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PREVALENCE OF LATERAL EPICONDYLITIS AMONG PUNE MUNICIPAL TRANSPORT (PMT) DRIVERS

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Abstract : Background: *Lateral epicondylitis (tennis elbow) is a degenerative disorder of the common extensor tendon origin that develops through repeated wrist extension and forceful gripping. Bus driving combines a sustained grip on the steering wheel, repetitive forearm work and whole-body vibration, yet little is known about elbow disorders in bus drivers of Pune.* ***Objective:*** *To estimate how common lateral epicondylitis is among Pune Municipal Transport (PMT) drivers and to describe the pain and disability that accompany it.* ***Methods:*** *A cross-sectional observational study was carried out over six months at PMT bus depots after ethical clearance and administrative permission. Male drivers aged 25–55 years with at least two years of driving experience gave informed consent and were enrolled (n = 119). Cozen's and Mill's tests were used for clinical screening, pain was rated on the Visual Analogue Scale (VAS), and pain with disability on the Patient-Rated Tennis Elbow Evaluation (PRTEE). Data were analysed descriptively in IBM SPSS Statistics version 26.0.* ***Results:*** *The mean age was 43.09 ± 6.33 years and the mean driving experience 13.93 ± 5.46 years. Seventy drivers (58.82%; 95% CI 49.84–67.26) screened positive, and the two tests agreed in every case. Among the 69 drivers with elbow pain, the mean VAS score was 6.87 ± 1.14 and the mean PRTEE total score was 80.62 ± 12.56.* ***Conclusion:*** *More than half of the drivers screened positive for lateral epicondylitis and reported marked pain and disability. Because the design is cross-sectional and screening-based, the figures indicate association rather than causation or confirmed diagnosis. Cabin ergonomics, scheduled rest breaks, driver education and periodic physiotherapy screening are recommended.*

IndexTerms - *Lateral epicondylitis, tennis elbow, bus drivers, prevalence, Cozen's test, Mill's test, PRTEE, VAS.*

I. INTRODUCTION

Lateral epicondylitis, commonly called tennis elbow, is a degenerative condition of the common extensor tendon at its attachment to the lateral epicondyle of the humerus. Despite its name, it is seen mostly in people whose everyday work repeatedly loads the forearm, not in athletes. It leads to work-related disability, lost productivity and higher healthcare spending, and is therefore treated as a public health concern; control depends on early diagnosis, conservative care, workplace ergonomic change and occupational health surveillance [1], [4].

The condition belongs to the larger group of work-related musculoskeletal disorders, which are among the leading occupational health problems globally, especially in jobs with repetitive arm movement, sustained postures and vibration. Professional drivers are a vulnerable group because they sit for long hours, hold the steering wheel continuously, make repeated forearm movements and are exposed to whole-body vibration. Musculoskeletal complaints among local bus drivers of Pune have already been described [3], but that attention has centred on the back and neck, while the elbow has been largely overlooked.

Clinically, patients report pain over the outer elbow that increases when they grip or squeeze, together with local tenderness and a weaker grip. Ordinary actions such as lifting a cup, turning a door handle or wringing a cloth can become painful, and the pain may spread along the back of the forearm. In general practice the yearly incidence is about 4–7 per 1000 patients, with the highest rates at 35–54 years and the dominant arm most often involved [2], [5], [6]. An episode typically settles by itself over 6 months to 2 years [7], [9], although manual workers who cannot rest the arm tend to report higher pain and a longer course [9]. The peak age range overlaps with the most productive years of working life, so the cost to the individual and the employer is considerable.

A systematic review with meta-analysis supports a link between occupational physical exposures, namely repetitive movement, forceful exertion and awkward wrist postures, and the development of lateral epicondylitis [7]. Epidemiological reviews likewise name repetitive wrist and forearm activity, forceful effort, vibration and poor ergonomics as the main occupational risk factors [4]. A bus driver's routine contains several of these: long daily hours at the wheel, a firm and constant grip on a large-diameter steering wheel, frequent gear changes in manual vehicles, sustained wrist extension and vibration transmitted from the road. Dense city traffic adds repeated steering corrections and constant readiness to brake.

