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ORIGINAL ARTICLE

The association between working posture and work duration with symptoms of Carpal Tunnel Syndrome (CTS) among online motorcycle taxi drivers in Medan City

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ABSTRACT

Carpal Tunnel Syndrome (CTS) is a neurological disorder caused by compression of the median nerve, commonly observed among workers performing repetitive movements. Online motorcycle taxi drivers represent a high-risk group due to demands for extended working hours and non-ergonomic riding postures. This study aimed to analyse the association between working posture, working duration, and complaints of CTS among online motorcycle taxi drivers. This observational analytical study employed a cross-sectional design and involved 92 online motorcycle taxi drivers in the Universitas Prima Indonesia area, Medan, selected via consecutive sampling. Data were collected using a characteristics questionnaire, the Boston Carpal Tunnel Questionnaire (BCTQ), Phalen's Test, and posture observation using the Rapid Upper Limb Assessment (RULA). Data were analysed using the Chi-Square test. Results indicated that 57.6% of respondents reported CTS complaints. The majority of respondents worked longer than 8 hours per day (66.3%) and had low-risk working postures (48.9%); however, the proportion of CTS was highest among those with high-risk postures (72.4%). Statistical analysis revealed a significant association between working posture and CTS occurrence (p=0.041) and between working duration and CTS occurrence (p=0.009). Working longer than 8 hours per day conferred a 3.2-fold increased risk of developing CTS. It is concluded that poor working posture and prolonged working duration are significantly associated with a higher incidence of CTS among online motorcycle taxi drivers. Ergonomic interventions, regulation of working hours, and occupational health education are recommended for prevention.

Keywords: Carpal Tunnel syndrome, working posture, working duration, online motorcycle taxi driver

Introduction

Occupational diseases, particularly musculoskeletal disorders, represent a significant global health issue with impacts on workers' quality of life and work productivity.[1] One prevalent musculoskeletal disorder is Carpal Tunnel Syndrome (CTS), a compressive neuropathy of the median nerve at the wrist characterised by pain, paraesthesia, and hand weakness.[2] Globally, the prevalence of CTS in the adult population is estimated at 1.55%, with a higher incidence among occupations involving repetitive movements and static postures.[3,4] In Indonesia, although national data are limited, studies among high-risk workers indicate CTS prevalence ranging from 5.6% to 14.8%.[5]

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The profession of online motorcycle taxi driver, which has grown rapidly in the past decade, constitutes a group of informal workers vulnerable to CTS.[6] The occupational characteristics include long working hours (often >8 hours/day), static and non-ergonomic riding postures, exposure to vehicle vibration, and repetitive hand and wrist movements when operating the throttle, brake, and handlebar grip.[7,8] Several prior studies, such as those by Awanda et al. in Pekanbaru and Chairunnisa et al. in South Tangerang, have indicated a high prevalence of CTS complaints and their association with occupational factors among online motorcycle taxi drivers.[9,10]

A preliminary study by the researcher at the same location found that 60% of 15 drivers exhibited CTS symptoms based on questionnaire and Phalen's Test, with tingling and wrist pain as the main complaints. However, awareness of early symptoms and preventive measures remains low among these workers. Based on this urgency, this study aimed to analyse the association between working posture, working duration, and complaints of Carpal Tunnel Syndrome among online motorcycle taxi drivers in Medan City.

Method

This was an observational analytical study with a cross-sectional approach. The research was conducted in the Universitas Prima Indonesia area, Medan City, in September 2025. The target population was all online motorcycle taxi drivers operating in the study location. As a sampling frame was unavailable, the minimum sample size was calculated using the Lemeshow formula for an unknown population, with a 95% confidence level (Z=1.96), estimated proportion (p) of 0.6, and a margin of error (d) of 0.1. The calculation yielded a minimum sample of 92 respondents. Consecutive sampling was used, enrolling all subjects meeting the inclusion criteria during the data collection period until the quota was fulfilled. Inclusion criteria were: (1) active online motorcycle taxi drivers operating in the study location, (2) minimum age of 18 years, (3) minimum work experience of one month, and (4) willingness to participate by signing an informed consent form. Exclusion criteria were drivers experiencing acute hand injury or having medical conditions that could affect CTS assessment (e.g., history of wrist fracture, severe rheumatoid arthritis, or diabetic neuropathy).

