



Prevalence and Associated Risk Factors of Side Strains Injuries in Professional Cricket Bowlers

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Abstract

Side strain injuries, particularly affecting the internal and external oblique muscles, are common in sports like cricket, baseball, rowing, and ice hockey, where high-force rotational movements are frequent. These muscles are essential for trunk stabilization, and fast bowlers in cricket are especially prone to strains due to the intense rotational forces involved in bowling. The injury typically causes sudden pain in the lateral trunk, with swelling and bruising, and worsens during movements like sneezing or twisting. Recovery requires rest and rehabilitation to prevent further damage and restore mobility. This study aimed to determine the prevalence of side strain injuries among professional male cricket bowlers. And to find out the associated risk factors of side strain injury. A cross-sectional survey was conducted at three cricket stadiums in Peshawar, recruiting 278 male U19 and first-class bowlers through purposive sampling. Data on BMI, bowling type, experience, match exposure, training sessions, injury history, fitness levels, sleep hours, and pain (NPRS) were collected via a self-made structured questionnaire. Demographic data, Risk factors, Signs and symptoms of side strain injury, Pitch conditions and NPRS were assessed along with the prevalence of Side Strain Injury. The study found that 278 professional cricket bowlers reveals key insights into the prevalence and risk factors for side strain injuries. The majority of participants are aged 15-25 years (82.4%), with most weighing between 45-55 kg (56.5%). Fast bowlers make up 63.7% of the sample, and 32.4% of participant's bowl at speeds of 142-150 km/h. notably, 74.8% reported side strain injuries, with higher Prevalence linked to poor fitness levels and faster bowling speeds. Significant associations were found between fitness categories, bowling speed, and injury risk ($p < 0.001$), indicating that lower fitness and faster speeds are key contributors to side strain injuries. This study highlights a high prevalence of side strain injuries among cricket bowlers, with fast bowlers being the most affected group. Key risk factors significantly associated with the occurrence of these injuries include bowling speed, fitness levels, and the NPRS (Numeric Pain Rating Scale), all of which demonstrated a strong statistical association with side strain injuries.

INTRODUCTION

A side strain also known as muscle strain which is caused by tearing of transversalis fascia or internal oblique muscle, after the injury stretching mechanism will be severely painful and making it difficult to move affected limb hence later on the strain may be marked by swelling and bruising. Strains occur suddenly from stretched position or over time regular repetitive activities of the internal oblique muscle. While it is mostly common in cricket players hence affect contralateral side. Side strain is also reported in baseball, rowing and ice hockey players^[1,2]. According to the global report in a 20years of review there are about 46 cases of injured muscles suspected in which 15% were of rectus abdominis, 11% external oblique. Further data was collected from professional Australian cricket over 18 seasons to 2013 which indicate that oblique strains are having second highest incidence and third highest prevalence among all other injuries types^[3-5]. Bowler's side strain injuries, affecting the internal or external oblique, occur when the non-bowling arm is fully flexed and the bowling shoulder flexes to bowl the ball. Muscle of the abdomen abdominal are essential for pitching and batting. The lateral abdominal wall can be injured in sports or from high-energy traumas. Depending on the player pain and its condition side strain are of three types; first, second and third degree side strain. In which first degree is less damage to few muscles and the player is able to continue his bowling without any pain but may feel some tightness during the match or practice which my little effect his performance at the moment and the discomfort is at the region of lower ribs and elbow level, the player does not stop the over and strain is converted to the second degree which may complicate the injury Musculoskeletal injuries of the abdominal wall and surrounding areas are relatively less common across all sports but in cricket and baseball they are more common. Abdominal wall muscles play major role in trunk stabilization, during games athletes involved running or jumping sports hence they are at some risk^[6-9]. Such as hyperextension in (gymnastics) or sudden high-force rotation in (cricket fast bowlers, baseball pitching and racquet sports) they can cause injuries to their abdominal wall muscles. Injuries to different areas are having percentages and they are game specific. Back and abdominal injuries are common in every sport activity. In field hockey game at America Walker, 2011 he reported that 22% strain injuries occur due to flexion of their trunks for extended period of time and repeated contraction of abdominal muscle^[10]. Internal oblique muscle strain is one of the common injury develop in professional baseball players of Japan their strains were develop from 2012 and were diagnosed in 2021 by having local pain, tenderness and MRI findings with the rate of

