

Original Article

# Assessment of musculoskeletal disorders and contributing factors in professional drivers

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## Abstract

Musculoskeletal disorders (MSDs) are the leading global cause of disability and pose a significant public health issue, particularly among professional drivers who are prone to such conditions due to prolonged sitting, poor posture, and exposure to whole-body vibrations. The objectives of this study are to assess the demographic, general, lifestyle, and wellness profiles of professional drivers, gauge their work environment characteristics, and measure the proportion of musculoskeletal symptoms using the modified Nordic questionnaire. This descriptive study collected data from 67 professional drivers at major bus stands in Lahore using a structured questionnaire. The data were analyzed using frequencies, percentages, means, and standard deviations. The results revealed that the drivers, predominantly middle-aged (average age  $39.72 \pm 9.53$  years) and married (95.52%), reported limited formal education (average  $7.56 \pm 3.91$  years). Lifestyle assessments indicated high rates of smoking (61.19%) and frequent consumption of soft drinks (88.06%). In their work environment, most drivers (68.66%) worked daytime shifts, and a significant proportion (56.72%) experienced vibration exposure. The most frequently reported musculoskeletal symptoms were in the lower back (58.21% in the past 12 months, 43.28% in the past 7 days) and hips/thighs (61.19% in the past 12 months), impacting their ability to work. These findings highlight the critical need for targeted ergonomic and lifestyle interventions to improve the occupational health and safety of drivers, potentially reducing musculoskeletal discomfort and enhancing overall well-being and productivity.

## Keywords

Professional drivers; Ergonomics; Occupational health; Modified Nordic Questionnaire; Pakistan; Musculoskeletal disorders

## 1. Introduction

Musculoskeletal disorders (MSDs) are injuries or conditions that affect muscles, nerves, tendons, joints, cartilage, or spinal discs. These disorders present with symptoms such as pain, inflammation, and sprains, affecting approximately 1.71 billion people globally [1,2]. MSDs rank as the primary global cause of disability and significant human suffering [3]. Moreover, occupational MSDs account for 42% to 58% of all work-related illnesses and pose a significant public health concern [4]. Professional drivers are particularly vulnerable to these disorders owing to factors such as prolonged sitting, poor posture, repetitive movements such as steering and shifting gears, and exposure to whole-body vibrations from uneven surfaces, which collectively heighten their risk [5]. This prolonged sitting and exposure to vibrations directly contribute to the high incidence of MSDs among drivers [4].

The literature highlights the prevalence and severity of MSDs among professional drivers, who often experience issues across multiple body regions [6,7]. Lower back issues are most frequently reported, followed by problems in the neck, shoulders, and upper back [4]. A study in Thailand noted that during a 12-month period, 81.9% of bus drivers experienced neck pain, while 80.7% suffered from back pain [8]. Similarly, in India, the prevalence of work-related MSDs for back pain reached 73% [9]. In Taiwan, 26% of drivers reported neck-related musculoskeletal issues, and in the UK, 45% of drivers reported MSDs affecting the upper limbs or neck [1,10].

Among professional drivers, vehicle ergonomics significantly contributes to the onset of MSDs [11]. Poorly designed seats, inadequate lumbar support, and improperly positioned steering wheels not only lead to postural misalignments but also increase biomechanical stress, which can aggravate musculoskeletal symptoms [12]. Vibration and jolting from uneven roads worsen these problems, potentially causing low back pain, cervicgia, and carpal tunnel syndrome [13]. Despite these risks, most professional drivers lack ergonomic training and often do not seek treatment for MSDs [14].

The impact of musculoskeletal problems on professional drivers is extensive, affecting not only their health but also resulting in significant economic consequences [15]. There is a direct correlation between musculoskeletal discomfort and decreased job performance, leading to impaired concentration, slower reaction times, and an increased risk of accidents [16]. This issue not only compromises driver safety but also incurs significant economic costs, including increased healthcare utilization, absenteeism, and reduced productivity, thus underscoring the need for comprehensive occupational health strategies [17].

