

PREVALENCE OF LATERAL EPICONDYLITIS AMONG UNIVERSITY STUDENTS AND ITS EFFECT ON HAND FUNCTION: A CROSS-SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Background: Tennis elbow, additionally referred to as lateral epicondylitis (LE), is a condition due to abnormal overloading of the number one extensor tendon. It usually affects the dominant arm and is not uncommon in boys and men. Despite extensive research across various professions, little is known about its prevalence among university students, a group prone to repetitive upper limb movements.

Objective: To determine dominant of LE among university students as well as effect on hand function.

Methods: A representative study was held in Chandigarh University, including 59 participants aged 18 – 25 years. Participants were selected through the convenient sampling. Participants fulfilling the inclusion criteria were recruited after obtaining the informed consent. Demographic details including age, gender and dominant hand were recorded. Data collection involved PRTEE questionnaire, DASH questionnaire, Hand Dynamometer, and Cozen's test and Mill's test for clinical diagnosis.

Results: The study demonstrated a prevalence of 28.8% (n=17) of lateral epicondylitis, with highest proportion in 22-23 years of age group (27.1%). Females gives larger proportion (54.2%) while males (45.8%) and majority were right-handed (84.7%). The positive Cozen's test result was observed in 28.8% of participants while 13.6% was observed in Mill's test. The mean DASH scores in LE group (49.853±10.918) were higher than non-LE group (10.952±6.514). Similarly, PRTEE scores among LE group (58.500±12.772) were higher than non-LE group (11.560±8.788). The grip strength was lower in LE group (20.282±5.151) as compared to non-LE group (34.879±5.190) indicating reduced grip strength with lateral epicondylitis. Overall, study indicates that lateral epicondylitis is present in university students and significantly affects hand function.

Conclusion: Overall, the study concludes that lateral epicondylitis has a notable prevalence among students and significantly affect the hand function by increased pain, reduced grip strength and functional limitation. Early screening, ergonomic education and physiotherapeutic management are recommended to reduce impairment.

KEYWORDS: Lateral epicondylitis, Tennis elbow, Grip strength, DASH, PRTEE, hand function, Prevalence.

INTRODUCTION

LE (Lateral Epicondylitis) also known as tennis elbow which is identify by pain as well as fondness on outer part of the elbow [1]. Tennis elbow ECRB (extensor carpi radialis brevis) muscle overuse results through boring subtle trauma demonstrated in the number one tendinosis of ECRB that can affect muscle fiber type composition in addition to muscle tendon complexity [2]. It is situation predicted by sporadically pain at muscle-tendon junction of wrist extensors (lateral epicondylitis) in elbow region [2]. LE widely impacts people that are complex in repetitive one-way movements with drivers, plumbers, carpenters, gardeners, and electricians [4]. It causes limitation in work by reducing performance as well as productivity of employees [5]. The features of epicondylitis are detailed in appreciation of pain as the number one symptom, the rounded LE when once it radiates distally to the forearm [6]. Some neurological symptoms such as cervical spine diseases along with radiculopathy as well as posterior interposes nerve involvement also bursitis with lateral epicondylitis [7]. Most significant phase comes under between ages of 30 and 50 [8]. Quick as well as repetitive movements of wrist along with forearm can rupture proximal attachment of long extensor muscles causing pain as well as swelling [8]. LE result not only elbow function but some of hand function [4]. Eclipses are routinely affected especially through the purposeful reduction of patients' freedom which also includes lifting and placing a mug of water for bathing on top of heavier objects [3]. The grip electrode Selected portion of the hand electrode is the force applied to 35 muscle tissues alongside the hand electrode with grip activities in addition to the hand in which muscle tissues of the flexor system in the hand in addition to the forearm create grip force to secure wrist [2]. In case of tennis elbow, wrist extensor muscles can't secure wrist along with gripping [9]. College students are liable to excess use injuries such as tennis elbow, gives more strain to elbows as well as wrist while writing [2].