The mechanism explains why such work can injure the elbow. Although long labelled an inflammatory tendinitis, the disorder is now understood as a non-inflammatory degenerative tendinosis, mainly of the extensor carpi radialis brevis (ECRB) [10]. Repeated loading produces micro-damage at the tendon origin, and the poorly vascularised ECRB heals badly. Instead of rebuilding organised collagen, the tendon shows disorganised type I collagen, fibroblast proliferation, myxoid change and new vessel

formation, with few or no inflammatory cells (angiofibroblastic hyperplasia) [10], [11]. A tendon that is loaded again and again without recovery cannot repair itself, and the very exposure that causes the injury also prevents healing.

Diagnosis is clinical. It rests on lateral elbow pain provoked by gripping and wrist extension, tenderness at the lateral epicondyle and positive provocative tests such as Cozen's and Mill's tests, while radial tunnel syndrome and cervical radiculopathy must be considered when numbness or tingling is present [8]. Pain and disability are then quantified with tools such as the Patient-Rated Tennis Elbow Evaluation (PRTEE) and pain scales [1].

Despite the physical demands of the job, very few studies have specifically screened PMT drivers for lateral epicondylitis; research on drivers has mostly dealt with low back pain, neck pain and general musculoskeletal symptoms, and elbow pain is usually recorded only as a symptom. Because PMT drivers deliver an essential public service, any fall in their working capacity also affects commuters and the transport system. This study therefore aimed to determine the prevalence of lateral epicondylitis among PMT drivers by clinical screening, and to describe the associated pain (VAS) and disability (PRTEE), so as to give baseline data for ergonomic, physiotherapy and workplace screening programmes.

II. REVIEW OF LITERATURE

Population-based work puts the prevalence of lateral epicondylitis in the general adult population at roughly 1–3%, higher in people doing repetitive manual tasks, and ties it to forceful gripping and repeated wrist movement [12]. Among working-age adults aged 30–64 years, a prevalence of about 1.3% was found, with repetitive movement, forceful activity and combined physical load all showing significant associations [14]. A systematic review of work-related factors concluded that repetitive movement, high hand force and awkward posture raise the risk of elbow tendinopathy [13], and a later review with meta-analysis reached a consistent conclusion on work-relatedness [7]. Kumari and Jyoti summarised the epidemiology and occupational risk factors, reporting a peak at 35–54 years and stressing early diagnosis, job redesign and occupational health surveillance [4].

Studies on drivers mostly report general musculoskeletal complaints. A review of taxi drivers identified prolonged sitting, whole-body vibration and a poor fit between driver and cabin as key physical risk factors, quoting musculoskeletal disorder prevalence among professional drivers between 43.1% and 93%, with the lower back affected most often [16]. In Pune, musculoskeletal disorders have been documented among local bus drivers [3], and lateral epicondylitis was found in 36% of 100 non-occupational sports bike riders, attributed to handlebar grip, vibration and repetitive forearm use [2]. Medial elbow pain was reported by 38.4% of 268 taxi drivers in Lahore [15]. These reports show that grip- and vibration-exposed groups carry a notable elbow burden, but none of them clinically screened bus drivers for lateral epicondylitis, which is the gap addressed here.

III. MATERIALS AND METHODS

A. Study design and setting

An observational, cross-sectional design was used. The study ran for six months at PMT bus depots in Pune city, after clearance from the Institutional Ethics Committee, permission from Tilak Maharashtra Vidyapeeth and permission from the PMT authorities. A total of 119 eligible drivers took part.

B. Selection criteria

Drivers employed by PMT, aged 25–55 years, with at least two years of driving experience and willing to give informed consent were included. Drivers with a past fracture or surgery of the elbow or forearm, systemic illness such as rheumatoid arthritis or diabetes with neuropathy, or physiotherapy for lateral epicondylitis within the preceding six months were excluded.

C. Outcome measures

Cozen's test: the examiner steadies the elbow with a thumb on the lateral epicondyle while the participant makes a fist, pronates the forearm and extends and radially deviates the wrist against resistance; sudden sharp pain at the epicondyle is a positive result [8]. *Mill's test:* with the examiner palpating the lateral epicondyle, the forearm is passively pronated, the wrist fully flexed and the elbow extended; reproduction of lateral epicondylar pain is a positive result [8]. A driver was classed as screening positive when these tests reproduced the characteristic pain.

PRTEE: a 15-item patient-reported questionnaire covering the previous week, each item scored 0–10. The five-item pain subscale (0–50) and the function subscale (six specific and four usual-activity items, summed and halved; 0–50) are added to give a total of 0–100, where higher values mean greater pain and disability [1]. *VAS:* a single-item scale on which the participant marks current elbow pain from 0 (no pain) to 10 (worst imaginable pain) [1].

