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Original Article

Work Factors Associated with Low Back Pain Among Pedicab Drivers: A Cross-Sectional Study

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ABSTRACT
Background: Pedicab drivers face prolonged sitting, repetitive pedaling, trunk stabilization, and poor seat ergonomics. This study examined associations among posture, working hours, tenure, and LBP at Pasar Inpres in Palu City.
Methods: This analytic observational study used a cross-sectional design and was conducted in June 2024 at Pasar Inpres, Manonda Village, Palu Barat District, Palu City. The population comprised all pedicab drivers in the study area, and 51 respondents were recruited via a total sampling approach. LBP was defined as self-reported pain or discomfort in the lower back region at the time of data collection. Sitting posture was assessed using an observation sheet, while working hours, work tenure, and LBP were collected using questionnaires. Data were analyzed using the chi-square test or Fisher's exact test when appropriate. Prevalence ratios (PRs) and 95% confidence intervals (CIs) were calculated to estimate the magnitude of association.
Results: LBP was reported by 38 respondents (74.5%). Non-ergonomic sitting posture was associated with LBP (PR=1.58; 95% CI: 1.08-2.31; p=0.008). Working more than 8 hours/day was also associated with LBP (PR=1.47; 95% CI: 1.04-2.09; p=0.020), as was work tenure of more than 5 years (PR=2.05; 95% CI: 1.21-3.47; p<0.001).
Conclusion: LBP was common among pedicab drivers at Pasar Inpres, Palu City. Non-ergonomic sitting posture, working more than 8 hours/day, and work tenure of more than 5 years were significantly associated with LBP. Community-based occupational health programs should prioritize ergonomic sitting education, active rest, stretching, and simple seat support for pedicab drivers.

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INTRODUCTION

Low back pain (LBP) is a major public health and occupational health problem because it reduces mobility, work capacity, and quality of life. The World Health Organization reported that LBP affected 619 million people globally in 2020 and is projected to increase to 843 million cases by 2050, largely driven by population growth and aging (World Health Organization, 2023a). LBP has also remained the leading cause of years lived with disability worldwide, making it relevant not only as a clinical complaint but also as a work-productivity problem (Ferreira et al., 2023).

Occupational ergonomic exposure is one modifiable contributor to LBP. Workers who maintain an awkward posture, sit for long periods, repeat the same movement, or work for many years in physically demanding conditions may experience sustained mechanical loading of the

lumbar region. Evidence from WHO/ILO joint estimates and related systematic reviews has emphasized that ergonomic risk factors are important in the work-related burden of musculoskeletal disorders (Hulshof et al., 2021; World Health Organization & International Labour Organization, 2021). Sedentary behavior, prolonged occupational sitting, and workstation-related ergonomic risks have also been linked to musculoskeletal pain and LBP in different worker populations (Alzahrani, Alghadir, Anwer, Mackey, & Omer, 2022; Dzakpasu et al., 2021; Mahdavi, Riahi, & Shakouri, 2021; Prasetya et al., 2024; Putsa, Jalayondeja, Mekhora, Bhuanantanondh, & Jalayondeja, 2022).

Drivers represent a vulnerable occupational group because their work combines static sitting, constrained posture, vibration exposure, limited movement space, and irregular rest. Systematic reviews among occupational drivers have shown that LBP and other musculoskeletal disorders remain common in this group (Chen et al., 2024; Jia et al., 2024; Pickard et al., 2022; Raza, Bhushan, Khan, & Naz, 2024; Tahernejad et al., 2024). Studies among taxi, bus, three-wheel, auto-rickshaw, and other professional drivers similarly reported that LBP is associated with factors such as long driving duration, longer occupational exposure, poor seat condition, and constrained sitting posture (Abere, Yenealem, & Worede, 2023; Faiyazi, Sidiq, & Sharma, 2026; Kurtul & Gungordu, 2022; Nabi et al., 2023; Suliman, Elamin, & Elghazally, 2026; Terfa et al., 2022). Indonesian evidence also supports the relevance of posture, duration of sitting or driving, and work-related ergonomic factors in LBP complaints (Afif, Jayanti, & Wahyuni, 2021; Anggara, 2024; Mahendrayana, Karmaya, Yuliana, & Wirata, 2024; Prianggi, Murti, & Prasetya, 2021).

Pedicab drivers in Pasar Inpres, Palu City, work in an informal transportation setting. Their tasks differ from those of motorized drivers because pedicab operation requires repeated pedaling, trunk stabilization, forward or flexed sitting posture, and prolonged time spent on a seat that may not be ergonomically designed. These combined exposures make pedicab drivers a distinct informal worker group requiring specific occupational health attention. However, local evidence on LBP among pedicab drivers remains limited. This study, therefore, aimed to analyze the association between sitting posture, working hours, work tenure, and LBP among pedicab drivers in Pasar Inpres, Palu City.

METHODS

This study used an analytic observational design with a cross-sectional approach. The design was appropriate because the exposure variables and LBP complaints were measured simultaneously to identify statistical associations within the study population. Because of this design, the results should be interpreted as associations rather than causal relationships.

