

## Original Research Article

# Incidence of tennis elbow and association of hand grip strength among college students

Riyas Basheer K. B.<sup>1\*</sup>, Subhashchandra Rai<sup>1</sup>, Irshana Balkies A. M.<sup>2</sup>, Jasim Junaid N. P.<sup>2</sup>

<sup>1</sup>Department of Physiotherapy, Tejasvini Physiotherapy College, Tejasvini Hospital Group of Institutions, Kudupu, Mangalore, Karnataka, India

<sup>2</sup>Physiotherapy Intern, Malabar Medical College Hospital and Research Centre, Modakkalloor, Calicut, Kerala, India

**Received:** 06 November 2020

**Revised:** 09 December 2020

**Accepted:** 10 December 2020

### \*Correspondence:

Dr. Riyas Basheer K. B.,

E-mail: riyas2423@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Lateral epicondylitis is an overuse injury involving the origin of common extensor tendon at elbow joint. Among the college students there is more complaint on wrist and elbow. Objective was to find out the incidence of tennis elbow & grip strength among the students during the entire academic year.

**Methods:** Three hundred and seventy subjects fulfilled the inclusion criteria with age respondents between seventeen to twenty four years. This study is done in those students who have local tenderness on palpation over the lateral epicondyle (grade 2). NPRS was used for measuring the pain intensity. Mill's test and Cozen's test was performed to confirm the tennis elbow. The subject is asked to squeeze the dynamometer three times with left and right hand respectively. There was one minute resting period between each squeeze were taken into account.

**Results:** The incidence of confirmed tennis elbow was 4.05% & 2.70% in right and left respectively. Among those participants Mill's test was positive in 16.2% on right and left side and Cozen's test was positive in 8.1% on right side and 5.4% on left side. The mean rank of left and right grip strength for the students who are confirmed as tennis elbow were 52.75 Kg and 50.67 Kg and for not-confirmed were 36.56 Kg and 36.41 Kg respectively.

**Conclusions:** The study concluded that 6.7% incidence rate of tennis elbow was observed in college students during the entire academic year. And also concluded there is no much significance correlation between grip strength and tennis elbow incidence rate.

**Keywords:** Grip strength, Lateral epicondylitis, Pain, Students, Tennis elbow

## INTRODUCTION

Tennis elbow is thought to result from overuse of the extensor carpi radialis brevis (ECRB) muscle by repetitive micro trauma resulting in a primary tendinosis of the ECRB, with or without involvement of the extensor digitorum communis (EDC). The predominant activity of the wrist extensors might be one explanation for predisposition to the condition.

Epicondylitis is a condition described by intermittent pain at the muscle-tendon junction or at insertion points of the wrist extensors (lateral epicondylitis) in the elbow region. The clinical features of epicondylitis are described as complaint of pain as the primary symptom, generally localized around the lateral epicondyle but sometimes radiating distally to the forearm.<sup>1</sup> Tennis elbow is usually caused by overusing the muscles attached to elbow and used to straighten wrist. If the muscles and tendons are strained, tiny tears and inflammation can develop near the

bony lump (the lateral epicondyle) on outer side of the elbow.<sup>2</sup>

The grip strength is the force applied by the hand to pull on or suspend from objects and is a specific part of hand strength. There are 35 muscles involved in movement of the forearm and hand, with many of these involved in gripping activities. During gripping activities, the muscles of the flexor mechanism in the hand and forearm create grip strength while the extensors of the forearm stabilize the wrist. In case of tennis elbow, wrist extensor muscles can't stabilize the wrist while gripping.<sup>3</sup>

College students are prone to overuse injuries like tennis elbow, may be because of their long time writing and giving more strain to elbows and wrist while writing. Elbow flexion and radial deviation are the normal positions adapt for writing, for every person there must be variations.

Tennis elbow is one of the musculoskeletal condition troubles an adulthood with pain and disability.<sup>4</sup> Professional education students also having skill activities on their academics later on end up with chronic inflammatory conditions. So this study will focus on the incidence of tennis elbow and effect on grip strength among college students.