D. Procedure

The purpose of the study was explained and written consent obtained. Age, sex, dominant hand, years of driving, daily driving hours, working days per week, rest breaks and elbow symptoms were then recorded on a data sheet. Each driver was examined with Cozen's and Mill's tests, followed by the VAS and PRTEE. All findings were entered on the data collection sheet, and the proportion screening positive was computed as the prevalence.

E. Statistical analysis

Analysis was done in IBM SPSS Statistics for Windows, version 26.0. No data were missing, so no imputation was needed. Continuous variables are given as mean, standard deviation, median, interquartile range and range; categorical variables as counts and percentages. Normality was checked with the Shapiro–Wilk test ($p < 0.05$ indicating non-normality). The primary outcome, the proportion screening positive, is reported with a 95% Wilson score confidence interval, verified against an exact binomial interval. Positivity was also described by dominant hand, and VAS and PRTEE scores by screening status. The analysis was purely descriptive, with no between-group tests or regression models.

IV. RESULTS

All 119 participants were men. Their mean age was 43.09 ± 6.33 years (range 30–55) and their mean driving experience 13.93 ± 5.46 years (range 4–27). Every driver worked 8 hours a day, 6 days a week, with a 60-minute rest break (Table 1). Right-hand dominance was present in 74.79% of drivers (Table 2).

Table 1: demographic and occupational characteristics of the participants (n = 119)

Variable	Mean (SD)	Median (IQR)	Range
Age (years)	43.09 (6.33)	42.00 (10.00)	30–55
Driving experience (years)	13.93 (5.46)	14.00 (7.50)	4–27
Driving hours per day	8.00 (0.00)	8.00 (0.00)	8–8
Working days per week	6.00 (0.00)	6.00 (0.00)	6–6
Rest-break duration (minutes)	60.00 (0.00)	60.00 (0.00)	60–60

Table 2: distribution of demographic and clinical characteristics (n = 119)

Variable	Category	n	Percentage (%)
Gender	Male	119	100
Dominant hand	Right	89	74.79
	Left	30	25.21
Elbow pain	Present	69	57.98
	Absent	50	42.02
Affected side	Right	34	28.57
	Left	23	19.33
	Bilateral	12	10.08
	None	50	42.02
Pain increases during driving	Yes	58	48.74
	No	61	51.26
Numbness or tingling	Yes	15	12.61
	No	104	87.39

A. Prevalence of screening positivity

Seventy of the 119 drivers screened positive, giving a prevalence of 58.82% (95% CI 49.84–67.26%); the remaining 49 (41.18%) screened negative (Table 3, Fig. 1). Cozen's and Mill's tests agreed completely, and 69 of the 70 screening-positive drivers reported elbow pain. Of the 69 drivers with pain, 34 (49.3%) had right-sided, 23 (33.3%) left-sided and 12 (17.4%) bilateral symptoms (Fig. 2). Pain increased during driving in 48.74% of all drivers, and numbness or tingling was reported by 12.61%.

Table 3: prevalence of lateral epicondylitis screening positivity (n = 119)

Screening status	n	Percentage (%)	95% CI (lower–upper)
Positive	70	58.82	49.84–67.26
Negative	49	41.18	—
Total	119	100	—

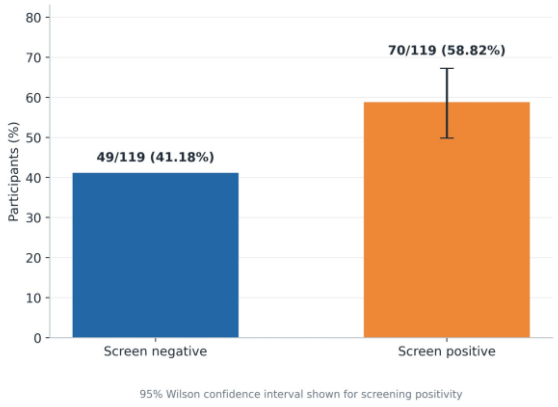


Fig. 1: screening positivity (95% Wilson confidence interval)

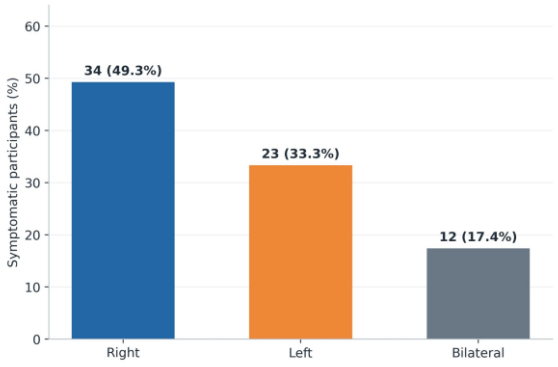


Fig. 2: affected side among drivers with elbow pain (%)

B. Dominant hand

Screening positivity was 53.93% (48/89) in right-hand-dominant and 73.33% (22/30) in left-hand-dominant drivers (Table 4, Fig. 3). This is a descriptive observation only; no statistical test was applied.

