rotation ($r = 0.30$). A weak negative correlation was found between disability and fear of movement ($r = -0.173$). Regression analysis revealed that VAS, flexion, and external rotation significantly predicted disability ($p < 0.05$). Shoulder disability is strongly associated with pain intensity and moderately with shoulder mobility. Fear of movement shows a weak association with shoulder disability in individuals with chronic shoulder dysfunction.

Keywords: Kinesiophobia, Visual Analogue Scale, Penn Shoulder Score, Fear-Avoidance Belief, Shoulder Pain, Disability.

INTRODUCTION

Dysfunction of the shoulder joint causes about 20–30% of musculoskeletal pain in general population [1]. It mainly causes

morbidity and disability which limits the individual's daily life, work and social activities [2]. Shoulder pain leads to restricted and painful movement of the arm,

which results in difficulties in performing movement-related activities [3]. Disability related to the shoulder was found in 30% of healthy subjects above the age of 65 years and was significantly associated with reduced movement [4]. A variety of shoulder disorders can cause a reduction in shoulder range of motion and which subsequently leads to disability [1].

Clinically, patients with shoulder pain and movement restriction have an inability to reach overhead or behind their head or their back, all of which interferes with activities of daily living. Such limitations also affect psychological and social functions of individuals [5]. It will lead to disability over a period of time. Disability related to the shoulder was significantly associated with reduced movement [4]. Previously Anwar et al [1] reported significant relationship between shoulder flexion, abduction and rotation ROMs with severity of pain and physical disability in patient with shoulder dysfunction. One study found an association between a limited shoulder range of motion and disability related to shoulder in 30% of healthy adults aged 65 years or older. Another study reported a significant correlation between abduction and rotation with shoulder function in idiopathic loss of shoulder ROM patients [3]. In addition to shoulder pain and disability, patients may suffer from psychological symptoms that include anxiety, depression, catastrophizing and fear of motion which has significant impact on Quality of Life (QoL) [6].

Fear of motion is considered to be a relevant factor in order to understand how acute pain becomes chronic for some people because fear of injury or reinjury. It will lead to disability over a period of time by avoiding movements due to fear [7,8]. One review-based study revealed that a greater degree of kinesiophobia is associated with greater levels of pain intensity, pain severity and disability as well as lower quality of life in patients with chronic musculoskeletal pain. Fear imposes a barrier to the prescribed exercise and reduce adherence to treatment

and perseverance of a negative experience with pain [1].

There are some studies showed evident inconsistency regarding the association of shoulder disability, shoulder pain and fear of movement like- Luque-suarez et al [9] found significant association of pain, disability and fear of movement, whereas Ozden et al [2] showed lack of relationship between these variables in shoulder pathologies. Lentz et al [6] reported that kinesiophobia was associated with greater shoulder disability, whereas Clausen et al showed a lack of relationship between both variables.

Considering all the above-mentioned study findings which are observed to be inconclusive due to some methodological constraints, this cross-sectional study was planned to investigate the extent of association between the variables (shoulder disability with shoulder pain intensity, shoulder mobility and fear of movement) in different shoulder pathologies contributing shoulder dysfunction includes adhesive capsulitis, rotator cuff impingement syndrome, bicipital tendinitis and subacromial impingement syndrome individually.

MATERIALS & METHODS

Study participants

This study was conducted in the department of musculoskeletal physiotherapy, MGM hospital Aurangabad, Maharashtra, India from July 2021 to August 2022. In this cross-sectional study, we included 113 patients of both genders and age group between 21-65year, Patients who had clinically diagnosed with unilateral shoulder dysfunction (adhesive capsulitis, rotator cuff disease, bicipital tendinitis and subacromial impingement syndrome, supraspinatus tendinopathy.) clinical diagnosis by therapist was confirmed using standard evaluation and specific special tests, patient reported symptoms of shoulder pain more than 2months, shoulder pain on VAS ranging from 4-7. History of major trauma, shoulder pain with cervical origin or cervical radiculopathy symptoms that affect the upper

extremity, any systemic disease, neurological symptoms affecting upper limb were excluded.

Collection of data

The patients were interviewed and the information gathered about their demographic data of patients including name, age, gender, occupation, any history of systemic diseases and medications. Assessment of shoulder joint including pain intensity by VAS and range of motion using universal goniometer was taken for most appropriate diagnosis. Penn shoulder score and fear avoidance belief questionnaire was filled/ self-administered by patients with shoulder dysfunction.

Outcome measures

Penn shoulder score is a self-administered questionnaire for the assessment of shoulder disability. It has 100-point scale that consists of 3 subscales, including pain, satisfaction, and function. The pain subscale consists of 3 pain items includes pain at rest, with normal activities and with strenuous activities. All three subscale has a 10-point numeric rating scale with end points of “no pain” and “worst possible pain.” It takes 5 to 10 minutes for a patient to complete and is the only reliable and valid region-specific measure for the shoulder [10].

