

# Elbow, Wrist and Hand Tendinopathies in Badminton Players

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Received October 11, 2018; Revised January 03, 2019; Accepted February 05, 2019

**Abstract** Badminton is one of the most popular sports worldwide. Pathophysiology of badminton injuries is reported to be dominated by overuse injuries and upper limb accounts for approximately one third of overuse injuries mainly to tendons, which are known as tendinopathies. A descriptive cross sectional study was conducted including 25 badminton players, to investigate occurrence and associated factors of elbow, wrist and hand tendinopathies in badminton players. A interviewer administered questionnaire was used to obtain descriptive data (age, sex, level of the player, standards of warm up and cool down, components of training schedule (ex. strengthening exercises, flexibility exercises), intensity of practice (Duration, frequency), duration of playing of the racquet sport and previous injuries to upper limb) from the players. Player's height, weight, pain response, palm length, finger length, thumb length, palm width, grip strength, active/passive and painful/ pain free Range of motions of elbow, wrist, hand movements, racquet weight, racquet grip size were measured. An overall occurrence of 28% of elbow, wrist and hand tendinopathies was recorded. Among them 20% were elbow tendinopathies, 4% were wrist tendinopathies and 4% were hand tendinopathies. Among all, most commonly reported tendinopathy was lateral epicondylitis (45.9%). There was no significant association observed between occurrence of elbow, wrist and hand tendinopathies with intrinsic factors as age, gender, body mass index and hand anthropometries. Out of extrinsic factors, level of player (competitive/recreational), duration of play, history of previous upper limb injuries, training hours per week, strengthening exercises to upper limb, racket characteristics warm up and cool down exercises practices did not show any significant association with elbow, wrist and hand tendinopathies. Performing upper limb flexibility exercises showed a significant association ( $p < 0.05$ ) with elbow, wrist and hand tendinopathies. The occurrence of elbow, wrist or hand tendinopathy was higher in players who did not perform routine upper limb flexibility exercises.

**Keywords:** badminton, tendinopathy, elbow, wrist, hand

**Cite This Article:** Senadheera V.V., Mayooran S., and Dissanayake J.K., "Elbow, Wrist and Hand Tendinopathies in Badminton Players." *American Journal of Sports Science and Medicine*, vol. 7, no. 1 (2019): 16-19. doi: 10.12691/ajssm-7-1-3.

## 1. Introduction

Pathophysiology of badminton injuries is reported to be dominated by overuse injuries [1,2]. A musculoskeletal injury was defined as due to overuse if it had developed gradually and could not be explained by a single trauma [3].

Overuse injuries occur often in connective soft tissues, particularly to tendons and their sheaths [4]. Tendinopathy, is identified as the best, descriptive term for tendinous lesions arising due to overuse [5]. Degeneration of the tendon body (tendinosis), inflammation of the tendon sheath (tendinitis) or both can be seen as the responses of tendons to repetitive overload beyond the physiological limit [6].

Tendons subjected to repetitive loading may be injured because they don't have enough time to recover before

they undergo another loading cycle, though the load magnitude may be within the normal range. Excessive loading of tendons during vigorous physical training is thought to be the main pathological cause for degeneration [7].

Tendinopathies are common in hand, wrist and forearm area, the shoulder and neck. Shoulder, elbow, wrist and hand tendinopathy occurs due to forceful and repetitive shoulder movements, wrist flexion and extension, forceful ulnar deviation, rapid rotation of the wrist and repetitive finger flexion [4]. Overuse tendon injuries to elbow, wrist and hand include lateral epicondylitis, medial epicondylitis, tendinitis, tenosynovitis, stenosing tenosynovitis of finger (trigger finger), stenosing tenosynovitis of thumb (DeQuervain's) and tendinosis.

Many factors may cause elbow, wrist and hand tendinopathies in badminton players as, repetitive movements, prolonged gripping of racquet, warm up and cool down standards, components of training schedule

(ex. strengthening exercises), intensity of practice (Duration, frequency), standards of the equipments (racquet weight, handle size, tension of strings of racquet, standards of shuttle cock), duration of playing of the badminton, improper techniques, muscle imbalances and previous acute injuries to upper limb [8].

