



# INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

## PREVALENCE OF SHOULDER INSTABILITY IN YOUNG AMATEUR FAST BOWLERS

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### Abstract:

**Introduction:** Bowling is a high-intensity activity characterized by various dynamic postures, involving repetitive twisting, extension, and rotation in a short period. The hours of repetitious practice contribute to a gradual deterioration in the functional capacity of the body. In the phases of throwing inherent to bowling actions, including preparation/wind-up, cocking, acceleration, and deceleration, the shoulder joint plays a pivotal role. Common shoulder injuries observed in throwing sports encompass micro instability, superior labrum anterior posterior (SLAP) tear, impingement, glenohumeral internal rotation deficit, scapular dyskinesia, and rotator cuff tear. The throwing motion necessitates a coordinated progression from toes to fingertips. Both bowlers and fielders are susceptible to shoulder injuries due to the substantial forces generated and the repetitive nature of throwing. The prevalence of shoulder instability in young amateur fast bowlers is a critical concern, given the demands of the sport and the potential long-term impact on musculoskeletal health

**Objective:** The aim of study is to find the prevalence of shoulder instability in young amateur fast bowlers with or without shoulder pain.

**Methodology:** A convenient sample of 120 young amateur fast bowlers, aged [insert age range], participating in {PCMC} Pune's sports clubs and cricket academies, formed the basis of this 6-month observational study. The participants underwent clinical examinations, including the anterior apprehension test (Crank Test) with a specificity of 0.99 and the posterior apprehension test with a sensitivity of 29. The study also considered additional factors such as bowling technique, training regimen, and injury history through self-reported surveys.

**Results:** The findings reveal a significant prevalence of shoulder instability among the studied cohort, with 44.6% of the population exhibiting positive results in the anterior and/or posterior apprehension tests. Conversely, 65.4% of the population showed no signs of shoulder instability. Correlations between specific bowling techniques and the occurrence of shoulder instability are explored, providing valuable insights into the factors contributing to shoulder issues in young fast bowlers.

**Conclusion:** This research contributes to the understanding of shoulder instability in young amateur fast bowlers, emphasizing the importance of targeted preventive measures and rehabilitation strategies. The specific outcomes of the anterior and posterior apprehension tests, coupled with the prevalence data, provide valuable clinical

insights. Further research is warranted to develop tailored intervention programs for the effective management of shoulder instability in this demographic.

## **Introduction:**

The shoulder complex consists of five articulations: The glenohumeral, sternoclavicular, coracoclavicular, acromioclavicular and scapulothoracic complex joints making the most complex joint of human body. One of the most important joint used in shoulder movement is glenohumeral joint which lacks bony stability and sacrifices the stability for increased mobility.<sup>1</sup>

Bowling is a high intensity activity that consists of various dynamic postures. Bowling involves repetitive twisting, extension and rotation in short period and the hours of repetitious practice produce a gradual deterioration in functional capacity of the body.<sup>2</sup>

Phases of throwing which mostly uses shoulder joint in bowling action includes preparation/ wind up phase, cocking, acceleration, and deceleration. Preparation/ Wind-up phase establishes the rhythm of the pitch or throw. The major forces arise in the lower half of the body in pitching, hip flexion of the lead leg raises the center of gravity. During this phase, shoulder muscles are relatively inactive. In Cocking phase, all segments of body are activated for ball release. The shoulder goes into abduction following horizontal extension and then into maximal external rotation. The internal rotators are in stretched position. At the end of cocking phase static anterior stabilizers are under strain. Due to repetitive nature of throwing, these structures can become weak and lead to instability. Acceleration phase is extremely explosive. It consists of forceful internal rotation and elastic force due to tight fibrous capsule, which generates excessive force at glenohumeral joint, to keep humeral head fixed in glenoid rotator cuff muscles were activated. The acceleration phase concludes with the ball release. Deceleration/ follow through, in this phase very high forces pull forward on the glenohumeral joint following ball release, which places large stresses on the posterior shoulder structures.<sup>3</sup>

