

## Research Article

# Ergonomic Risk Factors and Prevalence of Low Back Pain among Bus Drivers

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## Abstract

A research has been conducted among 96 bus drivers in Johor Bahru, Malaysia to determine the prevalence of Low Back Pain and determine its association with several ergonomic risk factors. A cross-sectional study was conducted by using the modified version of 'Standardized Nordic Questionnaire' that consisted of three parts; the respondent details, complaints on low back pain and potential risk factors. The Chi-Square Test was used as the statistical analysis in order to determine the association between the prevalence of low back pain and ergonomic risk factors. Results have shown that (1) prevalence of low back pain was 74%, (2) working hours per week [ $p=0.001$ ], workspace condition [ $p=0.003$ ] and body posture [ $p=0.000$ ] were associated with low back pain. The ergonomic risk factors will exposed the drivers to the higher level in generating low back pain, meanwhile, the condition of the buses may affected the degree of sickness among this population. In overall, the assessment on various ergonomic risk factors and the maintenance of buses should be the priority to protect safety and health among the employees.

**Keywords:** Low Back Pain; Ergonomic risk factors; Occupational safety and health; Bus driver

## Introduction

Ergonomist around the world has identified some of ergonomic risk factors related to Musculoskeletal Disorders (MSDs) such as repetitive work, work in extreme conditions and postures, vibration and work with forceful movement [1]. There are evidences by many researchers that the MSDs especially Low Back Pain (LBP) affected the occupational workers including drivers [2]. It is believed that most of the drivers experienced high risk in developing LBP due to ergonomic risk factors such as prolonged sitting and vibration [3]. It was found that 81% of American bus drivers and 49% of Swedish bus drivers had reported with LBP [4]. In Malaysia, a study showed that there is high prevalence of LBP among bus drivers which is 60.4% [5].

This paper is an attempt to identify the prevalence of low back pain and describe the potential risk factors associated with LBP among bus drivers in Johor Bahru.

## Methodology

A cross-sectional study was implemented among 96 respondents using the modified version of Standardized Nordic Questionnaire to obtain prevalence of low back pain [6]. It consists of (i) socio-demographic information such as age, race, marital status, education level and (ii) potential ergonomic risk factors such as duration of driving, sitting posture and workstation conditions. The statistical analysis used in this study was Chi-Square Test ( $p<0.05$ =significant) in order to determine the association between the ergonomic risk factors and prevalence of Low Back Pain.

## Results and Discussion

As stated in (Table 1), 74% ( $n=71$ ) of the respondents had experienced pain at the lower back of their body, meanwhile, 26%

( $n=25$ ) had no complaints at the lower back.

As referred to the previous finding [5], the lower back had the highest complaints of MSDs with 60.4% compared to other body parts among the Malaysian Bus Drivers. Another study by [7] reported that 60% prevalence of LBP had been discovered among professional truck drivers. In Taipei, the prevalence of LBP among commercial bus driver was about 51% [8]. The study conducted among Israeli professional bus drivers has a slightly lower prevalence at 45%, same goes to the respondent in Japan at 45.8% [9].

Total working hours per week was found associated with the prevalence of LBP by  $p$ -value of 0.001, as stated in (Table 2). In frequency, total number of respondents working at '30 hours to 50 hours' and 'more than 50 hours' per week were 72.

Total working hours have been found related to the occurrence of LBP due to the understanding of the effect on prolonged sitting. It is believed that when the drivers are passively sitting, the lumbar spine is poorly supported and may expose to any sudden injury. The

**Table 1:** Prevalence of Low Back Pain among Bus Drivers.

Complaints	Yes [%]	No [%]
Pain at the lower back of the body	74	26

Prevalence of Low Back Pain (LBP).

**Table 2:** Association between prevalence of LBP and Working Hour per Week.

Risk Factor Total Working hours/week	Standard Deviation	P-value
Less than 30 hours	0.58	0.001*
30 hours to 50 hours	0.48	
More than 50 hours	0.18	

Association between LBP and Working Hours.

**Table 3:** Association between prevalence of LBP and Sitting Posture.

Risk Factor Favorable Sitting Posture	Standard Deviation	P-value
Yes	0.47	0.000*
No	0.26	

Association between LBP and Sitting Posture.

**Table 4:** Association between prevalence of LBP and Workspace Condition.

Risk Factor Workspace Condition	Standard Deviation	P-value
Sufficient Workspace		
Yes	0.47	0.030*
No	0.29	
Comfort Seat		
Yes	0.45	0.678
No	0.43	
Steering easy to handle		
Yes	0.43	0.482
No	0.48	

Association between LBP and Sitting Posture.

long working periods without an adequate work rest may contribute to the LBP [10,11].

It has been indicated that driving more than twenty hours a week was significant to the high prevalence of LBP and related to sickness absence [12]. The risk to get LBP is higher when the drivers work about 30-50 hours per week compared with the drivers who work less than 30 hours. The risks are five times greater for the drivers who have work more than 50 hours per week [13]. Other finding discovered that driving more than 20 hours in a week has the possibility to lead in developing LBP [14].

Sitting posture that has been favored and observed among the respondents was the sitting position of 'sitting up straight with thigh parallel to the floor'. The above (Table 3) showed that sitting posture was found associated to the prevalence of LBP among the respondents. As observed, most of the drivers did not sit up straight during their working hours.

Awkward bending and prolonged static posture has been reported to cause LBP as the static compression of the cells in the disks is linked to an increase of cell death. The flexion of the hip joint may cause the pelvis to tilt rearward and flattening the lumbar curve [15]. It was also reported that postural stress is an important risk factor in getting low back pain [16]. Among the bus drivers, they usually maintain awkward body posture for a long period during their working hours include slumped sitting, leaning on one side, bending and twisting [9]. In theory, the erector spinae muscle remained inactive and muscle becomes stiff limiting the trunk muscle movement and it may generate the pain [17].

In general, there are two technical paradigms of posture that may relate to MSDs including LBP. First, the static posture involves maintaining the same position for relatively long periods of time and the awkward postures involves working in a position that is deviated from neutral position [18]. It is believed that the musculoskeletal pain and discomfort especially at the upper extremity and lower back of the body were related to poor seating posture and prolonged static position [19].

From (Table 4), only 'sufficient workspace' was found related to the prevalence of LBP by p-value of 0.003. Other, 'comfort seat' and 'steering easy to handle' were not associated with the LBP among the respondents.

A bad designed of workstation will increase the worker's static work patterns resulted with working in bad posture throughout the day [20]. In addition, most of the drivers are at high risk in generating LBP when there are lacks of space at the workstation. This is because it can impose postural strain on lumbar spines [21].

## Conclusion

In overall, the finding of this paper was consistent to the previous researches and relatively high prevalence among bus drivers. The ergonomic risk factors that found associated with LBP were 'total working hours per week', 'sitting posture while driving' and 'sufficient workspace'. Therefore, the assessment of the workstation and regular maintenance of the buses are recommended to prevent any bad health effect among the bus drivers. In overall, this study has proven that LBP is a common problem among bus drivers.

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