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ORIGINAL ARTICLE

Frequency of Scapular Dyskinesis and its Association with Shoulder Pain in Gym-Going Females in Hayatabad: A Cross-Sectional Survey

Hira Anwar[1], Zarghuna Taj[2], Bakhtawar Malik[3], Syeda Afsheen Hasnain Daud[4], Najia Zulfiqar[5]

[1 2 3] Physical Therapist, Khyber Medical University, Peshawar Pakistan

[4] Lecturer, Khyber Medical University, Institute of Physical Medicine and Rehabilitation, Peshawar Pakistan

[5] Associate Professor, University of Haripur, KPK, Pakistan

Author`s Contribution

[1,2,3] Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work. **[1,4,5]** Drafting the work or reviewing it critically for important intellectual content, Final approval of the version to be published, **[1-5]** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Article Info.

Received: July 18, 2025
Acceptance: February 11, 2026

Conflict of Interest: None
Funding Sources: None

Address of Correspondence

Name: Najia Zulfiqar
Email: najia.zulfiqar@uoh.edu.pk
ORCID: 0000-0002-0649-7877

Cite this article as: Anwar H, Taj Z, Malik B, Daud S A H, Zulfiqar N, Frequency of Scapular Dyskinesis and its Association with Shoulder Pain in Gym-Going Females in Hayatabad: A Cross-Sectional Survey
JRCRS.2026:14(1):35-40
https://dx.doi.org/10.53389/JRCRS.2026140107

A B S T R A C T

Background: Scapular dyskinesis is a common issue among individuals who engage in regular gym activities. As the scapula provides a stable base for movement, alterations in its positioning or motion can impair shoulder function. To address performance limitations, it is essential to identify the frequency of scapular dyskinesis, particularly in at-risk populations such as female gym-goers.

Objective: To determine the frequency of scapular dyskinesis in gym-going females and to examine its association with shoulder pain.

Methodology: For this cross-sectional study, 114 participants were surveyed through convenience sampling at Rehman Medical Complex gym, Hayatabad Sports Complex, and Iqra University gym in Peshawar. Participants were selected based on predefined inclusion and exclusion criteria. Eligible participants were females aged 18–40 years who voluntarily participated and had been performing upper-body workouts for at least one month. Those with a history of shoulder pathology, diabetes mellitus, pregnancy, recent upper-limb fractures within past two months, or neurological disorders were excluded. The data were collected over a three-month period from May 2022 to July 2022, followed by an additional three months for data analysis and manuscript preparation, which were completed by October 2022. Participants received two diagnostic tests to identify scapular dyskinesis. By using SPSS version 26, frequencies were calculated for categorical variables, and the chi-square test was applied to examine the association between scapular dyskinesis and shoulder pain.

Results: The study revealed an overall frequency of scapular dyskinesis of 70.3%. A statistically significant association exists between scapular dyskinesis and shoulder pain ($p = 0.006$).

Conclusion: Scapular dyskinesis was found to be highly frequent among gym-going females and demonstrated a significant association with shoulder pain. These findings underscore the importance of appropriate training techniques and targeted scapular muscle conditioning to prevent dysfunction and optimise upper-limb performance in female gym populations. Clinically, the results support the incorporation of structured scapular muscle strengthening exercises into routine gym-based training programs as a preventive strategy to reduce the risk and severity of shoulder pain among gym-going individuals.

Keywords: Gym-goer, lateral scapular slide test, scapular dyskinesis, shoulder pain

Introduction

Scapular dyskinesia (SD) is defined as an alteration in the normal position of the scapula. It leads to abnormal three-dimensional scapular kinematics due to muscle weakness, imbalance, and injuries to soft tissue and bone.[1] Lower trapezius, serratus anterior, rhomboids major and minor, and the key shoulder rotators help stabilize the scapula. Increased activity in the upper trapezius, combined with decreased control of the lower trapezius and serratus anterior, can result in abnormal scapular motion. Most gym settings do not typically emphasize balanced training of these muscles, which can lead to SD.[2] It appears as a non-specific response to shoulder dysfunction and adds to functional inadequacies related to shoulder pathology. Therefore, it is suspected to be a shoulder injury.[3] Muscle activation for proper, coordinated movements of scapular stabilizer muscles can be used in their treatment.[4]

Several research studies have been conducted on SD, its causes, and occurrence during different athletic and general activities. A notable study found that Kibler et al.f prevalence of SD was 61% in overhead athletes and 33% in non-overhead athletes.[5] Divya Khare et al. A recent study found that gym-goers often neglect to strengthen their scapular stabilizer muscles. This neglect increases the prevalence of SD among gym-goers compared to those who do not.[6] Benjamin et al. found different risk factors for shoulder injuries in elite male handball players. They found that noticeable SD, lower external rotation strength, and a reduced total range of motion are associated with a higher risk of shoulder injury.[7] Another cross-sectional study found a link between increased cases of SD and higher ergonomic risk levels among office workers.[8] The effect of SD on the performance of young, asymptomatic elite swimmers was also analyzed in a study. However, this study did not find a significant effect on performance.[9] Another study conducted in Pune, India, focused on badminton players and found a high prevalence.[10]

