

Research Article

Musculoskeletal Disorder and Ergonomic Hazard Safety Practices Among Commercial Tricycle Drivers in Ibadan North Local Government Area, Oyo State, Nigeria

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Abstract

Musculoskeletal disorders (MSDs) among tricycle drivers present major occupational health challenges, often attributed to ergonomic hazards and poor safety practices. Studies have documented MSDs among commercial tricycle drivers, but its ergonomic hazards safety practices had not been adequately documented. This study was therefore designed to document musculoskeletal disorder and ergonomic hazards safety practices among commercial tricycle drivers in Ibadan North Local Government Area, Oyo State, Nigeria. This is a cross-sectional study which utilized a 3-stage random sampling technique to select wards, parks and 277 commercial tricycle drivers. A validated, semi-structured questionnaire was used to collect data on respondents' socio-demographic characteristics; work related factors; and occurrence, patterns and episodes of MSDs and ergonomic hazards safety practices. Data were analyzed using descriptive statistics and chi-square at $p=0.05$. Respondents' mean age was 37.0 ± 9.0 years while 61.7% worked for more than 8 hours in a week. More than half (54.2%) acquired brand new tricycles while 64.6% said they made use of proper seat adjustment. Majority (96.4%) of the respondents reported that they experienced discomfort or pain in their muscles or joints while driving. The mean ergonomic hazards safety practices was 5.4 ± 1.7 , while 71.1% had poor ergonomic hazard safety practices. Significantly, 80.3% of respondents who drove fairly-used tricycle had poor ergonomic hazards safety practices compared to 69.3% of their counterparts who rode brand new tricycles. Furthermore, 81.0% of the respondents who used back support during operation had poor ergonomic hazards safety practices compared to 69.2% of those who used proper seat adjustment during operation. Most of the respondents had experienced discomfort in their muscles or joints; most respondents had adjusted their tricycles to enhance comfort while majority had poor ergonomic hazard safety practices. Therefore, implementing interventions aimed at improving drivers' comfort during tricycle operation is crucial for reducing musculoskeletal disorder occurrences.

Keywords

Musculoskeletal Disorder, Ergonomic Hazard, Safety Practices

1. Introduction

Musculoskeletal Disorders (MSDs) are group of painful disorders that affect the soft tissues of various joints such as neck, shoulder, elbow, hand, wrist, knee, and foot depending

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on the type of activity in which one is involved [1]. The disorders can be inflammatory or degenerative type affecting various tissues and joints due to a single or cumulative trauma [2]. Musculoskeletal disorders (MSDs) are among the most prevalent occupational health problems worldwide, especially among workers exposed to repetitive movements, awkward postures, vibration, and prolonged sitting [3, 4].

Commercial tricycle driving, a growing means of transportation in many Nigerian cities, exposes drivers to multiple ergonomic hazards due to long hours of operation, poor vehicle design, and inadequate safety practices. These factors can lead to chronic pain, reduced productivity, and diminished quality of life [5]. In Nigeria, the commercial tricycle driving is a predominantly male occupation, providing livelihood opportunities for many urban dwellers with varying educational backgrounds [6, 7]. Despite its socio-economic importance, the occupation presents significant ergonomic and health challenges. Prolonged driving, frequent braking, poor road conditions, and modifications to tricycles to enhance comfort have been linked to MSDs among operators [3, 8, 9]. Furthermore, tricycle designs often do not reflect the anthropometric characteristics of local users, leading to mismatched seating postures and increased biomechanical strain [5].

Previous studies have reported that ergonomic awareness and safety practices among commercial drivers remain suboptimal, even when knowledge of ergonomic principles exists [10]. Poor ergonomic adherence, combined with the use of fairly-used tricycles and absence of structured rest breaks, increases the likelihood of MSDs [11]. While some research has explored musculoskeletal problems among motorcyclists and drivers, limited evidence exists on ergonomic hazard safety practices specifically among commercial tricycle drivers in urban Nigeria.

