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Research Article

# Shoulder Injuries in The Wrestlers: A Prospective Study from The Indian Subcontinent

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## Abstract

**Purpose:** Wrestling is a popular sport in many countries around the world including India. Its origin can be traced back to the Sumerians as early as 5000 BC. Like all sports, it is beneficial to its participants and has been linked to better grades, fewer school absences and better behavior. However, it is associated with high injury rate due to its arduous nature. Those to the shoulder and the knee are very common. The aim of our study was to categorize the pattern of these injuries to the shoulder in the Indian wrestlers.

**Materials and Method:** A prospective study was conducted involving 196 wrestlers who were followed up over a period of 02 years. Their shoulder injuries were studied by means of a structured questionnaire which they filled up with assistance from their athletic trainers.

**Results:** There were a total of 188 injuries in 121 wrestlers with overall injury rate of 5.13/1,000 athlete exposure. 30 wrestlers sustained 35 shoulder injuries (35/188; 18.62%). The mean age was 18.8 yrs±3.22 (Range 12- 27yrs), mean weight was 68.96 kg±12.93 (Range 42-94 kgs) and mean height was 168.33cm ± 11.225 (Range 132.5- 187.5cm). Total athlete exposure was 9743. Hence, the Injury rate was 3.59, Case rate was 1.16 and Player rate was 0.15. 40% injuries were new, while 60% were recurrent. More number of injuries occurred in competition (Incidence Density Ratio =12.90) and in defence position (57.1%). More number of injuries occurred in wrestlers practicing freestyle wrestling (71.42%). Injury proportion ratio for shoulder was 0.70. There was no statistically significant association with style of wrestling, age, weight, height and duration of practice. Ligament sprains and muscular strains were the commonest injuries. Four patients were advised surgery, while only 01 opted for it. Twelve out of 30 wrestlers were absent from practice for <1 week.

**Conclusion:** Injuries are the biggest nightmare of an athlete. Consistent and professional evaluation of the injury pattern sustained by these athletes helps us to understand them and develop a well-designed injury prevention program. Understanding the variables that can cause these injuries helps to minimize the duration of absence from the sport and prolong athletic life.

**Keywords:** Freestyle; Greeco-Roman; Shoulder; Wrestling Injuries

## Introduction

Wrestling is the earliest sport known to man. Since ancient times it has been practiced as the most natural method of attack and defence. It is as widely popular now as it was since its inclusion in the first Olympics in 776 BC [1]. At present there are two internationally recognized styles; Free Style (FS) and Greeco-Roman (GR) which are governed by different rules. Greeco-Roman wrestlers cannot grab their opponents below the waist. Like all sports, wrestling is beneficial to its participants. However, it leads to high injury rate which can be as high as 30.7 injuries per 1000 athlete-exposures among college wrestlers, due to its arduous nature. This is second only to injury rates among college football players [2]. studied the time loss and non-time loss injuries and reported that these were highest in football followed by wrestling [3]. In this sport all parts of the body are involved voluntarily or

involuntarily leading to high biomechanical forces and resultant injuries, some of which are unique to wrestling [4]. Common sites that are injured in wrestling are the knee, face, shoulder, ankle and neck. Most injuries occur as a result of either contact with a competitor or mat or twisting forces [5]. Youth wrestlers experience a greater proportion of fingers/wrist/hand injuries and head/ neck injuries. In contrast, scholastic wrestlers injure large joints, such as, shoulder proportionally more than young wrestlers [6].

Many researchers have found that the highest rate of injury involves the shoulder and the knee (3,6). Barroso et al. found that the topography with the highest number of lesions was the knee (25.5%), followed by the shoulder (20%) [1]. However, Pasque et al, in a prospective study with adolescent athletes for a season, found a large number of musculoskeletal lesions in the shoulder (24%) and in second place, in the knee (17%) [5]. The purpose of our study was to study the type of shoulder injuries in the Indian wrestlers and correlate them with the category of wrestlers who were prone to these injuries and other factors which contributed to these injuries.

## Materials and Method

Permission was taken from the institutional post graduate board of studies to conduct this study and informed consent was taken from the study population before starting the study.

### Study Population

All the wrestlers enrolled in the largest akhada/ wrestling school of the city were included in the study. Over a period of 02 years we studied 196 wrestlers prospectively. They were of all age groups, weight class, height and experience. Their shoulder injuries were documented by means of a structured questionnaire which they completed with assistance from their athletic trainers. The structured questionnaire included the date of injury, the type of injury (whether new or recurrent), clinical impression, player position, player activity, playing surface, imaging findings, management of injury and the date of return to sport. In addition it also included the player information e.g age, weight (wt), height (ht), duration for which the player had been practicing and style of wrestling(FS or GR).The athletic trainers were also required to report daily participation, the type of session and the injuries sustained. The structured questionnaire was presented in the paper form. All old injuries sustained before the study period, injuries due to systemic diseases and soft tissue or bony pathologies unrelated to the practice of wrestling were excluded from this study. Aggravation of previous injuries was also excluded from the study. All skin infections were also excluded. However, recurrent injuries at the same site sustained during the period of study were included and were recorded as recurrent injuries.