Scapular dyskinesia has been previously studied in various athletic populations and general individuals; however, its prevalence specifically among female gym-goers remains underexplored. We could trace only one study that explored SD in gym-goers.[2] However, none of the prior studies have attempted to analyze the incidence of SD specifically in gym-going females. The primary objective of the current study is to assess the prevalence of SD among female gym-goers and examine its association with shoulder pain. Many fitness centers fail to adequately target and strengthen scapular stabilizing muscles, contributing to the development of this condition. Identifying the frequency of SD in female gym-goers is essential for implementing preventive and rehabilitative strategies. Ultimately, such efforts can help improve functional performance and reduce the likelihood of musculoskeletal injuries in this population.

Methodology

A descriptive cross-sectional study design was used to investigate SD and its association with shoulder pain in female gym-goers. The study was conducted at three sites in Hayatabad, Peshawar, including Rehman Medical Institute Gym, Hayatabad Sports Complex, and Iqra University Gym. The data were collected, analyzed, and interpreted, and the manuscript was prepared over six months, from May 2022 to October 2022.Convenience sampling was used, and a sample size of 114 was determined using RAOSOFT software, with a 95% confidence interval. The research received permission from the Institute of Physical Medicine and Rehabilitation at Khyber Medical University, Peshawar, and was granted ethical approval under reference number **KMU/IPM&R/2022/683** & also permission was taken by the respective gym instructors. All participants were informed about the study's purpose, and written consent was obtained before their participation. The inclusion criteria were female participants aged 18–40 years, who willingly participated in the study and had performed upper body workouts for at least the past month at the time of data collection. The exclusion criteria included participants with a previous history of shoulder pathology, diabetes, pregnancy, upper limb fractures within the past two months, or any neurological disorder. Written informed consent was obtained from each participant after verifying that they met the inclusion criteria. Two tests were conducted: the Lateral Scapular Slide Test (LSST) and the Scapular Dyskinesis Test (SDT). The LSST was used to assess scapular positioning at three different angles of 0°, 45°, and 90° in the coronal plane. A measuring tape was used to determine the distance between the inferior angle of the scapula and the spinous processes of the thoracic spine. A bilateral difference of more than 1.5 cm was considered indicative of SD. The Scapular Dyskinesis Test, a visually based dynamic assessment, was used to detect dyskinesis. Each participant was asked to perform five repetitions of bilateral active shoulder flexion and abduction while holding weights (1.5 kg for those weighing ≤68 kg and 2.5 kg for those >68 kg). Participants were instructed to elevate their arms overhead in a "thumbs-up" position over a

three-second count and then lower them over another three-second count. With a distance of 2–3 cm from the posterior thorax, scapular movement was observed, and any signs of dysrhythmia or winging were noted. Participants were also asked whether they experienced shoulder pain related to SD using a simple dichotomous (yes/no) response format.

Results

The Lateral Scapular Slide Test (LSST) was applied at 0°, 45°, and 90° arm positions in the coronal plane. Table 1 shows how frequently SD occurred among female gym-goers.

Table 01: Frequency of Scapular Dyskinesis among Participants (n = 114)

LSST Range (cm)	Frequency at 0°	Frequency at 45°	Frequency at 90°
0 – 0.5	10	5	5
0.6 – 1.0	25	15	10
1.1 – 1.5	35	40	30
1.6 – 2.0	25	20	40
2.1 – 2.5	15	25	20
> 2.5	4	3	9

The frequency distribution of LSST ranges varied across different shoulder abduction angles. As shown in Table 01, 35 participants at 0° (rest position) and 40 participants at 45° (akimbo position) fell within the 1.1–1.5 cm range, indicating mild scapular asymmetry. In contrast, at 90° (shoulder abduction with internal rotation), 40 participants fell within the 1.6–2.0 cm range, indicating moderate dyskinesis during higher levels of arm elevation. These findings indicate that scapular dyskinesis becomes more pronounced at 90° of shoulder abduction, as a greater number of participants fell into the higher LSST range at this angle.

The Scapular Dyskinesis Test (SDT) was also conducted, focusing on its two components of dysrhythmia and winging. Table 2 shows how frequently participants reported having dysrhythmia and winging.

Table 02: Frequency of Scapular Dyskinesis by SDT (n = 114)

Type	Category	Number of Participants
Dysrhythmia	Present	59 (51.8%)
	Not Present	55 (48.2%)
Winging	Right side only	32 (28.1%)
	Left side only	44 (38.6%)
	Both sides	7 (6.1%)
	Not Present	31 (27.2%)

A total of 59 participants reported having dysrhythmia, with winging being most noticeable on the left side. Out of 114 participants, 80 of whom had SD, while 34 did not. A cross-tabulation analysis was performed to examine the association between scapular dyskinesis (SD) and shoulder pain, and the Chi-square test was applied to determine the statistical significance of this association as presented in Table 3.

