

**RISK FACTORS OF TENNIS ELBOW PATIENTS ATTENDED
AT TWO SELECTED ORGANIZATIONS IN DHAKA**

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Bachelor of Science in Physiotherapy (B.Sc. PT)

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitled

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AT TWO SELECTED ORGANIZATIONS IN DHAKA**

Submitted by **Shahoriar Ahmed**, for partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B.Sc. PT).

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Declaration

I declare that the work presented here is my own. All source used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of the study. I would be bound to take written consent from my supervisor.

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Acronyms

ADL	Activity of Daily Living
BHPI	Bangladesh Health Professions Institute
CRP	Centre for Rehabilitation for the Paralyzed
ECRL	Extensor Carpi Radialis Longus
LE	Lateral Epicondylitis
LET	Lateral Elbow Tendinopathy
NSAIDs	Non Steroidal Anti-Inflammatory Drugs
SPSS	Statistical Package for the Social Sciences
TE	Tennis Elbow
WHO	World Health Organization
WMSD	Work-related Musculoskeletal Disorder

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Abstract

Purpose: The purpose of the study was to identify the risk factors of development of Tennis Elbow for the patient attended at CRP and Bangladesh Tennis Federation. *Objectives:* To find out the risk factors associated with development of Tennis Elbow; to explore the socio-demographic information of the affected group; to determine vulnerable age group of Tennis Elbow and to assemble the association between Tennis Elbow and possible exposure (Overuse of hand, behavior of pain, smoking, recurrent injury, weight lifting by hand, Types of pain). *Methodology:* A hospital based unmatched (1:1) case-control study was carried out to complete the objectives of the study. Thirty participants with Tennis Elbow were identified from musculoskeletal unit of CRP and Tennis Federation as case and another thirty healthy people were selected as control. The data was collected by using a structural questionnaire by face to face interview. Data were analyzed through SPSS 16 version. *Results:* A total 60 participants with Tennis Elbow the mean age of the participants was 41.75 (± 12.54) years and minimum age was 24 years and maximum age was 70 years. Among case the mean age of the participants was 40.97 (± 13.95) years and control group was 40.53 (± 11.18). The frequency of Tennis Elbow was highest in between the 24-39 Years that is 50% (n=15). A total of 60 participants 16 (26.67%) of the cases were male and 14 (23.33%) were female whereas 20 (33.33%) of the controls were male and 10 (16.67%) were female. 6.7% of the affected respondents have at least some primary education. 21.67% (n=13) cases and 30% (n=18) control were lived in urban area and 28.33% (n=17) case and 20% (n=12) control were from rural area. The factors significantly associated with the development of Tennis Elbow were overuse hand (OR 5.6875; 95%CI, 1.59-20.33), Weight lifting by hand (OR 1.643; 95%CI, 1.52-5.12), Recurrent Injury (OR 18.308; 95%CI, 3.67-91.22), Smoking (OR 3; 95%CI, 1.05-8.6). *Conclusion:* The important way for prevention of Tennis Elbow including the modification of over use of hand and weight lifting for reduce risk factors and it is also important to take comprehensive preventive measures like sports by modification of the working position and correction the hand during playing and the daily living activities.

Key words: Risk factors, Tennis Elbow.

1.1 Background

The common extensor tendon inserts on to the lateral epicondyle which explains the use of terms such as lateral epicondylitis, lateral epicondylosis, and lateralepicondylalgiato describe what the lay person calls “tennis elbow”. The use of the suffix “itis” may be misleading since it assumes that there is an inflammatory state within the injured tendon. The suffixes “osis” and “algia” represent a degenerative condition or pain respectively. Waugh provides a strong argument for the use of the term lateral epicondylalgia since it may encompass all potential causes of lateral elbow pain without making an assumption (Waugh, 2005).

Allman (1975) showed that about one half of the more than twenty million Tennis players at one time or another suffers from the affliction which has come to be known as “Tennis Elbow”. There are many theories as to the causes and cures of the alignment which is evidenced as irritation and pain over either side of the involved Elbow but most often to the lateral condylar area. Most often the condition occurs at the age 35 and affected both sexes equally. Etiology, prevention, is interrelated to the problem. Khan (1999) showed that Lateral epicondylitis (LE) or “tennis elbow” is an injury at the insertion of the extensor carpi radialisbrevis and the extensor digitorum. It is characterized by pain at the external aspect of the elbow exacerbated during extension of the elbow with the wrist in flexion or during resisted extension of the wrist with the elbow in extension (Blanchette& Normand, 2011). Various names including tendinitis, tendinosis, paratenonitis, and peritendinitishave been used to represent the clinical condition known as tennis elbow, depending on the status of the tendon tissue at different stages of healing. Chourasia et al. (2012) showed that LE is characterized by microtears, collagen degeneration and angioblastic proliferation of the common extensor tendon. LE may affect the muscle fiber type composition, neural drive and stiffness of the muscle tendon complex. Pain at the lateral aspect of the elbow is a primary symptom of LE. This pain is often exacerbated by gripping activities with grip strength often impaired.

Smedt et al. (2007) mentioned that Tennis elbow is a painful condition affecting the tendinous tissue of the origins of the wrist extensor muscles at the lateral epicondyle of the humerus, leading to loss of function of the affected limb. Therefore it can have a major impact on the patient's social and professional life. Plancher et al. (1996) showed that Tennis elbow defines a condition of varying degrees of pain or point tenderness at the origin of the wrist extensor muscles near the lateral epicondyle of the humerus. Grip strength of the involved hand and the ability of the extremity to tolerate load especially with the elbow extended are limited. Any of the wrist or digit extensor muscles that share the common extensor tendon may be involved, but the extensor carpi radialis brevis (ECRB) is more frequently implicated.

Rayan et al. (2010) showed that Lateral epicondylitis or tennis elbow is one of the most regularly encountered disorders of the elbow that can cause significant pain and dysfunction. This disorder was first described by Runge in 1873 and the term tennis elbow was coined in 1883 by Major. Lateral epicondylitis is characterized by localized pain over the origin of extensor muscles of the finger and wrist at the lateral epicondyle. The cornerstone of the diagnosis are detailed history regarding aggravating and relieving factors and the provocative tests like grasping in elbow extension, resisted wrist and long finger extension and resisted forearm supination. There is often a decrease in the grip strength. Future studies should investigate whether the asymmetric hypertrophy of forearm muscles observed in children may increase the risk of tennis elbow in adulthood (Sanchis et al., 2012). Solheim et al. (2011) showed that Tennis elbow (TE)-also called lateral epicondylitis, epicondylosis, epicondylalgia or tendinopathy—is a common disorder of the elbow with a prevalence of 1–3% in the general population and 7% in manual workers. Previous studies have suggested a prevalence of 35–50% among tennis players.

Shiri et al. (2006) showed that Epicondylitis or tennis elbow is a common injury in tennis players (Renstrom, 2002). Tennis elbow (TE) also called lateral epicondylitis, epicondylosis, epicondylalgia or tendinopathy—is a common disorder of the elbow with a prevalence of 1–3% in the general population and 7% in manual workers. Previous studies have suggested a prevalence of 35–50% among tennis players. Gruchow et al.

(1979) showed that Tennis elbow is a painful condition affecting the tendinous tissue of the origins of the wrist extensor muscles at the lateral epicondyle of the humerus, leading to loss of function of the affected limb. Therefore it can have a major impact on the patient's social and professional life (Silverstein et al., 1987). Assendelft et al. (1996) showed that Pain around the lateral epicondyle is commonly referred to as "tennis elbow", tennis players make up only 10% of the patient population. Half of tennis players develop pain around the elbow, of which 75% represent true tennis elbow.

Ellenbecker et al. (2009) stated that Injuries to the elbow region in elite tennis players primarily involve repetitive overuse and center on the tendonous structures inserting at the medial and lateral humeral epicondyle. Ono et al. (1998) showed that Prevalence of epicondylitis among 209 nursery school cooks and 366 control workers aged 40–59 were studied. Both groups consisted of women workers chosen from 1299 subjects who agreed to participate from 1329 social welfare employees in a city. All workers were interviewed with a questionnaire and had a clinical examination of the tenderness to palpation of epicondyles and epicondylar pain provoked by resisted extension and flexion of the wrist. Sanchis et al. (2010) showed that male professional tennis players who started tennis practice before puberty had 20% more lean mass in the dominant than in the contralateral upper extremity. Recently, using the same method, it has been estimated that 50–75% of this asymmetry is attained at prepubertal ages ().

Hennig et al. (1992) showed that Common injuries in tennis players have been associated to the asymmetric hypertrophy of the upper extremity, i.e., epicondylitis. Smedt et al. (2007) showed that Tennis elbow is a common disorder of the elbow. A recent demographic study described the epidemiology of this condition and investigated its risk factors in a sample of 4783 people aged 30– 64 years. The prevalence in this group was 1.3% and did not differ between men and women. The condition was most prevalent in the age group of 45–54 years. Sanchis et al. (2012) showed that Tennis at prepubertal age is associated with marked enhancement of the muscle mass of the dominant arm, which achieves a total muscle volume that is 13% greater compared to the non-dominant arm. This asymmetry in arm's total muscle volume is greater than the 3% observed in non-

active controls of comparable age and body size, and similar to the 12% asymmetry reported in adult professional tennis players. Smidt et al. (2002) showed that Lateral epicondylitis (tennis elbow) is a frequent complaint in primary care, and is judged an overload injury, affecting the common extensor muscles at the lateral humeral epicondyle. The incidence of lateral epicondylitis is estimated at 4–7 per 1000 patients per year in general practice and between 1% and 3% per year of adults in the general population are affected. A typical episode of lateral epicondylitis lasts 6–24 months on average but most patients recover within a year.

