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Prevalence of Scapular Dyskinesia among Female Students at Jouf University – Alqurayyat: A Cross Sectional Study

Rozpowszechnienie dyskinezy szkaplerzowej wśród studentek Uniwersytetu Jouf – Alqurayyat: badanie przekrojowe

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Abstract

Purpose. To find out the prevalence, characteristic and type of scapular dyskinesia among female students at Jouf University – Alqurayyat.

Methods. A cross-sectional design. One hundred thirty-six female students were recruited from Alqurayyat female branch – Jouf University (Northern Saudi Arabia), to participate in this study. Demographic data were assessed through a structural questionnaire, scapular dyskinesia was clinically assessed through direct observation (Scapular Dyskinesia Test) and manually assisted movements (Scapular Assistance Test (SAT) and Scapular Reposition (Retraction) Test (SRT)), and the levels of pain and functional disability were assessed through Shoulder Pain and Disability Index (SPADI).

Results. The prevalence of scapular dyskinesia was 99.3%, with 56.3% of them had affected left hand and 76% of them had type II existence. There was significant association between scapular dyskinesia and shoulder function ($p < 0.05$).

Conclusion. The prevalence of scapular dyskinesia among female students at Jouf University - Alqurayyat was 99.3%, with most of them having left hand involvement and presence of type II dyskinesia.

Key words:

Scapular dyskinesia, Scapular movement, Shoulder pain, Disability

Streszczenie

Cel. Określenie częstości występowania, cech i rodzaju dyskinezy szkaplerzowej wśród studentek Uniwersytetu Jouf – Alqurayyat.

Metody. Projekt przekrojowy. Do udziału w badaniu zrekrutowano sto trzydzieści sześć studentek z żeńskiego oddziału w Alqurayyat na Uniwersytecie Jouf (Północna Arabia Saudyjska). Dane demograficzne oceniano za pomocą kwestionariusza strukturalnego, dyskinezę szkaplerzową oceniano klinicznie poprzez bezpośrednią obserwację (test dyskinezy szkaplerzowej) i ruchy wspomagane ręcznie (test wspomaganie łopatki (SAT) i test odstawienia (retrakcji) łopatki (SRT)), natomiast poziom bólu oraz niepełnosprawność funkcjonalną oceniano za pomocą wskaźnika bólu barku i niepełnosprawności (SPADI).

Wyniki: Częstość występowania dyskinezy szkaplerzowej wynosiła 99,3%; 56,3% przypadków dotyczyło lewej ręki, a u 76% wystąpił typ II. Zaobserwowano istotny związek między dyskinezą szkaplerzową a funkcją barku ($p < 0.05$).

Wniosek: Częstość występowania dyskinezy łopatki wśród studentek Uniwersytetu Jouf w Alqurayyat wyniosła 99,3%, przy czym u większości z nich dolegliwość dotyczyła lewej ręki oraz typu II.

Słowa kluczowe

Dyskineza szkaplerzowa, ruchy łopatki, ból barku, niepełnosprawność

Introduction

The shoulder joint movement shows a critical part in the function of upper extremity and the activity of daily life. Lifetime risk for shoulder pathology is between 40-60% [1]. In Saudi Arabia, the prevalence of shoulder pain among medical student was 25.6% and it affects the life and performance of daily duty for 11.3% of students [2].

The motion of shoulder girdle is complex and requires coordinated movement of scapula and humerus [3, 4]. The scapula plays key role in synchronizing this shoulder kinematic [5], particularly to good function and alignment of both glenohumeral and acromioclavicular joints [6]. Position of scapula optimizes the activation of shoulder muscles especially rotator cuff and development of strength in whole upper limb [7]; alteration in this position or motion of scapula called scapular dyskinesia [8, 9].