Common shoulder injuries seen in throwing sports include micro instability, superior labrum anterior posterior, (SLAP) tear, impingement, glenohumeral internal rotation deficit, scapular dyskinesia, Rotator cuff tear. The throwing motion involves coordinated motion progressing from toes to fingertips. Both bowlers and fielders are prone to shoulder injuries arising due to large amount of forces generated and repetitive nature of throwing.<sup>4</sup>

Cricket has become an unofficial game of India. No other sport is as popular as cricket in India. During bowling in cricket, the internal shoulder rotator are involved in the acceleration phase of the arm through concentric contraction, while the external rotator are involved during the deceleration phase.<sup>5</sup>

In addition to the technique skills required to perform cricketers also need to possess high level of fitness thus making susceptible to overuse injuries as a result of repetitive training. The upper extremity account for 25% and 22% of injuries in amateur<sup>13</sup> and provincial<sup>14</sup> cricket players respectively. However, fast bowler have incidence of shoulder injuries with fast bowlers sustaining 42% of upper extremity injuries to cricket.<sup>6</sup>

Injuries in fast bowlers maybe caused by no. of factors such as postural defects, Poor bowling technique, inadequate physical or physiological attributes as well as high physical demands.<sup>7</sup>

Further during a match many bowlers are placed to field in the outfield and while bowling and throwing they have tendency to develop overuse injury of shoulder associated with throwing “Thrower’s shoulder” and other refers to acute traumatic injuries that are especially prevalent when players fall on shoulder while they are fielding.<sup>8</sup>

Stability in the glenohumeral joint is provided by glenohumeral ligaments glenoid labrum, shoulder capsule and by rotator cuff muscles. The external rotator strength has been reported to be around 65% of internal rotator strength.<sup>9</sup>

It has also been suggested that athletes in other overhead sports with altered scapular kinematics may be more susceptible to shoulder injuries. These data suggest that factors associated with training load, team role, fielding position, flexibility, strength and scapula kinematics should be taken into account when investigating factors associated with shoulder problems in cricketers.<sup>10,11</sup>

The authors discussed how measures of symptoms, activities, and function may be specific to region/joint, disease, or injury. General outcome measures are usually less responsive to change in the patient's status compared with more specific outcome measures, which focus primarily on the condition or population of interest to increase responsiveness.

Region-specific measures have the advantage of being appropriate for a wide variety of injuries, whereas more specific measures may be more relevant to patients and clinicians. The authors further stated that a measure must be validated for a specific purpose such as the evaluation of a population of subjects with a specific condition.

Not surprisingly, there has been a recent trend in the orthopedic literature to evaluate region-specific scoring systems for acceptable psychometric parameters (validity, responsiveness, and reliability) for injury-specific pathologies.<sup>12,13</sup>

There is a critical role of scapula in shoulder mechanics. In order to ensure that the head of humerus remain centred in the glenoid, the scapula must slide and rotate appropriately around the posterior chest wall. Any dysfunction in scapula movement is typically evidenced by a "winging" motion when the arm is elevated or by observing the posture of the upper back. Whether the winging comes before the injury or as a consequence is hotly debated. Either way it needs to function properly. And to complicate things even further, the thoracic spine also needs to be able to extend and rotate fully to allow the scapula to move. A kyphotic or slouched upper back are terrible for allowing the arm to reach full elevation and is a big contributor to shoulder problems. It should be clear that in order for a cricketer's shoulder to be pain-free, there needs to be a lot of dynamic strength and mobility of the upper trunk and shoulder girdle. But throwing technique is equally critical to both performance and injury prevention between the scapula and the humerus was introduced in the 1930s and termed "scapula-humeral rhythm" by Codman.<sup>14</sup>