Addressing musculoskeletal issues in professional drivers necessitates a comprehensive approach that incorporates ergonomic interventions, behavioral modifications, and health promotion strategies. Understanding the complex relationships among occupational factors, biomechanical stressors, and individual risk factors enables stakeholders to implement targeted interventions aimed at reducing musculoskeletal risks and promoting a safer, healthier work environment. Therefore, this study was conducted to provide a comprehensive assessment of professional drivers in Lahore, Pakistan. The objectives of this study are to assess the demographic, general, lifestyle, and wellness profiles of professional drivers; gauge their work environment characteristics; and measure the proportion of musculoskeletal symptoms using the modified Nordic questionnaire with the aim of identifying factors affecting driver health and guiding potential improvements in occupational health practices.

## 2. Methods

### 2.1. Study design and duration

This descriptive study was carried out over a three-month period from April to June 2023.

### 2.2. Ethics approval

This study obtained ethical approval from the Ethics Review Committee of Hussain Memorial Hospital, the affiliated hospital of the health sciences college affiliated with Government College University, Faisalabad (No. HMM-23-ERC-38). Furthermore, the study conformed to internationally recognized ethical standards for health-related research involving human subjects [18].

### 2.3. Sampling technique and sample size

Professional drivers were selected using a convenience sampling method.

A sample size of 67 was determined using the OpenEpi calculator. This calculation was based on a 95% confidence level, a 5% margin of error, and the 3.6% proportion of professional drivers who reported MSDs in a previous study among bus rapid transit staff [19]. To increase the power of the study, the sample size was increased to 67.

### 2.4. Study setting

The data were collected at the General Bus Stands (GBS) located in Badami Bagh, Thokar Niaz Baig, and Band Roads. These stations are regular gathering points for a significant number of professional drivers, making them an optimal setting for this study.

### 2.5. Study participants

This study recruited professional drivers who operate commercial vehicles transporting passengers or cargo both within Lahore and to other cities across provincial boundaries in Pakistan.

### 2.6. Selection criteria

The study recruited professional drivers, including bus, van, and taxi operators, who regularly drove for more than six hours daily, had been engaged in the driving profession for at least five years, and provided written informed consent. However, the study excluded female drivers and individuals with a history of systemic diseases or traumatic injuries to eliminate confounding factors in the assessment of musculoskeletal conditions [20].

### 2.7. Data collection tool and procedure

The questionnaire was developed after a thorough review of relevant literature and incorporated elements from the validated Modified Nordic Questionnaire [21,22]. It was reviewed by two field experts to ensure that the questionnaire's content was well aligned with the study's objectives. Moreover, it was pretested on three professional drivers before its final use to ensure its acceptability and comprehension among the targeted population.

The data were collected through face-to-face interviews, each lasting between 5 and 10 minutes, using this structured questionnaire. The survey instrument was divided into three sections: demographic, general, lifestyle, and wellness profile; professional driver profile and work environment characteristics; and musculoskeletal symptoms, which were assessed using the Modified Nordic Questionnaire.

### 2.8. Statistical analysis

The data were analyzed using Microsoft Excel (Office 365) and the Statistical Package for the Social Sciences (SPSS) version 26.00. Frequencies, percentages, means, and standard deviations were calculated to achieve the study objectives.

## 3. Results

Table 1 shows the demographic, general, lifestyle, and wellness profiles of the professional drivers. The average age of the drivers was  $39.72 \pm 9.53$  years. Moreover, the average educational attainment was  $7.56 \pm 3.91$  years, with 95.52% of the drivers being married and 98.51% predominantly using their right hand. In terms of lifestyle, only

26.87% of the drivers engaged in regular exercise. The smoking rate among the drivers was high at 61.19%, with those who smoked an average of  $6.83 \pm 2.98$  cigarettes per day. Furthermore, a significant majority (88.06%) of drivers frequently consumed soft or fizzy drinks.