Scapular dyskinesia can broadly be defined as loss of control of normal scapular physiology, mechanics, and motion, as Dyskinesia (dys [alteration of] kinesis [motion]) [6]. It is classified into 3 types; (1) type I: a posterior displacement from the posterior thorax of the inferior medial angle, (2) type II: a posterior displacement from the posterior thorax of the entire medial border of the scapula and (3) type III: an early scapular elevation or excessive/insufficient scapular upward rotation (dysrhythmia) during dynamic observation [5]. Plenty factors might cause the dyskinesia as bony causes like clavicle fracture (malunion / nonunion) and thoracic kyphosis. Joint related causes include acromioclavicular instability and arthritis, and glenohumeral internal derangement. Neurologic causes consist of palsy of long thoracic and spinal accessory nerve and cervical radiculopathy. Finally, the most causative of dyskinesia are the soft tissue related causes like injuries of rotator cuff, tightness of the pectoralis minor and short head of the biceps, stiffness of infraspinatus and posterior capsule tightness that lead to internal rotation deficit, which results in winging of the scapula with internal rotation and horizontal abduction of the arm [6, 10, 11].

Scapular dyskinesia is not an injury or a musculoskeletal diagnosis [10], rather than it is a potential risk factor for shoulder pain, and is associated with rotator cuff tendinopathy, shoulder impingement syndrome and multidirectional impairments [12]. 67% to 100% of athletes with shoulder injuries present with scapular dyskinesia affected mainly the dominant hand. Yet, it is found in many asymptomatic individuals [13]. Likewise finding of scapular dyskinesia in examination may be the sequel of an injury and not linked to any previous trauma [14].

Previous studies concluded that clinical assessment of scapular dyskinesia is done firstly by assessment the related joint, bony and soft tissue causative factors, secondly by direct observation (Scapular Dyskinesia Test) and manually assisted movement (Scapular Assistance Test (SAT) and Scapular Reposition (Retraction) Test (SRT)) [1, 6, 7].

Kyphotic posture was seen in most of student as well as adaptation in this posture lead to weakness and lengthening of scapular muscle, thus alignment of shoulder joint may be affected increasing the prevalence of shoulder pain [15]. Therefore, this study aimed to find out the prevalence, characteri-

stic and type of scapular dyskinesia among female students at Jouf University – Alqurayyat in Northern Saudi Arabia.

Subjects and methods

Study design

A cross sectional study was used in this research. This study was approved by the institutional ethical committee, Jouf University, and prior to implementation.

Recruitment

A convenient sample of one hundred thirty-six female students was invited to participate in this study. They were recruited from Alqurayyat female branch – Jouf University (Northern Saudi Arabia); the objective, the tests and process of the study were explained to all participants and a written consent of each female was taken for her voluntary participation.

Criteria for inclusion and exclusion

Participants were included if their age ranged between 18-26 years old, whether having shoulder pain or not. Any student with recent shoulder trauma, past surgical history in the upper limb, or history of upper extremity neurological involvement was excluded.

Outcome measures

Demographic data

Participants, who met the inclusion criteria, were asked to respond to a structural questionnaire including demographic data about age, body mass index (BMI), dominant hand, and college.

Scapular Dyskinesia Test

It was performed for clinical assessment of shoulder dyskinesia, during static position (resting scapular position) followed by dynamic assessment through asking each participant to stand holding 1 kg of weight in each hand and elevate the arm in the scapular and the sagittal planes, repeating this active movement 3-5 times. Scapular inferior, medial and superior borders were observed for any early elevation, rapid downward rotation and shoulder shrugging. Existence of any scapular prominence noted as “yes” or “no” to categorize the participant with or without scapular dyskinesia, followed with reporting the best performance [1, 8, 16, 17]. Scapular Dyskinesia Test has shown moderate reliability (weighted kappa 0.48–0.61, 75–82% agreement) [18]. Moreover, its sensitivity 78% with arm flexed and 74% in scapular plane; also its positive predictive value 76% with arm flexed and 78% in scapular plane [6].