Evidence of the cumulated incidence of badminton related elbow, wrist and hand tendinopathies are limited. The complex anatomy interrelated and closely situated structures and highly dynamic movements of shoulder, elbow, wrist and hand joints make it difficult to study related pathologies. Consequently little scientific data regarding the tendinopathies of elbow, wrist and hand in badminton players are available to assist the clinician. Therefore the aim of this study was to describe the occurrence and factors associated with elbow, wrist and hand tendinopathies in badminton players.

## 2. Methodology

A descriptive cross sectional study was conducted including 25 badminton players who were attending to practice at gymnasium of University of Peradeniya during the period of 01/09/2107 – 30/09/2017. Ethical clearance was obtained from the Ethics review committee of Faculty of Medicine, University of Peradeniya, Sri Lanka. Written informed consent was obtained prior to study. Players who have suffered from acute injuries to upper limb during past six months, who have been playing badminton less than six months were excluded. Players with elbow, wrist and hand pain for more than two weeks were included in the study and diagnosed for elbow, wrist and hand tendinopathy, by clinical criteria which include pain without a history of acute injury (elbow, wrist and hand) for more than two weeks, Tenderness to palpation and reproduction of pain with resisted movements.

An interviewer administered questionnaire was used to obtain descriptive data (age, sex, level of the player, standards of warm up and cool down, components of training schedule (ex. strengthening exercises, flexibility exercises), intensity of practice (Duration, frequency), duration of playing of the racquet sport and previous injuries to upper limb) from the players with elbow, wrist and hand tendinopathy.

Player's height and weight were measured by a standard measuring tape and a standard weight scale (Digital Personal Scale/180kg) correspondingly. Player's pain response (during rest and during activity) was rated by the use of visual analogue scale (0-10). Player's palm length (from bottom crease at wrist to bottom of middle finger), finger length (from bottom of middle finger to tip of the middle finger), thumb length (from bottom of thumb to tip of the thumb) and palm width (perpendicular distance from bottom of the thumb to ulnar border of hand) were measured by using a standard measuring tape. Grip strength of both hands was assessed by using a grip strength dynamometer (Jamar Hydraulic Hand Evaluation Kit). Active/passive and painful/ pain free Range of motions of elbow, wrist and hand movements were measured by universal goniometer and finger goniometer. Racquet weight was measured by using a standard weight scale. Racquet grip size was measured by using a standard measuring tape.

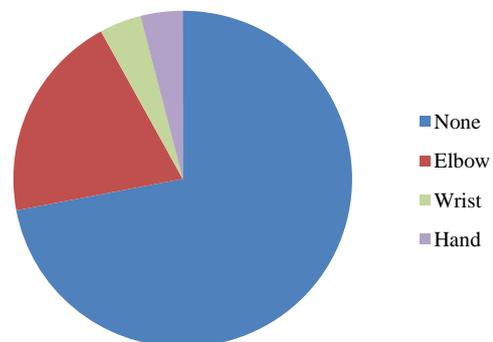
To inter examiner reliability (exclude inter observational error) each one of the measurements were done by the same investigator. To intra examiner reliability (exclude intra observational error) every measurement was taken for three times and average of those three repetitions was taken as the reliable measurement.

Regression analysis and chi-square test was used to find the association between risk factors and occurrence of tendinopathy. ANOVA test was used to compare mean values of hand anthropometries and racket characteristics between players with and without elbow, wrist and hand tendinopathies.

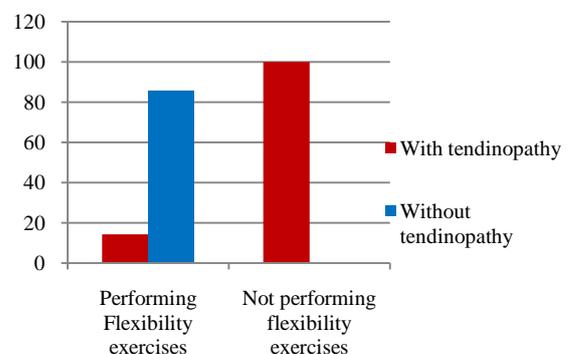
## 3. Results

Twenty five badminton players were studied. Among them 60% (15) were competitive players (2 elite and 13 sub elite players) and 40% (10) were recreational players. The sample included 20 (80%) males and 5 (20%) females. Age of the players distributed from 23 years to 65 years. Twenty three players (92%) had normal BMI (18.5-24.9) and two (8%) were overweight (BMI 25-29.9).