Rijn et al. (2009) showed that Epicondylitis (i.e. lateral epicondylitis and medial epicondylitis) is one of the most prevalent disorders, with an estimated prevalence of 5% in the general population, 8.9% among meat cutters and 14.5% among workers in the fish processing industry. A claim incidence rate for epicondylitis of 11.7/10000 full-time workers per year. Low job control and low social support at work were positively associated with the occurrence of lateral epicondylitis in the general workforce with ORs of 2.2 and 1.8, respectively. Depressive symptoms and high job demands were not clearly related with an increased risk to develop lateral epicondylitis.

Noteboom et al. (1994) showed that the purpose of this paper is to review the relevant anatomy, clinical examination, differential diagnosis, conservative care, and surgical treatment for patients with tennis elbow. The incidence of lateral epicondylitis has been found to vary with different population groups. In two separate studies at industrial health clinics, lateral epicondylitis was found to be most commonly associated with work-related activities, ranging from 35 to 64% of all diagnosed cases. Mackay et al. (2003) showed that Tennis elbow is a common condition that is generally diagnosed on clinical grounds. As such, it can become a term of convenience used to label any case of poorly defined lateral arm pain. The condition is linked with chronic overuse injuries and not uncommonly leads to prolonged sick leave or work-related incapacity claims. Verhaar et al. (1995) showed that we performed a prospective, randomized trial on 106 patients to compare the effects of local corticosteroid injections with physiotherapy as advocated by Cyriax in the treatment of tennis elbow. The main outcome measures were the severity of pain, pain provoked by resisted dorsiflexion of the wrist, and patient satisfaction.

1.2 Rationale

Now a day the rate of Tennis Elbow patient are increasing day by day. For this reason of Tennis Elbow patient who has pain on Elbow and cannot move and perform any work properly. Life become threatens for them. The researcher meet with the qualified and they cannot give me more information because there is no such type of study on Tennis Elbow in CRP and they encourage the researcher to select this area.

There is a great demand in indentifying the risk factors of Tennis Elbow to reduce the sufferings of the Tennis Elbow patients. By conducting this research it is expected that some of these factors can be identified to minimize the cost treatment, morbidity, absent from work and moreover physical and psychological distress. Identification of these factors will supplement policy development and infrastructure modification.

Tennis Elbow is the most common cause of activity limitation in the persons over the age 40. The identification of the risk factors of Tennis Elbow can help to act as preventive measure to lessen the suffering of community people as a whole.

The number of Tennis Elbow is increasing day by day due to lack of awareness. It affects a large number of individual who became a border for themselves and make a devastating effect on their family and society as well as in whole country. So the study was conducted with the 'risk factor of Tennis Elbow' for Bangladeshi people. Other Health professional will get update knowledge about factors which causing tennis Elbow. By this knowledge also mass of population will be benefited.

1.3 Research Question

What are the Risk Factor of Tennis Elbow?

1.4 Objectives

1.4.1 General objective

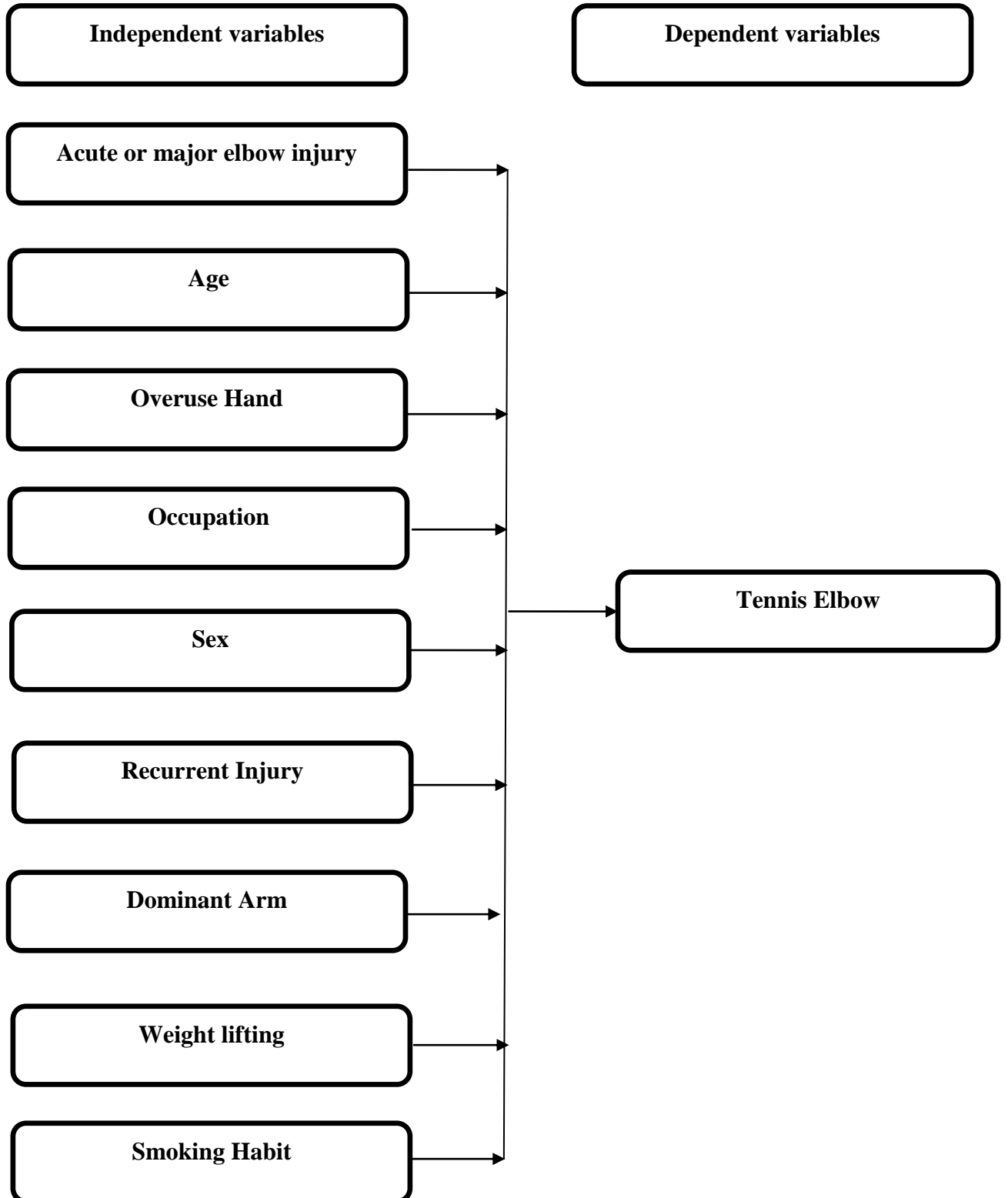
To identify possible risk factors associated with Tennis Elbow.

1.4.2 Specific Objectives

- To explore socio-demographic (age, gender, occupation, educational status, socio-economic status) characteristics of patients with Tennis Elbow.
- To figure out the link between Types of pain and Tennis Elbow.
- To identify the association between smoking and Tennis Elbow.
- To find out the association between recurrent injury and Tennis Elbow.
- To ascertain the link between behavior of pain and Tennis Elbow.
- To figure out the link between lifting heavy weight and Tennis Elbow.
- To investigate the association between overuse of hand and Tennis Elbow.

1.5 List of Variables

CONCEPTUAL FRAMEWORK



1.6 Operational Definition

Risk Factor

A risk factor is something that increases your chances of getting a disease. Sometimes, this risk comes from something you do. For example, smoking increases your chances of developing colon cancer. Therefore, smoking is a risk factor for colon cancer. Other times, there's nothing you can do about the risk. It just exists. For example, people 50 and older are more likely to develop colon cancer than people under 50. So, age is a risk factor for colon cancer.

Tennis Elbow

Tennis elbow defines a condition of varying degrees of pain or point tenderness at the origin of the wrist extensor muscles near the lateral epicondyle of the humerus. Grip strength of the involved hand and the ability of the extremity to tolerate load especially with the elbow extended are limited.

Activities of Daily Living

The essential functional activities, those have to be done independently from morning to evening.

Stressful Job Pattern

Has to perform repeated work for more than 3 hours.

Smoking

Cigarette smoking and takes betel leaf, zorda and gul per day 1-14 cigarette.

Over use Hand

Overuse of hand more than 2 hours.

Heavy weight lifting

Lifting objects at least 15 Kg or more.

2.1 Literature Review

Tennis Elbow is occurring most often in the age group of 40–60 years except in tennis players who are generally younger—and it affects men and women to the same degree. In addition to age, risk factors for developing tennis elbow include repetitive and forceful motions of wrist and arm, participating in racket sports, using a faulty tennis playing technique and smoking tobacco (Smedt et al., 2007). Eygendaal et al. (2007) showed that in tennis the injury risk was fairly similar for males and females; the older age groups were affected more often and indoor tennis was related to a higher incidence of injuries in comparison to outdoor tennis. Grip size does not seem to play a role in elbow injuries; playing with a “Western grip” can possibly increase valgus stress on the elbow, especially during acceleration.

Eygendaal et al. (2007) showed that Tennis racquet grip size does not have a significant effect on forearm muscle activity and therefore might not represent a significant risk factor for lateral epicondylitis. Allman (1975) states that it has been estimated that one-half of all tennis players suffer at one time or another from the affliction known as "tennis elbow". Shiri et al. (2006) showed that Tennis elbow is a common disorder of the elbow. A recent demographic study described the epidemiology of this condition and investigated its risk factors in a sample of 4783 people aged 30–64 years. The prevalence in this group was 1.3% and did not differ between men and women. The condition was most prevalent in the age group of 45–54 years. People with a history of current or prior tobacco use were found to have an increased risk of developing tennis elbow. Repetitive movements and forceful activities were also positively correlated with lateral epicondylitis. Tennis racquet grip size is also cited as a risk factor for overuse injuries about the forearm and elbow.