Table 4: screening positivity by dominant hand

Dominant hand	Total (n)	Positive n (%)	Negative n (%)	95% CI for positivity
Right	89	48 (53.93)	41 (46.07)	43.63–63.91
Left	30	22 (73.33)	8 (26.67)	55.55–85.82

C. Pain intensity and disability

Among the 69 drivers with elbow pain, the mean VAS score was 6.87 ± 1.14 (median 7; range 4–9) and the mean PRTEE total score 80.62 ± 12.56 (median 82; range 49–98) (Table 5). Drivers who screened negative recorded a mean VAS of 0.04 and a mean PRTEE of 0.00.

Table 5: pain and disability among drivers with elbow pain (n = 69)

Outcome	Mean (SD)	Median	Q1	Q3	IQR	Range
VAS (0–10)	6.87 (1.14)	7	6	8	2	4–9
PRTEE total (0–100)	80.62 (12.56)	82	72	93	21	49–98

D. Duration of symptoms

The most frequent symptom duration was 1–3 months (25 drivers, 36.23%), followed by 3–6 months (17, 24.64%). Symptoms had lasted more than 6 months in 12 drivers (17.39%), and one further driver (1.45%) reported 1–3 years; in total, 18.84% had symptoms beyond six months (Fig. 4). Departures from normality were found for age, driving experience, VAS and PRTEE in the whole sample (Shapiro–Wilk, all $p < 0.05$), so medians and interquartile ranges are reported beside means.

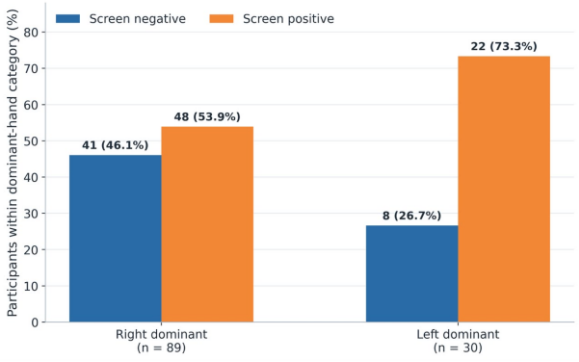


Fig. 3: screening positivity by dominant hand (%)

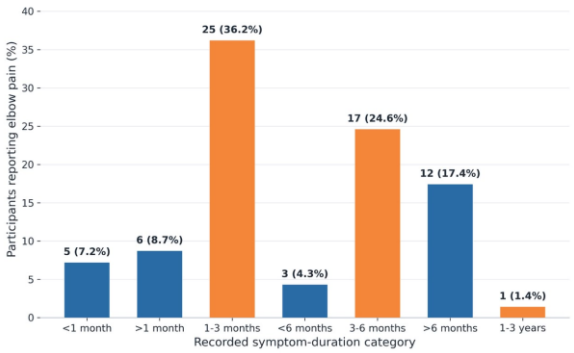


Fig. 4: duration of elbow symptoms among drivers with pain (%)

V. DISCUSSION

In this cross-sectional study, 58.82% of 119 PMT drivers screened positive for lateral epicondylitis. This is screening positivity and not a confirmed diagnosis. Elbow pain was present in 57.98% of drivers and in 69 of the 70 screening-positive drivers, so the test results matched symptoms closely, and the complete agreement between Cozen's and Mill's tests suggests that the finding is not an artefact of a single manoeuvre [8].

The estimate is much higher than the 1–3% reported for the general population [12] and the 1.3% for working-age adults [14]. It also exceeds the 36% found in non-occupational sports bike riders in Pune [2] and the 38.4% of medial elbow pain in Lahore taxi

drivers [15]. These studies, however, differed in population, diagnostic approach and outcome (population samples, self-reported pain, medial rather than lateral pain), which limits direct comparison. Three reasons may account for the higher figure. General population samples include many people with no exposure to repetitive gripping, which dilutes their prevalence. Earlier driver studies relied on self-reported pain, whereas every driver here was examined and drivers who did not consider mild discomfort worth reporting could be detected. Finally, provocative tests are designed to be sensitive, so a screening-based figure is naturally higher than a diagnosis-based one. The result should therefore be read as the share of drivers with clinical features compatible with lateral epicondylitis, not those with proven tendon pathology.