Data collection utilised primary instruments. Respondent characteristic data (age, sex, work tenure, daily working duration) were gathered via a questionnaire. Carpal Tunnel Syndrome (CTS) complaints were measured using a combination of the Boston Carpal Tunnel Questionnaire (BCTQ) for subjective symptoms and the Phalen's Test physical examination. Respondents were categorised as having CTS complaints if their BCTQ score was ≥3 and/or their Phalen's Test result was positive. Working posture was assessed through direct observation using the Rapid Upper Limb Assessment (RULA) sheet, which evaluates the position of the upper arm, forearm, wrist, neck, trunk, and legs during riding activity. The RULA score was categorised as low risk (score 1-2), medium risk (3-4), and high risk (5-7). Working duration was defined as total daily working hours and categorised based on labour laws into at-risk (>8 hours) and not at-risk (≤8 hours). Collected data were processed through the stages of editing, coding, processing, and cleaning. Data analysis was performed using statistical software. Univariate analysis was used to describe the frequency distribution of each variable. Bivariate analysis employed the Chi-Square test to examine the association between independent variables (working posture and working duration) and the dependent variable (CTS complaints). The significance level was set at α=0.05. For significant variables, the Odds Ratio (OR) with a 95% confidence interval was also calculated to measure the magnitude of risk.

Results

A total of 92 online motorcycle taxi drivers participated in this study. The respondents' characteristics are presented in Table 1. All respondents (100%) were male. The majority were aged >30 years (54.3%) and had a work tenure of <5 years (70.7%). Regarding occupational exposure, most respondents (66.3%) worked at-risk durations (>8 hours per day). Based on the RULA assessment, the distribution of working posture was low risk (48.9%), medium risk (19.6%), and high risk (32.5%). In terms of outcome, over half of the respondents (57.6%) reported complaints of Carpal Tunnel Syndrome.

The bivariate analysis of the association between working posture, working duration, and CTS incidence is presented in Table 2. The highest proportion of CTS was found in the high-risk posture group (72.4%), followed by the medium-risk (66.7%) and low-risk (44.4%) groups. The Chi-Square test indicated a statistically significant association between working posture and CTS incidence (p=0.041). Similarly, the proportion of CTS was significantly higher in the group working >8 hours per day (67.2%) compared to

those working ≤8 hours (38.7%), with a p-value of 0.009. Further analysis revealed that drivers working >8 hours per day had 3.2 times the odds (OR) of developing CTS compared to those working ≤8 hours (95% CI: 1.32-7.98).

Table 1. Demographic characteristics of online motorcycle taxi driver (n=92)

Variable	n	%
Age		
< 30 years	42	45.7
≥ 30 years	50	54.3
Work Tenure		
< 5 years	65	70.7
≥ 5 years	27	29.3
Working Duration		
≤ 8 hours	31	33.7
> 8 hours	61	66.3
Working Posture (RULA)		
Low Risk	45	48.9
Medium Risk	18	19.6
High Risk	29	32.5
CTS Complaint		
Yes	53	57.6
No	39	42.4

Table 2. Association between working posture, working duration, and Carpal Tunnel Syndrome incidence among online motorcycle taxi drivers

Variable	CTS Yes (n, %)	CTS No (n, %)	p-value	OR (95% CI)
Working Posture				
Low Risk	20 (44.4)	25 (55.6)	0.041	-
Medium Risk	12 (66.7)	6 (33.3)		
High Risk	21 (72.4)	8 (27.6)		
Working Duration				
≤ 8 hours	12 (38.7)	19 (61.3)	0.009	3.25 (1.32 - 7.98)
> 8 hours	41 (67.2)	20 (32.8)		