Barr et al. (2009) showed that Lateral epicondylitis (tennis elbow) is a painful musculoskeletal condition which is considered to be due to over-use, over-stress or over-exertion of the wrist extensors of the forearm. It is often associated with individuals who have repetitive occupations and/or hobbies, affects the dominant hand and primarily

occurs between the ages of 35 and 64 years. Dalyan et al. (1999) showed that forceful repetitive activity does not need to be work-related to cause tennis elbow. For example, wheelchair users are also at risk for developing tennis elbow, although shoulder tendinopathies and carpal tunnel syndrome are more prevalent. Functional activities such as pressure reliefs, transfers, and wheelchair propulsion are the commonly reported aggravating activities associated with elbow pain.

Rayan et al. (2010) showed that less than 5-10% of patients with lateral tennis elbow syndrome are tennis players, however as group tennis players do run a higher risk of developing this syndrome. The incidence of tennis elbow varies from 1-3%. It is seen more often in fourth decade. Even if etiology is attributed to various factors like bursitis, synovitis, ligament inflammation, periosteitis; the most common accepted etiology is microscopic tears with formation of reparative tissue on the lateral epicondyle. We know that Tennis elbow is a painful, disabling musculoskeletal condition predominant in the 35-50 age groups, and often causes considerable pain in normal daily activities such as gripping, carrying and lifting. Tennis elbow is traditionally considered to be self-limiting, but may last for 6-18 months. Its estimated prevalence in the general population is 3-7%. However, workers undertaking repetitive tasks are at greater risk, representing between 35-64% of all cases (Chesterton et al., 2009). Peterson et al. (2011) showed that Tennis Elbow (TE) is a common disorder. Typical symptoms are pain at the lateral epicondyle of the humerus and pain on resisted dorsiflexion of the wrist. The incidence is estimated to be 1%–3% per year. Repetitive strain and heavy manual labor increase the risk of being affected. Most of the incidents heal within 3 months, but about one third have a more protracted course, and an estimated 17% still have symptoms after 1 year.

Shiri et al. (2006) showed that Grip strength is affected and simple activities such as simply taking a cup of coffee may become painful. This is the most common condition diagnosed in the elbow and it affects between 1% and 3% of the population. Gruchow et al. (1979) showed that it should be noted that the term “tennis elbow” is inappropriate because tennis players represent only 5 to 10% of cases, however the practice of racket sports increases the risk of developing LE and 40% to 50% of players may develop this

condition. Piligian et al. (2000) showed that Tennis elbow is considered the most prevalent work-related musculoskeletal disorder (WMSD) of the elbow and sufficient evidence exists for a strong association between its prevalence and a combination of physical risk factors including force, repetition, and posture. Haahr & Andersen (2003) have both shown job classifications with high force demands and manually intensive work have a high prevalence of tennis elbow including construction workers, mechanics, butchers, and others. The prevalence of tennis elbow ranges from 6-15% in specific jobs identified in the meat and fish processing industries. Unskilled or untrained workers appear more likely to develop tennis elbow (Chiang et al., 1993).

Physical workplace demands such as force, repetition, and awkward upper extremity postures are not only risk factors for developing tennis elbow, but are also indicators of poor prognosis for medical intervention. Shiri et al. (2006) showed that factors that contributed to either the occurrence or recurrence of tennis elbow in tennis players were the player's age, level of ability, and amount of playing time (Gruchow & Pelletier, 1979). Epicondylitis (i.e. lateral epicondylitis and medial epicondylitis) is one of the most prevalent disorders, with an estimated prevalence of 5% in the general population, 8.9% among meat cutters and 14.5% among workers in the fish processing industry.

Rijn et al. (2009) showed that certain workers are reported to be at increased risk for these disorders. The prevalence of lateral epicondylitis and medial epicondylitis in workers whose job required repetitive work varied from 1.3 to 12.2% and from 0.2 to 3.8%, respectively. Shiri et al. (2006) have concluded that occupational physical factors such as repetitive movements of hands or wrists, handling loads heavier than 5 kg, activities demanding high hand grip forces and the use of vibrating tools were risk factors for lateral epicondylitis and medial epicondylitis. Gruchow and Pelletier (1979) have both shown the symptoms of tennis elbow are not peculiar to tennis players, or limited to the elbow. "Painful shoulder" (Subacromial bursa), miner's elbow, and housemaid's knee are other names for similar conditions. As these names suggest, the conditions are frequently associated with specialized and repetitious use of the joint involved. The question we are asking concerning tennis elbow is whether the risk is greater for tennis players because

there are some unique characteristics of the game which predispose to the condition, or because playing tennis simply results in overuse of the elbow joint. Struijs et al. (2004) showed that Pain on the lateral side of the elbow, which is aggravated by resisted dorsal flexion of the wrist. It is a common complain, with an estimated annual incidence in the general population of 1–3%. The natural history of tennis elbow is relatively mild: untreated, the complaints are estimated to last between six months and two years, and few patients need an operation. The pain experienced results in absence from work in about 16% of patients in Dutch general practice, with a mean sick leave of 9.3 weeks. Bjordal et al. (2008) states that Lateral elbow tendinopathy (LET) or "tennis elbow" is a common disorder with a prevalence of at least 1.7% and occurring most often between the third and sixth decades of life. Physical strain may play a part in the development of Lateral elbow tendinopathy (LET), as the dominant arm is significantly more often affected than the non-dominant arm. The condition is largely self-limiting, and symptoms seem to resolve between 6 and 24 months in most patients.

Noteboom et al. (1994) showed that Lateral epicondylitis is a syndrome characterized by pain over the outer aspect of the elbow and is usually aggravated by radial extension of the wrist. This syndrome most commonly occurs in the 35-50 year age group, is found in men more than women, and tends to involve the subject's dominant arm. Tenderness is typically localized to the tendinous origin of the extensor carpi radialisbrevis. The pain can be aggravated by gripping, heavy lifting, or simple tasks of daily living. Chronic symptoms are commonly associated with inadequate muscle power and endurance. Most investigators contend that repetitive and cumulative injury produces this condition.

Gruchow and Pelletier (1979) both showed that reported cases of tennis elbow during the study period increased with age for both men and women. This increase was most evident in the over 40 age groups, where there was a 4-fold increase in prevalence among men and a nearly 2-fold increase among women. Men had a marginally higher over-all prevalence rate than women, but this was not consistent within each age group, and was not a statistically significant difference. The incidence rate of new cases during the study period also was significantly higher in the over 40 age group of men, but no difference

was observed between the rates for older and younger women. As for prevalence, men experienced a marginally higher over-all incidence rate, but the difference between men and women was not statistically significant.

Haahr & Andersen (2003) both showed that in a Swedish population study the annual incidence was less than 1%; the prevalence was 1–3% and up to 10% among females of around 40 years of age. Tennis elbow is characterized by pain in the lateral aspect of the elbow. Pain becomes worse with strenuous use of the hand and forearm. Clinical examination reveals both direct and indirect tenderness at the lateral humeral epicondyle. There is strong evidence of an association between the occurrence of tennis elbow and exposure to the combined risk factors of force, repetition, and posture. Furthermore, evidence was found for an association with forceful work alone. Solheim et al. (2011) showed that Tennis Elbow is occurring most often in the age group of 40–60 years except in tennis players who are generally younger and it affects men and women to the same degree. In addition to age, risk factors for developing tennis elbow include repetitive and forceful motions of wrist and arm, participating in racket sports, using a faulty tennis playing technique and smoking tobacco.

Blackwell & Cole (1994) stated that Lateral epicondylitis is 7–20 times more common than its medial counterpart and produces pain along the lateral elbow and forearm. Treatment is generally conservative. In cases lasting more than a year, surgery can be considered. Hjelm et al. (2010) show that Lateral humeral epicondylitis is a condition that primarily occurs in the recreational tennis player. One of the reasons is an increase of wrist extension in more experienced players just prior to ball impact. Novice players strike the ball with their wrist in more flexed position at impact. A recent prospective study in junior tennis players reported elbow injuries in 9% during the two studied years and found injuries to the ankle, shoulder or low back to be more common. Smidt et al. (2002) shown that the effectiveness of physiotherapy, corticosteroid injections, and non-steroidal anti-inflammatory drugs for lateral epicondylitis present conflicting results. Labelle and colleagues concluded that there is insufficient evidence for any specific treatment. Rijn et al. (2009) showed that Epicondylitis can be divided into lateral

epicondylitis, known as tennis elbow, and medial epicondylitis, which is known as golfers elbow. Lateral epicondylitis and medial epicondylitis are the result of overuse of the extensor and flexor muscles, respectively, which lead to inflammation or irritation of the tendon insertion. Certain workers are reported to be at increased risk for these disorders. The prevalence of lateral epicondylitis and medial epicondylitis in workers whose job required repetitive work varied from 1.3 to 12.2% and from 0.2 to 3.8%, respectively. Shiri et al. (2006) have concluded that occupational physical factors such as repetitive movements of hands or wrists, handling loads heavier than 5 kg, activities demanding high hand grip forces and the use of vibrating tools were risk factors for lateral epicondylitis and medial epicondylitis.

