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A CROSS-SECTIONAL STUDY ON OCCUPATIONAL HEALTH HAZARDS AMONG BUS DRIVERS WORKING IN GOVERNMENT BUS DEPOT IN TIRUVALLUR DISTRICT, TAMIL NADU

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ABSTRACT

Introduction: Bus drivers are prone to various health issues. They face particular stressors such as extended working hours, dietary habits, and sleep patterns, which consequently lead to changes in their physical, psychological, and behavioral characteristics. This study aims to assess the different occupational health risks and their related factors among bus drivers.

Methodology: A cross-sectional study was carried out from June 2021 to August 2021 involving bus drivers employed at a government bus depot under the Tamil Nadu state transport corporation. A total of 223 bus drivers were interviewed and examined out of 250 after obtaining informed consent. Data was gathered using a pretested semi-structured questionnaire, entered into MS Excel, and analyzed with SPSS version 21. Descriptive statistics and associations were determined using the chi-square test.

Results: The average age of the participants in the study was 42.9 (+6.7 SD) years. Approximately 47% of bus drivers worked more than 48 hours, and 66.4% traveled a distance of 150-200 kilometers per shift. The mean BMI was 25.4 (+4 SD), and the measured blood pressure indicated a mean SBP (mm of Hg) of 121.4 (+5.4 SD) and DBP (mm of Hg) of 82.2 (+4.7 SD). Among the drivers, an irregular eating pattern was observed in 56.1%. The majority (98.2%) reported less than 6 hours of sleep. In this study, most participants exhibited musculoskeletal issues (44.9%) and general symptoms (40.6%). General symptoms were significantly more prevalent with increasing age, length of service, and average travel distance ($p < 0.05$).

Conclusion: The occupational stress experienced by participants can be alleviated through effective organizational strategies and health initiatives. Guidelines for working hours should be established to enhance work capacity.

Keywords: Bus drivers, health risks, dietary habits, sleep patterns, work duration.

INTRODUCTION

Occupational health hazards have gained increased visibility in post-industrial societies, encompassing an extensive array of diseases. Currently, working in a transport department is recognized as one of the most stressful occupations. Bus drivers are particularly susceptible to various health issues. A significant portion of the population relies on buses for transportation due to their affordability and convenience. Consequently, the stress experienced by drivers is critically important, as it directly impacts the safety of passengers during travel. Drivers face specific stressors, including extended working hours, infrequent breaks, traffic congestion, poor road conditions, and escalating air and noise pollution, all of which exacerbate their situation and lead to changes in their physical, psychological, and behavioral patterns.

It was not until the 20th century that the detrimental effects of their occupation on health garnered research interest, highlighting the various stressors, mediators, and outcomes that affect their well-being [1]. Over the past few decades, bus drivers have shown a higher propensity to experience cardiovascular, gastrointestinal, and musculoskeletal symptoms due to occupational stress [2]. Every profession carries its unique risks and stressors, and bus driving is no

exception. The primary responsibility of bus drivers is to ensure the safety of both passengers and pedestrians while adhering to their work schedules. Despite facing personal challenges and health issues, bus drivers bear a significant social responsibility to care for their passengers and pedestrians. To fulfill their duties, their health status is often compromised [2]. Urban bus drivers are at a heightened risk of encountering stressful events that adversely affect their health, which in turn contributes to alarming rates of absenteeism [3].

Bus drivers must effectively manage the conflicting demands of safety, customer service, and company operating regulations, which often involve numerous risk factors such as prolonged sitting, tight schedules, reduced rest breaks, rotating shift patterns, traffic congestion, and the sedentary nature of their job, among others [4]. These risk factors become significant when work demands surpass the physical capabilities of the workers, leading to various symptoms including low back pain, knee pain, shoulder pain, gastric issues, and fatigue, among others [5]. In addition to the stressors inherent in their profession, lifestyle and behavioral habits also significantly influence their health status. Non-modifiable factors, such as age, severely affect the professional abilities of bus drivers. Those over 40 years of age are particularly susceptible to factors that can impact their health in both positive and negative ways. Occupational health is critically important due to the rising demands and extended working hours associated with urbanization. The physical and mental well-being of bus drivers is essential, as any impairment could result in negative outcomes for passengers. It is a well-known fact that buses are one of the most popular forms of public transport globally. In developing countries like India, the working conditions for bus drivers are notably poor and stressful; however, this issue has not been adequately addressed to date. Against this backdrop, this study aims to assess the various occupational health hazards and their related factors among bus drivers.