The study was conducted in June 2024 at Pasar Inpres, Manonda Village, Palu Barat District, Palu City, Central Sulawesi, Indonesia. The location was selected because pedicab drivers remain active in the market area and are exposed to prolonged sitting, repetitive pedaling, and manual labor. The population consisted of all pedicab drivers operating at Pasar Inpres, Manonda Village, Palu Barat District. The total population was 51 drivers. This study used total sampling; therefore, all 51 drivers were included as respondents. Total sampling was chosen because the accessible population was relatively small and all eligible drivers could be reached during data collection.

The dependent variable was LBP. In this study, LBP was operationally defined as self-reported pain or discomfort in the lower back region, anatomically located between the lower rib margins and the gluteal folds, reported at the time of data collection. The independent variables were sitting posture, working hours, and work tenure. Sitting posture was categorized as ergonomic and non-ergonomic based on direct observation while the respondent was sitting on or operating the pedicab. A non-ergonomic posture was recorded when the driver showed one or more unfavorable posture indicators, such as unsupported lower back, excessive trunk flexion, asymmetric sitting, constrained seating position, or a sitting position that did not maintain a neutral lumbar posture. Working hours were categorized as 8 hours/day or less and more than 8 hours/day. Work tenure was categorized as 5 years or less and more than 5 years. Respondent age was presented descriptively.

Data were collected using questionnaires and observation sheets. The questionnaire was used to collect data on respondent characteristics, daily working hours, work tenure, and LBP complaints. The observation sheet was used to assess sitting posture. Before data collection, respondents received an explanation about the study objective and participation procedure. Participation was voluntary, and informed consent was obtained from all respondents. Administrative permission was obtained in accordance with local academic and field procedures, and respondent confidentiality was maintained throughout data processing and reporting.

Data were edited, coded, tabulated, and analyzed using univariate and bivariate analysis. Univariate analysis was presented as frequency and percentage. Bivariate analysis used the chi-square test with a significance level of 0.05. Fisher's exact test was considered when the expected cell count was less than 5. PRs and 95% CIs were calculated to show the magnitude and precision of the association between work factors and LBP.

RESULTS

A total of 51 pedicab drivers participated in this study. Respondent characteristics, occupational factors, and LBP status are presented in Table 1.

Table 1. Characteristics of pedicab drivers at Pasar Inpres, Palu City

Variable	Category	n	%
Age group	20-30 years	12	23.5
	31-40 years	17	33.3
	41-50 years	14	27.4
	51-60 years	7	13.7
	61-70 years	0	0.0
	71-80 years	1	2.0
Sitting posture	Non-ergonomic	28	54.9
	Ergonomic	23	45.1
Working hours	>8 hours/day	26	51.0
	<=8 hours/day	25	49.0
Work tenure	>5 years	33	64.7
	<=5 years	18	35.3
Low back pain	LBP	38	74.5
	No LBP	13	25.5
Total respondents		51	100.0

Source: Primary data, 2024.

Most respondents were in the 31-40-year age group (33.3%). Most respondents had non-ergonomic sitting posture (54.9%), worked more than 8 hours/day (51.0%), and had work tenure of more than 5 years (64.7%). LBP was reported by 38 respondents (74.5%).

Table 2. Association between work factors and low back pain among pedicab drivers

Variable	Category	LBP n (%)	No LBP n (%)	Total n (%)	PR (95% CI)	p-value
Sitting posture	Non-ergonomic	25 (89.3)	3 (10.7)	28 (100.0)	1.58 (1.08-2.31)	0.008
	Ergonomic	13 (56.5)	10 (43.5)	23 (100.0)	1.00 (ref.)	
Working hours	>8 hours/day	23 (88.5)	3 (11.5)	26 (100.0)	1.47 (1.04-2.09)	0.020
	<=8 hours/day	15 (60.0)	10 (40.0)	25 (100.0)	1.00 (ref.)	
Work tenure	>5 years	30 (90.9)	3 (9.1)	33 (100.0)	2.05 (1.21-3.47)	<0.001
	<=5 years	8 (44.4)	10 (55.6)	18 (100.0)	1.00 (ref.)	

Source: Primary data, 2024.

Note: PR = prevalence ratio; CI = confidence interval; LBP = low back pain.

Table 2 shows that LBP was more frequent among respondents with non-ergonomic sitting posture than among those with ergonomic sitting posture (89.3% vs. 56.5%; PR=1.58; 95% CI: 1.08-2.31; p=0.008). LBP was also more frequent among respondents who worked more than 8 hours/day than among those who worked 8 hours/day or less (88.5% vs. 60.0%; PR=1.47; 95% CI: 1.04-2.09; p=0.020). The highest association magnitude was observed for work tenure. Respondents with work tenure of more than 5 years had a higher prevalence of LBP than those with work tenure of 5 years or less (90.9% vs. 44.4%; PR=2.05; 95% CI: 1.21-3.47; p<0.001).