Manually Assisted Movements

Manually assisted movements of the scapula are corrective maneuvers including 2 tests, Scapular Assistance Test (SAT) and Scapular Reposition (Retraction) Test (SRT). They were performed for clinical assessment of shoulder dyskinesia. For performance of SAT, the examiner assisted the scapular upward rotation and posterior tilt by stabilizing the upper medial border and applying a soft pushing in the inferior-medial border of the scapula outwards and upwards when the patient elevated the arm. Detection of different in pain sensation was a key indicator for this test, thus the test was positive when the

pain was relieved. It is usually positive in painful arc or shoulder impingement patients. Acceptable interrater reliability has been shown for this test [6, 18]. For performance of SRT, the examiner with one hand stabilized the medial border then asked the participant to elevate the arm and the examiner's other hand applied isometric resistance to the patient's arm. Like the previous test; the test was indicated positive when the pain was reduced, also it was positive if the strength of participants increased during the elevation [1, 18, 19].

Shoulder Pain and Disability Index

The Shoulder Pain and Disability Index (SPADI) is the self-report questionnaire that consists 13 items in two dimensions, one for pain and the other disability related with shoulder pathology. The participant was asked about the level and severity of pain in 5 items, as well as functional activities such as activities of daily living measured with 8 items. The SPADI took 5 to 10 minutes for a patient to complete. It is valid in clinical evaluation of shoulder pain and disability (high internal consistencies ($\alpha > 0.92$)) [20, 21].

Sample-size determination and Statistical analysis:

Epi online calculator (<http://www.openepi.com/SampleSize/SSPropor.htm>) was used to calculate the sample size utilizing $n = [DEFF * Np(1-p)] / [(d^2 / Z^2) - \alpha/2 * (N-1) + p * (1-p)]$ formula, where:

- n = the desired sample size,
- Z = standard deviation at 95% confidence level (1.96),
- p is the proportion in the target population estimated to have a particular characteristic.

the sample size should include 354 students. convenience sample was used and 136 students were enrolled.

Excel 2010 were used for entered and encoded the data. Stati-

stical analysis was done using IMP SPSS version 25 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) frequencies were used to summarize qualitative variables. While relation between variables was done using regression and significant probability P values. P value less than or equal to 0.05 was considered significant. beta coefficients of the regression assess every 1-unit degree of change between outcome and predictor variable. It can be positive or negative. When one variable increases as the other increases the relation is positive; when one decreases as the other increases it is negative.

Results

A total of 138 female students responded to our study. Regarding their demographic data, the main age group was 21-23 years, rating from 18-26 years old. BMI was normal in 68(50%). Majority of participants 120(88.2%) was right dominant hand. There were 57(42%) of participants studying in Faculty of Applied Medical Science. Regarding SPADI, its mean score was 30.03 ± 12.314 (Table 1).

Regarding the characteristic of scapular dyskinesia, direct observation showed that 135 participants (99.3%) had scapular dyskinesia, which was positive for Scapular Dyskinesia Test, affecting the left hand of 76 of them (56.3%) in spite that 67 of those participants were right hand dominant. Type II was the most common one as 76% of scapular dyskinesia participants were type II (Table 2).

The manually assisted movements for 135 participants showed that SAT was positive in 133 and negative in 2 participants. Moreover, SRT was positive in 103 and negative in 32 participants (Table 3). The presence of scapular dyskinesia has significant effect on shoulder function as shown in table 4.

