

Original Article

Disability Associated with Shoulder Pain during Life Span of Competitive Swimmers; A Cross-sectional study

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Abstract

Background: The occurrence of shoulder pain among competitive swimmers is bizarre, but no strategy exists to diminish shoulder injuries in swimmers. **Objective:** To assess the disability associated with shoulder pain across the lifespan of competitive swimmers. **Methods:** A cross-sectional study including 58 swimmers who were selected based on inclusion criteria for this study from different swimming centers in Lahore, Pakistan. The questionnaire consisted of a total of 28 questions, 24 questions on Penn shoulder score and 4 questions on disability of arm, shoulder and hand questionnaire score and a diagnostic side bridge test was assessed 2 times by each participant to check endurance. Manual muscle testing was performed bilaterally on the serratus anterior, middle trapezius and lower trapezius muscles. Means and standard deviations were calculated for quantitative variables while frequency and percentages were used for qualitative variables. Chi-square was estimated to find the association between disability and shoulder pain. **Results:** There were 21 (36.2%) males and 37 (63.2%) females participated in the study. This showed that hand dominance affects the ability of competitive swimmers. For the side bridge average time, left and right hand, the p-value was <0.001 which was statistically significant. **Conclusion:** This study concludes that disabilities are associated with shoulder pain across the lifespan of competitive swimmers. Pain and discomfort in the shoulder is the main risk factor among competitive swimmers that can ultimately lead to the disability of the extremity. As only a few participants were fully satisfied with the current level of their shoulder functioning.

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Introduction

Swimming is widespread leisure and competitive sport among all peers.¹ In America, five million swimmers were competing on high school squads and 336000 were actively competing on club squads.² Annually a lot of people swim for workout and reformation. Competitive swimmers practice six to seven days per week and sometimes they practice twice a day to improve their muscle strength.³ These swimmers are unprotected due to massive working out that might overwork the sensitive soft tissue structures and might subsidize shoulder pain and discomfort.^{4, 5} Shoulder pain, discomfort and supraspinatus tendinopathy are communal in competitive swimmers.⁶

Pain and discomfort are the main symptoms after orthopedic injury in these swimmers.^{7, 8} The chief cause of pain and discomfort in the shoulder is glenohumeral slackness, impingement disorder and rotator cuff or biceps injury.^{9, 10} The most commonly involved muscles are the serratus anterior, supraspinatus, trapezius and deltoid.⁷ The competitive swimmers who report pain in the shoulder must be treated as a clinical patients, their management must lead towards treating the underlying cause and disability.¹¹ Many swimmers do swimming to improve muscle strength and to compete in races.¹²

Since water has resistant effects, these swimmers usually get minor injury, pain and discomfort from that, which might affect the activities of daily living of competitive swimmers.^{12, 13} The reported incidence of shoulder pain is 40 to 91%.^{14, 15} Most of the time competitive swimmers are often associated with the term “swimmer’s shoulder”. This term does not elaborate on any specific diagnosis, but it indicates a condition associated with competitive swimmers which

are characterized by pain, discomfort and dysfunction of the shoulder complex.^{16, 17} This word was first introduced by Hawkins and Kennedy to explain a painful and common disorder of repeated shoulder impingement in swimmers. This definition identifies that the discomfort is referred to the anterior area of the shoulder during or at the end of the workout, which compromises the athletes’ performance.^{15,17} Well-regimented and proprioceptive physical activities might be useful for recovering swimmers shoulders.¹⁸⁻²⁰

Various studies have been conducted to find out the trends in pain and discomfort in the shoulder leading to disabilities in swimmers. However, this study was conducted to find out whether the disability is associated with shoulder pain across the lifespan of competitive swimmers. This study assessed whether the competitive swimmers were satisfied with their level of shoulder functioning, were the competitive swimmers able to perform their activities of daily living despite the pain and discomfort in their shoulders and to what extent the pain and discomfort in their shoulders have affected their arms and hands.

Methods

The sample size was 58 participants which were calculated through epi-tool Software. The confidence interval was set at 95%, cluster-1, design-1 and margin of error 0.5%. A questionnaire consisting of a total of 28 questions was printed, 24 questions on Penn shoulder score (PSS) and 4 questions on disability of arm, shoulder and hand questionnaire (DASH) score and was distributed among the swimmers who were selected strictly based on inclusion criteria for this study. Data was collected from swimmers swimming in different swimming centers in Lahore, Pakistan. Approval was taken from the ethical committee of the university.

The swimmers were inquired about and assessed about patient self-report, satisfaction, levels of pain and function. Data was collected from competitive swimmers from multi-site centers of swimming in Lahore, such as Wapda Sports Complex Swimming Pool, Forman Christian College, and Pakistan Sports Board Swimming Pool, Lahore. Competitive swimmers of age 8 to 40 years, who trained themselves 6 to 7 days per week to improve muscle strength were included in the study. Swimmers with a recent history of surgery, fracture, shoulder pathology, or any comorbidity were excluded from the study.

The data collection tools used for this study were PSS and DASH scores, to evaluate participants' self-reported pain intensity, satisfaction and function. The sensitivity analysis publicized an effect size of 1.01 and a standardized response mean of 1.27. Thus, PSS is a valid and reliable measure for recording the outcome of participants with various shoulder disorders. The reliability of the DASH is exceptional, that is intra-class correlation coefficient is 0.97. Statistical package for social sciences (SPSS) version 23 was used to analyze the data. Means and standard deviations were calculated for quantitative variables while frequency and percentages were used for qualitative

variables. Chi-square was estimated to find the association between disability and shoulder pain.