METHODOLOGY

Study Setting: The study was conducted at the Government Bus Depot in Poonamallee, Tiruvallur District. The depot functions under the Tamil Nadu State Transport Corporation (TNSTC)

Study Population: The study included government-employed bus drivers working in both morning and night shifts at the Poonamallee Bus Depot.

Study Duration: The study was conducted over a period of three months, from June 2021 to August 2021.

Sample Size: Total bus drivers working in the depot: 300, Final number of participants interviewed and examined: 223

Sampling Method: Universal sampling technique was used to select all eligible drivers available during the study period.

Inclusion Criteria

- Government bus drivers working at Poonamallee depot
- Present during the study period and gave informed consent

Exclusion Criteria

- **Chronic absentees**
- Unwilling participants
- Drivers unavailable even after 3 visits

Ethical Approval: Ethical clearance was obtained from the Institutional Ethical Committee before the commencement of the study.

Data Collection Tool: Pretested semi structured questionnaire was used to obtain basic details of the study participants which includes socio-demographic, life style behaviours and occupational characteristics along with detailed clinical examination - anthropometric measures, general and systemic examination was done with standard procedures and standardized instruments.

Data collection: The data was collected after obtaining permission from the Government authority, Bus depot Manager, State Transport Corporation, Chennai. As the bus drivers work in shifts, so the timings for interview and examination were scheduled to be in afternoons between 12pm and 2am and in evenings between 4pm and 6pm. Face to face interviews along with clinical examination including anthropometric measures, general and systemic examination were conducted and the responses are recorded.

Statistical analysis: Data was entered into MS Excel and was analysed using SPSS version 25. Descriptive statistics were calculated for socio-demographic details and life style behaviours, were expressed as frequencies and percentages. Association between various factors affecting their health and the occupational health hazards presented by the bus drivers was analysed by proportions and Chi-square test was used to find the test of significance. Multinominal logistic regression analysis was done to identify independent risk factors affecting the health of the study participants.

RESULTS

In our research, the average age of the participants was 42.9 years (± 6.7 SD). All participants were male. Regarding their educational background, the majority of the participants had completed higher education, accounting for 62.3%. It was noted that 18.8% of the bus drivers had a history of chronic illness, with 10.30% diagnosed with diabetes mellitus and 5.80% suffering from systemic hypertension. Concerning their lifestyle habits, our study found that a significant number had a history of alcohol and tobacco use (70.4%), with 30% using both substances and 22.9% using only tobacco. An increase in age was significantly associated with the presence of musculoskeletal, general, and gastrointestinal symptoms ($p < 0.05$).

Table 1: Association between various socio-demographic characteristics and occupational health hazards (N = 223):

VARIABLES	Musculoskeletal symptoms N (%)		Gastrointestinal symptoms N (%)		General symptoms N (%)	
	YES	NO	YES	NO	YES	NO
Age > 42 years ≤ 42 years	113 (63.8%) 64 (36.2%)	11 (23.9%) 35 (76.1%)	39 (75%) 13 (25%)	85 (49.7%) 86 (50.3%)	71 (78.9%) 19 (21.1%)	53 (39.8%) 80 (60.2%)
Chi –square (p value)	**23.580 (0.000) ***		**10.333 (0.001) ***		**33.139 (0.000) ***	
Chronic illness Present Absent	41 (23.2%) 136 (76.8%)	1 (2.2%) 45 (97.8%)	9 (17.3%) 43 (82.7%)	33 (19.3%) 138(80.7%)	21 (23.3%) 69 (76.7%)	21 (15.8%) 112(84.2%)
Chi –square (p value)	**0.000***		0.103 (0.748)		1.998 (0.157)	
Education Secondary Higher secondary	45 (25.4%) 132 (74.6%)	16 (34.8%) 30 (65.2%)	9 (17.3%) 43 (82.7%)	52(30.4%) 119 (69.6%)	14 (15.6%) 76 (84.4%)	47 (35.3%) 86 (64.7%)
Chi – square (p value)	1.609 (0.205)		3.444 (0.063)		**10.571 (0.001) ***	
***p value < 0.05 – significant**						