The secondary outcomes were visual analogue scale (VAS) is used for measurement of pain which is a straight line with the endpoints defining extreme limits such as ‘no pain at all’ and ‘pain as bad as it could be’. On the line connecting the two endpoints, the patient is asked to indicate where his degree of pain. The subject's pain is then defined as the difference between "no pain at all" and the mark, where 0 represents no pain and 10 the worst possible pain [10]. Universal goniometer was used to measure shoulder range of motion of flexion, abduction, adduction, internal rotation, external rotation [11]. The FABQ is used to

assess fear avoidance in patients with shoulder pain. It includes two subscales for fear avoidance beliefs about work (FABQ-W) and physical activity (FABQ-PA). The FABQ-W and FABQ-PA both have a total of seven components. Five additional items are included in the FABQ; however, they are not included in the sub-scale score. A seven-point scale is used for responses, with (0 strongly disagree) and (6 strongly agree). The FABQ-W and FABQ-PA have maximum scores of 42 and 24, respectively; higher scores indicate more fear avoidance beliefs. Items are included for the relevant sub-scale scores. Test-retest reliability for the fear-avoidance belief questionnaire is high [12].

STATISTICAL ANALYSIS

The collected data entered in Microsoft Excel and analyzed using SPSS version 26.0th. The mean and standard deviation for age, side affected, gender, VAS, PSS, FABQ were calculated. Normal distribution of data was analysed using Kolmogorov-Smirnov test and Shapiro-wilk test. Spearman rank test used to check significant correlation between disability with pain intensity, mobility and fear of movement in patients with shoulder dysfunctions as data were not normally distributed & non-parametric. The level of significance was set at $p < 0.05$. A linear multivariable regression model was used to observe the extent of association between the outcome measures (PSS), VAS, Range of motion (Goniometry) and FABQ.

RESULT

A total of 113 participants (66 male and 47 female) recruited for this study. The study participants consist of a cohort of shoulder dysfunction with a varying diagnosis, including Supraspinatus Tendinopathy, Rotator cuff disease, Subacromial impingement syndrome, Bicipital Tendinitis, Adhesive capsulitis.

Table 1 Demographic Characteristics of participants

Characteristics	
AGE (Mean +/- SD)	47.80± 8.60
No of Males (%)	66 (58%)
No of females (%)	47(42%)
Right	63(56%)
Left	50(44%)
Symptom Duration (months) (Mean± SD)	3.02 ± 0.77
Adhesive Capsulitis n (%)	35 (31%)
Supraspinatus Tendinopathy (n %)	39 (35%)
Rotator cuff disease (n %)	32 (28%)
Subacromial impingement syndrome (n %)	4 (4%)
Bicipital Tendinitis	3 (3%)

Table 2 shows study outcomes including VAS (Pain intensity), Shoulder ROM, Penn Shoulder Score (PSS) and Fear-avoidance belief questionnaire.

Study Outcomes	Mean ± SD	Range
PAIN (VAS score)	5.84 ± 1.10	4-7
RANGE OF MOTION		
Flexion (in degrees)	135.9±15.74	60-180
Abduction (in degrees)	106.8 ±18.4	30-180
External rotation (in degrees)	47.43±12.8	0-75
Internal rotation (in degrees)	52.65±9.39	0-90
PENN SHOULDER SCORE	45.92 ±9.71	23-61
FABQ	35.61 ±13.23	03-60

Table 3 Demonstrates the correlation between disability with pain intensity, mobility and fear of movement.

Variables	Disability (PSS)	
	r value	p value
VAS		
On Activity	-0.7809	<0.0001
PROM		
Flexion	0.1414	0.1352
Abduction	0.3216	0.0005***
External Rotation	0.4405	<0.0001****
Internal Rotation	0.3085	0.0009***
FABQ	-0.1739	0.0654

P value significant***, Highly significant****

Table 4- Multivariable Linear Regression Analysis of PSS total score (Dependent variable) with shoulder pain, range of motion and fear of movement (exposure variables)

Variables	Unstandardized		Standardized β	P value	95% CI for Standardized β	
	Beta	Std. Error			Lower Limit	Upper Limit
Constant (PSS score)	49.852	6.205		0.000	37.551	62.154
VAS	-5.698	0.436	-0.680	0.000	-6.562	-4.833
Flexion	0.115	0.033	0.186	0.001	0.050	0.180
Abduction	0.038	0.029	0.073	0.185	-0.019	0.095
ER	0.276	0.065	0.367	0.000	0.146	0.405
IR	-0.112	0.088	-0.109	0.204	-1.286	0.062
FABQ	-0.062	0.037	-0.086	0.096	-0.136	0.011

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0.857a	0.734	0.719	5.17149	0.734	48.817	6	106	0.000

a. Predictors: (Constant), FABQ, VAS, Flexion, Abduction, ER, IR

b. Dependent Variable: PSS

DISCUSSION

This study set out to determine the association of shoulder disability with shoulder pain intensity, shoulder mobility and fear of movements in patients with shoulder dysfunction.