Results

The mean age of 58 swimmers who were included in this study was 17.66 ± 7.52 years. Most of the swimmers were females. Out of 58 swimmers, 21 (36.2 %) were males and 37 (63.2%) were females. Most of the swimmers had affected their right arm and hand due to pain and discomfort in the shoulders. (Table-I)

Most of the patients have no pain, while others have moderate pain with daily life activities (ADLs) like eating, dressing and bathing as shown in Table II. The swimmers were inquired about how satisfied they were with the functioning of their shoulders and most of them had a moderate level of satisfaction with shoulder function. (Table-III) A Chi-square test was applied which showed a significant p-value ≤ 0.001 , which proves that pain and discomfort in the shoulder of the dominant side lead to pain and discomfort in the arm and hand of the dominant side and a significant association was found between disability and shoulder pain, given in Table-IV.

Table-I: Frequency and Percentage of Affected Hand

Affected Hand	Frequency	Percentage
Left Arm and Hand	25	43.1%
Right Arm and	32	55.2%
Both Arms and Hands	1	1.7%
Total	58	100%

Table II: Pain with Daily Life Activities Like Eating, Dressing and Bathing

Pain with ADLs and Intensity of Pain	Frequency	Percentage
0.00	18	31%
1.00	2	3.4%
2.00	5	8.6%
3.00	7	12.1%
4.00	12	20.7%
5.00	8	13.8%
6.00	4	6.9%
7.00	2	3.4%
8.00	0	0
9.00	0	0
10.00	0	0
Total	58	100%

Table III: Swimmers' satisfaction level with shoulder function

Satisfaction Level	Frequency	Percentage
0.00	1	1.7
1.00	0	0
2.00	4	6.9
3.00	4	6.9
4.00	4	6.9
5.00	12	20.7
6.00	8	13.8
7.00	11	19.0
8.00	6	10.3
9.00	2	3.4
10.00	6	10.3
Total	58	100.0

Table IV: Side Bridge Average Time

	Dominant Hand	N	Mean	Std. Deviation	t-test	p-value
Side Bridge Average Time	Left	19	0.49	0.54	2.21	0.032
	Right	32	1.47	1.88	2.01	0.000

Discussion

A lot of studies have been conducted on swimmers concerning their shoulder pain and discomfort. This study and many other studies conducted earlier gave a high occurrence of shoulder pain across the lifespan of swimmers. The high levels of swim training in competitive swimmers resulted in increased competitive levels, thus practice guidelines for reducing these shoulder injuries are also necessary.^{9, 21, 22} A study conducted by Cools Am and his team suggests that before developing these guidelines, training and exposure factors which are associated with shoulder pain and discomfort must be

identified first.²³ In the current study, it was concluded that pain and discomfort in the shoulder is the main risk factor among competitive swimmers that can ultimately lead to the disability of the extremity. According to a study by Sawera Soman and her team, there is a virtuous association between pain and disability.¹⁹ The current study also showed a significant association. A study was conducted which showed an association between swimming practice proportions and pain in the shoulder throughout the life span for swimmers came to be the highest prevalence

among young swimmers with pain and A study conducted by Harrington and his team also showed an association between pain in the shoulder and disability with a lessening in pectoralis minor length in swimmers.¹⁸ Thomas and his team in April 2021 concluded that leading swimmers who are consistent and have shoulder pain and discomfort show altered structural and functional measures.²⁴ The present study concluded that exposure and physical examination varies between swimmers with or without considerable shoulder pain and discomfort.

Stef Feijen suggested that an elaborate consideration and understanding of training features associated with shoulder injury are needed before any practice strategies might be established.⁴ Discussing the results of the current study, coincide with the findings given for reduced shoulder motion in the study by Stephen J. Thomas and his team.⁶ The reduction in the shoulder motion, internal and external rotation, might be due to rotator cuff degeneration or overuse and thus resulted in pain and reduced level of satisfaction of shoulder functioning in swimmers.^{6, 25} A study showed results between disability and pain which coincides with a study by Tate and his team.

They concluded that there is pain and disability in female competitive swimmers throughout their life span.⁹ It has been discussed that competitive swimmers were at a higher risk of injury which leads to pain, discomfort and ultimately disability in the shoulder that affects their ADLs. The main limitation of this study is that this does not have the characteristic of an extensive population of swimmers. Future researchers are recommended to conduct a study on a broader level with a greater sample size to improve the accuracy and generalizability of outcomes. The researchers are also recommended to conduct a randomized

discomfort in the shoulder.¹⁵ controlled trial with a customized rehabilitation program for competitive swimmers with shoulder pain to be compared with traditional physical therapy.

Conclusion

This study concluded that disabilities are associated with shoulder pain across the lifespan of competitive swimmers. Pain and discomfort in the shoulder is the main risk factor among swimmers that can ultimately lead to the disability of the extremity. Only a few swimmers were fully satisfied with their shoulder functioning and the contributing cause behind the low satisfaction level of shoulder functioning among swimmers was pain and discomfort in their shoulder which led to pain in the arm and hand of that extremity during activities of daily living.

Declarations

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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Authors' contributions: All authors read and approved the final manuscript.

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