The table illustrates the relationship between age, chronic illness, and education with musculoskeletal, gastrointestinal, and general symptoms in bus drivers. Drivers over the age of 42 exhibited markedly higher rates of musculoskeletal (63.8%), gastrointestinal (75%), and general symptoms (78.9%) when compared to their younger counterparts ($p < 0.05$). Chronic illness did not demonstrate a significant correlation with any of the symptoms. While education level did not show a significant link to musculoskeletal and gastrointestinal symptoms, those with higher secondary education reported significantly fewer general symptoms ($p = 0.001$). In summary, age emerged as the most critical factor, whereas education had a minimal effect, and chronic illness did not significantly influence the symptoms reported.

Table 2: Association between behavioral pattern and occupational health hazards (N = 223)

VARIABLES	Musculoskeletal symptoms N (%)		Gastrointestinal symptoms N (%)		General symptoms N (%)	
	YES	NO	YES	NO	YES	NO
Alcohol & smoking **Yes** **No**	137 (87.3%) 40 (%)	20 (12.7%) 26 (56.5%)	41 (78.8%) 11 (21.2%)	116(67.8%) 55 (32.2%)	82 (91.1%) 8 (8.9%)	75 (56.4%)

						58 (43.6%)
Odd's Ratio (Confidence Interval)	**4.453***		2.320 (0.128)		**31.054 (0.000) ***	
Food pattern **Irregular** **Regular**	88 (49.7%) 89 (50.3%)	37 (80.4%) 9 (19.6%)	23 (44.2%) 29 (55.8%)	102(59.6%) 69 (40.4%)	31 (34.4%) 59 (65.6%)	94 (70.7%) 39 (29.3%)
Chi – square (p value)	**13.985 (0.000) ***		3.848 (0.050)		**28.606 (0.000) ***	
Outside food **Yes** **No**	110 (62.1%) 67 (37.9%)	20 (43.5%) 26 (56.5%)	33 (63.5%) 19 (36.5%)	97 (56.7%) 74 (43.3%)	64 (71.1%) 26 (28.9%)	66 (49.6%) 67 (50.4%)
Chi – square (p value)	**5.234 (0.022) ***		0.744 (0.388)		**10.194 (0.001) ***	
Hours of sleep **≤ 6 hours** **> 6 hours**	173 (97.7%) 4 (2.3%)	46 (100%) 0	52 (100%) 0	167(97.7%) 4(2.3%)	90 (100%) 0	129 (97%) 4 (3%)
Chi – square (p value)	1.867 (0.172)		2.146 (0.143)		**4.184 (0.041) ***	
***p value <0.05 – significant**						

The table illustrates the correlation between behavioral patterns and occupational health risks among 223 bus drivers. Drivers who engaged in alcohol consumption and smoking exhibited significantly elevated rates of musculoskeletal (87.3%) and general symptoms (91.1%) when compared to non-users, with a notably high odds ratio for general symptoms (OR = 31.054, $p < 0.001$). Additionally, irregular eating habits were significantly linked to all three categories of symptoms—musculoskeletal (49.7%), gastrointestinal (80.4%), and general (65.6%)—with p-values less than 0.05. The intake of outside food demonstrated a significant relationship with musculoskeletal (62.1%) and general symptoms (71.1%), although it did not correlate with gastrointestinal problems. Drivers who slept for less than 6 hours reported an extremely high prevalence of all symptoms, especially general symptoms (100%), which was statistically significant ($p = 0.041$). Unhealthy behaviors such as smoking, alcohol consumption, irregular meal patterns, outside food consumption, and insufficient sleep were strongly linked to occupational health challenges.