12.2%hence injury common on the contralateral side of batting and pitching^[11] In recent year of 2023 Matthew F. Garnett *et al.* work on a topic of Repetitive Strain Injuries in Adults in the Past 3 Months: United States, he found that Nine percent of American people (18 and older) reported strain injury within the previous three months in 2021. Those between the ages of 35 and 49 (10.3%) and 50 and 64 (11.6%), More incomes, 400% or above the federal poverty threshold (9.8%), were generally associated with larger percentages. 44.2% of individuals with repetitive strain injuries reported limiting their activities for at least 24 hours. The highest percentages of individuals with this condition were White adults (47.0%), women (47.1%), and adults whose family income was less than 200% of the federal poverty threshold (51.0%). 51.4% of the highest percentages were among women^[12-18].

MATERIALS AND METHODS

The study was designed based on a highly descriptive cross-sectional survey method, aimed at exploring injury rates among cricket bowlers in Peshawar. Non probability convenience sampling was employed to select participants from various cricket academies of Peshawar. A sample size of 278 individuals was determined, using the Raosoft sample size calculator ensuring adequate representation of the target population. A detailed self-made questionnaire was utilized for data collection, based on Demographic, risk factor and multiple question regarding past injuries, physical fitness and bowling experience which was administered for the study. The bowling speed of each bowler was accurately measured using a speed gun. Agility T-Test 5 seconds as "Average," and over 11.5 seconds as "Poor ". Numerical Pain Rating Scale (NPRS) is a widely for fitness. Times under 9.5 seconds were rated "Excellent" 9.5–10.5 seconds as "Good" 10.5–11. used tool for assessing pain intensity, typically ranging from 0 to 10. 0-1: No pain or minimal pain 2-3: Mild pain, 4-6: Moderate pain, 7-10: Severe pain (31).The collected data underwent analysis using SPSS version 25. Descriptive statistics, including mean, median, mode, and standard deviation, were calculated. Chi-square test, were employed to examine associations between side strain injury and risk factors.

RESULTS AND DISCUSSIONS

The analysis reveals significant associations between fitness categories, bowling speed, and pain intensity with side strain injury scores (p -value = 0.000). Poorer fitness levels and faster bowling speeds, particularly in the 120-129 km/h and 142-170 km/h ranges, are linked to a higher incidence of side strain injuries. Participants with poor fitness had the most injuries, while those with excellent or average fitness reported none. Additionally, individuals experiencing

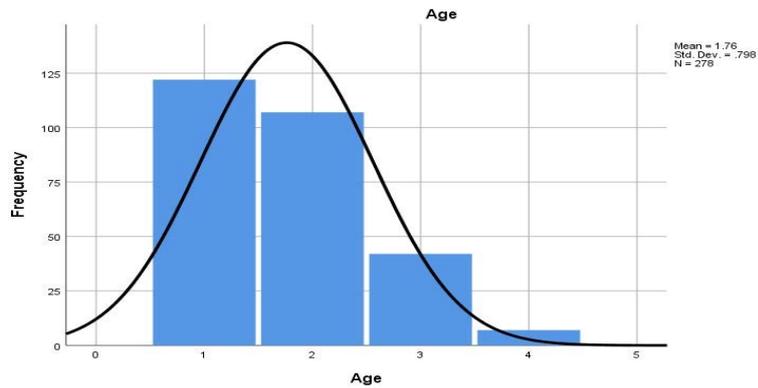


Fig. 1: Histogram of Age Distribution

Table 1: Frequency, Percentage of Demographic

Demographics			
Category	Attribute	Frequency	Percentage (%)
AGE	15-20 Years	122	43.9
	21-25 Years	107	38.5
	26-30 Years	42	15.1
	31-35 Years	7	2.5
	Total	278	100.0