Chourasia et al. (2012) showed that the relationship between function, grip strength and rapid force generating capacity was also assessed. A better understanding of the impact of LE on grip function may lead to improved therapeutic interventions for LE as well as possibly reducing the risk of recurrence of LE by addressing deficits in rapid force generating capacity. Noteboom et al. (1994) showed that people who played tennis constituted a rather small proportion of the total, only 8%. However, as a group, tennis players do run a higher risk of developing lateral epicondylitis. The epidemiological data available concerning injuries among tennis players and reported that 50% of competitive tennis players will suffer from at least one episode of lateral epicondylitis. Heating modalities such as hot packs, whirlpool, and ultrasound have been used in the sub acute and chronic phases. Tennis patients with lateral epicondylitis should be encouraged to use a racquet with a mid- to large-size head, a lighter weight, and a reduced string tension by 3-5 lbs.

Morris et al. (1989) showed that Tennis elbow is thought to result from overuse of the extensor carpi radialisbrevis (ECRB) muscle by repetitive microtrauma resulting in a primary tendinosis of the ECRB, with or without involvement of the extensor digitorumcommunis (EDC). In tennis, the predominant activity of the wrist extensors in all strokes (serve, forehand and one- and two-handed backhand) might be one explanation for predisposition to the condition. Ellenbecker et al. (2009) showed that

Tennis injuries have been reported throughout all regions of the body with more common areas being the shoulder, elbow, and knee. Epidemiologic studies that highlight the anatomical regions of the body and the frequency of where tennis injuries most commonly occur. Of note is the fact that musculoskeletal injuries in tennis occur in nearly all regions of the body. Most of the injuries in tennis can be defined as overuse injuries coming from the repetitive micro trauma inherent in the sport. Hakim et al. (2003) showed that Age, height, weight, body mass index, activity levels, occupation, parity, menopausal status and presence of diabetes mellitus showed no significant differences between the zygosity groups or between singleton and paired responders. The prevalence of both disorders increased with age but no environmental risk factor was found to have a significant effect on either frozen shoulder or tennis elbow in our population. The prevalence of Frozen Shoulder and Tennis Elbow were 11.6% and 16.7%, respectively. A heritability of 42% was estimated for Frozen Shoulder and 40% for Tennis Elbow after adjusting for age. There was no confounding by environmental risk factors.

Ono (1998) showed that Repetitive work has been defined as physical work tasks with similar work cycles and repetitiveness performed repeatedly. In the development of cumulative trauma disorders, jobs with the combination of high force and high repetitiveness were found to involve high risks. Similarly, highly repetitive and forceful work was considered to be a risk for elbow disorders as it strains the muscle-tendon structures of the arms. Ernst (1992) showed that Tennis elbow is a common overuse syndrome. It is accompanied by degenerative changes in the enthesis of the extensor carpi radialisbrevis muscle. It may be best diagnosed clinically by eliminating other possible causes of lateral elbow pain. Physical methods should always be selected as initial treatment. Immobilization is the initial advice that most doctors give: ultrasound has been shown to be effective in a placebo-controlled, double-blind trial, and low energy laser has been found to reduce objective but not subjective symptoms. Other forms of physical treatment like electrotherapy, thermotherapy and massages can be tried.

3.1 Study Design

A hospital based unmatched (1:1) case control study design was used for identifying the risk factors of development of Tennis Elbow for the patient attended at CRP and Tennis Federation. People with Tennis Elbow were selected as case and people without Tennis Elbow were selected as control.

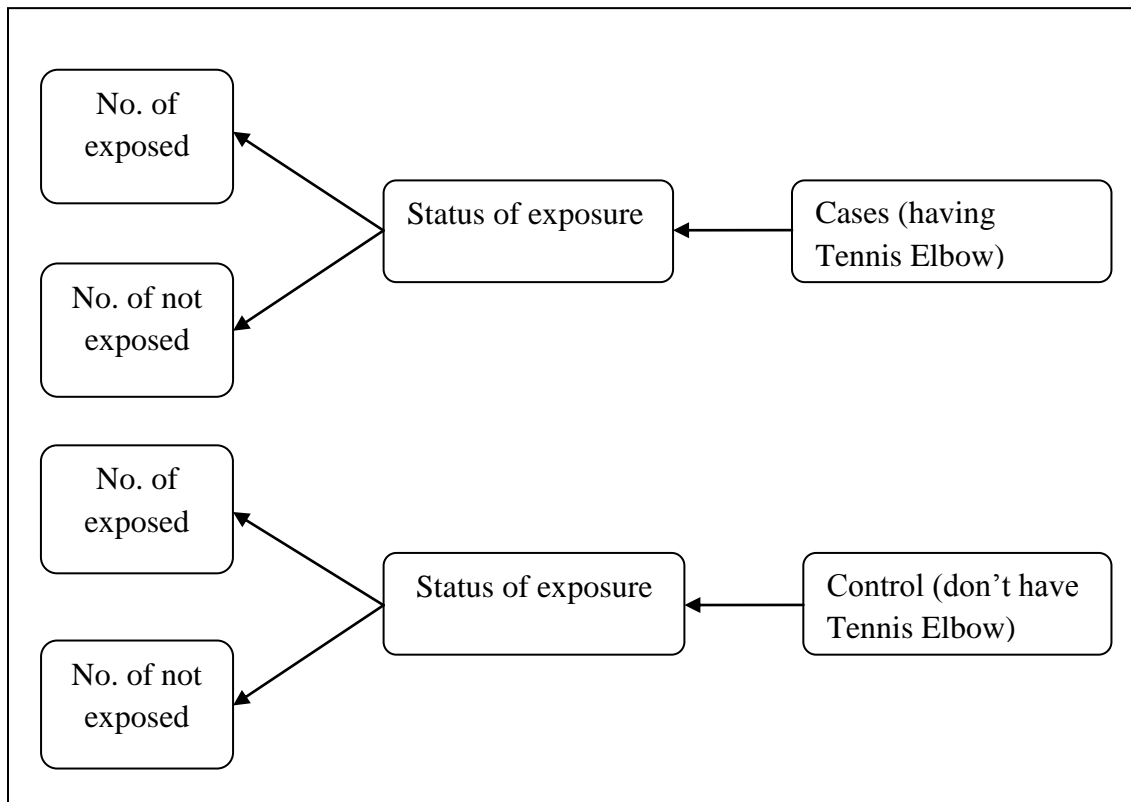


Figure-1: Design of the study

3.2 Study site

Musculoskeletal unit of the Centre for the Rehabilitation of the Paralyzed (CRP) - Savar, Mirpur and Bangladesh Tennis Federation was selected as the study site.

3.3 Study area

Musculoskeletal unit of the Centre for the Rehabilitation of the Paralyzed (CRP) -Savar, Mirpur and Bangladesh Tennis Federation was selected as the as the study site. In the

study that place was easy to obtain the desire data. This place comes to tennis elbow patients for physiotherapy treatment from different area of Bangladesh, and the Tennis club where tennis elbow player are available so that this place was selected.

3.4 Study population and sample population

The study populations were people with tennis elbow and sample population were those who came to CRP to receive treatment and the Tennis player of Tennis Federation who have present tennis elbow.

3.5 Sampling Procedure

In the study here used convenient sampling technique because considering the inclusion – exclusion criteria and the number of patients coming to musculoskeletal unit: it would be difficult to find the expected number of subjects. This technique was more feasible, less time consuming and expensive to obtain relevant information.

3.6 Subject Inclusion criteria

3.6.1 Inclusion criteria for case

- Patients with tennis elbow who was attending in CRP for treatment as a case.
- Tennis Elbow patient at Tennis Federation diagnosed by Doctor or Physiotherapist.
- All male and female were same priorities.
- All ages were included.

Male and female had different anatomical, physiological changes as well as different intensity, frequency and pattern of activity. Inclusion of males and females may be more comprehensive in identifying the risk factors.

3.6.2 Inclusion criteria for control

- Patients without tennis elbow were considered as control.
- All male and female were same priorities.
- All ages were included.

3.7 Subject Exclusion criteria

3.7.1 Exclusion criteria for case

- Patients with other serious associated diseases like referred pain from cervical to elbow.
- Subject who was unconscious, cognitive problem
- Mentally challenged people.

3.7.2 Exclusion criteria for control

- Patients with other serious associated diseases like referred pain from cervical to elbow.
- Subject who was unconscious, cognitive problem
- Mentally challenged people.

3.8 Sample size

There was 30 cases and 30 controls, was selected as sample in the study.

Formula:

$$n = \frac{2pq(Z\alpha + Z\beta)^2}{(P1 - P0)^2} = 162$$

Where,

$$P1 = \frac{P0R}{1 + P0(R - 1)}$$

$$P = \frac{P1 + P0}{2}$$

$$q = 1 - p$$

Here,

The quantities $Z\alpha$ and $Z\beta$ are values from the standard normal distribution.

Hypothesized minimum relative risk worth to be detected by the study, $R = 2$

Level of significance, $\alpha = 0.05$ ($Z\alpha = 1.96$, obtained from Z table)

Power of the study, $(1 - \beta) = 80\%$ ($Z\beta = 0.84$ obtained from the Z table)

Number of the calculated sample = n

$P_0 = 0.88$ (prevalence of Tennis Elbow in literature)

According to this formula the actual sample size was about 162 but due to the limitation of time only 60 samples that was 30 cases and 30 was controls were selected conveniently from the population for this study.

3.9 Data collection methods and tools

Data was collected by direct interview using the questionnaire. The questions was divided into five sections which almost covered all issues regarding risk factors of tennis elbow including age, sex, occupation, residential area, injury, dominant arm, occupation, smoking, substance abuse and sports. Beside this, paper, pen, pencil, comprehensive field note would be used as the materials of data collection.