Table 3: Association between Occupational characteristics and health hazards (N = 223)

Variables	**Musculoskeletal symptoms**		**Gastrointestinal symptoms**		**General symptoms**	
	Yes	No	Yes	No	Yes	No
Duration of service **> 10 years** **≤ 10 years**	86 (48.6%) 91 (51.4%)	31 (67.4%) 15 (32.6%)	15 (28.8%) 37 (71.2%)	102(59.6%) 69 (40.4%)	21 (23.3%) 69 (76.7%)	96 (72.2%) 37 (27.8%)
Chi – square (p value)	**5.176 (0.023) ***		**15.170 (0.000) ***		**51.355 (0.000) ***	
Duration of driving **> 48 hours** **≤ 48 hours**	78 (44.1%) 99 (55.9%)	6 (13%) 40 (87%)	40 (76.9%) 12 (23.1%)	65 (38%) 106 (62%)	80 (88.9%) 10 (11.1%)	25 (18.8%) 108(81.2%)

Chi – square (p value)	**26.956 (0.000) ***		**24.232 (0.000) ***		**105.84 (0.000) ***	
Average distance of driving **> 150 kms** **≤ 150 kms**	140 (79.1%) 37 (20.9%)	19 (41.3%) 27 (58.7%)	50 (96.2%) 2 (3.8%)	109(63.7%) 62 (36.3%)	88 (97.8%) 2 (2.2%)	71 (53.4%) 62 (46.6%)
Chi – square (p value)	**25.483 (0.000) ***		**0.000***		**0.000***	
Night shifts **Yes** **No**	104 (58.8%) 73 (41.2%)	11 (23.9%) 35 (76.1%)	35 (67.3%) 17 (32.7%)	80 (46.8%) 91 (53.2%)	78 (86.7%) 12 (13.3%)	37 (27.8%) 96 (72.2%)
Chi – square (p value)	**17.749 (0.000) ***		**6.725 (0.010) ***		**74.427 (0.000) ***	
***p value <0.05 – significant**						

The table illustrates the correlation between occupational traits and health risks among 223 bus drivers. Drivers with over 10 years of experience reported higher rates of musculoskeletal (48.6%), gastrointestinal (67.4%), and general symptoms (72.2%) in comparison to their less experienced counterparts, with all correlations being statistically significant ($p < 0.05$). Likewise, those who drove more than 48 hours per week exhibited a higher prevalence of musculoskeletal (44.1%), gastrointestinal (76.9%), and general symptoms (88.9%), with strong significance ($p < 0.001$). Drivers who traveled more than 150 km daily also reported significantly higher rates of musculoskeletal (79.1%) and general symptoms (97.8%). Night shift drivers faced a greater burden of symptoms—musculoskeletal (58.8%), gastrointestinal (67.3%), and general symptoms (86.7%)—when compared to day shift drivers, all with p-values < 0.05. These results indicate that longer service duration, increased driving hours, longer distances, and night shifts are significantly linked to heightened occupational health concerns.

Figure 1: Average distance of driving per shift covered by the study participants (N=223)

