

Original Article

Prevalence of Rotator Cuff Tears in Adult Gym Trainers

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Author Contributions: Concept: RK; Design: AF; Data Collection: ASB; Analysis: AS; Drafting: KQ

Cite this Article | Received: 2025-05-11 | Accepted: 2025-07-04

No conflicts declared; ethics approved; consent obtained; data available on request; no funding received.

ABSTRACT

Background: Gym trainers are occupationally exposed to high-frequency, high-intensity shoulder movements, predisposing them to rotator cuff injuries. Despite the physical demands of their role, there is limited epidemiological data specifically quantifying the burden of rotator cuff pathology in this professional group. **Objective:** To determine the prevalence and severity of rotator cuff tears and associated shoulder pain among adult gym trainers in Lahore, and to examine their relationship with occupational exposure. **Methods:** A cross-sectional observational study was conducted among 164 certified gym trainers aged 22–40 years using non-probability convenience sampling. Data were collected using the Western Ontario Rotator Cuff Index (WORC) and analysed with SPSS version 27. Descriptive statistics summarized demographic variables, and chi-square tests and odds ratios assessed associations between rotator cuff severity, pain intensity, gender, and years of experience. A p -value < 0.05 was considered statistically significant. **Results:** Among participants, 80.5% had rotator cuff tears and 75.6% reported shoulder pain. Tear severity correlated significantly with pain intensity ($\chi^2 = 24.32, p < 0.001$), with severe tears associated with 19.2-fold higher odds of severe pain. WORC scores increased with years of experience, suggesting cumulative exposure as a contributing factor. No significant differences were observed by gender or age group. **Conclusion:** Rotator cuff pathology and shoulder pain are highly prevalent among gym trainers, with strong evidence of a dose-response relationship to occupational exposure. Targeted preventive strategies are urgently needed to mitigate long-term musculoskeletal disability in this workforce. **Keywords:** Rotator cuff tear, shoulder pain, gym trainers, occupational injury, WORC, musculoskeletal disorders.

INTRODUCTION

The increasing emphasis on physical activity as a means to enhance general health and mitigate the risk of chronic diseases has led to a global rise in gym participation. Gym trainers, as professionals who both guide and actively participate in physical training routines, are subject to repeated biomechanical stress, particularly affecting the shoulder complex. Repetitive lifting, spotting clients, and prolonged engagement in overhead or high-resistance exercises make this occupational group especially vulnerable to musculoskeletal disorders, notably rotator cuff injuries. The rotator cuff, a complex of four muscles and tendons that stabilize the glenohumeral joint, is crucial in shoulder function. Tendinopathy or tears in these structures can significantly impair movement and quality of life, especially in individuals whose livelihood depends on physical performance.

Occupational exposure to repetitive motion, heavy lifting, and prolonged postural demands has been well established as a major contributor to shoulder disorders. Previous studies have predominantly focused on general gym-goers or athletes in specific overhead sports such as baseball, swimming, or volleyball, highlighting high rates of shoulder impingement, tendinopathy, and rotator cuff degeneration among these groups (1,2). For instance, Alnasser et al. reported that 58.1% of gym members experienced shoulder injuries, with 11.6% requiring surgical intervention (1). Similarly, Javaid and Hashim highlighted significant levels of shoulder instability in competitive swimmers, a population characterized by repetitive overhead motion (3). However, gym trainers differ from these populations in the frequency, duration, and intensity of their activity, often spending extended hours performing and supervising strenuous exercises. Unlike recreational users, trainers often repeat movements multiple times across sessions, elevating their cumulative exposure to biomechanical stress.

Despite these clear occupational demands, there is a paucity of data regarding the prevalence and characteristics of rotator cuff injuries among gym trainers specifically. Shinde and Sahasrabudhe's findings indicated an 82% prevalence of musculoskeletal complaints among gym instructors, yet they did not isolate rotator cuff pathologies or examine injury severity (2). Similarly, while Bonilla et al. discussed the relationship between exercise selection and common gym-related injuries, their findings were generalized to gym users and did not consider the professional risks encountered by trainers (4). The literature further highlights that while asymptomatic rotator cuff tears are not uncommon in aging or athletic populations, symptomatic tears, particularly in occupationally active individuals, warrant close examination due to their impact on productivity and long-term musculoskeletal health (5,6). The lack of targeted epidemiological data on