College students can be at a higher danger for tennis elbow due to several elements:

1. Extended Computer Use: Use a mouse to reach repetitive tension in forearm muscles in addition to tendons for prolonged periods of typing
2. Repetitive physical activities: Participating in physical sports, such as tennis or weightlifting, can put stress on elbow.
3. Poor Ergonomics: Incorrect pc arrangement throughout operation can contribute to repetitive stress accidents.
4. Stress and Lifestyle: Irregular physical activity along with High-stress levels patterns can exacerbate risk of excess use injuries [1]

Pathology is degenerative tendinosis, which has four stages (Table 1) [13]. It has dense populations of vascular hyperplasia, fibroblasts as well as unorganized collagen [10]. On radiographs, lateral epicondyle attain on some mild calcification. Typical diagnosis of lateral epicondylitis is an origin just anterior along with distal to lateral humeral epicondyle which is related to recent adjustments in one's profession. Patient frequently explains discomfort of moving luggage, shaving, or groceries as well as lifting coffee cups [11].

Conservative treatment regimen is focused on minimizing the excessive forces by using a counterforce brace, altering technique as well as equipment, reducing inflammation alongwith pain with rest, ice, as well as cortisone injections, suggesting healing process with high voltage galvanic stimulation, arm as well as forearm strength, endurance. Surgery may be necessary containing manipulation acupuncture, exercise therapy as well as ultrasound, mobilizations, phonophoresis along with iontophoresis, prediciting promise in reducing discomfort as well as enhancing function for people with lateral epicondylitis [12].

Table 1: Pathologic stages of lateral epicondylitis. [13]

Stage	Tendinosis degenerative changes
I	Peritendinous inflammation without any pathogenic changes
II	which include pathological adjustments such as angiofibroblastic degeneration or tendinosis
III	pathological changes and complete structural failure involved
IV	Involved fibrosis, smooth matrix calcifications and hard bone calcifications even more than the features of stages II and III

Table 2: Clinical classification of lateral epicondylitis phases.

Phase	Description of pain changes of different phases
I	After an activity, I normally get better in a day.
II	Warm-up exercises can alleviate mild pain more than 48 hours after activity, no pain while activity, and recovery within 72 hours.
III	Mild discomfort both before and during the exercise, which can be somewhat alleviated with warm-up and has no appreciable detrimental effects on the activities
IV	Mild pain interferes with day-to-day tasks and makes them difficult to accomplish.
V	Severe pain that is unrelated to activities has a significant detrimental effect on activity performance but does not stop everyday activities. To manage the pain, total rest is required.
VI	Pain that persists even after resting completely and can interfere with normal activities
VII	Sleep disturbances, persistent discomfort at rest, and aggravation following activities

Table 3: Predisposed factors of Lateral epicondylitis [10]

Category	Predisposed factors
Physical factors	Age Sex Waist circumference Dominant side
Social factors	Smoking habit Alcohol intake
Metabolic factors	Hyper glycemia Obesity Hypertension

Need Of The Study

The study on college or university students for lateral epicondylitis is very rare and also a limited studies are available for the impact of hand function in lateral epicondylitis.

Research Gap

Lateral epicondylitis has been widely studied in occupational workers, and athletes, limited research has been focused on its prevalence among students.

Additionally, previous studies have been often focused either pain assessment or functional disability separately. Limited studies have evaluated the combined effect of lateral epicondylitis on hand function using both subjective and objective measures:

- 1.DASH questionnaire
- 2.PRTEE questionnaire
- 3.Hand dynamometer for grip strength
- 4.Clinical examination – Cozen’s test and Mill’s test

Therefore, recent study was undertaken to determine dominant of lateral epicondylitis of university students and its effect on hand function using the combination of validated outcome measures and clinical examination.

AIM OF THE STUDY

To govern dominance of lateral epicondylitis of university students and its effect on hand function.