The finding fits the occupational exposure of the group. With 8 hours of driving on 6 days a week, the drivers accumulate roughly 2,400 driving hours a year, and the average experience of about 14 years means this load has continued for over a decade. Their work involves a constant grip on a large wheel, repeated gear changes, sustained wrist extension and road vibration, exposures linked to lateral epicondylitis in occupational studies [7] and to musculoskeletal disorders in professional drivers [16]. Overload at the ECRB origin, a poorly vascularised site, is consistent with the tendinosis model [10], [11]. Driving also involves static rather than vigorous effort: the wrist extensors contract continuously to stabilise the wrist against vibration and steering torque, and frequent corrections in urban traffic add many small loading cycles. Such low-level, prolonged contraction leaves little time for recovery, which agrees with a gradual degenerative process rather than an acute injury [10].

Among symptomatic drivers, the mean VAS of 6.87 and PRTEE of 80.62 indicate severe pain and marked functional limitation, given that the PRTEE runs from 0 to 100 and higher scores mean worse status [1]. For a job that depends on a firm, repeated grip, this may affect steering control, comfort during long shifts and life outside work. That VAS and PRTEE were both high and fairly narrowly distributed supports the clinical relevance of the symptoms.

Most symptomatic drivers had been affected for under six months (1–3 months, 36.23%; 3–6 months, 24.64%), while 18.84% had symptoms for longer. This matches the usual course of 6 months to 2 years [7], [9] and shows that a notable proportion keep working despite persistent symptoms. Because pain increased during driving in 48.74%, the symptoms appear linked to the task itself; drivers cannot rest the arm, so continued exposure may delay recovery and encourage chronicity. The many short-duration cases suggest that workplace screening could identify problems early.

Right-sided pain was commonest (28.57% of all drivers), in line with the 74.79% right-hand dominance and the known predilection for the dominant arm [2], [5], [6]. Bilateral symptoms (10.08%) are plausible because both forearms are loaded when steering. Positivity was descriptively higher among left-hand-dominant drivers (73.33% vs 53.93%), but only 30 drivers were left-handed, the confidence intervals overlapped and no test was run, so this is exploratory. One speculation is that left-handed drivers perform tasks such as gear shifting with the non-dominant hand, but this requires testing in larger samples and is not a finding of this study. Numbness or tingling in 12.61% is a reminder to consider nerve entrapment or a cervical source [8]; provocative tests cannot exclude these, and screening is a first step that does not replace a full clinical examination.

A. Clinical implications

Because more than half of the drivers screened positive and those affected reported high pain and disability, lateral epicondylitis seems to be an unrecognised occupational problem in this group. Four measures are suggested: (1) ergonomic review of the cabin, including steering wheel size and angle, seat position and anti-vibration seating; (2) scheduled micro-breaks and education on grip modification and avoidance of sustained wrist extension; (3) early physiotherapy, including wrist extensor stretching, eccentric strengthening and activity modification; and (4) periodic screening at PMT depots so that cases are detected before they become chronic.

B. Strengths and limitations

Strengths include a reasonably large single-occupation sample, examination of every driver with two standard clinical tests, validated outcome tools and complete data. Limitations are as follows. (1) Prevalence reflects screening positivity without imaging or specialist confirmation and may be overestimated. (2) Only men were studied, so the results cannot be generalised to women. (3) All drivers had identical exposure, so no dose–response relationship could be examined. (4) The cross-sectional design cannot establish causality, and healthy-worker survivor bias and recall bias are possible. (5) Non-occupational factors such as gym use, sport or secondary jobs were not controlled. (6) No inferential testing was performed.

C. Future scope

Later studies should include women drivers, use ultrasonography to confirm the diagnosis, add a non-driving control group, apply inferential methods such as chi-square tests and logistic regression to identify risk factors, and test ergonomic and physiotherapy interventions.

VI. CONCLUSION

More than half of the PMT drivers studied (58.82%) screened positive for lateral epicondylitis, and those with symptoms reported substantial pain and disability, so the condition appears to be a common occupational problem in this workforce. Confirmatory studies and trials of preventive interventions in drivers are needed.

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