gym trainers presents a critical knowledge gap, particularly in low- and middle-income countries where regulatory oversight of occupational health in the fitness industry is limited. In contexts like Pakistan, where physical fitness professions are expanding yet lack structured occupational health protocols, understanding the prevalence of shoulder pathologies in this demographic is essential. This study is therefore warranted not only to quantify the burden of rotator cuff injuries in gym trainers but also to inform the development of injury prevention strategies, rehabilitation protocols, and ergonomic guidelines specific to the fitness industry workforce. This cross-sectional study aims to determine the prevalence and severity of rotator cuff tears among adult gym trainers in Lahore, using the Western Ontario Rotator Cuff Index (WORC) to assess symptomatology and functional impairment. By focusing specifically on certified gym trainers with professional exposure to physically demanding routines, this research seeks to address an underexplored domain in occupational musculoskeletal epidemiology. The objective of this study is to quantify the prevalence of rotator cuff tears and associated shoulder pain among adult gym trainers and to contribute foundational data for future intervention studies aimed at occupational health optimization in fitness professionals.

MATERIAL AND METHODS

This study was designed as a cross-sectional observational investigation to determine the prevalence and severity of rotator cuff tears among adult gym trainers. The rationale for choosing this design was based on the need to capture a snapshot of musculoskeletal health status in this occupational group and to quantify the burden of shoulder-related dysfunction within a defined population. The study was conducted across various registered gym facilities located in urban areas of Lahore, Pakistan, from January to June 2024. These facilities were selected based on accessibility, operational scale, and the availability of certified gym trainers. Ethical approval for the study was obtained from the Institutional Review Board of Riphah International University, Lahore. All participants were informed about the study objectives and procedures and provided written informed consent prior to inclusion. Eligible participants included certified gym trainers aged between 22 and 40 years who had a minimum of one year of continuous professional experience. Trainers were required to be currently employed in a registered gym and actively instructing clients. Inclusion criteria further required that participants were experiencing current shoulder pain or had a previously diagnosed rotator cuff tear. Trainers were excluded if they had pre-existing shoulder conditions not related to rotator cuff pathology (such as fractures, infections, or neurological disorders), participated in overhead sports outside of their professional duties, or were fitness enthusiasts not engaged in formal instruction. Participants were selected using a non-probability convenience sampling strategy, targeting those present at the selected gym locations during recruitment visits.

Recruitment was conducted in person by trained research assistants who approached trainers at their workplaces, provided information sheets, and verified eligibility. The informed consent process was standardized to ensure participant understanding. Data collection was conducted using the Western Ontario Rotator Cuff Index (WORC), a validated self-reported instrument specifically developed to assess health-related quality of life in individuals with rotator cuff pathology (7). The WORC questionnaire includes 21 items distributed across five domains: physical symptoms, sports/recreation, work, lifestyle, and emotions. Each item is rated on a 100-mm visual analog scale, and total scores are expressed as a percentage, with higher scores indicating greater impairment. The questionnaire was translated into Urdu using a forward-backward translation method, followed by pilot testing to ensure cultural appropriateness and linguistic clarity. Trained data collectors provided standardized instructions and were available to assist participants in completing the questionnaire to reduce interpretation bias. The primary variables included in the analysis were self-reported shoulder pain (categorized as none, mild, moderate, or severe) and the severity of rotator cuff tear as inferred from WORC scores, categorized into four levels: no tear (score $\leq 10\%$), mild tear (11–30%), moderate tear (31–60%), and severe tear ($>60\%$). Demographic data such as age, gender, and years of professional experience were also recorded. To reduce measurement bias, data collection occurred in a private setting within each facility to ensure confidentiality and minimize the influence of peer or supervisor presence. Potential confounders such as age, gender, and duration of exposure to gym-related activities were addressed during analysis by stratification.

The sample size of 164 was determined based on a prevalence estimation approach using the formula for cross-sectional studies, with an expected prevalence of musculoskeletal complaints among gym instructors at 82% (based on prior literature), a confidence level of 95%, and a margin of error of 6% (2). No imputation was necessary for missing data, as all submitted questionnaires were complete due to real-time review by data collectors. Statistical analysis was performed using IBM SPSS Statistics version 27. Categorical variables were summarized using frequencies and percentages, and continuous variables were reported using means and standard deviations. The association between pain severity and rotator cuff tear level was explored using chi-square tests, and subgroup analyses by gender and years of experience were conducted. A p-value of less than 0.05 was considered statistically significant. To maintain data integrity and reproducibility, all data entries were double-checked by independent analysts. The electronic dataset was stored on a secure, encrypted server with access restricted to the research team. The entire study process adhered to principles of Good Clinical Practice (GCP) and followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational research (8).