### Operational Definitions Used in The Study

**Definitions of Injury:** An injury was defined as any significant condition that limited function prompting the wrestler to seek the help of professionals from the area of health or that which caused abandonment of a fight or of training, and resulted in lost time from athletic participation for one day or more. A recurrent injury was defined as injury involving a body site that had sustained an injury at the same location earlier with an injury free period in between. An athlete exposure consisted of 1 athlete participating in 1 wrestling practice or match.

**Return to Game:** Follow-up was performed until the wrestler returned to practice/ competition or quit the game.

### Study Design

All wrestlers included in the study were subjected to a detailed clinical history and physical examination and were investigated by appropriate imaging modality depending on the type of injury. Radiographs were performed either on Digital Radiography system or on Computed Radiography system. Image processing or enhancement was applied on DR images as well as CR images depending on requirement. Ultrasound was performed using a 5-13 MHZ linear probe but in large patients a lower frequency probe i.e. 2-6 MHZ was necessary. Computed Tomography (CT) was done on 4 spiral CT scanner. Magnetic Resonance Imaging was performed in sagittal, coronal and axial plains. In all patients T1 weighted and T2 weighted images were obtained. In addition to these, T1 Gradient Echo Sequence (GRE), T2 Fast Spin Echoes (FSE), T2 fat suppressed and other sequences like PD weighted and PD weighted fat suppressed, were done as and when required. All investigations were performed by a radiologist with 11 years of experience as a general radiologist and 01 year as musculoskeletal radiologist. Radiographs were performed in cases of suspected fractures followed by CT scan if the diagnosis was in doubt. While, ultrasound was performed in all cases of suspected soft tissue injuries followed by MRI for further characterization in case of clinical indication. CT scan was also performed in cases of suspected osseous injury in cases of soft tissue injury.

## Statistical Analysis

Data was collected and analyzed using SPSS software and EPINFO for Chi- square analysis. Injury rates were calculated as ratio of injuries per 1000 athlete -matches. Case rate per 100 players was calculated by dividing number of injuries divided by total number of players. While, Player rate per 100 players was calculated by dividing the number of players sustaining at least 1 injury by the total number of players. The case rate per 100 players is different from the player rate per 100 players in that it includes multiple injuries to the same players.

Incidence Density Ratio (IDR) was calculated as follows:

IDR= Game Injury Rate /practice injury rate. An IDR of 1 indicates no difference in the injury rates. An IDR greater than 1 indicates that the games have the higher injury rates, and an IDR

less than l indicates higher injury rates in practice.

Definition of Injury Proportion Rate (IPR) is as follows:

IPR=Total freestyle specific injuries/total freestyle injuries

Total Greco-roman specific injuries/total Greco-Roman injuries

## Results

The study included 196 wrestlers, with age range of 9 years to 34 years (mean age=19.23 ± 0.279 yrs), weight range of 38 kg to120 kg (mean wt=67.94 ± 1.07 kg) and height range of 123 cms-195cms (mean ht=165.62 ± 10.6cms), practicing freestyle (FS) (160/196) and greeco-roman (GR) (36/196) type of wrestling. There were 188 injuries in 121 wrestlers. Injured wrestlers sustained 188 injuries and had 36626 athlete exposures. Hence, the overall injury rate was 5.13 Injuries /1,000 athlete-exposures. Case rate was 0.95 while, player rate was 0.61.

Injuries to the shoulder were commonest after knee injuries. Total of 30 wrestlers sustained 35 shoulder injuries (35/188; 18.62%). The mean age was 18.8 yrs±3.22 (Range 1227yrs), mean weight was 68.96 kg ± 12.93 (Range 42-94 kgs) and mean height was 168.33cm ± 11.225 (Range 132.5-187.5cm). Total athlete exposure was 9743. Hence, the Injury rate was 3.59, Case rate was 1.16 and Player rate was 0.15. More number of injuries (14/35) to the shoulder joint were recurrent (40% injuries were new, while 60% were recurrent). This was statistically significant (P = 0.000).

More number of injuries occurred in competition (Incidence Density Ratio =12.90). Injuries that occurred in defense position were 20/35 (57.1%) and were more than those in attack position. This was statistically significant (P = 0.00) (Figure 1).