Table 03: Cross-examination of Scapular Dyskinesis and Shoulder Pain

Scapular Dyskinesis	Shoulder Pain		Total	X^2	P-Value
	Yes	No			
Yes	27 (23.7%)	53 (46.5%)	80 (70.2%)	7.65	0.006
No	3 (2.6%)	31 (27.2%)	34 (29.8%)		
Total	30 (26.3%)	84 (73.7%)	114 (100%)		

The data confirms a statistically significant link between SD and shoulder pain, which indicated that female gym-goers who have SD also experience shoulder pain.

Discussion

The present study aimed to evaluate the presence of SD, including winging and dysrhythmia, using clinical tests such as the LSST, and to explore its association with shoulder pain. The results showed a high prevalence and 80 gym-going females had SD. The LSST and SDT were used for the study objectives. SD was measured at three angles of 0°, 45°, and 90° in LSST. The frequency of females having a bilateral difference >1.5 cm was highest at 90° (LSST-3). It was found that at 90° abduction, most females had a bilateral difference of 2 cm or greater; hence, SD was more prevalent at 90° (see Table 1). A similar study conducted on gym-goers and non-gym-goers found that SD is more common in the former as compared to the latter, with significance also observed at 90° at the inferior angle of the scapula in LSST.[11]

In SDT, 59 of the females were found to have dysrhythmia. During arm flexion and abduction movements, premature elevation and uncontrolled depression were observed. In recent study, McQuade et al. observed that scapular muscular fatigue causes an increase in scapular motion during the mid-range of arm elevation. This results in disturbing the scapulohumeral rhythm, causing it to decrease.[12] Seven females were observed with bilateral winging, 32 on the right side, and 44 on the left side. The results of the current study showed SD more commonly on the left side. According to Kendall and McCreary, weakness of the serratus anterior tends to occur more frequently on the left side than on the right.[13] However, other researchers

found the prevalence was higher on the dominant side among office workers and badminton players.[8, 10]

In the present study, 27 out of 80 females with SD had shoulder pain. A statistically significant association was found between SD and shoulder pain, with a p-value of 0.006. As mentioned in the literature, the scapula plays a key role in all shoulder functions. Coordinated movement of the scapula and arm is necessary to achieve a full range of motion when lifting the arm.[14] In SD, decreased strength and improper activation of the serratus anterior and lower trapezius stop the scapula from achieving proper upward rotation and posterior tilt when the arm is raised.[15] These factors cause the subacromial space to decrease, resulting in the anterior glenohumeral ligaments being stretched more, which leads to internal impingement and a decrease in the strength of the rotator cuff muscles.[16, 17] Weakness in the rotator cuff muscles can further reduce the subacromial space, which occurs because it causes the humeral head to move up.[18]

SD carries a high risk of developing future shoulder pain. Hickey et al. found that SD raises this risk by 43%. However, it is not yet clear whether SD directly causes shoulder pain or if it is an indirect factor.[19] As an indirect cause, isolated SD is not seen as a risk factor for shoulder pain unless there is an increased load.[20]

The results of this study, along with the subsequent discussion, suggest a link between SD and shoulder pain. However, it is unclear whether shoulder pain is a cause or a result of SD. If it is the cause, it may be due to less upward rotation or a lack of posterior tilt. If it is the effect, it might stem from improper muscle activation or inhibition caused by pain.[21]

Changes in soft tissue flexibility, muscle imbalances, and delayed activation of scapular muscles are the most common causes of SD. A loss of flexibility in the pectoralis minor and the short head of the biceps can lead to scapular tilting forward and becoming protracted.[22, 23] A lack of supervision during upper-body workouts in gym-going females, along with neglecting the strengthening of scapular stabilizers, can lead to muscular imbalances, and repetitive shoulder movements can result in overuse injuries.[21] All these factors can contribute to the development of SD. While SD is not classified as a disease, it can increase an individual's likelihood of developing various shoulder problems over time.[24, 25] Therefore, proper supervision should be provided during upper body workouts for gym-going females to help prevent SD.

Limitation: The limitation of the present study is to measure shoulder pain in yes and no response without seeking any information about the intensity, frequency and duration of pain.

Recommendation: In light of the findings of the present study it is recommended that gym-going females be routinely assessed for scapular dyskinesis using simple clinical screening tools, particularly at 90° of shoulder abduction, where the highest frequency was observed. Fitness centers should emphasize supervised upper-body training program that incorporate scapular muscle strengthening and flexibility exercises to address muscular imbalances and potentially reduce the risk of shoulder pain. Furthermore, future longitudinal and interventional studies are recommended to establish a causal relationship between scapular dyskinesis and shoulder pain and to assess the effectiveness of preventive and rehabilitative interventions.

Conclusion

The study finds that female gym-goers are more likely to experience SD. Although the exact cause has not yet been clearly determined, the results of this research indicate a significant association between SD and shoulder pain. Based on the study's clear findings, fitness centers can change their programs to focus on strengthening the scapular muscles. This can help lower the number of gym-goers who report shoulder pain. Since the study's findings are confirmed, gym routines can be changed to focus more on scapular muscle training. This adjustment can help reduce painful shoulder symptoms in gym-goers.

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