Table 2: Frequency of side strain score, Risk factors and NPRS

Prevalence				
Category	Attribute	Frequency	Percentage (%)	
Side Strain Score	0	70	25.2	
	3	208	74.8	
	Total	278	100.0	
Bowling Role	risk Factors			
	Fast	177	63.7	
	Medium	37	13.3	
	Spin	64	23.0	
	Total	278	100.0	
Average Bowling Speed In km/h	0-96 Km/h (Slow)	22	7.9	
	7-119 Km/h (Medium)	20	7.2	
	120-129 Km/h (Medium Fast)	66	23.7	
	130-141 Km/h (Fast Medium)	80	28.8	
	142-150 Km/h (Fast)	90	32.4	
	Total	278	100.0	
	Years of Bowling Experience	1-3 Years	164	59.0
4-6 Years		79	28.4	
7-9 Years		30	10.8	
10-12 Years		5	1.8	
Total		278	100.0	
Fitness categories	Excellent	20	7.2	
	Good	127	45.7	
	Average	23	8.3	
	Poor	108	38.8	
	Total	278	100.0	
Fitness Time in Seconds	7	11	4.0	
	8	3	1.1	
	9	6	2.2	
	10	127	45.7	
	11	23	8.3	
	12	26	9.4	
	13	20	7.2	
	14	31	11.2	
	15	31	11.2	
	Total	278	100.0	
	NPRS score	NP RS		
		No pain (0)	21	7.6
		Mild Pain (1-3)	49	17.6
Moderate Pain (4-6)		100	36.0	
Severe pain (7-10)		108	38.8	
Total		278	100.0	

moderate to severe pain had the highest occurrence of injuries, highlighting that lower fitness, higher speed, and greater pain are key risk factors for side strain injuries. Details are available in table 3^[19-23].

This study highlights a high prevalence of side strain injuries among cricket bowlers, with 74.8% of the 278 participants reporting a side strain injury score of 3. The findings underscore the significance of several risk factors, including bowling roles, speed, experience, and fitness levels, in contributing to injury susceptibility. Notably, fast bowlers made up the majority of participants (63.7%), followed by spin bowlers (23.0%) and medium bowlers (13.3%), indicating that fast bowlers are more prone to side strain injuries. Moreover, the analysis of bowling speed revealed a strong association between higher speeds and injury risk, with 32.4% of participants bowling at fast speeds (142-170 km/h) and exhibiting the highest prevalence of side strain injuries. Conversely, bowlers in the fast-medium range (130-141 km/h) had the fewest injuries, while slower bowlers (0-96 km/h and 97-119 km/h) reported fewer occurrences of side strain injuries, suggesting that faster bowling speeds significantly increase injury susceptibility. Side strain injuries are quite common among fast bowlers in cricket. A study Nealon AR et al shows that Side strain injuries are common due to the intense physical demands of fast bowling, which involves rapid rotation and forceful movements^[24,25]. The repetitive and high-intensity nature of this action can lead to muscle tears, particularly in the intercostal and oblique muscles. Fast bowlers are at a higher risk compared to spin bowlers because of the greater forces involved in their bowling action^[2].

Fitness levels were another critical factor in determining injury risk. Participants with poor fitness had the highest occurrence of side strain injuries, with 108 individuals reporting a score of 3. In contrast, those with excellent fitness showed no side strain injuries, while individuals with good fitness had a mixed outcome, with 27 participants scoring 0 and 100 reporting injuries. A study by Forrest MR et al suggest that higher fitness levels, particularly in terms of core strength and flexibility, can help reduce the risk of side strain injury. Well-conditioned muscles are better able to handle the stresses and strains of fast bowling, which involves rapid rotation and forceful movements. Conversely, lower fitness levels can increase the likelihood of muscle fatigue and improper technique, both of which contribute to the risk of side strain injuries^[16].

This study provides strong evidence that lower fitness levels, faster bowling speeds, and greater pain intensity are key contributors to side strain injury risk among cricket bowlers. These findings emphasize the importance of targeted injury prevention strategies

focusing on improving physical fitness, managing bowling workloads, and monitoring pain levels. Small sample consisted of male participants which does not cover a cross-section of all cricket bowlers. There were no female cricketers and the study did not have a wider age range, therefore the findings of this study cannot be generalized. The study focused primarily focus on side strain injuries but cricket bowlers are also prone to other injuries, such as shoulder, elbow and lower back injuries. A broader analysis of multiple injury types might provide a more holistic view of injury patterns among bowlers.

CONCLUSION

Prevalence of (74.8%) side strain injuries among cricket bowlers, with fast bowlers being the most affected group follow medium fast and spin bowlers. The key risk factors significantly associated with the side strain injuries include speed of bowling, low level fitness, and the previous and current history of pain with a strong statistical association with side strain injuries (p-value = 0.000).

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