The present study revealed that shoulder disability was directly associated with shoulder pain intensity, shoulder mobility in patients with shoulder dysfunction which accepts our hypothesis. However, fear of movement (kinesiophobia) was weakly associated with shoulder disability among patients with shoulder dysfunction.

In current study, shoulder disability was highly associated with shoulder pain as a pain level increases, disability associated with shoulder also increases. Due to presence of pain and disability, person with shoulder dysfunction might have fear of aggravating pain during shoulder movements which may affect ADLs and have impact on social functioning and activities. Over a period of time, because of pain people avoid shoulder movements and causes immobilization complications such as deconditioning which provokes more pain and leads to functional impairments [2]. One review study found disability and pain were shown to be associated with psychological pain beliefs of the individual.[13] Previously, lot of studies showed that levels of pain and shoulder disability reported using different outcome measures-SPADI and DASH are correlated significantly in patients with shoulder pathologies [6,14,15].

In the present study, the shoulder disability significantly associated with shoulder mobility in patients with shoulder dysfunction. There was moderate to weak association of shoulder disability with shoulder abduction, external rotation, flexion and internal rotation movements.

In the context of shoulder dysfunction, a large number of studies support our study findings. Uçurum SG et al [16] reported a significant correlation between abduction and rotation movement with shoulder function in idiopathic loss of shoulder range

of motion patients. Similarly, there was weak to moderate correlation between disability and shoulder movements. Previous studies reported that the shoulder abduction, forward flexion and rotations have moderate to good correlation with upper limb activities such as, washing the back, and combing hair. Anwar et al [1] explored the cross-sectional association of shoulder movement (flexion, abduction, external rotation, internal rotation) was found to be associated with disability. As there is increase in limitation of shoulder movement due to increase in pain level. As pain level is high its distribution is widespread and it limits individuals' activity which will leads to disability over a period of time.

Another factor that can contribute shoulder disability is fear to perform shoulder movements. Fear of movement causes limitation for adequate execution of movement or activity making patients careful to avoid activities which are prone to aggravation of pain and leading to disability. But we observed fear of movement assessed by FABQ were weakly associated with shoulder disability. It has shown negative correlation indicating that increasing score inversely affects the function among patients with shoulder dysfunction. Patients maintain a fear of activity and assume that the activity is directly related to the presence of pain. This behavioral response makes patients expose to more disability. Clausen et al [17] recently investigated whether kinesiophobia is associated with shoulder function in a heterogeneous subacromial impingement with shoulder pain. This study supports our findings that fear of movement was associated with shoulder function, but its influence was small. In previous study revealed that greater level of kinesiophobia was associated with both greater shoulder pain intensity and disability [9]. Major DH et al [18] conducted a study and observed higher level of fear of movement associated with higher level of disability. However, a study done by Ozden et al [2] observed fear

of movement was associated with neither shoulder pain nor function which contradicts our findings. In addition, Martinez-Calderon and colleagues [13] conducted a systemic review and concluded pain and disability were shown to be associated with psychological pain beliefs of the individual. However, some studies in this review also show that fear of movement is not associated with pain and disability. As we got weak association of shoulder disability with fear of movement could be justified by- as Fear of movement favors hyper vigilance and avoidance behaviors and consequently, shoulder pain individuals often immobilize their shoulder to avoid certain movements. Exercise therapy produces huge benefits in individuals with chronic shoulder pain and is often the preferred choice of therapy. Nevertheless, these maladaptive behaviors mean a barrier to practice exercise, which hampers recovery [3]. Based on the present findings of the study, we cannot confirm as the sample was mainly composed of participants with the chronic shoulder pain. On multifactorial linear regression analysis was performed to find out extent of association between Penn shoulder score with VAS, shoulder ranges and Fear-avoidance belief questionnaire. It has been observed that PSS significantly added difference in VAS, shoulder flexion and external rotation. However there has been no difference were seen in shoulder abduction, internal rotation and fear-avoidance belief questionnaire. Taken collectively, our findings definitely support the strong association of shoulder disability with shoulder pain intensity and shoulder mobility; however, shoulder disability was weakly associated with fear of movement.

Limitation of the study

This study results might be cofounded by gender wise uneven distribution, age, BMI. In addition, the present study had a heterogeneous cohort of patients with shoulder dysfunction including variety of

shoulder disorders. And the subjective /patient reported outcome measure bias could occur as the outcomes were expressed on ordinal scale.

CONCLUSION

This cross-sectional study reconfirms the evidence of the definite association between shoulder disability and shoulder pain, shoulder mobility and fear of movement in patients with shoulder dysfunction. This study also demonstrated the strong association of shoulder disability with shoulder pain intensity and mild to moderate associated with shoulder mobility. However, shoulder disability was weakly associated with fear of movement in patients with shoulder dysfunction.

Declaration by Authors

Ethical Approval:

Before the commencement of the study, Ethical committee approval was obtained from MGM Institute of physiotherapy research committee Aurangabad, Maharashtra India. Informed consent taken from the participants.

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