Objectives Of The Study

- 1.To classify the cases by the use of Cozen’s test as well as Mill’s test.
- 2.To evaluate hand functions by DASH and PRTEE questionnaire.
- 3.To count the hand grip strength with the help of dynamometer.
- 4.To differentiate between the affected and non-affected persons.

METHODOLOGY

Study design: recent study was determined as representative study to dominance lateral epicondylitis among university students and its effect on hand function. This was chosen as it allows the assessment of the condition and functional limitation without intervention.

Study setting: Study was held in Chandigarh University, Mohali. Data collection was done in academic setting.

Study population: The participants were university students (undergraduate and postgraduate) between the age of 18-25 years.

Sample size: Sample measurement of 59 participants was selected build on convenience sampling. Participants who came in inclusion as well as exclusion criteria were included in study.

Following simple formula (Daniel, 1999) can be used [15]: (Cochran Formula)

$$n = Z^2 P (1-P) / d^2$$

|Where n = sample size

Z = Z statistic for a level of confidence

P = expected prevalence or proportion (in proportion of one; if 20%, P = 0.2)

d = precision (in proportion of one, if 5%, d = 0.05)

Sampling technique: Participants were choosen on basis of willingness and availability to participate.

Selection Criteria:

Inclusion criteria:

- 1.Both male and female students
- 2.Students aged between 18 – 25 years
- 3.Students who are willing to participate
- 4.Students with or without elbow pain

Exclusion criteria:

- 1.Students with any upper limb surgery, fracture, infection, etc.
- 2.Students from outside of the campus
- 3.Students with any cardiovascular disease
- 4.Students with any neurological disease
- 5.Any trauma to the elbow region

Study variables:

1.Independent variables-

- Age
- Gender
- Dominant hand
- Occupation

2.Dependent variables-

- DASH questionnaire
- PRTEE questionnaire

- Hand dynamometer
- Cozen's test
- Mill's test

Outcome measures:

1.Disabilities of Arm, Shoulder and Hand (DASH)-

DASH questionnaire standardized self-reported outcome task symptoms in individuals with upper limb disorders that contains 30 items of physical function.

Total score is calculated and transformed to a scale of 0-100, where 0 tells no disability along with 100 shows maximum disability.

2.Patient-Rated Tennis Elbow Evaluation (PRTEE)-

PRTEE is condition which evaluate functional disability in individuals with lateral epicondylitis.

Number of 15 items divided into sting and task. Total score ranges from 0 to 100, with high chances of disability as well as low indicates no pain and disability.

3.Hand Dynamometer-

Grip strength was calculated by using digital hand dynamometer. Participants were told to positioned in standardized manner with elbow, shoulder adducted to be flexed at 90% fore arm in neutral position.

3 trails were recorded for every participant and the average value was calculated and recorded in (kg) kilograms.

4.Cozen's test –

This test was performed to assess the lateral epicondylitis. Participants were in seated position, told to make a fist radially deviate as well as extend wrist against resistance. Test was taken positive if pain was produced over LE (lateral epicondyle) and it was considered negative if there was no pain over the lateral epicondyle.

Positive = 1

Negative = 0

5.Mill's test-

Mill's test was performed passively by stretching the wrist extensors. The participants were in seated position. Examiner stretched elbow, pronated forearm as well as flexed wrist. Test was positive if pain was produced over the lateral epicondyle and it was negative if there was no pain over lateral epicondyle.

Positive = 1

Negative = 0

Diagnostic Ultrasonography-

Elbow joints with joint effusions as well as lateral epicondylitis, tears of the distal biceps and triceps tendons, ligament tears, cubital, ulnar nerve entrapment, olecranon bursitis, and intra-articular loose bodies can all be diagnosed with US (Diagnostic Ultrasonography) [16].

Due to curved surface, US of elbow having four-quadrant approach, represented by anterior, medial, lateral, as well as posterior aspects of elbow joint [16].