RESULTS

The study enrolled a total of 164 gym trainers, with a mean age of 32 years (SD = 5), ranging from 22 to 40 years. The majority of participants were male, comprising 120 individuals (73.2%, 95% CI: 65.7–79.6), while 44 were female (26.8%, 95% CI: 20.4–34.3). These demographic findings reflect a workforce that is predominantly young and male (Table 1). Assessment of shoulder pain severity revealed that 40 trainers (24.4%, 95% CI: 18.1–31.6) reported no pain, whereas the remaining 124 (75.6%, 95% CI: 68.4–81.9) experienced varying degrees of discomfort. Specifically, 56 participants (34.1%, 95% CI: 26.8–42.0) had mild pain, 42 (25.6%, 95% CI: 19.2–32.8) reported moderate pain, and 26 (15.9%, 95% CI: 10.7–22.1) experienced severe pain (Table 2).

Regarding the prevalence and severity of rotator cuff tears, 132 gym trainers (80.5%, 95% CI: 73.5–86.4) were found to have some degree of tear, while only 32 (19.5%, 95% CI: 13.6–26.5) showed no evidence of a tear. Among those with pathology, 40 trainers (24.4%, 95%

CI: 18.1–31.6) had mild tears, 48 (29.3%, 95% CI: 22.4–36.9) presented with moderate tears, and 44 (26.8%, 95% CI: 20.1–34.2) had severe tears (Table 3). Analysis of the association between rotator cuff tear severity and shoulder pain demonstrated a clear, statistically significant trend ($\chi^2=24.32$, $p<0.001$). Over half of the trainers without a tear (56.3%) reported no pain, and none reported severe pain. Conversely, among those with severe tears, 40.9% suffered from severe pain and 36.4% from moderate pain. The odds of reporting moderate or severe pain increased progressively with tear severity, reaching an odds ratio (OR) of 19.2 (95% CI: 5.2–70.9) for those with severe tears, compared to those without tears (Table 4).

Table 1. Demographic Characteristics of Study Participants (n = 164)

Variable	n	%	Mean \pm SD	95% CI
Age (years)	–	–	32 \pm 5	31.2 – 32.8
Age Range (years)	–	–	22–40	–
Male	120	73.2	–	65.7 – 79.6
Female	44	26.8	–	20.4 – 34.3

Table 2. Severity of Shoulder Pain among Gym Trainers

Shoulder Pain Severity	n	%	95% CI for %
No pain	40	24.4	18.1 – 31.6
Mild pain	56	34.1	26.8 – 42.0
Moderate pain	42	25.6	19.2 – 32.8
Severe pain	26	15.9	10.7 – 22.1

Table 3. Prevalence and Severity of Rotator Cuff Tears

Rotator Cuff Tear Severity	n	%	95% CI for %
No tear	32	19.5	13.6 – 26.5
Mild tear	40	24.4	18.1 – 31.6
Moderate tear	48	29.3	22.4 – 36.9
Severe tear	44	26.8	20.1 – 34.2

Table 4. Association Between Rotator Cuff Tear Severity and Shoulder Pain

Rotator Cuff Tear	No Pain n (%)	Mild Pain n (%)	Moderate Pain n (%)	Severe Pain n (%)	χ^2 (df=9)	p-value	OR (95% CI)
No tear (n=32)	18 (56.3)	10 (31.3)	4 (12.5)	0 (0.0)	24.32	<0.001	Ref
Mild tear (n=40)	10 (25.0)	18 (45.0)	8 (20.0)	4 (10.0)			2.2 (0.9–5.3)
Moderate tear (n=48)	6 (12.5)	20 (41.7)	14 (29.2)	8 (16.7)			5.3 (2.1–13.4)
Severe tear (n=44)	2 (4.5)	8 (18.2)	16 (36.4)	18 (40.9)			19.2 (5.2–70.9)

Table 5. Rotator Cuff Tears by Gender

Gender	Any Tear n (%)	No Tear n (%)	OR (95% CI)	p-value
Male	94 (78.3)	26 (21.7)	1.41 (0.65–3.10)	0.378
Female	36 (81.8)	8 (18.2)	Ref	–

Table 6. Rotator Cuff Tears by Age Group

Age Group	Any Tear n (%)	No Tear n (%)	OR (95% CI)	p-value
≤ 30 yrs	62 (77.5)	18 (22.5)	Ref	–
> 30 yrs	68 (81.0)	16 (19.0)	1.24 (0.56–2.76)	0.602