Scapulohumeral rhythm using radiography and suggested what became the widely accepted 2:1 ratio between glenohumeral (GH) elevation and scapulothoracic (ST) upward rotation. The scapula on the thorax contributes to elevation (flexion and abduction) of the humerus by upwardly rotating the glenoid fossa 50° to 60° from its resting position [13] If the humerus were fixed to the fossa, this alone would result in up to 60° of elevation of the humerus. The humerus, of course, is not fixed but can move independently on the glenoid fossa.<sup>15</sup>

## Methodology:

This observational study aims to assess the prevalence of shoulder instability in young amateur fast bowlers engaged in cricket over a 6-month period. A convenient sample of 120 participants will be recruited from sports clubs and cricket academies in {PCMC} Pune. The study will focus on individuals who meet the inclusion criteria, including young males aged 16-25, actively participating in clubs or cricket academies, with a minimum playing experience of 6 months, and specializing in fast bowling. Outcome measures will involve the Anterior Apprehension Test (Crank Test) with a specificity of 0.99 and the Posterior Apprehension Test with a sensitivity of 29. Exclusion criteria encompass players with a history of shoulder surgery, those out of practice for 12 weeks, and individuals experiencing shoulder pain. This comprehensive approach aims to provide valuable insights into the prevalence of shoulder instability and associated risk factors among young fast bowlers, contributing to the broader understanding of musculoskeletal health in cricket athletes.

### Anterior apprehension Test {crank test}

Aim of the test: Identifies the past history of anterior shoulder dislocation

Patient position: Patient supine with shoulder in 90degree abduction. slowly take shoulder into external rotation.

Positive sign: patient doesn't allow and/or does not like shoulder to move in direction to stimulate anterior dislocation

### Posterior apprehension test

Aim of the study: Identifies past history of posterior shoulder dislocation.

Patients position: Patient supine with shoulder elevated 90\* with scapula stabilized by table. Place a posterior force through shoulder via force on patients elbow while simultaneously moving shoulder into medial rotation and horizontal adduction.

Positive sign: Patient doesn't allow and/or does not like shoulder to move in direction to stimulate posterior dislocation.

### Data Analysis:

The study adhered to ethical guidelines, and the data were anonymized to ensure participant confidentiality. All statistical analyses were performed using and detailed results are presented in the following sections. The demographic profile of the study participants, including age, playing experience, and frequency of fast bowling, was summarized using descriptive statistics. This allowed for a clear understanding of the composition of the study sample. The primary outcome measures, the Anterior Apprehension Test (Crank Test) and the Posterior Apprehension Test, were analyzed to determine the prevalence of shoulder instability among the participants. The specificity of 0.99 for the Anterior Apprehension Test and sensitivity of 29 for the Posterior Apprehension Test played a crucial role in identifying positive cases.

TABLE NO. 1

AGE GROUP	16-18	18-20	20-22	22-25
No.of Cricketers	52	45	16	07

BAR GRAPH NO.1

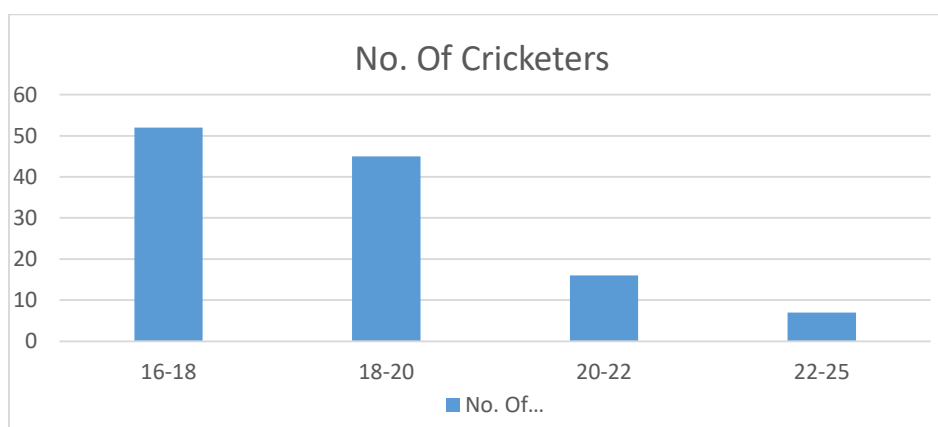


TABLE NO.2

<b>Anterior Apprehnsion Test</b>	<b>53</b>
<b>Posterior Apprehnsion Test</b>	<b>0</b>