NOTE: Ultrasonography is typically performed by trained Radiologist. In present study, it was not included as an outcome measure. It has been discussed solely to provide supportive information regarding the diagnostic methods for lateral epicondylitis [16].

Procedure:

The procedure was carried out in the following steps:

- 1.Ethical acceptance for recent study was taken from DEC (Departmental Ethics Committee) Chandigarh University prior to the commencement of data collection.
- 2.Participants that have inclusion criteria were told about study before data collection.
- 3.Demographic details including name, age, dominant hand were recorded.
- 4.Participants were assessed with the help of DASH and PRTEE questionnaires to evaluate functional status and pain level.
- 5.Grip strength was measured by digital hand dynamometer.
- 6.Three trails of grip strength were recorded and average value was calculated and recorded in kilograms.
- 7.Clinical examination was performed by Cozen's test as well as Mill's test.
- 8.Participants were classified as having lateral epicondylitis if they showed positive sign on clinical tests.
- 9.Positive sign of clinical examination was recorded as 1 while negative sign recorded as 0.
- 10.All observations recorded in Excel sheet.

RESULT

The present study was done to dominant lateral epicondylitis of university students and to evaluate its effect on hand function using DASH score, PRTEE score, grip strength, and clinical examination tests.

The findings of the study revealed that 28.8% (n=17) (Table 4) of the study subjects were identified as having lateral epicondylitis, while the majority 71.2% (n=42) (Table 4) were non-cases. This indicates that a notable proportion of university students are affected by lateral epicondylitis.

Table 4: Showing Prevalence of Lateral Epicondylitis among Study Subjects

Variable	Categories	Percentage	Frequency
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Prevalence	NON - LE	71.2%	42
	LE	28.8%	17

With regard to socio-demographic characteristics, the study population was fairly distributed among all groups of age, with highest proportion of 22–23 years age group (27.1%) (Table 5). Females constituted a slightly higher proportion (54.2%) (Table 6) compared to males (45.8%) (Table 6). All participants were students, and the majority were right-handed (84.7%) (Table 7). Statistical analysis showed no remarkable association between lateral epicondylitis as well as socio-demographic variables like gender, age as well as dominant hand.

Table 5 Distribution of Study Subjects according to Age

Variable	Categories	Percentage	Frequency
Age	18-19 Years	25.4%	15
	20-21 Years	23.7%	14
	22-23 Years	27.1%	16
	24-25 Years	23.7%	14

Table 6: Distribution of Study Subjects according to Gender

Variable	Categories	Percentage	Frequency
Gender	Male	45.8%	27
	Female	54.2%	32

Table 7: Distribution of Study Subjects according to Dominant Hand

Variable	Categories	Percentage	Frequency
Dominant Hand	Right	84.7%	50
	Left	15.3%	9

Clinical examination findings showed that 28.8% of subjects were positive on Cozen's test (Table 8) while 13.6% were positive on Mill's test (Table 9). Both Cozen's and Mill's tests demonstrated a significant association with lateral epicondylitis, indicating their effectiveness as clinical diagnostic tools.

Table 8: Distribution of Study Subjects according to Cozen's Test

Variable	Categories	Percentage	Frequency
Cozen's Test	Negative	71.2%	42
	Positive	28.8%	17

Table 9: Distribution of Study Subjects according to Mill's Test

Variable	Categories	Percentage	Frequency
Mill's Test	Negative	86.4%	51
	Positive	13.6%	8

According to functional assessment a difference was observed between LE case as well as non-LE case groups. The mean DASH score among the LE group (49.853 ± 10.918) is higher than that non-LE group (10.952 ± 6.514), (indicating greater upper limb disability among affected individuals (Table 10). Similarly, the mean PRTEE score was significantly higher in the LE group (58.500 ± 12.772) compared to the non-LE group (11.560 ± 8.788), reflecting increased pain and functional limitation (Table 11).