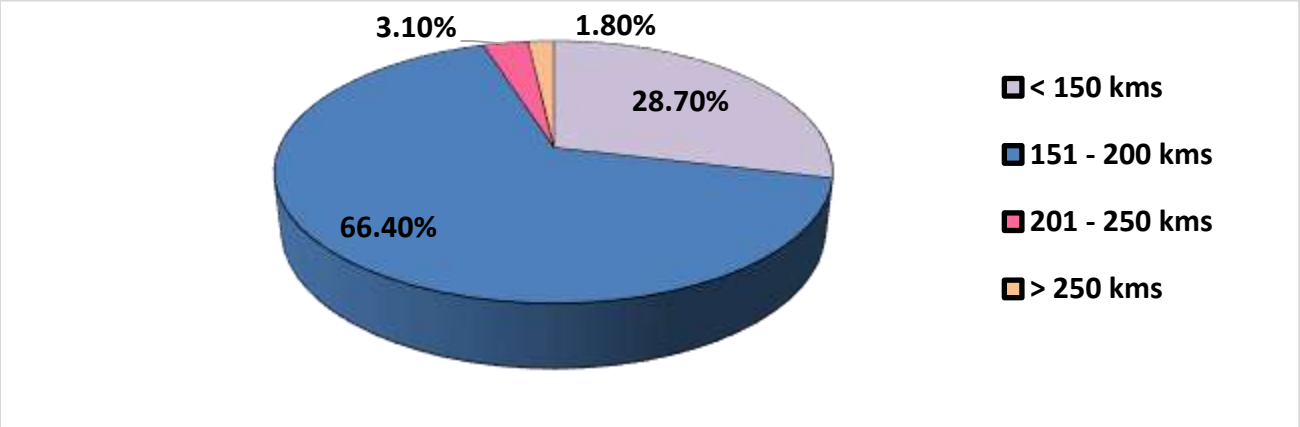

Figure 1 depicts the average distance traveled per shift by the participants in the study (N = 223). A large majority of bus drivers (66.4%) traveled distances ranging from 151–200 km per shift. A notable segment (28.7%) drove less than 150 km, whereas a smaller fraction (3.1%) drove 201–250 km. Merely 1.8% of the drivers covered distances exceeding 250 km. This suggests that the majority of drivers function within a medium-distance range, which may contribute to cumulative occupational strain.

Figure 2: Symptoms presented by the study participants in past one month (N = 223)

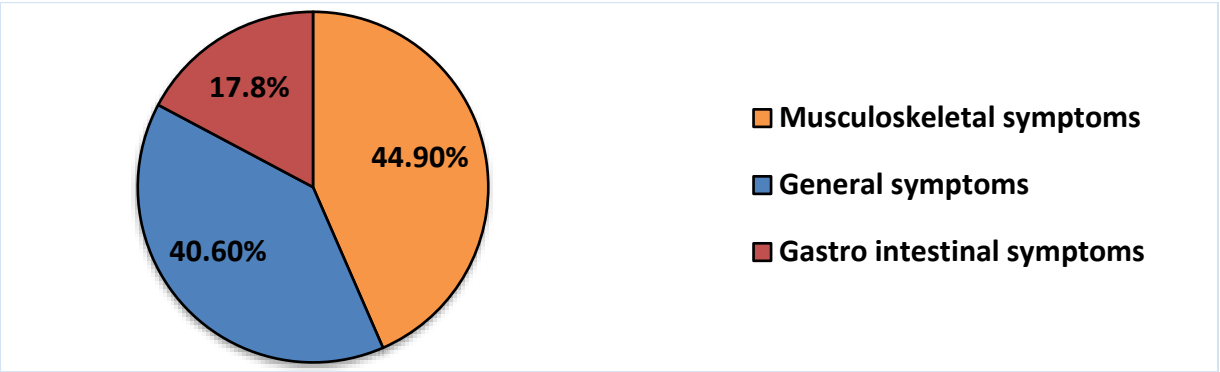

Figure 2 illustrates the distribution of symptoms reported by the study participants (N = 223) over the previous month. Musculoskeletal symptoms were the most frequently reported, impacting 44.9% of participants (approximately 100 individuals). This was succeeded by general symptoms, which were experienced by 40.6% (around 91 individuals). Gastrointestinal symptoms were noted by 17.8% (approximately 40 individuals). The data underscores that a considerable segment of the workforce endures physical discomfort, with musculoskeletal issues being the most widespread.

Table 4: Multinominal logistic regression analysis among the bus drivers (N = 223)

Parameters	**Musculoskeletal symptoms**			**Gastro - intestinal symptoms**			**General symptoms**		
	AOR	CI	P value	AOR	CI	P value	AOR	CI	P value
Age (Years) **> 42** **≤ 42 R**	2.830	1.193 – 6.715	**0.018**	1.653	0.731 – 3.738	0.228	2.690	1.056 – 6.850	**0.038**
Eating habits **Irregular** **Regular R**	0.432	0.172 – 1.084	0.074	1.096	0.508 – 2.368	0.815	0.510	0.207 – 1.258	0.144
Duration of service **> 10 years** **≤ 10 years R**	1.073	0.383 – 3.007	0.893	3.509	1.337 – 9.208	**0.011**	5.175	1.840 – 14.555	**0.002**
Duration of driving **> 48 hours** **< 48 hours R**	0.770	0.532 – 1.114	0.165	0.524	0.176 – 1.563	0.246	0.216	0.076 – 0.613	**0.004**
Average distance **> 150 kms** **< 150 kms**	0.337	0.099 – 1.144	0.081	0.079	0.016 – 0.394	**0.002**	0.059	0.011 – 0.334	**0.001**
AOR – Adjusted Odds Ratio CI – Confidence Interval p value <0.05 significant									