3.10 Data management and analysis plan

Measurement of association

Exposure	Tennis elbow	
	Yes (Case)	No (Control)
Yes	A	B
No	C	D

Odds of exposure = ad / bc

Table-1: Measurement of Odds ratio

In the case-control study, there was not calculate the incidence rate of the disease so actual relative could not be obtained. The measure of the association between exposure and occurrence of the disease of the case-control study was Odds ratio. The ratio of Odds of then exposure in diseased participants to the Odds of the exposure in the non disease participants was calculated as an Odds ratio. According to the above mention was an example of a calculated Odds ratio.

SPSS 16 version was used to analyze data. Data was analyzed in the form descriptive statistics for demographic data. Odds ratio was computed to determine how much risk there was in presence of certain exposure compared to those who did not have that exposure.

3.11 Inform Consent

The aims and objectives of this study should be informed to the subjects verbally. Before conducting research with the respondents, it is necessary to gain consent from the subjects. Here gave the consent form to the subject and explained them. The subjects had the rights to withdraw themselves from the research at any times. It should be assured the participant that his or her name or address would not be used. The information of the subjects might be published in any normal presentation or seminar or writing but they would not be identified. The participant will also be informed or given notice that the research result would not be harmful for them. It would be kept confidential. Every participant has the right to discuss about his or her problem with senior authority.

3.12 Ethical considerations

It was ensured that it would maintain the ethical issue at all aspects of the study because it is the crucial part of the all form of research. A research proposal was submitted to local ethical review committee of Bangladesh Health Professions Institute (BHPI) for being approval. At first official permission was to be applied for the study to the head of the Physiotherapy Department of CRP. Then the head of the Physiotherapy Department of CRP permitted to collect data at musculoskeletal department of CRP, Savar. The ethical consideration was making sure by an informed consent letter to the participant. During the course of the study, a consent form was given to the interested participant and consent was obtained from each participant with a clear description of the study purpose. They were also informed that their participation was fully voluntary and they had the right to withdraw or discontinue from this study at any time without any hesitation or risk. Participants were also informed that confidentiality would be maintained and client codes were used to keep clients identity invisible. They were assured that taking part in this study would not cause any harm to them but the result of the study would be beneficial for them.

3.13 Limitations

There are a lot of limitations in this study. Collected data were hospital based and collected data from Tennis Federation are Difficult. These were not reflecting the whole population in generalizing and not find the real picture properly in this study. Sample was drawn with convenient sampling technique which had possible chance to selection bias. For receiving physiotherapy treatment, only few Tennis Elbow patients came to the physiotherapy department at CRP. Most of the patients are not represented all over populated of Bangladesh, so most of the Tennis Elbow patients did not participate in this study. In This study observed only common factors of the Tennis Elbow in this study and did not specify all of the factors properly. So to specify all of the factors properly may find more specific association of the factors. The research project was done by an undergraduate student and this was his first research project. He had limited experience with techniques and strategies in terms of the practical aspects of research. As it was the first survey so might be there were some mistakes.

All relevant information was analyzed by SPSS 16 version software. The purpose of the study is to find out the risk factor of Tennis Elbow and to achieve this goal the result need to calculate and analysis in a systematic way and the result or analyzed data represent by table, bar chart and pie charts.

The individual factors of Tennis Elbow results were shown this table as below:

Name of the factors	Number of Cases	Number of control	ODD Ratio (OR)	95% CI
Overuse hand	20	6	5.6875	1.59 , 20.33
Weight lifting by hand	20	7	1.643	1.05 , 5.12
Recurrent Injury	17	2	18.308	3.67 , 91.22
Smoking	19	12	3	1.05 , 8.6
Age	17	10	1.167	1.03 , 3.46

Table-2: The individual factors of Tennis Elbow

Overuse Hand

From the table it is observed that the total participants of this study were 60 where 30 were case and 30 were control, among them 20 participants overuse their hand more than 2 hours and 10 participants overuse their hand less than 2 hours in the case group. On the other hand 6 participants overuse their hand more than 2 hours and 24 participants overuse their hand less than 2 hours in the control group. Calculated odds ratio for overuse of hand 5.6875 (table-2) which means there was an association between the overuse of hand and tennis elbow that is 5.6875 times more possible chance to occur Tennis Elbow due to overuse of hand and 95% CI was Lower 1.59 Upper 20.33 indicating that this association was significant.

Weight lifting by Hand

From the table it is observed that the total participants of this study were 60 where 30 were case and 30 were control, among them 20 were weight lifting by hand more than 11 kg and 10 were weight lifting by hand less than 10 kg in the case group. On the other hand 7 were weight lifting by hand more than 11 kg and 23 were weight lifting by hand less than 10 kg in the control group. Calculated odds ratio for weight lifting by hand is 1.643 (Table-2) which means there was association between the weight lifting of hand and Tennis Elbow that is 1.643 times more possible chance to occur Tennis Elbow due to heavy weight lifting and 95% CI was 1.05 and 5.120 indicating that this association was significant.

Smoking

From the table it is observed that the total participants of this study were 60 where 30 were case and 30 were control, among them 19 participants had the habit of smoking and 11 participants had no habit of smoking in the case group. On the other hand 12 participants had the habit of smoking and 18 participants had no habit of smoking in the control group. Calculated odds ratio for smoker is 3 (Table-2) which means there was association between the smoker and Tennis Elbow that is 3 times more possible chance to occur Tennis Elbow due to smoking and 95% CI was 1.05 and 8.6 indicating that this association was significant.

Recurrent Injury

From the table it is observed that the total participants of this study were 60 where 30 were case and 30 were control, among them 17 participants had present recurrent injury and 13 participants had no recurrent injury in the case group. On the other hand 2 participants had present recurrent injury and 28 participants had no recurrent injury in the control group. Calculated odds ratio for recurrent injury is 18.308 (Table-2) which means there was association between the recurrent injury and Tennis Elbow that is 18.308 times more possible chance to occur Tennis Elbow due to recurrent injury and 95% CI was 3.674 and 91.229 indicating that this association was significant.

Age

From the table it is observed that the total participants of this study were 60 where 30 were case and 30 were control, among them 17 participants age less than 40 and 13 participants age greater than 40 in the case group. On the other hand 10 participants age less than 40 and 20 participants age greater than 30 in the control group. Calculated odds ratio from non smoker is 1.167 (Table-2) which means there was association between the age range and Tennis Elbow that is 1.16 times more possible chance to occur Tennis Elbow due to age and 95% CI was 1.03 , 3.46 indicating that this association was significant.

Socio-demographic Information

	Case (%)	Control (%)	Total (%)
Age (mean ± SD)	40.97±13.95	40.53±11.18	41.75 ±12.54
24-39 Years	15 (50%)	15 (50%)	30 (50%)
40-55 Years	9 (30%)	10 (33.3%)	19 (31.7%)
56-71 Years	6 (20%)	5 (16.7%)	11 (18.3%)
Gender			
Male	14(46.7%)	20 (66.7%)	36(60%)
Female	16(53.3%)	10 (33.3%)	24(40%)
Marital Status			
Married	22 (73.3%)	24 (80%)	46 (76.7%)
Unmarried	7 (23.3%)	6 (20%)	13 (21.7%)
Widow	1 (3.3%)	0	1(1.7%)
Residential Area			
Urban	13 (43.3%)	18 (60%)	31 (51.7%)
Rural	17 (56.7%)	12 (40%)	29 (48.3%)
Occupation			
Farmer	3 (10%)	21 (6.7%)	5 (8.3%)
Driver	1 (3.3%)	3 (3.3%)	1 (1.7%)
Businessman	2 (6.7%)	1 (13.3%)	6 (1.7%)
Housewife	12 (40%)	6 (33.3%)	22 (36.7%)
Sports man	6 (20%)	9 (30.3%)	15 (25%)
Teacher	2 (6.7%)	0	2 (3.3%)
Student	4 (13.3%)	4 (13.3%)	8 (13.3%)

	Case (%)	Control (%)	Total (%)
Educational Status			
No formal Schooling	2 (6.7%)	2 (6.7%)	4 (6.7%)
Less than primary School	2 (6.7%)	2 (6.7%)	4 (6.7%)
Upper Secondary School	4 (13.3%)	3 (10%)	7 (11.7%)
SSC Completed	9 (30%)	9 (30%)	18 (30%)
HSC Completed	7 (23.3%)	6 (20%)	13 (21.7%)
College or University	5 (16.7%)	6 (20%)	11 (18.3%)
Masters Completed	1 (3.3%)	0	1 (1.7%)

Table-3: Characteristic of the Respondents

4.1 Age of the participants

A total 60 participants with Tennis Elbow (30 case) and without Tennis Elbow (30 control) was interviewed for this study. Out of the participant the mean age of the participants was 40.53 (± 11.18) years and minimum age was 24 years and maximum age was 70 years.

Among case the mean age of the participants was 40.97 (± 13.95) years and according to data view the frequency of Tennis Elbow was highest in between the 24-39 Years that is 25% (n=15) case and 25% (n=15) control. 15% (n=9) case and 16.67% (n=10) control were between 40-55 years, 10% (n=6) case and 8.33% (n=5) control were between 56-71 years. Beside this the mean age of the unaffected group was 40.53(± 11.18). So it can be said that age has a positive relation with the development of Tennis Elbow.

Age range	Case (%)	Control (%)	Total (%)
24-39 Years	15 (25%)	15 (25%)	30 (50%)
40-55 Years	9 (15%)	10 (16.67%)	19 (31.67%)
56-71 Years	6 (10%)	5 (8.33%)	11 (18.33%)
Total	30 (50%)	30 (50%)	60 (100%)

Table-4: Age range among case and control

4.2 Male Female ratio

Among the 60 participants 24 were female and 36 were male. In percentage 40% participants were female and 60% were male.