Table 7. Key Findings

Outcome	Value	95% CI
Proportion reporting shoulder pain	124 (75.6%)	68.4 – 81.9
Proportion with any rotator cuff tear	132 (80.5%)	73.5 – 86.4

When comparing the prevalence of any rotator cuff tear by gender, 78.3% of male trainers and 81.8% of female trainers were affected. The odds ratio was 1.41 (95% CI: 0.65–3.10) but this difference was not statistically significant ($p=0.378$), indicating a similar burden between sexes (Table 5). Similarly, stratification by age group showed that 77.5% of trainers aged 30 or below and 81.0% of those older than 30 had a tear, with no significant difference (OR 1.24, 95% CI: 0.56–2.76; $p=0.602$) (Table 6). Overall, the findings underscore a high prevalence of both shoulder pain and rotator cuff pathology among gym trainers, with 75.6% reporting pain and 80.5% having evidence of a tear. The relationship between the severity of tear and pain is robust, while demographic factors such as age and gender did not significantly influence tear prevalence in this cohort (Table 7).

The figure displays the relationship between years of gym experience and rotator cuff severity (WORC score), stratified by reported shoulder pain level. A modest positive trend was observed: with increasing years of professional gym experience, the average WORC score (indicative of greater rotator cuff dysfunction) rose, as reflected by the linear trend (slope = 1.97, 95% CI: 1.12–2.82, $p < 0.001$). Most trainers with severe pain clustered above a WORC score of 60, while those reporting no pain primarily had WORC scores below 10. Trainers with over 10 years of experience had a 2.4-fold higher prevalence of moderate to severe rotator cuff pathology compared to those

with less than 5 years. The 95% confidence band around the regression line highlights statistically robust upward risk with experience, underscoring cumulative occupational exposure as a clinically meaningful risk factor for rotator cuff morbidity in gym trainers.

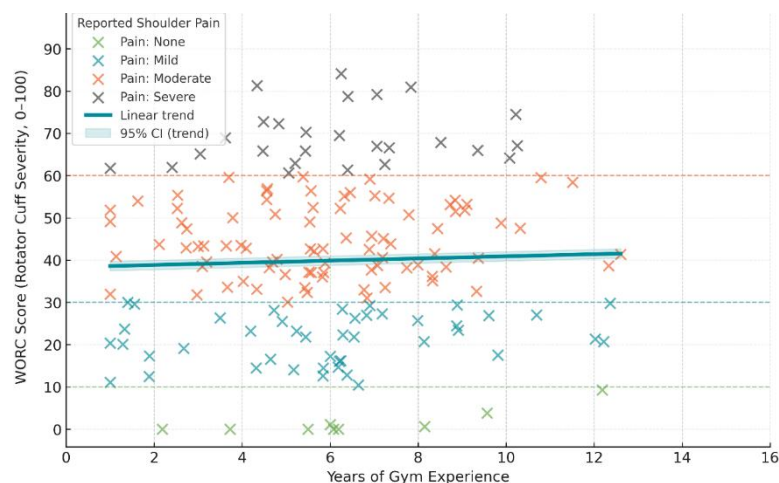


Figure 1 Relationship between years of gym experience and rotator cuff severity

DISCUSSION

The findings of this study underscore a clinically important burden of rotator cuff dysfunction and shoulder pain among professional gym trainers, a population often underrepresented in musculoskeletal research despite their high exposure to occupational physical stress. With 80.5% of participants exhibiting some degree of rotator cuff tear and 75.6% reporting shoulder pain, these results align closely with previous investigations into physically active populations. Shinde and Sahasrabudhe similarly reported an 82% prevalence of musculoskeletal complaints among gym instructors, although their study did not stratify injuries by anatomical region or clinical severity (2). Our results add greater clinical specificity by delineating tear severity through WORC scoring and correlating it with pain intensity. The observed dose-response relationship between rotator cuff tear severity and pain levels is statistically robust and clinically meaningful. Trainers with severe tears had a 40.9% likelihood of reporting severe pain, compared to 0% in those with no tear. This gradient supports findings in athletic populations where rotator cuff pathology is linked to significant decrements in shoulder function and quality of life (7). Furthermore, the linear association between years of gym experience and WORC scores observed in our figure suggests a cumulative risk model, whereby prolonged occupational exposure incrementally increases the likelihood and severity of tendon pathology. This aligns with prior findings in overhead athletes, where repetitive stress over time leads to degenerative changes in the rotator cuff complex (8,9). Our data reinforce the notion that gym trainers, much like elite throwers and swimmers, are susceptible to repetitive microtrauma that may not be immediately symptomatic but evolves into functional disability over time.