**METHODS**

This is a cross sectional study conducted at Malabar Medical College Hospital & Reseach Centre, Calicut, Kerala and Tejasvini Physiotherapy College, Mangaluru, Karnataka during the academic year January 2019 to March 2020 (Obtained Institutional ethical clearance for the same from both institutes). The complete procedure was explained to the subjects. Students aged between 17-23 years including both males and females were included in the study. On arriving at the experimental settings instructions were given to the subjects in the same sequence which include; proper handling of the dynamometer (a clear command to squeeze the handle of dynamometer as hard as possible and hold it for five seconds, For each subject one minute rest is allowed to overcome fatigue), the subject is asked to squeeze the dynamometer three times with left and right hand respectively. There was one-minute resting period between each squeeze and the mean values of the three squeezes were taken into account.

Tennis elbow is checked through Mill's test and Cozen's test by placing the subject in sitting position. Cozen's test: The subject's elbow is stabilized by the examiner's thumb, which rests on the subject's lateral epicondyle. The patient is then asked to actively make a fist, pronate the forearm, and radially deviate and extend the wrist while the examiner resists the motion. A sudden severe pain in the area of the lateral epicondyle of the humerus is a positive sign. Mill's Test: While palpating the lateral epicondyle, the examiner passively pronate the subject's

forearm, flexes the wrist fully, and extends the elbow. Pain over the lateral epicondyle of the humerus indicates a positive test. Positive Cozen's & Mill's test, with grade II tenderness over the lateral epicondyle or along the muscles and a pain score of more than or equal to 4 in NPRS diagnosed as Tennis elbow. Outcome measures used in the study were Cozen's test, Mill's test, NPRS score and dynamometry score in Kg.

**Statistical analysis**

Statistical analysis was performed by using SPSS 20.0. As the data not follows normal distribution curve, non-parametric tests were used for the analysis of handgrip and tennis elbow correlation. Mann-Whitney U Rank test was used to find out the relationship between these groups.

**RESULTS**

Among the 370 students 60 students got positive Mill's test sign at both right and left elbow. Whereas, with Cozen's test 30 students got positive sign at right elbow and 20 students got positive sign at left elbow (Table 1). 4.05% & 2.70% students are confirmed with tennis elbow at right and left elbow respectively with a pain level >4 with NPRS (Table 2).

**Table 1: Tennis elbow confirmatory test analysis.**

TE confirmatory test	Side	Results	Number	Percentage
<b>Mill's test (N=370)</b>	Right	Negative	310	83.8
		Positive	60	16.2
	Left	Negative	310	83.8
		Positive	60	16.2
<b>Cozen's test (N=370)</b>	Right	Negative	340	91.9
		Positive	30	8.1
	Left	Negative	350	94.6
		Positive	20	5.4

**Table 2: Tennis elbow confirmation among the college students.**

Variable	Side	NPRS value	TE confirmed	TE Not confirmed	TE Conf %
<b>Positive MT and CT</b>	Right	>4	15	355	4.05
	Left	>4	10	360	2.70

The mean right and left grip strength of the students who are having positive Mill's test was 33.71kg and 39.92 kg respectively. And the mean right and left grip strength of the students having positive Cozen's test was 50.92 Kg and 45 Kg respectively. Also result shows there is no significance difference (P>0.005) between grip strength among right and left negative Mill's and Cozen's test (Table 3).

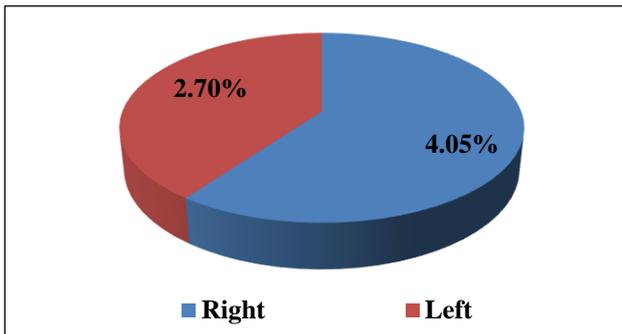
**Table 3: Inter group analysis of grip strength with TE confirmatory test.**