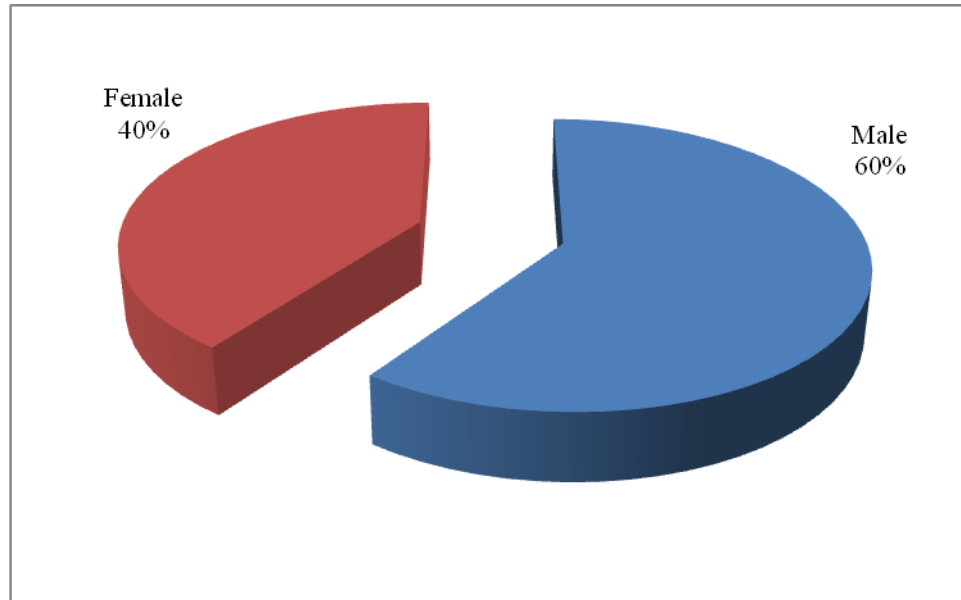


Figure -2: Male Female ratio of the participants

A total of 60 participants 16 (26.67%) of the cases were male and 14 (23.33%) were female whereas 20 (33.33%) of the controls were male and 10 (16.67%) were female.

Gender	Case (%)	Control (%)	Total (%)
Male	16 (26.67%)	20 (33.33%)	36 (60%)
Female	14 (23.33%)	10 (16.67%)	24 (40%)
Total	30 (50%)	30 (50%)	60 (100%)

Table-5: Male and Female Ratio among Case and Control

4.3 Marital Status of the participants

A total of 60 participants 22 (73.3%) of the cases were married, 7 (23.3%) were unmarried and 1 (3.3%) were widow whereas 24 (80%) of the controls were married, 6 (20%) and 0 % were widow.

Marital Status	Case (%)	Control (%)	Total (%)
Married	22 (36.67%)	24 (40%)	46 (76.7%)
Unmarried	7 (11.67%)	6 (10%)	13 (21.7%)
Widow	1 (1.66%)	0	1(1.7%)
Total	30 (50%)	30 (50%)	60 (100%)

Table - 6: Marital Status among case and control

4.4 Educational Status of the participants

Among 30 cases and 30 control there were respectively 6.7% case and 6.7% control no formal schooling, 6.7% case and 6.7% control less than primary school, 13.3% case and 10% control upper secondary school, 30% case and 30% control had SSC completed, 23.3% case and 20% control completed HSC, 16.7% case and 20% control had college or university, 3.3% case and 0% control have masters completed.

Educational Status	Case (%)	Control (%)	Total (%)
No formal Schooling	2 (6.7%)	2 (6.7%)	4 (6.7%)
Less than primary School	2 (6.7%)	2 (6.7%)	4 (6.7%)
Upper Secondary School	4 (13.3%)	3 (10%)	7 (11.7%)
SSC Completed	9 (30%)	9 (30%)	18 (30%)
HSC Completed	7 (23.3%)	6 (20%)	13 (21.7%)
College or University	5 (16.7%)	6 (20%)	11 (18.3%)
Masters Completed	1 (3.3%)	0	1 (1.7%)

Table -7: Educational Status among case and control

4.5 Occupation

Among the 60 participants 5 participant was Farmer, 1 participants were Garments Worker, 1 participants were Driver, 6 participants were businessman, 22 participants were Housewife,15 participants were sportsman, 2 participants was teacher, Others 8 participants.

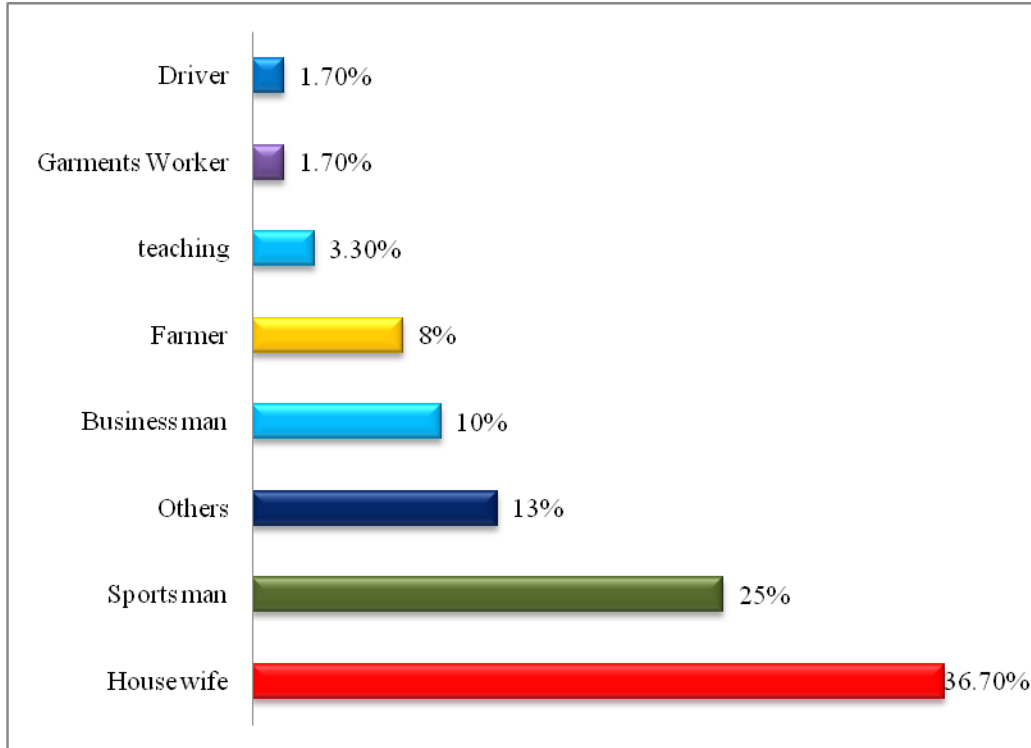


Figure -4: Occupation of the participants

Result showed that among 30 cases who had Tennis Elbow most of the participants were housewife that is 40% (n=12), 20% (n=6) were sports man, 10% (n=3) were farmer, 3.3% (n=1) were driver, businessman were 1.7% (n=1), teacher were 6.7% (n=2), 13.3%(n=4) were student.

On the other hand 33.3% (n=6) were housewife, 30.3% (n=9) were sports man, 10% (n=3) were farmer, 3.3% (n=1) were driver, businessman were 1.7% (n=1), teacher were 6.7%(n=2), 13.3%(n=4) were student.

26% (n=13) were housewife, 42% (n=21) were service holder, 12% (n=6) were businessman, farmer and teacher were 6% (n=3) respectively, students were 4% (n=2), driver and retired were 2% (n=1) respectively among control group.

	Total (%)	Case (%)	Control (%)
Occupation			
Farmer	5 (8.3%)	3 (10%)	21 (6.7%)
Driver	1 (1.7%)	1 (3.3%)	3 (3.3%)
Businessman	6 (1.7%)	2 (6.7%)	1 (13.3%)
Housewife	22 (36.7%)	12 (40%)	6 (33.3%)
Sports man	15 (25%)	6 (20%)	9 (30.3%)
Teacher	2 (3.3%)	2 (6.7%)	0
Student	8 (13.3%)	4 (13.3%)	4 (13.3%)

Table -8: Occupational Status among case and control

4.6 Overuse Hand

Among 60 participants 7 participants overuse their hand for 15-30 minutes, 19 participants overuse their hand for 1 hour and 34 participants overuse their hand for more than 2 hours. In percentage 11.70% participants overuse the hand 15-30 minutes, 31.70% participants overuse the hand 1 hour and 56.70% participants overuse the hand more than 2 hours.

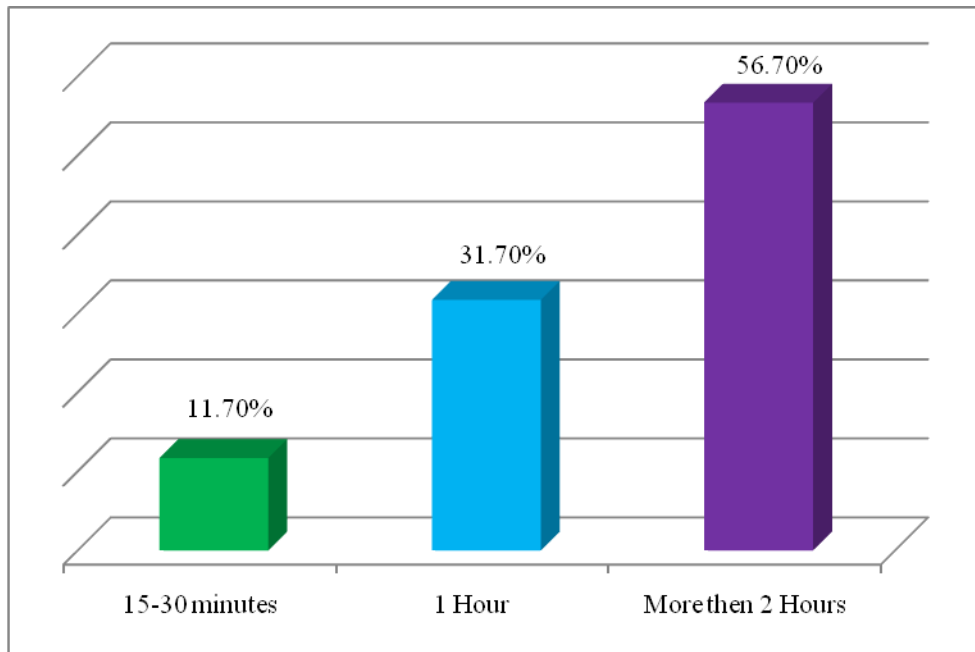


Figure-5: Overuse Hand

Among 30 cases and 30 control there were respectively 35% (n=21) case and 10% (n=6) control use their hand more than 2 hours, 6.67% (n=4) case and 16.67% (n=10) control use their hand one hour, 8.33%(n=5) case and 23.33% (n=14) control use their hand 15-30 minutes.

