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ORIGINAL ARTICLE

Frequency of Shoulder and Elbow Overuse Injuries and its Association with Risk Factors among Overhead Athletes in Peshawar, Pakistan

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[1 3 4 5] Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work, [1 2] Drafting the work or reviewing it critically for important intellectual content, [1-5] Final approval of the version to be published, 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: February 19, 2025
Acceptance: August 18, 2025

Conflict of Interest: None
Funding Sources: None

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Cite this article as: Hassan M, Ali S, Ali M K S, Ali A, Ahmad F, Frequency of Shoulder and Elbow Overuse Injuries and its Association with Risk Factors among Overhead Athletes in Peshawar, Pakistan. JRCRS.2025:13(3):186-190
https://dx.doi.org/10.53389/JRCRS.2025130311

A B S T R A C T

Background: In sports that involve overhead movements, the overuse injuries occurs due to the repetitive exertion of force in an arc overhead exerts significant stress on the shoulder and elbow joints.

Objective: To find out the frequency of shoulder and elbow overuse injuries among overhead athletes and the association of frequency with associated factors such as age, gender, sport, years of experience and weekly playing hours.

Methodology: This cross-sectional study was conducted at Peshawar Sports Complex and Hayatabad Sports Complex, Peshawar from July to October 2024. A total of 132 athletes of ages between 18-40 years were included in this study. Data was collected through Oslo Sports Trauma Centre Overuse Injury Questionnaire from the athletes. Data was analyzed using Statistical Package for Social Sciences version 27.0 to create graphs and tables. Chi square test was used for statistical analysis to find the association between overuse injuries and its risk factors.

Results: A total of 132 athletes were part of this study. The frequency of shoulder overuse injuries was 17.4% while the frequency of elbow overuse injuries was 5.3%. Most of the affected athletes were between the ages of 18-25 years. There was no significant association between the frequency of shoulder and elbow overuse injuries and its risk factors.

Conclusion: This study concluded that statistically, the overuse injuries do not show significant association with the factors such as age, gender, sport, years of experience and weekly training hours.

Keywords: Elbow Injuries, Overhead Athletes, Overuse Injuries, Shoulder Injuries.

Introduction

Overuse injuries in overhead athletes are usually caused by repeated stress on the musculoskeletal system without sufficient rest and recovery, resulting in cumulative micro-trauma to the muscles, tendons, and bones.[1] These injuries, particularly in sports such as swimming, volleyball, and baseball, are increasingly regarded as a serious concern due to their frequency, impact on performance, and long-term health consequences.[2] Overhead athletes are especially prone to elbow and shoulder problems because of the biomechanical demands of their sports, which require repetitive overhead motions.[3]

The shoulder joint is especially vulnerable during throwing or hitting activities. According to research, the percentage of overhead athletes who experience shoulder injuries ranges from 18% to 61%, depending on the sport and level of competition.[4] Shoulder injury is one of the most prevalent musculoskeletal issues in sports involving overhead motions. A systematic review found that the

prevalence of shoulder injuries varies widely across studies, with estimates ranging from 5% to 36%.[5] Elbow overuse problems are a serious concern among overhead athletes, especially young athletes playing sports such as volleyball, baseball, and swimming, which involve repetitive arm motions.[6] The main cause of these injuries is the repetitive and forceful use of the arm, which places substantial stress on the surrounding muscles and the elbow joint.[7]

Overhead athletes are susceptible to various risk factors for overuse injuries to the elbow and shoulder, which can be classified as intrinsic and extrinsic factors.[8] Athletes are more vulnerable to injuries due to intrinsic factors such as age, experience level, and unique anatomical variations, including muscular imbalances, insufficient strength, and poor flexibility, all of which affect the stability and function of the elbow and shoulder joints.[9]

Extrinsic factors include training volume and intensity, field position, and time of season. These variables may exacerbate overuse injuries due to insufficient movement and short recovery periods.[10] The risk of injury can also increase with overtraining, poor technique, inadequate warm-up exercises, and early specialization in a particular sport.[11] Young athletes are particularly vulnerable because of their developing musculoskeletal systems and often insufficient training programs.[10]

The need to conduct research on the topic "Frequency of Shoulder and Elbow Overuse Injuries and Their Association with Risk Factors among Overhead Athletes" arises from the scarcity of local literature in this area, as existing studies primarily focus only on the frequency of overuse injuries. Furthermore, no studies have been conducted in Pakistan on this topic. The aim of this study is to determine the frequency of overuse injuries among overhead athletes and to examine their association with key factors including age, gender, type of sport, years of experience, and the number of playing hours. Understanding how these variables impact the risk of injury will help inform targeted prevention strategies to reduce the incidence of overuse injuries in this athletic population.