Variable	TE Test	Results (N=370)	Mean Rank (Kg)	Mann-Whitney U	Z Value	P Value
Right Grip Strength	Mill's Test	Negative (310)	37.65	326.5	0.588	0.557
		Positive (60)	33.71			
Left Grip Strength	Mill's Test	Negative (310)	36.43	331	0.521	0.602
		Positive (60)	39.92			
Right Grip Strength	Cozen's Test	Negative (340)	35.75	117.5	1.677	0.093
		Positive (30)	50.92			
Left Grip Strength	Cozen's Test	Negative (350)	36.54	106	0.776	0.438
		Positive (20)	45.00			

**Table 4: TE confirmatory cases and grip strength analysis.**

Variable	Side	Confirmatory test results	Mean Rank	Mann Whitney U	Z Value	P Value
Grip Strength	Right	Negative (355)	36.41	64.0	1.139	0.274
		Positive (15)	50.67			
	Left	Negative (360)	36.56	39.5	1.065	0.287
		Positive (10)	52.75			

This study results also suggest there is no significance difference in grip strength right (P=0.274) and left (P=0.287) side with confirmed tennis elbow case (Table 4).



**Figure 1: Tennis elbow confirmed cases expressed in percentages.**

**DISCUSSION**

Total 400 students were participated in this study with age group between 17-23 years old. 370 of them were included in the study based on the inclusion and exclusion criteria. Among these 60 students shows positive Mill's test on the right side and left side as well. 30 students show positive Cozen's test on right side and 20 students positive with Cozen's test on left side. These are suggestive of early warnings signs to tennis elbow. Out of these 370 participants 15 students on the right side and 10 students on the left side were diagnosed with tennis elbow by using Mill's test and Cozen's test. The study results explain that the mean rank of left and right grip strength for the students who are confirmed as tennis elbow were 52.75Kg and 50.67Kg and for not-confirmed were 36.56Kg and 36.41Kg respectively. The analysis

with Mann Whitney U test shows not much significance between these two groups.

Tennis elbow is thought to result from overuse of the extensor carpi radialis brevis (ECRB) muscle by repetitive micro trauma resulting in primary tendinosis of the ECRB, with or without involvement of the extensor digitorum communis (EDC).<sup>5</sup>

The primary impairment in the lateral epicondylalgia is a deficit in grip strength which is predominantly due to pain, and its consequences on motor functions. According to Schmidt, et al patients with tennis elbow try to avoid pain and rarely challenge their maximal grip.<sup>14</sup> Functional ability may be therefore determined by their pain free capabilities. Pain and disuse of arm have important role in worsening the agonist and antagonist muscle function resulting in overall reduction in muscle performance of involved arm.

Grip strength may also play a role in injury prevention and rehabilitation. In many cases, strengthening of grip has been a prescription for rehabilitation from injuries such as golfer's and tennis elbow. Hand grip strength measurement is extensively used in many areas of medical science and sports as a functional test of overall strength. Grip is also used as an indicator of general health, nutritional status, and has been recently suggested as risk-stratifying method for all cause death.

College students are prone to overuse injuries like tennis elbow, may be because of their long time writing and giving more strain to elbows and wrist while writing. Elbow flexion and radial deviation are the normal positions we adapt for writing, for every person there must be variations. Repeated actions of elbow and wrist can be the reason for tennis elbow.

The result of the study shows the incidence of 6.76% of tennis elbow identified during the study conducted in the year 2019 as they were engaged in activities like writing, typing, using mobile phones, driving. Right elbow was dominantly affected in all participants.

Direct tenderness was considered positive if palpation on the lateral epicondyle or the adjacent tissue (up to 4 cm distal to the epicondyle) elicited any degree of palpation tenderness. Indirect tenderness was examined by resisted dorsal flexion of the wrist with the elbow stretched and was considered positive if exacerbation of pain was located in the specified area. The reason and nature of lateral epicondylitis are still matters for assumption there is well-meaning sign that it is not mutual among manual workers and is not obviously linked with any specific working activity. We also recommend conducting large study by using ultrasonographic and EMG evidence for the tennis elbow on students. Limitations of the study include non-classification of athletic students and sedentary active students and also classification under dominance of upper extremity usage.