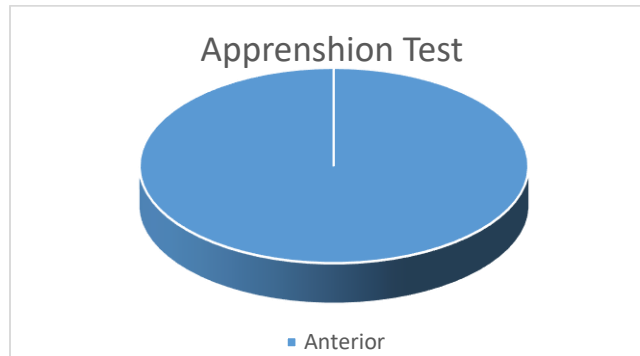
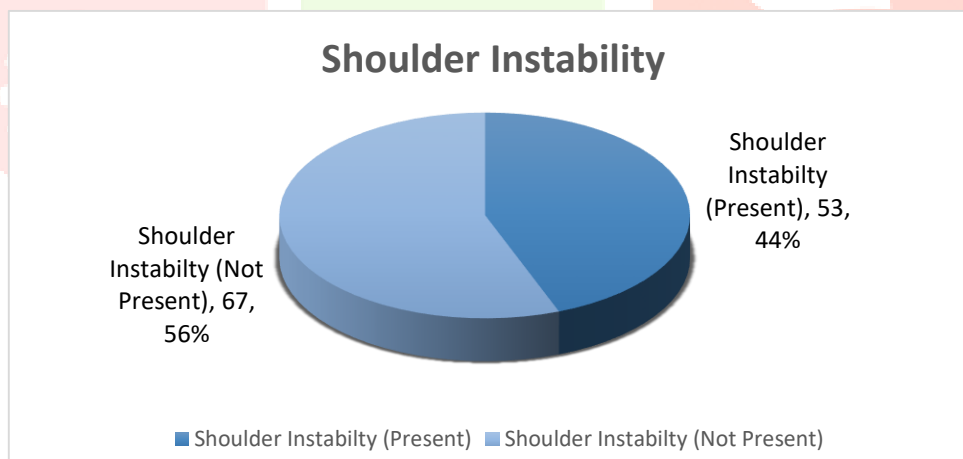


TABLE NO. 3

<b>SHOULDER INSTABILITY</b>	
<b>PRESENT</b>	<b>53 (44%)</b>
<b>NOT PRESENT</b>	<b>67 (56%)</b>

PIE CHART NO.3



### Results:

The findings reveal a significant prevalence of shoulder instability among the studied cohort, with 44.6% of the population exhibiting positive results in the anterior and/or posterior apprehension tests. Conversely, 65.4% of the population showed no signs of shoulder instability. Correlations between specific bowling techniques and the occurrence of shoulder instability are explored, providing valuable insights into the factors contributing to shoulder issues in young fast bowlers.

**Discussion:**

The primary objective of this study was to determine the prevalence of shoulder instability in young amateur fast bowlers without pain. Our findings revealed that 44.6% of fast bowlers exhibited shoulder instability, while 65.4% did not display any signs of instability. These results contribute valuable insights to the existing body of knowledge on shoulder injuries in cricket, particularly among fast bowlers.