Overuse Hand	Case	Control	Total
More than 2 hours	21 (35%)	6 (10%)	27 (45%)
One hour	4 (6.67%)	10 (16.67%)	14 (23.34%)
15-30 minutes	5 (8.33%)	14 (23.33)	19 (31.66%)
Total	30 (50%)	30 (50%)	60 (100%)

Table - 9: Overuse Hand among case and control

4.7 Recurrent Injury:

Among 60 participants 19 participants recurrent injury present and 41 participants absent. In percentage 31.7% recurrent injury present and 68.30% recurrent injury absent.

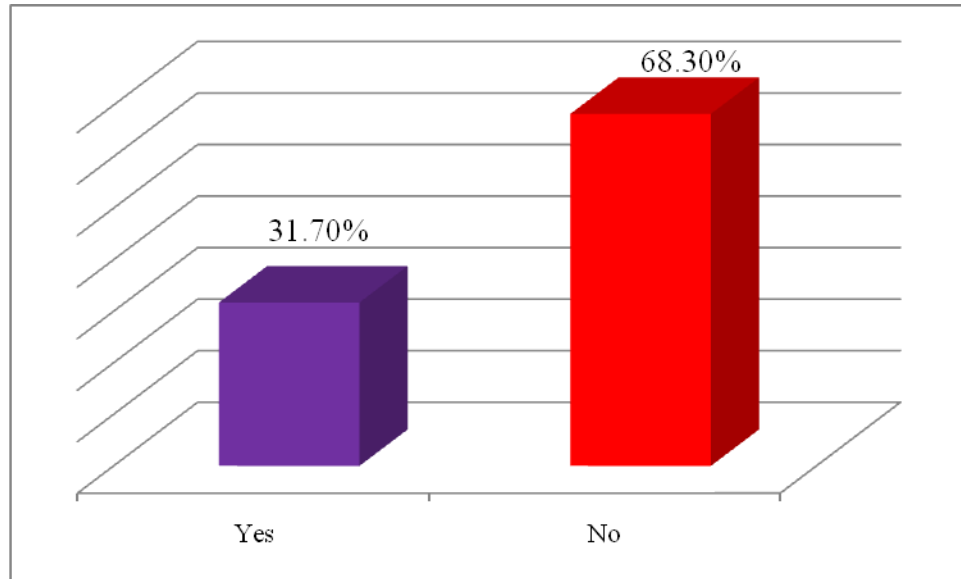


Figure-6: Recurrent injury

Among 30 cases and 30 control there were respectively 35% (n=21) case and 3.33% (n=2) control have present recurrent injury and 15% (n=9) case and 46.67% (n=28) control have no recurrent injury.

Recurrent Injury	Case (%)	Control (%)	Total (%)
Yes	21 (35%)	2 (3.33%)	31 (51.7%)
No	9 (15%)	28 (46.67%)	29 (48.3%)
Total	30 (50%)	30 (50%)	60 (100%)

Table -10: Recurrent injury among case and control

4.8 Weight Lifting By Hand

Among 30 cases and 30 control there were respectively 26.67% (n=16) case and 48.33% (n=29) control weight lifting by hand 4-12 kg, 21.6% (n=13) case and 1.67% (n=1) control weight lifting by hand 13-21 kg and 1.67 % (n=1) case weight lifting by hand 22-30 kg.

Weight Lifting By Hand	Case	Control	Total
4-12 kg weight lifting	16 (26.67%)	29 (48.33%)	45 (75%)
13-21 kg weight lifting	13 (21.67%)	1 (1.67%)	14 (23.33%)
22-30 kg weight lifting	1 (1.67%)	0	3 (1.67%)
Total	30 (50%)	30 (50%)	60 (100%)

Table -11: Weight lifting by Hand among case control

4.9 Residential Area

In this study about 51.7% (n=31) people were lived in urban area and about 48.3% (n=29) people were from rural areas. Whereas 21.67% (n=13) cases and 30 % (n=18) control were lived in urban area and 28.33% (n=17) case and 20% (n=12) control were from rural area.

Residential Area	Case (%)	Control (%)	Total (%)
Urban	13 (21.67%)	18 (30%)	31 (51.7%)
Rural	17 (28.33%)	12 (20%)	29 (48.3%)
Total	30 (50%)	30 (50%)	60 (100%)

Table -12: Residential Area among case and control

4.10 Type of pain

Among 30 cases and 30 control there were respectively 23.33% (n=14) case and 46.67% (n=28) control have present acute type of pain, 26.67% (n=16) case and 3.33% (n=2) control have present chronic type of pain.

Type of pain	Case	Control	Total
Acute	14 (23.33%)	28 (46.67%)	42 (70%)
Chronic	16 (26.67%)	2 (3.33%)	18 (30%)
Total	30 (50%)	30 (50%)	60 (100%)

Table - 13: Type of pain among case and control

4.11 Behavior of pain

Among 30 cases and 30 control there were respectively 10% (n=6) case and 22% (n=13) control had present occasional pain, 35% (n=21) case and 28% (n=17) control had present intermittent pain and 5% (n=3) case had present constant pain.

Behavior of pain	Case	Control	Total
Occasional	6 (10%)	13 (22%)	19 (32%)
Intermittent	21 (35%)	17 (28%)	38 (63%)
Constant	3 (5%)	0	3 (5%)
Total	30 (50%)	30 (50%)	60 (100%)

Table - 14: Behavior of pain among case and control

In this study there were 30 cases and 30 number of control that means case: control was 1:1 and hospital based unmatched setting. Intended of this study to determine the risk factors affecting the Tennis Elbow with considering the variables like socio-demographic and residential area ,occupation, weight lifting, overuse hand, habit of smoking, recurrent injury, dominant arm, racket weight and what is the behavior of the pain and when do you notice the pain. In this study found the positive association of the Tennis Elbow and weight lifting, overuse hand, habit of smoking, recurrent injury, dominant arm, racket weight , what is the behavior of the pain and when do you notice the pain.

Smedt et al. (2007) observed that TE is occurring most often in the age group of 40-60 years except in tennis players who are generally younger and it affects men and women to the same degree. In addition to age, risk factors for developing tennis elbow include repetitive and forceful motions of wrist and arm, participating in racket sports, using a faulty tennis playing technique and smoking tobacco. In this study found the similar age group more incidence of the Tennis Elbow. He found that most age frequency of the case group of the study was more than 35 years that was 32%.

Shiri et al., (2006) observed that People with a history of current or prior tobacco use were found to have an increased risk of developing tennis elbow. Repetitive movements and forceful activities were also positively correlated with lateral epicondylitis in this study found the relation between Tennis Elbow and smoking. The presence of smoking habit in this study because the Odds ratio was 3 and 95% CI was 1.05 and 8.6. This means that, based on the data obtained from the sample, presence of smoking habit has occurred Tennis Elbow incidence that is 3 times higher than non smoker. In this study found the strong relation between Tennis Elbow and recurrent injury. The mentions recurrent injury in this study because the Odds ratio was 18.308 and 95% CI was 3.674 and 91.229. This means that, based on the data obtained from the sample, recurrent injury has occurred Tennis Elbow incidence that is 18.308 times higher. In this study found the strong relation between Tennis Elbow and Weight lifting by hand. This study mentions

Weight lifting by hand in this study because the Odds ratio was 1.643 and 95% CI was 1.05 and 5.120. This means that, based on the data obtained from the sample, Weight lifting by hand has occurred Tennis Elbow incidence that is 1.64 times higher than light weight lifting.

Smoking, forceful work and the combination of repetitive movements of the arm and forceful activities are associated with the occurrence of LE. LE naturally resolves over a period of 1 to 2 years in 80% to 90% of cases (Mens et al., 1999) .In this study found the strong relation between Tennis Elbow and overuse of hand. This study mentions overuse of hand in this study because the Odds ratio was 5.6875 and 95% CI was 1.59 and 20.33. This means that, based on the data obtained from the sample, overuse of hand has occurred Tennis Elbow incidence that is 5.68 times higher than light use of hand.

CHAPTER-VI: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In this case control study there was 30 cases and the same number of control that means case: control was 1:1 and conducted in hospital based unmatched setting. The objective of this study to determine the risk factor of Tennis Elbow with considering the factor like socio-demographic and residential area, occupation, weight lifting, overuse hand, habit of smoking, recurrent injury, dominant arm, racket weight and what is the behavior of the pain and when do you notice the pain.