**Table 1.** Demographic, general, lifestyle, and wellness profiles of professional drivers (n = 67).

Variables		Frequency (%)	Mean $\pm$ SD
<i>Sociodemographics</i>			
Age (in years)		-	39.72 $\pm$ 9.53
Marital status	Married	64 (95.52)	-
	Single	3 (4.48)	-
Education (in years)		-	7.56 $\pm$ 3.91
Monthly household income (in PKR)		-	46093.75 $\pm$ 25486.69
<i>General information</i>			
Dominant hand use while driving	Right	66 (98.51)	-
	Left	1 (1.49)	-
<i>Lifestyle and wellness</i>			
Do you exercise?	Yes	18 (26.87)	-
	No	49 (73.13)	-
Daily exercise duration (in minutes)		-	31.67 $\pm$ 11.35
Types of exercise (n = 18)	Moderate Intensity Aerobic	13 (19.40)	-
	Vigorous-intensity Aerobic	0 (0.00)	-
	Muscle Strengthening	0 (0.00)	-
	Light-intensity	5 (7.46)	-
Smoking status	Smoker	41 (61.19)	-
	Nonsmoker	26 (38.81)	-
Daily cigarette consumption (n = 41)		-	6.83 $\pm$ 2.98
Average sleep duration (in hours)		-	7.28 $\pm$ 1.85
Frequent consumption of soft/fizzy drinks	Yes	59 (88.06)	-
	No	8 (11.94)	-

Table 2 shows information regarding the work environment and lifestyle of professional drivers. The majority of drivers (68.66%) worked daytime shifts, and 31.34% worked nighttime shifts. The primary roads used by drivers were GT roads (49.25%) and motorways (43.28%), with a smaller percentage (7.46%) driving on intercity roads. Moreover, 56.72% of the drivers experienced vibration exposure while driving. The majority of drivers (86.57%) reported feeling exhausted by the end of the day. Despite high adjustability (89.55%), seat comfort remained an issue for more than half of the drivers (52.24%).

Table 3 shows the proportions of musculoskeletal symptoms among professional drivers. Most of the drivers reported experiencing pain in the lower back (58.21%) or hips/thighs (61.19%) in the past 12 months. Moreover, 43.28% of drivers experienced lower back pain, and 20.90% reported hip/thigh pain in the past seven days. A significant proportion of drivers also reported neck (34.33%) and knee pain (38.81%) over the past year. The impact of work on the lower back was notably significant; 16.42% of the drivers reported that pain prevented them from working, while 5.97% of the drivers reported having hips/thighs. Other areas, such as the shoulders, upper back, and ankles/feet, exhibited lower proportions of pain and minimal impact on work.

**Table 2.** Professional driver profile and work environment characteristics (n = 67).

Variables		Frequency (%)	Mean $\pm$ SD
Working shift/timings	Daytime	46 (68.66)	-
	Nighttime	21 (31.34)	-
Average daily driving time (hours)		-	8.63 $\pm$ 3.50
Work days per week		-	6.41 $\pm$ 0.61
Years working as a driver		-	21.72 $\pm$ 9.53
Primary type of road driven on	Motorway	29 (43.28)	-
	GT road	33 (49.25)	-
	Intercity	5 (7.46)	-
Average daily distance covered (km)		-	400.31 $\pm$ 150.49
Type of vehicle driven	Manual	65 (97.01)	-
	Automatic	2 (2.99)	-
Typical traffic environment	Heavy traffic	48 (71.64)	-
	Medium traffic	10 (14.93)	-
	Less traffic	9 (13.43)	-
Usual traveling mode	Continuous	22 (32.84)	-
	With interval	45 (67.16)	-
Vibration exposure while driving	Yes	38 (56.72)	-
	No	29 (43.28)	-
Seat comfort	Yes	32 (47.76)	-
	No	35 (52.24)	-
Seat adjustability	Yes	60 (89.55)	-
	No	7 (10.45)	-
Typical sitting duration (hours)		-	8.72 $\pm$ 3.24
End-of-day exhaustion	Yes	58 (86.57)	-
	No	9 (13.43)	-
Use of Seat Cushions	Yes	13 (19.40)	-
	No	54 (80.60)	-

**Table 3.** Musculoskeletal symptoms among professional drivers according to the modified Nordic questionnaire (n = 67).