Methodology

This descriptive cross-sectional study was conducted at Peshawar Sports Complex and Hayatabad Sports Complex, Peshawar from July to October 2024. Ethical approval with the reference number i-e: IRC/NCS/023/24 was taken from the Institutional Research Committee of the NCS University System, Peshawar. The non-probability convenient sampling technique was used to collect the data. The sample size was calculated by using the Raosoft sample size calculator with 95% confidence interval, 5% margin of error and response distribution of 50%. 132 athletes of age 18-40 years, both males and females playing overhead sports such as badminton, tennis and volley ball were included in this study. The athletes played for recreational purposes and athletes with traumatic and surgical injuries were excluded from this study. The data collection procedure started after obtaining approval from institutional research committee and permission from director NCS University System and head of sports clubs, Peshawar. The Oslo Sports Trauma Centre Overuse Injuries Questionnaire was given to all the athletes after obtaining consent. The athletes were asked to indicate the numeric value on the questionnaire. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 27.0. The Chi-square test was used to find the association between shoulder between shoulder and elbow overuse injuries and its associated risk factors

Results

A total of 132 athletes participated in this study. The majority, 86 (65.2%), were aged 18-21 years, followed by 20 (15.2%) aged 22-25 years, and 15 (11.4%) aged 26-29 years. Male athletes predominated with 123 (93.2%), while 9 (6.8%) were female. Regarding the distribution of sports, badminton players comprised 61 (46.2%) of the group, tennis players 45 (34.1%), and volleyball players 26 (19.7%). In terms of experience, 44 (33.3%) athletes had 1-2 years, 33 (25.0%) had 3-4 years, and 14 (10.6%) had 5-6 years of sporting experience. Weekly training hours varied: 54 (40.9%) trained 8-12 hours per week, 18 (13.6%) trained 13-17 hours, and 35 (26.5%) trained 18-22 hours. Using the Oslo Sports Trauma Research Center Overuse Injury Questionnaire, 23 athletes (17.4%) reported shoulder overuse injuries, whereas 7 (5.3%) reported elbow overuse injuries as shown in the table 1.

The frequency of shoulder overuse injuries was distributed across different age groups: 18-21 years (9/86 athletes), 22-25 years (6/20), 26-29 years (6/15), and smaller numbers in older groups. Statistical analysis showed no significant association between age and shoulder overuse injuries ($p = 0.28$). Similarly, no significant association was found between age and elbow overuse injuries ($p = 0.178$). Table 2 Among male athletes, 20 reported shoulder overuse injuries, compared to 3 females. For elbow overuse injuries, 6 males and 1 female were affected. However, gender was not significantly associated with either shoulder ($p = 0.192$) or elbow overuse injuries ($p = 0.397$). The distribution of shoulder overuse injuries by sport was as follows: 13 in badminton, 6 in tennis, and 4 in volleyball. Elbow overuse injuries were reported by 3 badminton players, 3 tennis players, and 1 volleyball player. There were no significant

differences in frequency of injuries across the sports for shoulder (p = 0.538) or elbow injuries (p = 0.863). Table 2

Shoulder overuse injuries occurred in athletes with varying years of experience, including <1 year (3 injuries), 1-2 years (6 injuries), 3-4 years (7 injuries), and others. Elbow injuries also occurred across experience levels. Statistical tests showed no significant association between years of experience and shoulder (p = 0.383) or elbow injuries (p = 0.742). Athletes training 8-12 hours per week had the highest number of shoulder overuse injuries (10 cases), followed by those training 13-17 and 18-22 hours. Elbow injuries were less frequent and similarly varied across training hour categories. No significant association was found between weekly training hours and shoulder (p = 0.595) or elbow overuse injuries (p = 0.827). Table 3

Overall, no statistically significant associations were observed between shoulder or elbow overuse injuries and the examined risk factors including age, gender, sport, years of experience, and weekly training hours in this cohort of overhead athletes. The reason for no significant association is small sample size and low frequency of overuse injuries found in the targeted population.

Table 1: Frequency of Shoulder and Elbow Overuse Injuries

Shoulder Overuse Injuries			Elbow Overuse Injuries		
Injury	**Frequency**	**Percent**	**Injury**	**Frequency**	**Percent**
Yes	23	17.4	Yes	7	5.3
No	109	82.6	No	125	94.7
Total	132	100.0	Total	132	100.0

Table 2 Association of Shoulder and Elbow Overuse Injuries with Age, gender and Sports

		Shoulder Overuse Injury				Elbow Overuse Injury			
	(years)	**Yes**	**No**	**Total**	**Chi-square test**	**Yes**	**No**	**Total**	**Chi-square test**
Age	18-21	9	77	86	p-value = 0.28	3	83	86	p-value = 0.178
	22-25	6	14	20		1	19	20	
	26-29	6	9	15		3	12	15	
	30-33	2	4	6		0	6	6	
	34-37	0	2	2		0	2	2	
	38-40	0	3	3		0	3	3	
Total		23	109	132		7	125	132	

Association of Shoulder and Elbow Overuse Injuries with Sports

		Shoulder Overuse Injury				Elbow Overuse Injury			
		Yes	**No**	**Total**	**Chi-Square Test**	**Yes**	**No**	**Total**	**Chi-Square Test**
Sport	**Badminton**	13	48	61	p-value = 0.538	3	58	61	p-value = 0.863
	Tennis	6	39	45		3	42	45	
	Volleyball	4	22	26		1	25	26	
	Total	23	109	132		7	125	132	