Our results align with previous research conducted by K D Aginsky and L Lategan R Strech, which highlighted the significance of isokinetic strength characteristics of the internal/external rotator shoulder muscles, shoulder flexibility, and bowling action in influencing the incidence of chronic shoulder injuries in the bowling arm. The study underscored that shoulder injuries are more prevalent in fast bowlers with a front-on action compared to those with a side-on or semi front-on action, attributing the faster arm action to increased stress on the shoulder joint, predisposing bowlers to shoulder injuries<sup>17</sup>.

Moreover, K D Aginsky and L Lategan R Strech emphasized the importance of strengthening external rotators to mitigate shoulder instability risks. Their study suggested that an imbalance in strength between internal and external rotators could contribute to shoulder instability, and fast bowlers should focus on strengthening their external rotators to achieve a more balanced muscle strength profile<sup>17</sup>.

Sibi Walter and Carl Peterson contributed to our understanding by highlighting the role of frequent shoulder joint rotation in both fielding throwing and cricket bowling. They emphasized the need for maintaining internal and external rotator muscle strength symmetry to protect against musculotendinous trauma caused by repetitive abduction and rotational movements<sup>18</sup>.

Roxanne Davies, Rosa du Randt, Danie Venter, and Richard Stretch further emphasized the importance of correct bowling techniques in preventing serious injuries. Their study demonstrated that incorrect techniques, coupled with increased workload and poor physical preparation, significantly increased the risk of injury. Notably, bowlers exceeding workload guidelines experienced a higher number of recurring injuries, highlighting the importance of adherence to recommended rest periods and proper management of previous injuries<sup>19</sup>.

In conclusion, our study contributes to the comprehensive understanding of shoulder instability in young amateur fast bowlers, emphasizing the multifactorial nature of shoulder injuries in cricket. Recommendations for strengthening external rotators, maintaining muscle strength symmetry, and promoting correct bowling techniques could play a crucial role in injury prevention and overall musculoskeletal health in this population. Continued research and awareness are essential for the development of effective injury prevention strategies and player well-being in the sport of cricket<sup>19</sup>.

**Conclusion:**

This research contributes to the understanding of shoulder instability in young amateur fast bowlers, emphasizing the importance of targeted preventive measures and rehabilitation strategies. The specific outcomes of the anterior and posterior apprehension tests, coupled with the prevalence data, provide valuable clinical insights. Further research is warranted to develop tailored intervention programs for the effective management of shoulder instability in this demographic.

**Limitations of the study:** The absence of Magnetic Resonance Imaging (MRI) and X-rays is a significant limitation. These imaging modalities are essential for a comprehensive assessment of shoulder stability and could have provided a more detailed understanding of anatomical structures and potential pathologies. Another limitation lies in the study's focus on anterior and posterior apprehension tests, neglecting the assessment of inferior dislocation. While the selected tests offer valuable insights into anterior and posterior instability, a holistic evaluation of shoulder stability should include assessments for inferior dislocation. The study's

restriction to young male fast bowlers aged 16-25 and engaged exclusively in fast bowling may limit the generalizability of the findings to a broader cricketing population. Variability in age, gender, and playing style among cricket athletes could introduce potential biases. The reliance on self-reported data for factors such as bowling technique, training regimen, and injury history introduces a potential source of bias. Participants may recall information inaccurately, and the study lacks an objective measure to validate these self-reports. The relatively short duration of the study (6 months) may limit the ability to capture the long-term effects of bowling practices on shoulder stability.

### **Clinical Implications and future scope:**

The study highlights the potential role of targeted shoulder muscle strengthening in reducing the risk of instability. Clinical interventions could include tailored exercise programs aimed at enhancing the strength and stability of the shoulder muscles, particularly the external rotators. Such programs may serve as a preventive measure and rehabilitation strategy for amateur cricketers at risk of shoulder instability. Increased awareness of shoulder instability, as indicated by this study, can prompt early detection and intervention. In conclusion, the current study provides a foundation for practical implications in clinical settings and offers exciting avenues for future research aimed at advancing our understanding of shoulder health in amateur cricketers and improving injury prevention strategies.

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