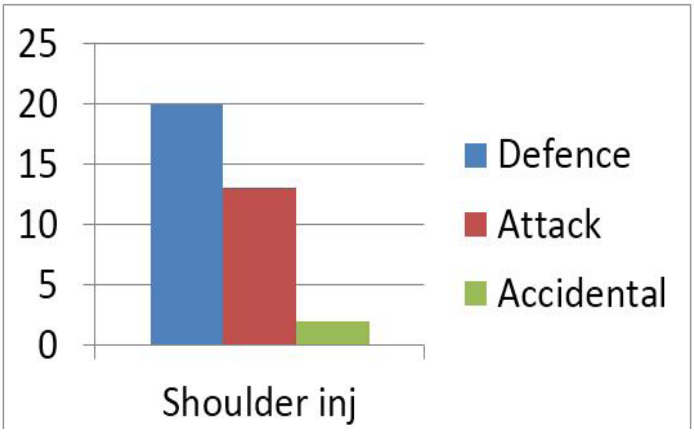


**Figure 1:** Shoulder Injuries vs Position of wrestler.

More number of injuries occurred in wrestlers practicing freestyle wrestling (25/35=71.42%). Injury proportion ratio for shoulder was 0.70. This was not statistically significant (P=0, 202) (Figure 2).

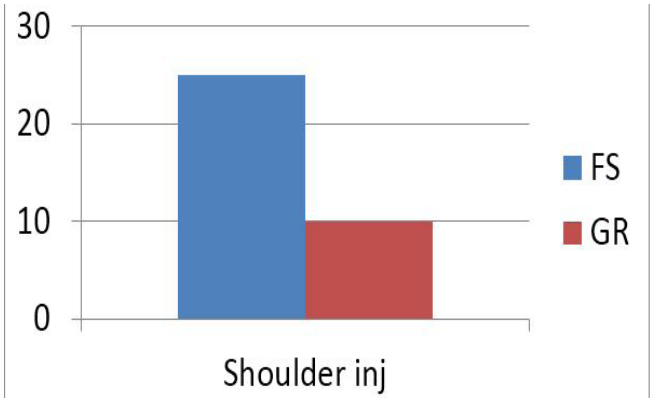


**Figure 2:** Shoulder Injuries vs Style of Wrestling.

There was no statistically significant association with age, weight, height and duration of practice. Ligament Sprains and muscular strains were the commonest injuries (37.5%) (Table 1).

| SHOULDER LESIONS (N=40) | | |
|---|---|---|
| Sprain/Tears (muscular and ligamentous) | 15 | (15/40) 37.5% |
| Contusion | 4 | (4/40) 10% |
| Bursitis | 2 | (2/40) 5% |
| Tendinosis | 4 | (4/40) 10% |
| Fracture | 1 | (1/40) 2.5% |
| Bony Bankart | 2 | (2/40) 5% |
| Bankart | 3 | (3/40) 7.5% |
| Hill Sachs' | 5 | (5/40) 12.5% |
| SLAP-1 | 1 | (1/40) 2.5% |
| ALPSA | 1 | (1/40) 2.5% |
| Gird | 1 | (1/40) 2.5% |
| Perthes | 1 | (1/35) 2.5% |

**Table 1:** Various Shoulder Lesions.

Four patients were advised surgery, while only 01 opted for it. Twelve out of 30 wrestlers were absent from practice for<1 week.

## Discussion

Sports injuries occur due to various risk factors interacting at a given time [7]. Associations between variables can be identified at times. However, they are not necessarily cause-effect in nature [8]. Injuries vary widely among various sports and specific injury patterns have been found to occur in different sports. This injury pattern is related to the different degree of risk factors found with different sports [9]. Sports like wrestling and football require frequent player to player contact and hence are associated with highest shoulder injury rate. In addition, there is also frequent impact

with playing surface in case of wrestling further compounding the problem. These injuries are also high in baseball, softball and volleyball even though these do not involve the player-to-player contact. Continued stress on the shoulder as a result of repetitive movements lead to high injury rate in baseball, softball and volleyball [10]. Heavy forces placed on the upper extremity and the extreme positions that can occur during wrestling lead to high shoulder injury rates. A common mechanism of shoulder injury is when the wrestler attempts to brace his fall with his extended arm when he is thrown to the mat from a standing position. However, if he is unable to extend his arm, the fall may be taken directly on the shoulder. 11Most number of injuries in our study population occurred in the defensive position. These injuries have been reported anywhere from 9.3 to 42% of all injuries. The shoulder has the highest proportion of injury, as high as 24% of total reported injuries. In our study population the total reported shoulder injuries were 18.61%. They were second only to knee injuries. The upper arm has the lowest reported frequency of upper extremity injury ranging from 0.8 to 1.4%. Percentage of shoulder injuries has been reported in the range of 3.5-24% of wrestling injuries in the pediatric population, and occur second only to injuries occurring at the knee [12,13].