An overall occurrence of 28% of elbow, wrist and hand tendinopathies was recorded. Among them 20% were elbow tendinopathies (lateral epicondylitis - 13.33%, medial epicondylitis - 6.67%), 4% were wrist tendinopathies and 4% were hand tendinopathies. Most common tendinopathy was lateral epicondylitis (45.9%). (Figure 1).



**Figure 1.** Prevalence of elbow, wrist and hand tendinopathies in badminton players



**Figure 2.** Prevalence of elbow, wrist and hand tendinopathies and performing routine upper limb flexibility exercises

84% of badminton players were reported to perform routine upper limb flexibility exercises while 16% did not.

Interestingly 100% of players who did not perform upper limb flexibility exercises had elbow, wrist or hand tendinopathies. There was significant association between not performing upper limb flexibility exercises and elbow, wrist and hand tendinopathy. The prevalence of elbow, wrist and hand tendinopathy was higher in players who did not perform routine upper limb flexibility exercises. (Figure 2).

There was no significant association observed between occurrence of elbow, wrist and hand tendinopathies with intrinsic factors as age, gender, body mass index and hand anthropometries. Out of extrinsic factors, level of player (competitive/recreational), duration of play, history of previous upper limb injuries, training hours per week, strengthening exercises to upper limb, racket characteristics warm up and cool down exercises practices did not show any significant association with elbow, wrist and hand tendinopathies.

## 4. Discussion

Previous studies report that upper limb accounts for 19-32% of overuse injuries in badminton players [1,9]. Sharrif et al., 2009 [2] had reported that in badminton player's elbow was the second most affected area of upper extremity, reporting golfer's elbow (medial epicondylitis) (54.2%) and tennis elbow (lateral epicondylitis) (12.5%). According to present study a higher occurrence (60%) of tennis elbow was recorded than the prevalence of golfer's elbow (40%).

The occurrence of elbow, wrist and hand tendinopathy was higher in players who did not perform routine upper limb flexibility exercises. This result is comparable with studies conducted on tendinopathies in lower limbs where it was reported that lack of flexibility may lead to development of lower limb tendinopathies [10,11].

Flexibility exercises help to maintain and improve soft tissue extensibility and normal tendon gliding mechanism. When flexibility is compromised it can lead to decreased mobility of multi-joint musculotendinous units and other soft tissue structures leading to tendinopathy [12].

In previous studies competitive and recreational players had showed different pathophysiological profiles. In elite players overuse injuries were more frequent than in recreational players while acute injuries were more frequent in recreational players. In the present study we observed the same though the difference was not significant. It was assumed that longer duration of engaging in the sport and vigorous training schedules may be a leading factor to development of tendinopathies in competitive players [1,13].

It was suggested that a previous injury experience was significantly associated with occurrence of new injury as surrounding tissues' structure and function are already compromised [13,14]. Furthermore it was reported that females tend to develop less tendinopathy than males [15], [16]. Post menopausal women seemed to be more prone for tendinopathies, suggesting that estrogen protects tendons [17,18]. Age was another factor that appears to predispose tendon lesions and the prevalence of tendinopathy seemed to increase with age in athletically active [19]. Moreover, prevalence of tendinopathies

seemed to rise with increased adipose tissue levels [20] and decreased range of motion [21,22]. Conflicting evidence observed for the association between strength and tendinopathy. Some studies indicated an association [23] while some did not [20]. Training related factors as greater number of training hours per week [15,16] and greater number of training sessions per week [24] had been showed to associate with patella tendinopathy.

The different findings may be due to the population variance between the present study and the previous studies. The present study may have limited by the sample size. Future studies with a larger sample size and conducted among both competitive (elite, sub elite) and recreational players are recommended to further investigate the upper limb tendinopathies in badminton players.

## 5. Conclusion

Overall occurrence of elbow, wrist and hand tendinopathy in the present sample of badminton players is 28%. Lateral epicondylitis (tennis elbow) was reported as the most common tendinopathy. Performing upper limb flexibility had a significant association with elbow, wrist and hand tendinopathies. The occurrence of elbow, wrist or hand tendinopathy was higher in players who did not perform routine upper limb flexibility exercises.

## Statement of Competing Interests

The authors have no competing interests.

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