Table 10: Comparison of DASH Scores between LE Case and Non-LE Case

Group		Mean	SD	N	Mean Diff.	T TEST	P value	Result
DASH	LE CASE	49.853	10.918	17	38.901	16.917	<0.001	Significant
	NON-LE CASE	10.952	6.514	42				

Table 11: Comparison of PRTEE Scores between LE Case and Non-LE Case

Group		Mean	SD	N	Mean Diff.	T TEST	P value	Result
PRTEE	LE CASE	58.500	12.772	17	46.940	16.221	<0.001	Significant

	NON-LE CASE	11.560	8.788	42				
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On the other hand, grip strength becomes lower in LE group (20.282 ± 5.151) compared to the non-LE group (34.879 ± 5.190), indicating reduced hand strength among individuals with lateral epicondylitis (Table 12).

Table 12: Comparison of Average Grip Strength between LE Case and Non-LE Case

Group		Mean	SD	N	Mean Diff.	T TEST	P value	Result
Average Grip	LE CASE	20.282	5.151	17	-14.596	-9.805	<0.001	Significant

Correlation reports revealed a significant positive relationship between DASH as well as PRTEE scores (Table 13), indicating that increased disability is associated with increased pain and functional impairment. A negative relationship was observed between PRTEE scores and grip strength; however, this was not statistically significant (Table 14).

Table 13: Correlation between DASH and PRTEE Scores (Pair 1)

Pearson's Correlation	PAIR 1	
	DASH	PRTEE
Mean	10.95	11.56
SD	6.514	8.788
N	42	
Correlation	0.619	
Table Value	0.304	
P Value	0.000	
Result	Significant	

Table 14: Correlation between PRTEE Score and Average Grip Strength (Pair 2)

Pearson's Correlation	PAIR 2	
	PRTEE	Average Grip
Mean	11.56	34.88
SD	8.788	5.190
N	42	
Correlation	-0.244	
Table Value	0.304	
P Value	0.118	
Result	Not Significant	

Overall, study demonstrates that lateral epicondylitis is present in a considerable proportion of university students and significantly affects hand function. While socio-demographic variables do not influence its occurrence, functional disability scores and clinical examination tests helps in identifying.

DISCUSSION

Present Cross-Sectional Observational Study was held to determine dominance of Lateral Epicondylitis University Students and its effect on Hand Function with the help of subjective and objective assessment tools like DASH, PRTEE, hand dynamometer, and clinical tests – Mill's test as well as Cozen's test.

LE (Lateral Epicondylitis) is musculoskeletal disorder containing extensor carpi radialis brevis muscle [3]. These structural changes contribute to pain. Along this, gripping reduced the ability to preformed the activities of daily living [3].

Previous literature has reported that Lateral Epicondylitis is connected with repetitive forceful exertions of forearm [18]. Recent study findings disclosed Dominance of 28.8% of LE (lateral epicondylitis) in the student population. This appears higher in the students in comparison to general population (between 1% to 3%) [19].

The finding suggest that lateral epicondylitis is associated with the occupational settings and it may also be prevalent in students due to lifestyle related stress.

Functional Disability Assessed using DASH: DASH questionnaire uses upper limb disability. The participants which diagnosed with the lateral epicondylitis present the higher DASH score as compared to those participants without the condition.

Higher DASH scores show the greater difficulty in performing the upper limb activities which includes the writing, carrying the objects, lifting the objects, gripping. This suggest that this condition impact on the daily activities in the young individuals.

The increased DASH scores seen in the affected group may be attributed to pain during wrist extension and gripping of the objects, which are usually required in the daily activities and in the academics.

Results are on same phase matched with previous studies that predicted DASH as reliable and valid tool for measuring the disability in upper extremity. Therefore, the present study confirms the lateral epicondylitis is associated with the self-reported disability and reduced in the functional performances.

Pain and Functional Limitation Assessed using PRTEE: The PRTEE questionnaire uses condition-specific instrument to check as well as functional limitation associated with the lateral epicondylitis. The participants with lateral epicondylitis indicate the higher PRTEE scores as compared to non-affected individuals [17].