Table 1. Demographic characteristics of the patients

Characteristics		Frequency	Percentage
Age in groups	18–20	24	17.6%
	21–23	120	75%
	24–26	10	7.4%
BMI	less than 18	30	22.1%
	18–24.9	68	50%
	25–29.9	29	21.3%
	30–34.9	9	6.6%
Dominant hand	Right	120	88.2%
	Left	16	11.8%
College	Applied Medical Sciences	57	42%
	College of Science and Arts	40	29.4%
	Community College	39	28.6%
SPADI score $M \pm SD$: 0.03 ± 12.314			

Table 2. Scapular dyskinesia characteristic

Characteristics		Frequency	Percentage
Scapular Dyskinesia Test	Yes	135	99.3%
	No	1	0.7%
Dyskinesia involved side	Right	59 (53 right dominant)	43.7%
	Left	76 (67 right dominant)	56.3%
Type of dyskinesia	type I	53	39.3%
	type II	76	56.3%
	type III	6	4.4%
	type IV	0	0%

Table 3. Manually Assisted Movements

Manually Assisted Movements		Scapular Dyskinesia Test		Total
		Yes	No	
Scapular Assistance Test	Positive	133	0	133
	Negative	2	1	3
Total		135	1	136
Scapular Reposition Test	Positive	103	0	103
	Negative	32	1	36
Total		135	1	136

Table 4. Relation between presence of dyskinesia and SPADI

	β	Sig
Dependent Variable: shoulder pain and disability index		
Independent variables: Presence of dyskinesia	-0.211	0.014

β : Standardized Coefficients; Sig: significance level

Discussion

The present study was designed to find out the prevalence, characteristic and type of scapular dyskinesia among female students at Jouf University – Alqurayyat in Northern Saudi Arabia. The result of this study revealed that 99.3% of students had scapular dyskinesia, this high prevalence also shown in 67%-100% athletes with sport injuries and in 61% of overhead athletes [13]. Presence of scapular dyskinesia among students may be due to fatigue of shoulder muscle, leading to alteration in kinematics of shoulder girdle [15], the fatigue may be as a result of bad ergonomic for long periods during studying in classroom or even when using laptop and telephone. Up to my knowledge, there was no study estimating the prevalence of scapular dyskinesia among students.

What is surprising that in 76 of students, left hand was most affected hand with dyskinesia (56.3%) in spite that 67 of tho-

se participants were the right hand dominant. Regarding this issue, there is controversy between studies as some of them found a greater rate in athletes' left side, while others in overhead and non-overhead athletes reported that dominant hand was most affected which was the right hand in most of the participants [13]. However, previous research in swimmers revealed that only left scapulae dyskinesia was detected but it was the dominant hand for those participants and most participants were right hand dominant and dyskinesia was present in (58.1%) who complained of shoulder pain [22].

On other hand, type II dyskinesia was the most existing in 76 students ($n = 135$); however, this result in student population differ from athlete population, as type III is most prominent in rugby and tennis players [23, 24]. Also, Merolla et al. [25] who studied 35 overhead athletes observed that the presence of type I in 24 cases (83%) and type II in 5 cases (17%).

Regarding Manually Assisted Movements, SAT was positive in 133 and negative in 2 participants. These results reflect those of Rabin et al. [26] who studied the positive SAT in different shoulder disorders and set up its relation to scapular dyskinesia and found that SAT was mostly positive among participants with scapular dyskinesia. Additionally, SRT was positive in 103 and negative in 32 participants in the current study. This finding is consistent with that of Tate et al. [19] who found that nearly half of the athletes ($n = 142$) are positive for this test; this test is corrective maneuver and is positively associated with both supraspinatus strength and presence of labral injuries [6], thus this may reflect the negative participant who may not complain from the latter problem.

The result showed significant effect of scapular dyskinesia on the shoulder joint function. This finding broadly supports the work of other studies in this area linking scapular dyskinesia with shoulder function; Lopes et al. [27] conclude that scapu-

lar dyskinesia has association with shoulder function and disability. Several studies found that scapular dyskinesia is associated with shoulder injuries and dysfunction [5, 6, 8, 10, 28].

Conclusion

Scapular dyskinesia among female students is high. Type II scapular dyskinesia is most existence type and left hand is most affected hand. Scapular dyskinesia is associated with shoulder joint function in student and it may be a predicted factor leading to shoulder injuries among students.

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