According to the meta-analysis performed by Hwett et al. exposure-based injury rates in case of pediatric wrestling injuries were between 6.0 and 7.6 injuries per 1,000 athletic-exposures. Injury rates increased with age, experience, and level of participation. The head/spine/trunk was the body region that incurred the greatest frequency of injuries, followed by the upper and lower extremities [11,12]. Studied four high schools during a 2-year period and found the most commonly injured area to be spine and trunk (34%, 60/176), followed by the lower extremities (33%, 58/ 176) and the upper extremities (29%, 51/ 176) [13] documented the types of injuries in adolescent and preadolescent boys in two large wrestling tournaments and found that the primary areas injured were the upper extremity (33%, 73/221injuries), neck and back (24%, 53 / 221 injuries). In addition, older wrestlers and perhaps heavier wrestlers were reported to have an increased risk of injury. In wrestling, head and face elements are commonly exposed to trauma because of wrestling positions. In extremities, the knee, shoulder, and ankle joints are reported to be the most commonly involved [2]. Use of legs in FS and hands and arms in GR as per rules possibly makes these wrestlers more vulnerable to lower and upper extremity injuries, respectively [14]. In our study population more, number of injuries occurred in wrestlers practicing freestyle type of wrestling.

Another study by Ngom et al. involving children in Dakar found that the limbs were predominantly affected especially the upper limbs. Majority of injuries affected the elbow joint followed by forearm and shoulder and fractures were most commonly found followed by contusions and dislocations [15]. This was not the case in our study. Overall knee injuries were commonest followed by shoulder injuries. The commonest lesion was sprains and strains, followed by contusions. Otero et al also found that the injuries to the shoulder were amongst the top 04 areas injured which resulted in lost time or surgery [16].

In a study conducted by Akbarnejad et al on wrestlers practicing the GR style of wrestling, the highest incidence of wrestling injuries was to the athlete's skin (62%), followed by muscle (22%), bones (9%) and joints (7%), respectively. This is similar to the findings in our study. Considering the region of injury involved, it was found that 33.3% of the injuries involved the upper extremities. Such findings were expected, since in GR style wrestling the majority of the force applied is restricted to the upper extremities particularly the hand as the wrestlers are restricted to competing with their counterpart only in this area [3]. Over half of the 159 athletes practicing combat sports and analysed by Noh et al presented with sprains, strains and bruising and most of the wrestlers in their study had been injured this way [17] conducted a study examining high school wrestling injuries and noted that wrestlers with general ligamentous laxity suffered fewer shoulder injuries than did other wrestlers. Therefore, they suggested that shoulder flexibility should be an essential component of injury prevention programs. In addition to flexibility, rotator cuff strength, endurance, shoulder stability and proper muscle balance are also an essential component of such programs [18]. Hewett et al. found that most of these injuries such as rotator cuff strains and contusions were self-limiting. However, many result in significant lost time, such as acromioclavicular separations and glenohumeral subluxations or dislocations [18]. A prospective study conducted by Pasque et al. found the shoulder injuries to be 24% of the total injuries reported in a high school wrestling population [5] studied shoulder injuries among US high school athletes participating in 09 sports including wrestling and our findings are consistent with the observations made by them [19]. Shoulder injuries occur very commonly in the sport of wrestling. These are not related to any of the variables like age, height, weight and duration of practice. Also, these don't appear to be associated with the style of wrestling. These are however very important as they can result in time loss from practice and can significantly curtail the athletic life of an individual.

## Limitations

There were several limitations of this study. Since it was the first of its kind from the Indian subcontinent. Hence, we kept the study very simple without complicating the study parameters. Inspite of that we observed following weakness during the course of this study:

- Non- availability of proper policies regarding training of these athletes.
- Ignorance of study population along with that of trainers who persist in treating injuries according to traditional methods.

- Ignorance about importance of reporting injuries/ avoidance to continue practicing.
- Ignorance/lack of proper follow up to continue playing in competitions.
- Out of the two styles FS is the more popular style. All wrestlers start their career practicing this style and generally shift to GR style on sustaining injuries to lower limb.
- Lack of proper supervision during the time away from sport following injury.
- Lack of regular medical checkups and information regarding their injuries.

## Conclusion

It is very important to consistently and professionally evaluate the injury pattern sustained by the athletes. It helps us to understand them and develop a well-designed injury prevention program. Understanding the variables that can cause these injuries helps to minimize the duration of absence from the sport and prolong athletic life.

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