Discussion

This study confirms that Carpal Tunnel Syndrome complaints represent a significant occupational health issue among online motorcycle taxi drivers in Medan City, with a prevalence reaching 57.6%. This finding aligns with previous research by Syafitri & Muzakir in Bekasi, which reported 76.4% of drivers experiencing CTS symptoms, and a study by Awanda et al. in Pekanbaru with a prevalence of 71%.[9,11] The high prevalence indicates that the occupational demands of online motorcycle taxi driving—characterised by repetitive and static physical tasks—create a high-risk work environment for musculoskeletal disorders, particularly CTS.

The results demonstrate a significant association between working posture and CTS incidence. The increasing proportion of CTS corresponding with higher postural risk levels supports the theory that maintaining a non-neutral wrist position (such as excessive flexion, extension, or ulnar/radial deviation) for prolonged periods can elevate intracarpal pressure and compress the median nerve.[12,13] While riding, drivers often sustain grip and wrist positions involving flexion or deviation to control the handlebar, throttle, and brake. Maintaining these positions for hours without adequate rest induces repetitive mechanical stress on the soft tissues within the carpal tunnel, leading to oedema, ischaemia, and eventual nerve compression.[14] This finding is consistent with research by Utami et al. in Bukittinggi, which also reported a significant relationship between working posture and CTS among online motorcycle taxi drivers.[15] The RULA assessment in this study effectively quantified the ergonomic risk of the riding posture, with higher scores correlating with a greater proportion of CTS.

In addition to working posture, daily working duration also proved to have a significant and strong association with CTS incidence. Drivers working more than 8 hours per day had a 3.2 times higher risk of developing CTS compared to those working within the standard labour limit (≤8 hours). Prolonged working duration directly extends exposure time to biomechanical risk factors, such as awkward postures and

repetitive movements. This reduces tissue recovery time, accumulates muscle fatigue, and exacerbates nerve compression.[16] The fact that 66.3% of respondents exceeded an 8-hour workday reflects the prevalent work culture in this sector, which is driven by an order-based incentive system that encourages drivers to work extra hours to meet income targets. This practice, although informal, contravenes basic occupational safety and health principles that limit working hours to prevent occupational diseases. Research by Larasati and Subandi also supports that long working hours (>8 hours/day or >40 hours/week) significantly increase the risk of CTS across various occupations.[17]

Although most respondents had low-risk postures based on RULA (48.9%), the incidence of CTS remained high. This may indicate that the factor of excessively long working duration acts as a strong effect modifier. The combination of a less-than-ideal posture with prolonged exposure may accelerate the onset of symptoms, even for postures that are not ergonomically scored as very poor. Furthermore, other factors not fully captured by a static RULA score—such as exposure to whole-body vibration from vehicles and road surfaces, as well as the high frequency of repetitive movements—also contribute to the risk.[18]

The findings of this study carry important practical implications. A comprehensive approach is needed, encompassing ergonomic interventions such as training on correct riding postures, the use of assistive devices (e.g., ergonomic handlebar grips or gloves with wrist support), and the implementation of more humane working time management by the application service companies. Occupational health education regarding early CTS symptoms and the importance of rest and stretching during work shifts is also crucial to enhance awareness and preventive behaviours among drivers.

Conclusion

There is a significant association between working posture, working duration, and the incidence of Carpal Tunnel Syndrome among online motorcycle taxi drivers in Medan City. High-risk working postures and daily working durations exceeding 8 hours increase the likelihood of developing CTS. This research recommends that drivers improve their riding posture and manage rest periods; that application companies provide ergonomic training and consider policies limiting excessive working hours; and that relevant government agencies conduct occupational health and safety guidance for informal sector workers. For future research, it is suggested to explore other variables such as vibration intensity, the use of ergonomic personal protective equipment, and to conduct longitudinal or interventional studies to establish causal relationships and the effectiveness of prevention programmes.

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