## CONCLUSION

The study concluded that 6.7% incidence rate of tennis elbow was observed in 370 college students during the entire academic year. This study also showed the pain was prominent on the right side than left side indicating the dominance showing the more affection towards tennis elbow. And this study also concludes that there is no significant correlation between grip strength and tennis elbow incidence. We recommend that students should be aware on the benign nature of the condition, adequate rest and ergonomic measures to diminish the repetitive stress on the extensor muscle.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

- Hough P A, Nel M. Postural risks and musculoskeletal discomfort of three preferred positions during laptop use amongst students. *South Afr J Occupational Therapy*. 2017;47(1):3-8.
- Callegari B, De Resende MM, Da Silva Filho M. Hand rest and wrist supports are effective in preventing fatigue during prolonged typing. *J Hand Therapy*. 2018;31(1):42-51.
- Jepsen JR. Studies of upper limb pain in occupational medicine, in general practice, and among computer operators. *Danish Med J*. 2018;65(4).
- Upadhyay S, Shukla Y, Patel KK. Effects of progressive strengthening exercises in chronic lateral epicondylitis. *Inter J Health Sci Res*. 2017;7(4):244-57.
- Madeleine P, Vangsgaard S, Andersen JH, Ge HY, Arendt Nielsen L. Computer work and self-reported variables on anthropometrics, computer usage, work ability, productivity, pain, and physical activity. *BMC Musculoskeletal Dis*. 2013;14(1):1-10.
- Evans J P, Porter I, Gangannagaripalli JB, Bramwell C, Davey A, Smith CD, et al. Assessing patient-centred outcomes in lateral elbow tendinopathy: a systematic review and standardised comparison of english language clinical rating systems. *Sports Med*. 2019;5(1).
- Fan ZJ, Silverstein BA, Bao S, Bonauto DK, Howard NL, Smith CK. The association between combination of hand force and forearm posture and incidence of lateral epicondylitis in a working population. *Human factors: J Human Factors Ergon Soci*. 2013;56(1):151-65.
- Descatha A, Albo F, Leclerc A, Carton M, Godeau D, Roquelaure Y, et al. Lateral epicondylitis and physical exposure at work? a review of prospective studies and meta-analysis. *Arthritis Care Res*. 2016;68(11):1681-7.
- Shiri R, Viikari Juntura E. Lateral and medial epicondylitis: role of occupational factors. *Best Pract Res Clin Rheumatol*. 2011;25(1):43-57.
- Pienimäki T, Tarvainen T, Siira P, Malmivaara A, Vanharanta H. Associations between pain, grip strength, and manual tests in the treatment evaluation of chronic tennis elbow. *Clin J Pain*. 2002;18(3):164-70.
- Romero E, Ortega. Elbow position affects handgrip strength in adolescents: validity and reliability of Jamar, DynEx, and TKK dynamometers. 2010;24(1):272-7.
- Coldham F, Lewis J, Lee H. The Reliability of one vs. three grip trials in Symptomatic and Asymptomatic Subjects. *J Hand Surg*. 2006;19(3):318-27.
- Puh U. Age-related and sex-related differences in hand and pinch grip strength in adults. *Int J Rehabil Res*. 2010;33(1):4-11.
- Schmidt N, van der Windt D, Assendelft W, Mourits A, Deville W, de Winter A, et al. Interobserver Reproducibility of the Assessment of Severity of Complaints, Grip Strength, and Pressure Pain Threshold in Patients with Lateral Epicondylitis. *Arch Phys Med Rehabil*. 2002;83(11):45-50.
- Incel NA, EsmaCeceli, Durukan PB, RanaErdem H, RezanYorgancioglu Z. Grip Strength: Effect of Hand Dominance. *Singapore Med J*. 2002;43(5):234-7.

**Cite this article as:** Basheer RKB, Rai S, Balkies IAM, Junaid JNP. Incidence of tennis elbow and association of hand grip strength among college students. *Int J Res Med Sci* 2021;9:177-80.