Association of Shoulder and Elbow Overuse Injuries with Gender

		Shoulder Overuse Injury				Elbow Overuse Injury			
		Yes	**No**	**Total**	**Chi-Square Test**	**Yes**	**No**	**Total**	**Chi-Square Test**
Gender	**Male**	20	103	123	p-value = 0.192	6	117	123	p-value = 0.397
	Female	3	6	9		1	8	9	
	Total	23	109	132		7	125	132	

Table 3: Association of Shoulder and Elbow Overuse Injuries with Years of Experience and weekly training hours

		Shoulder Overuse Injury				Elbow Overuse Injury			
	(years)	**Yes**	**No**	**Total**	**Chi-Square Test**	**Yes**	**No**	**Total**	**Chi-Square Test**
Years of Experience	<1	3	9	12	p-value = 0.742	1	11	12	p-value = 0.383
	1-2	6	38	44		1	43	44	
	3-4	7	26	33		2	31	33	
	5-6	1	13	14		0	14	14	
	7-8	3	7	10		1	9	10	
	9-10	2	9	11		2	9	11	

	10+	1	7	8		0	8	8	
Total		23	109	132		7	125	132	
Association of Shoulder and Elbow Overuse Injuries with Weekly Training Hours									
	(hours)	Yes	No	Total	**Chi-Square Test**	**Yes**	**No**	**Total**	**Chi-Square Test**
Weekly Training Hours	8-12	10	44	54	p-value = 0.595	3	51	54	p-value = 0.827
	13-17	5	13	18		1	17	18	
	18-22	5	30	35		3	32	35	
	23-27	0	9	9		0	9	9	
	28-32	2	10	12		0	12	12	
	33-36	1	3	4		0	4	4	
Total		23	109	132		7	125	132	

Discussion

A systematic review in 2019 indicated that shoulder and elbow overuse injuries are notably prevalent among youth overhead athletes (12-16 years) with the prevalence rates of 31.3% for shoulder and 9.2% for elbow overuse injuries.[12] Another study also supports our findings, stating that athletes ranging from 15-18 years of age have increasing odds of sustaining shoulder and elbow overuse injuries.[13] A study in Pakistan found that 49.4% of badminton players reported shoulder pain, highlighting the significant impact of the sport on shoulder due to repetitive overhead motions.[14] In our study the proportion of badminton players is highest among the overhead athletes. Also, demographics of populations in both studies are almost the same. So, that is why this study significantly supports our results. A study performed in 2021, found that the incidence of overuse injuries in volleyball players was reported to be approximately 20%. The study highlighted that most injuries in the sport tend to be acute rather than chronic overuse conditions.[15] In volleyball, the shoulder is more affected than the elbow joint because of more stress. The study supports the finding of our study because the prevalence of shoulder overuse injuries is same. Due to the reason of same sport and population with almost the same demographics. Similarly, a study in Australia, found that athletes with 1-5 years of playing experience had the highest prevalence of overuse injuries. It also indicated that early-career athletes are at a higher risk for such injuries due to inadequate conditioning and technique.[16] This study does not support our findings as most of the athletes has injuries of knee and ankle joints. Ankle and shoulder joints differ in terms of stability; anatomically and biomechanically hence this past study is standing against the results of our study. Another study involving collegiate athletes, reported that overuse injuries were prevalent among those with fewer years of competitive experience. While a study in Finland, noted that athletes who trained for 8-17 hours per week had a significantly higher likelihood of reporting overuse injuries. The odd ratio for sustaining an overuse injury was found to be 1.63 times higher for athletes in this training volume compared to those who trained less than 7 hours per week. It emphasizes the impact of increased training load on injury risk.[17]

In this study population, male athletes greatly outnumber female athletes, resulting in unequal gender representation. Consequently, the sample may not accurately represent both genders of overhead athletes. The relatively small sample size may also limit the ability to generalize findings across all age groups and skill levels within overhead sports. Additionally, an unequal number of athletes were included from each of the three overhead sports, which may affect how well the results represent each sport's population. The injury data collected in this study were self-reported by the athletes, which introduces the possibility of recall bias. Athletes might underreport or inaccurately recall details about their injuries. These factors may influence the validity of the findings and should be taken into consideration when interpreting the results and applying them to broader populations.

Conclusion

This study highlights that overuse injuries of the shoulder and elbow are common concerns among overhead athletes, particularly affecting younger individuals and those engaged in sports requiring repetitive overhead motions. While no statistically significant associations were found between overuse injuries and factors such as age, gender, sport type, experience level, or training volume, trends suggest that male athletes, badminton players, and those with less competitive experience may be more susceptible. These findings emphasize the need for targeted injury prevention strategies and tailored training programs to mitigate the risk of overuse injuries in this population.

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