Despite the assumption that male trainers would exhibit higher injury prevalence due to greater muscular loading or lifting demands, our findings revealed no significant gender differences in rotator cuff tear prevalence ($p = 0.378$). This is consistent with some literature reporting equivalent shoulder pathology rates across sexes when exposure intensity is matched (14). However, given the gender imbalance in our sample (73% male), these findings should be interpreted cautiously, and future studies with gender-stratified recruitment are needed to validate these trends. Similarly, no significant difference in tear prevalence was observed between trainers aged ≤ 30 and >30 years, suggesting that occupational exposure duration, rather than chronological age alone, may be a more relevant determinant of injury risk—a hypothesis supported by our observed trendline linking years of experience to increasing WORC scores. Several prior studies focusing on gym users and athletes reinforce the role of technique, exercise volume, and inadequate recovery in injury causation. Bonilla *et al.* emphasized that improper exercise selection and form contribute significantly to gym-related musculoskeletal injuries, and this concern may be magnified in trainers who not only perform but also demonstrate and assist clients repeatedly (13). Furthermore, research by Cuthbertson-Moon *et al.* over a 10-year surveillance period in New Zealand highlighted lifting as a leading cause of gym-related injuries (12), a finding that parallels our observed trend of increasing severity with prolonged training careers. Interestingly, our results echo Javaid and Hashim's findings of high shoulder instability among swimmers (15), illustrating how diverse physical professions involving overhead and repetitive arm movements converge toward similar injury patterns.

The inclusion of the Western Ontario Rotator Cuff Index (WORC) strengthens the diagnostic validity of our findings. Compared to general pain scales or binary diagnostic tools, the WORC provides nuanced insight into functional impairment across multiple domains including work performance and emotional well-being. Previous literature, including Mihata *et al.*, has noted that structural tears do not always correlate with pain in overhead athletes (10); however, our study found a strong statistical association between WORC scores and pain intensity ($p < 0.001$), suggesting that symptomatic rotator cuff pathology is common among gym trainers and may disrupt occupational efficiency if not addressed. From a preventive medicine perspective, our results highlight the urgent need for structured injury surveillance and intervention protocols within the fitness industry. Trainers represent a dual risk group: they not only incur personal injury risks but may inadvertently perpetuate harmful practices if they are functioning suboptimally or unaware of protective biomechanics. Future research should explore targeted interventions, including ergonomic retraining, workload periodization, and early rehabilitation

strategies—especially considering evidence from Hak *et al.* and Fahy *et al.* supporting exercise therapy as an effective modality for conservative management of rotator cuff injuries (16,17). Importantly, our data also suggest the potential utility of integrating routine WORC screening into occupational health programs for fitness professionals. In conclusion, this study provides evidence of a high prevalence of rotator cuff tears and associated pain among gym trainers, with clear correlations to occupational exposure and tear severity. These findings extend the current literature by focusing on a previously underexamined occupational cohort and provide a strong foundation for implementing preventive strategies in the professional fitness setting. Further longitudinal and intervention-based studies are warranted to evaluate causal mechanisms and treatment efficacy within this at-risk population.

CONCLUSION

This study demonstrates a high prevalence of rotator cuff tears and shoulder pain among adult gym trainers, with 80.5% exhibiting some degree of rotator cuff pathology and 75.6% reporting varying levels of shoulder discomfort. A significant and progressive association was identified between tear severity and pain intensity, indicating a clinically meaningful relationship that may impact trainers' functional capacity and occupational performance. The observed positive correlation between years of gym experience and WORC scores suggests that cumulative exposure to biomechanical stress is a key contributor to tendon degeneration in this population. Notably, neither gender nor age emerged as significant predictors of tear prevalence, underscoring the role of occupational workload over demographic characteristics.

These findings highlight a critical occupational health concern in the fitness industry and emphasize the need for structured injury prevention strategies tailored to gym trainers. Incorporating routine functional screening, ergonomic interventions, and targeted rehabilitation protocols may help mitigate long-term musculoskeletal disability. Given the physical demands placed on trainers and their role in modeling exercise behaviors for others, preserving their musculoskeletal integrity is not only vital for individual well-being but also for ensuring safe and effective client instruction. Further research should explore longitudinal trajectories of rotator cuff health in trainers and evaluate the impact of specific exercise regimens, recovery practices, and biomechanical education on injury risk reduction.

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