DISCUSSION

This study found that 74.5% of pedicab drivers at Pasar Inpres, Palu City, experienced LBP. This proportion indicates that LBP is a dominant complaint in this informal transportation worker group. The finding should be interpreted in accordance with the study's definition and local work context, as LBP prevalence can vary depending on recall period, pain definition, measurement tools, vehicle type, and work setting. Nevertheless, the result is consistent with the broader evidence that occupational drivers experience a considerable burden of LBP and musculoskeletal disorders (Chen et al., 2024; Ferreira et al., 2023; Jia et al., 2024; Pickard et al., 2022; World Health Organization, 2023a). Among pedicab drivers, physical demands go beyond sitting. Drivers must also pedal, stabilize the trunk, adjust body position to road conditions, and remain seated for many hours. These combined exposures may explain the high proportion of LBP observed in this study.

Sitting posture was significantly associated with LBP. Respondents with a non-ergonomic sitting posture had a higher prevalence of LBP than respondents with an ergonomic posture. Biomechanically, unsupported or flexed sitting may increase lumbar flexion, reduce lumbar support, produce asymmetric loading, and maintain static contraction of back muscles. In the long term, these conditions may contribute to discomfort and lower back pain. Similar findings have been reported among three-wheel drivers and auto-rickshaw drivers, whose work also involves constrained sitting and limited ergonomic seat support (Faiyazi et al., 2026; Terfa et al., 2022). Indonesian studies among truck drivers and office workers also support the relevance of work posture and sitting position in LBP complaints (Afif et al., 2021; Mahendrayana et al., 2024).

Working hours were also significantly associated with LBP. Respondents who worked more than 8 hours/day had a higher prevalence of LBP than those who worked 8 hours/day or less. Long working hours may prolong lumbar loading and reduce the opportunity for muscle recovery. For pedicab drivers, long daily work can also involve repetitive pedaling, prolonged seated waiting, exposure to road vibration, and insufficient structured breaks. Studies among professional taxi and bus drivers similarly identified longer work duration as an occupational factor associated with (Abere et al., 2023; Kurtul & Gungordu, 2022; Nabi et al., 2023). Evidence from meta-analyses on sitting, working duration, and sedentary behavior also supports the relevance of prolonged exposure in musculoskeletal pain and LBP, although the strength of association may vary across populations and study designs (Alzahrani et al., 2022; Dzakpasu et al., 2021; Mahendrayana et al., 2024; Prianggi et al., 2021).

Work tenure showed the highest magnitude of association in this study. Respondents with more than 5 years of tenure had a higher prevalence of LBP than those with shorter tenure. This result is plausible because work tenure reflects cumulative exposure. Longer tenure means repeated exposure to the same seat design, posture, pedaling movement, workload, and recovery pattern over many years. Work-related musculoskeletal disorders often develop through repeated mechanical stress rather than a single exposure. Evidence from occupational and driver studies indicates that longer tenure and cumulative ergonomic exposure are relevant to LBP and other musculoskeletal complaints (Gupta et al., 2022; Hulshof et al., 2021; Raza et al., 2024; Suliman et al., 2026; Tahernejad et al., 2024).

These findings have practical implications for occupational health in the informal sector. Pedicab drivers are not always covered by structured workplace health programs, yet they experience work-related risks similar to those of other transportation workers. Preventive actions should be realistic and low-cost, including posture education, short stretching routines before and during work, scheduled rest after prolonged pedaling or sitting, simple lumbar support, and seat modifications to improve back support. Community-based programs can also

adapt ergonomic education from workplace and office-based prevention approaches to informal workers (Prasetya et al., 2024; Putsa et al., 2022). The WHO guideline on LBP emphasizes the importance of education, self-care, and non-surgical management approaches in primary and community settings; these principles are relevant for early prevention and management among informal workers (World Health Organization, 2023b).

This study has limitations. First, the cross-sectional design cannot establish temporal or causal relationships. Second, LBP was measured as a complaint status and may be affected by individual perception. Third, the sample size was limited to 51 pedicab drivers in one market area, so generalization should be cautious. Fourth, potential confounders, including age, body mass index, smoking, physical activity, seat design, road vibration, psychosocial stress, and history of injury, were not analyzed. These factors may influence the observed associations. Future studies should include larger samples, standardized pain instruments such as the Nordic Musculoskeletal Questionnaire or the Oswestry Disability Index, and multivariable analyses to clarify the independent predictors of LBP among informal transportation workers.

CONCLUSION

Low back pain was common among pedicab drivers at Pasar Inpres, Palu City. Non-ergonomic sitting posture, working more than 8 hours/day, and work tenure of more than 5 years were significantly associated with LBP. Occupational health interventions for pedicab drivers should prioritize ergonomic sitting education, active rest, stretching, and simple seat support. Public health centers and local stakeholders should consider market-based outreach, as pedicab drivers operate in an informal setting with limited access to occupational health services.

Authors' Contribution Statement: Hasanudin contributed to the conceptualization of the study, data collection, data processing, and data analysis. Saharudin contributed to supervision, methodological review, interpretation of the findings, and manuscript revision. Mustafa contributed to methodological input, academic review, drafting, and critical revision of the manuscript. Dedi Mahyudin Syam contributed to academic input, validation of the analysis, and refinement of the manuscript content. Fitri Handayani contributed to the literature review, manuscript editing, and final manuscript review.

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