PRTEE mainly assess the symptoms which commonly seen in the lateral epicondylitis, including pain while gripping or grasping the object, resisted wrist movements, lifting any object and repetitive movements of the hand.

The previous studies identified PRTEE demonstrated good test-retest reliability in lateral epicondylitis [17].

Grip Strength: It measured digital hand dynamometer. It disclosed that participants with lateral epicondylitis had reduced grip strength as compared to non-affected participants. It is one of the important key findings which helps in diagnosed of the lateral epicondylitis.

Previous studies have consistently demonstrated that individuals with lateral epicondylitis exhibit reduced grip strength compared to non-affected individuals.

Grip strength is an essential functional parameter. It has the ability to perform functions like holding, writing, carrying of weights. The decreased value in this study demonstrates the functional impairment.

Therefore, grip strength measurement serves as an objective complement to self-reported functional scales such as DASH and PRTEE.

Clinical tests: (Cozen's test and Mill's test): In this study, Cozen's test was positive in 100% of affected individuals whereas Mill's test was 80%. Both test are negative in non-affected individuals. The combination of mill's test as well as Cozen's test increase the correctness in identification of lateral epicondylitis.

These positive tests can be explained by the ability to stress the wrist extensor tendons, therefore recreating the pain at lateral epicondyle.

Hence, the use of mill's test as well as Cozen's test are valid, reliable as well as effective tools for the diagnose of lateral epicondylitis.

This suggests the association with pain and functional limitation. Pain in the affected extremity which may lead to the reduced strength and task performance.

Clinical Implications: The present study has important clinical implications. Students may benefit from:

- Ergonomic education
- Posture training
- Early detection of symptoms
- Modification of the activities
- Physiotherapy management

Awareness may help to reduce the risk of lateral epicondylitis.

Early intervention can also prevent the progression to chronic pain and functional limitation.

Limitations of the Study: Despite meaningful findings, the study has certain limitations:

- Small sample size
- Student-only population
- Cross-sectional design
- Specific university
- Specific age group
- Convenience sampling technique

Recommendations for Future Research: Future studies are recommended with:

- Larger sample size
- Multiple Institutions
- Assessment of risk factors such as screen time, study hours and ergonomics.
- Longitudinal follow-up designs
- Utilize diagnostic imaging techniques

CONCLUSION

The present cross-sectional observational study held to discuss dominance of lateral epicondylitis university student as well as effect on hand function.

A total 59 participants comes in between age of 18-25 years were assessed by Shoulder and Hand, Disabilities of Arm (DASH) questionnaire, PRTEE(Patient-Rated Tennis Elbow Evaluation) questionnaire, Hand dynamometer as well as clinical examination – mill’s test as well as Cozen’s test.

Finding study indicated that lateral epicondylitis was present in the student population with the prevalence of 28.8%. It suggests that LE (lateral epicondylitis) not only harm occupational or general population but affect students.

The higher prevalence observed in this study may be attributed to factors such as:

- Prolonged writing
- Excessive use of laptop and smartphones
- Repetitive movements of the wrist
- Poor ergonomics
- Poor posture

Further, the study revealed that the participants with lateral epicondylitis had higher DASH scores and PRTEE scores which indicates the increased pain, reduced the ability to perform daily activities, functional limitation.

Objective assessment by hand dynamometer indicates the reduced grip strength in participants with lateral epicondylitis as compared to non-affected participants. This reduction in grip strength may be due to:

- Pain
- Reduced in muscle activation
- Functional avoidance due to discomfort

Clinical examination using Cozen’s test and Mill’s test showed positive among participants with lateral epicondylitis. The combination of subjective, objective and clinical examination allowed the complete assessment of the condition.

Overall, the study concludes that lateral epicondylitis is relatively prevalent in students and affects hand function by increased pain, reduced grip strength, and functional disability.

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