The overuse hand, recurrent injury, weight lifting, smoking habit had found the positive risk factor with the Tennis Elbow. The important way for prevention of Tennis Elbow including the modification of overuse hand and weight lifting for reduce risk factors. This study suggested careful about the occupational activities during work which might be reduced the risk of Tennis Elbow. Always maintain the correct working position during daily living activities and correct the use of hand which also reduces the risk of Tennis Elbow. This study also found that smoking one of the risk factor of the Tennis Elbow in the study, so should be stopped smoking reduce the risk of the Tennis Elbow. So this study wishes to correct the over use of hand, weight lifting, light racket weight. This study also suggests reducing occupational injuries by modification of the working position and correction the posture during the daily living activities. It is crucial to develop research based findings about the risk factors of Tennis Elbow. This study can be considered as a ground work for the physiotherapy service provision for the Tennis Elbow. Proper physiotherapy can reduce the complication of Tennis Elbow. Like other countries, Tennis Elbow to be an upcoming burden for Bangladesh. For this reason, it is important to develop research based evidence of physiotherapy practice in this area. Physiotherapist's practice which is evidence based in all aspect of health care. There are few studies on musculoskeletal area in the Tennis Elbow region. These cannot cover all aspect of the vast area.

6.2 Recommendations

A recommendation evolves out of the context in which the study was conducted. It is recommended that if possible someone would overcome the existing limitation for further study. If it is possible than conducted further studies in this area. Though the research has some limitations but it identified some further step that might be taken for the better accomplishment of further research. For ensuring of the generalizability of the research it is recommended that a larger sample should be chosen randomly for the case control study. The sample should be representative from the whole population. In this study, sample only took from CRP (Musculoskeletal Department) and from Tennis Federation. It is recommended that the next generation of physiotherapy members continue study regarding the area, of large sample size and participants form different districts of Bangladesh. Conduct research on other musculoskeletal problems in Tennis Elbow area where physiotherapist can work. So it is very important to conduct such type research in this area. If the researcher will take long term study, the result will be more significant. Last of all entire researcher recommended to take setting in whole Bangladesh to generalize this study.

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APPENDIX – A

Informed consent

(Please read out to the participant)

Assalamualaikum/Namasker, my name is Shahoriar Ahmed, I am conducting this study for partial fulfillment of Bachelor of Science in Physiotherapy degree, entitled, “Risk factors of tennis elbow patients attended at two selected organizations in Dhaka.” from Bangladesh Health Professions Institute (BHPI), University of Dhaka. I would like to know about some personal and other related information. You will answer some questions which are mentioned in this form. This will take approximately 20-25 minutes. I would like to inform you that this is a purely academic study and will not be used for any other purpose. The researcher is not directly related with this obstetrics area, so your participation in the research will have no impact on your present or future treatment. All information provided by you was treated as confidential and in the event of any report or publication it was ensured that the source of information remains anonymous.

Your participation in this study is voluntary and you may withdraw yourself at any time during this study without any negative consequences. You also have the right not to answer a particular question that you don't like or do not want to answer during interview.

If you have any query about the study or your right as a participant, you may contact with me and Md. Shofiqul Islam , Department of Physiotherapy, BHPI, CRP, Savar, Dhaka.

Do you have any questions before I start?

So may I have your consent to proceed with the interview?

Yes

No

Name of the Interviewer Date

Signature of the Interviewer Date.....

APPENDIX – B

Title - Risk factors of tennis elbow patients attended at two selected organizations in Dhaka.

<p>Interview Schedule</p> <p>Patient's Identification</p> <p>(to be provided by patient or attendant)</p>	
Name :-	Date of Interview:
Address:	Contact no:

Section 1: Socio demographic information:

QN	Questions And Filters	Responses		
01.	Age(In year):	<table border="1" style="width: 100%; height: 20px; margin-bottom: 5px;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%;"></td> </tr> </table> Years		
02.	Sex	1 = Female 2 = Male		
03.	Educational Status	1 = No formal Schooling 2 = Vocational training 3 =Less then primary School 4 = Upper Secondary School 5 =Primary Completed 6 = SSC Completed 7 = HSC Completed 8 = College or University 9 = Masters Completed 10 = Others Completed		
04.	Residential Area	1 =Rural 2 =Urban		
05.	Marital Status	1 = Married 2 = Unmarried		

		3 = Divorce 4 = Widow 5 = Separate
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Section 2: Sample related information:

QN	Questions and Filters	Responses
06.	Past History of acute or major elbow injury	1 = Yes 2 = No
07.	Past History of Painful Swelling of Elbow Joint	1 = Yes 2 = No
08.	Weight lifting by the hand	1 =(.....) kilograms
09.	Occupation	1 = Farmer 2 = Garment Worker 3 = Driver 4 = Businessman 5 = Day Labor 6 = Housewife 7 = Sports Man 8 = Teaching 9 = Unemployment 10 = Others
10.	Past Medical History	1 = DM 2 = Hypertension 3 = Previous Elbow Injury 4 = NSAID 5 = Steroid Injection 6 = Manual Treatment(deep friction,massage,manipulation) 7 = Stretching 8 = Ultrasound 9 = Exercise

		10 = Rest 11 = Orthosis or other fixative 12 = Other Treatment
11.	Overuse Hand:- How long ?	1 = 15-30 minutes 2 = 1 Hour 3 = More then 2 Hours
12.	How severe is your pain on VAS Scale.	 0 (No pain) 5(Medium Pain) 10(Severe Pain)
13.	Have you feel tightness or (decrease JROM)contracture of your Elbow joint.	1 = Yes 2 = No
14.	How long do you suffer your current Elbow pain.	1 = Weeks 2 = Months 3 = Days
15.	Smoking	1 = Never Smoked 2 = Ex-Smoker 3 = Current Smoking /1-14 cigarettes/day/ 15-24 cigarettes/day or more cigarettes/day
16.	Dominant Arm	1 = Right 2 = Left
17.	Type of pain	1 = Acute 2 = Chronic
18.	What is the behavior of pain?	1 = Occasional 2 = Intermittent 3 = constant
19.	When do you notice the pain?	1 = During work 2 = After work 3 = During rest

20.	When you feel the pain most?	1 = Day 2 = Night
21.	Recurrent injury	1=yes 2=No
22.	Racket weight(gm)

APPENDIX – C

Permission letter

Date: 25.03.13

To

The Head of the Department,

Physiotherapy Department,

Center for the Rehabilitation of the Paralyzed (CRP)

Savar, Dhaka-1343

Subject: Permission to collect data to conduct a research study.

Sir,

I respectfully to state that I am a student of 4th year B.Sc. in Physiotherapy at Bangladesh Health Professions Institute(B.H.P.I).In 4th year we have to do a research project and I have chosen a title that is "Risk Factors of Tennis Elbow". I have chosen the physiotherapy department of CRP in Savar and Mirpur for data collection. For your kind information the research methodology, consent form & questionnaire have submitted with this application.

I therefore pray and hope that you would be kind enough to give me permission to do this study successfully in your department.

Yours faithfully

Shahoriar Ahmed

Shahoriar Ahmed

Bachelor of Science in Physiotherapy (B.Sc. PT)

CRP, Savar, Dhaka

Shahoriar Ahmed
Ms. Shrab Hossain
BPT, DU, D Orthopaedics Cymru (Belgium), MPT,
PGT-UK, AUS, CA
Associate Professor Physiotherapy, CRP
Head of the Physiotherapy Department CRP

APPENDIX – D



বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)
(The Academic Institute of CRP)

CRP-Chapain, Savar, Dhaka, Tel: 7745464-5, 7741404, Fax: 7745069
BHPI-Mirpur Campus, Plot-A/5, Block-A, Section-14, Mirpur, Dhaka-1206. Tel: 8020178, 8053662-3, Fax: 8053661

তারিখঃ ১৩.০৪.২০১৩

১৩/৪/১৩
৪০

প্রতি
সাধারণ সম্পাদক
বাংলাদেশ টেনিস ফেডারেশন
শাহবাগ, ঢাকা।

বিষয় : রিসার্চ প্রজেক্ট (dissertation) এর জন্য আপনার প্রতিষ্ঠান সফর ও তথ্য সংগ্রহ প্রসঙ্গে।

জনাব,

আপনার সদয় অবগতির জন্য জানাচ্ছি যে, পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্রে-সিআরপি'র শিক্ষা প্রতিষ্ঠান বাংলাদেশ হেল্থ প্রফেশনন্স ইনস্টিটিউট (বিএইচপিআই) ঢাকা বিশ্ববিদ্যালয় অনুমোদিত বিএসসি ইন ফিজিওথেরাপী কোর্স পরিচালনা করে আসছে।

উক্ত কোর্সের ছাত্রছাত্রীদের কোর্স কারিকুলামের অংশ হিসাবে বিভিন্ন বিষয়ের উপর রিসার্চ ও কোর্সওয়ার্ক করা বাধ্যতামূলক।

বিএইচপিআই'র ৪র্থ বর্ষ বিএসসি ইন ফিজিওথেরাপী কোর্সের ছাত্র মোঃ শাহরিয়ার আহমেদ তার রিসার্চ সংক্রান্ত কাজের তথ্য সংগ্রহের জন্য আপনার সুবিধামত সময়ে আপনার প্রতিষ্ঠানে সফর করতে আগ্রহী। তার রিসার্চ শিরোনাম "Risk factor of tennis Elbow."

তাই তাকে আপনার প্রতিষ্ঠান সফর এবং প্রয়োজনীয় তথ্য প্রদান সহ সার্বিক সহযোগীতা প্রদানের জন্য অনুরোধ করছি।

ধন্যবাদান্তে

১৩/০৪/১৩
মোঃ ওবায়দুল হক

সহযোগী অধ্যাপক ও কোর্স-কো অর্ডিনেটর
ফিজিওথেরাপী বিভাগ
বিএইচপিআই।