Variables	Pain Status		Work Impact
	Past 12 Months (%)	Past 7 Days (%)	Prevents Work (%)
Neck	23 (34.33)	17 (25.37)	7 (10.45)
Shoulders	11 (16.42)	7 (10.45)	2 (2.99)
Elbows	6 (8.96)	3 (4.48)	0 (0.00)
Wrists/hands	9 (13.43)	0 (0.00)	1 (1.49)
Upper back	16 (23.88)	11 (16.42)	3 (4.48)
Lower back	39 (58.21)	29 (43.28)	11 (16.42)
Hips/thighs	41 (61.19)	14 (20.90)	4 (5.97)
Knees	26 (38.81)	5 (7.46)	2 (2.99)
Ankles/feet	19 (28.36)	1 (1.49)	1 (1.49)

#### 4. Discussion

The findings from our study show the profile of demographic characteristics, work environment factors, and health behaviors among professional drivers that are associated with musculoskeletal symptoms. The demographic data indicate a predominantly middle-aged workforce with limited formal education and a high rate of marriage. These drivers engage in high-risk lifestyle choices, including low levels of physical activity and

high rates of smoking and soft drink consumption, all within the context of challenging work conditions. Most drivers work long hours, primarily during the day, experience frequent vibrations, and cope with poor ergonomic settings such as uncomfortable seats. The most frequently reported musculoskeletal symptoms occurred in the lower back and hips/thighs, which may reflect the physical demands of their work and potentially inadequate ergonomic support.

In support of these findings, research has identified biomechanical factors—including continuous repetitive motions, overuse of joints, poor posture, whole-body vibrations, and extended hours of driving—as significant contributors to musculoskeletal disorders among various professional groups [23]. Similarly, a study from Nigeria reported that the majority of bus drivers experienced musculoskeletal discomfort, particularly in the lower back, knees, neck, upper back, and shoulders, with psychological factors and work pressure also cited as contributing causes [24]. Furthermore, studies on mining truck drivers and elderly Malaysian taxi drivers emphasize the role of age, awkward body posture, and body vibrations in musculoskeletal discomfort, highlighting the prevalence of back pain, especially among older drivers who often smoke and use budgeted vehicles [25,26].

Prolonged exposure to nonnatural working postures, vibration, traffic conditions, and work-related stress are identified as significant causes of musculoskeletal disorders among professional drivers [27]. Factors such as long working hours, low income, less education, occupational stress, and limited ergonomics knowledge contribute to musculoskeletal discomfort [28]. Notably, a lack of professional training leads to poor posture during work hours, which is predominantly associated with lower back pain [29,30]. Additionally, the combination of sociodemographic factors such as age and limited physical activity with prolonged exposure to vehicle vibrations significantly exacerbates musculoskeletal disorders [31].

This study provides crucial insights into the occupational health challenges faced by professional drivers, but it is not without limitations. The use of a convenience sample restricts the generalizability of the findings to all professional drivers. Furthermore, the self-reported nature of the data may introduce bias, as participants might underreport behaviors perceived negatively, such as smoking, or overreport their engagement in exercise. Despite these limitations, the study's strengths include its comprehensive assessment of a range of factors affecting driver health, from demographic and lifestyle variables to detailed work environment characteristics. The use of the Modified Nordic Questionnaire for assessing musculoskeletal symptoms provides a robust framework for evaluating the prevalence and impact of these health issues within this population.

## 5. Conclusions

In conclusion, this study emphasizes multiple issues related to poor lifestyle habits and demanding work environments among professional drivers, which are closely linked to musculoskeletal symptoms, especially in the lower back and hips/thighs. These findings underscore the urgent need for targeted interventions to enhance workplace ergonomics and encourage healthier lifestyle choices among drivers. There is a potential to reduce musculoskeletal discomfort and improve the overall well-being and productivity of professional drivers by implementing ergonomic improvements, promoting physical fitness programs, and offering health education.

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sion, MR; project administration, HA. All authors have read and agreed to the published version of the manuscript.

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**Consent to participate:** Written informed consent was obtained from all participants prior to data collection.

**Data availability:** The data supporting this study's findings are available from the corresponding author, Moazzam, upon reasonable request.

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**Conflicts of interest:** The authors declare no conflicts of interest.

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