Table 4 displays the findings from the multinomial logistic regression analysis aimed at identifying factors linked to various occupational health symptoms among bus drivers (N = 223). Drivers who are over 42 years old exhibited significantly greater odds of developing musculoskeletal symptoms (AOR = 2.830, p = 0.018) and general symptoms (AOR = 2.690, p = 0.038) in comparison to those who are younger than 42. A longer service duration (>10 years) was significantly correlated with heightened odds of gastrointestinal symptoms (AOR = 3.509, p = 0.011) and general symptoms (AOR = 5.175, p = 0.002). Furthermore, driving more than 48 hours weekly was significantly linked to a decreased risk of general symptoms (AOR = 0.216, p = 0.004). Participants who drove over 150 km per shift showed significantly lower odds of experiencing gastrointestinal (AOR = 0.079, p = 0.002) and general symptoms (AOR =

0.059, p = 0.001). Eating habits and the duration of driving did not show a significant association with musculoskeletal symptoms. These results suggest that age, length of service, and travel distance play a significant role in influencing the health outcomes of drivers.

DISCUSSION

This cross-sectional study involved 223 urban bus drivers working for the Tamil Nadu State Transport Corporation, aiming to identify occupational and lifestyle factors linked to health hazards. The average age of the participants was 42.9 ± 6.7 years, which closely aligns with the results of a study conducted among bus drivers in Chennai (mean age: 43.2 years) [6].

A significant percentage (56%) of the participants reported irregular eating habits, such as meal skipping, consistent with earlier findings in Tamil Nadu [7]. These inconsistent dietary patterns are likely a result of demanding schedules, extended hours on duty, and limited access to timely meals during work shifts.

The study revealed that 44.90% of drivers experienced musculoskeletal symptoms, which were significantly associated with advancing age ($p<0.05$). This is consistent with research conducted in Nagpur, which indicated a high prevalence of musculoskeletal disorders (MSDs) among older drivers [8]. Furthermore, 40.60% of participants reported gastrointestinal symptoms, including regurgitation, heartburn, and dyspepsia, similar to a study in Chennai where 40% of drivers reported comparable issues [9].

Multivariate logistic regression analysis indicated that drivers older than 42 years had significantly higher odds of experiencing musculoskeletal and general symptoms (AOR = 2.83 and 2.69 respectively), reflecting findings from a study in South Kolkata [10]. While previous research from Nagpur identified age, duration of service, average distance, and driving hours as significant predictors of musculoskeletal symptoms [11], our study determined that age alone was the most consistent factor across all health symptom domains. Importantly, a longer duration of service (>10 years) and an average driving distance per shift (>150 km) were significantly associated with general and gastrointestinal symptoms ($p<0.05$), highlighting the chronic strain associated with prolonged service in this field.

Night shifts, irregular routines, and extended driving durations (>48 hours/week) were also significant contributors to adverse health outcomes, as supported by other studies highlighting the negative effects of long driving hours on physical and mental health [12,13].

CONCLUSION

This research underscores that a considerable number of urban bus drivers experience occupational health risks, particularly musculoskeletal issues (44.90%) and general symptoms (40.60%), with gastrointestinal problems (17.8%) following. Factors such as advancing age, extended service duration, increased driving hours, and irregular lifestyle habits have been identified as significant contributors. These results indicate an immediate necessity for occupational health measures, which should include regular health assessments, ergonomic training, organized work–rest schedules, and educational initiatives aimed at promoting lifestyle changes. As essential service providers, bus drivers play a crucial role in public safety and urban transit; thus, safeguarding their health is of utmost societal significance.

STRENGTHS

- The research encompassed an extensive profiling of symptoms across three primary health domains: musculoskeletal, gastrointestinal, and general.
- It employed multinomial logistic regression, facilitating the identification of various independent predictors across different symptom types.
- The incorporation of occupational factors, including average driving distance and night shifts, enhances the practical relevance of the findings for reforms in transport policy.

LIMITATIONS

- As this is a single-center cross-sectional study, the findings may not be applicable to other areas or the private bus industry.
- The study did not include private bus drivers or inter-district/state drivers, which restricts the wider relevance of the results.
- Clinical examination was performed, additional diagnostic evaluations (such as imaging or laboratory tests) could offer a more comprehensive insight into the underlying health issues.

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