Furthermore, there is a dearth of localized research on the prevalence of MSDs and ergonomic safety measures among commercial tricycle drivers, especially in Ibadan North LGA. Existing research has mainly focused on other transport groups, leaving little data on how ergonomic risks specifically impact tricycle drivers. As a result, the relationship between ergonomic practices and the occurrence of MSDs in this rapidly growing workforce remains understudied. Therefore, this study was designed to document the prevalence of musculoskeletal disorders and assess ergonomic hazard safety practices among commercial tricycle drivers in Ibadan North Local Government Area, Oyo State, Nigeria.

2. Methodology

2.1. Study Area

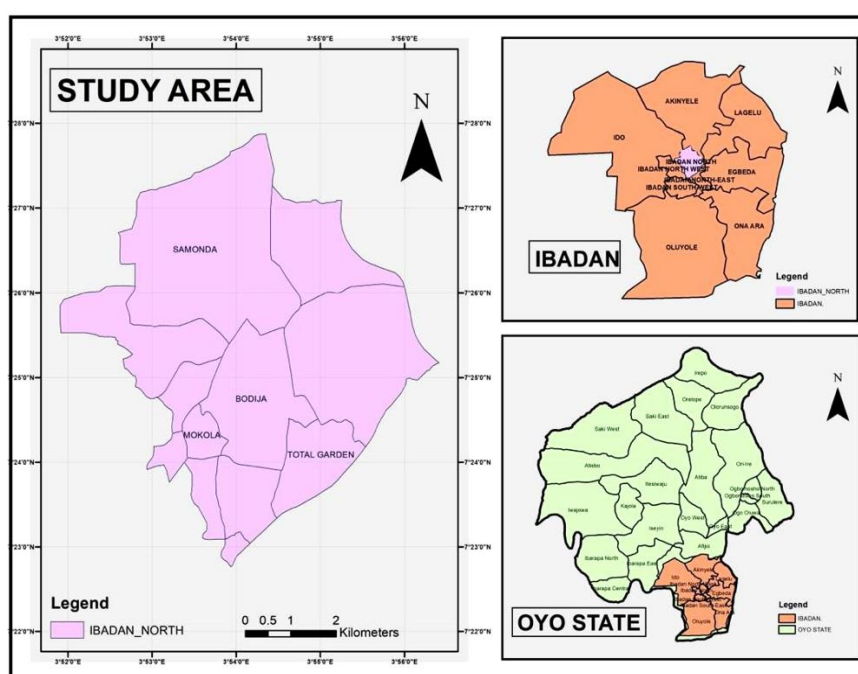


Figure 1. Map of Ibadan North Showing the Ward Areas Covered.

The study was carried out among commercial tricycle driv-

ers in Ibadan North Local Government Area of Oyo State, Nigeria (Figure 1). Ibadan North Local Government Area was

created in 1991, from the sub-division of Ibadan Municipal Government (IMG). It is located between longitude 3°53' and 3°56' East of Greenwich meridian and latitude 7°23' and 7°29'. It is an urban area bounded in the north by Akinyele Local Government, in the east by Ibadan North-East Local Government and in the west by Ido Local Government. Its headquarters is located at Agodi and covers an area of 145.58 km². Population of the local government, according to 2006 census, was 308,119 while the projected population for the year 2022 was put at 440,400 at a 2.3% annual population upsurge [12].

The LGA is quite densely built up, featuring both older/traditional sectors and more modern neighborhoods. It has multiple political wards (administrative subdivisions) that serve local governance. Some well-known constituents of the local government include Oyo State Secretariat, Sango, Bodija, University of Ibadan, University College Hospital (UCH), Ibadan National Museum, and Bower's Tower. The LGA includes a mix of residential, commercial, and institutional facilities, with vibrant marketplaces and vital transportation links, such as Iwo Road and Ojoo, facilitating movement across the city. Given its prominent location, there is a substantial infrastructure designed to support urban living, including a number of banks, hotels, restaurants, and recreational areas. Being a prominent part of the Southwest Nigeria, the area is predominantly populated by the Yoruba ethnic group. Notwithstanding, with the multi-ethnic characteristic of Nigeria, the study site accommodates people from other ethnic diversities.

2.2. Study Design and Population

This study adopted a cross-sectional design using a validated semi-structured questionnaire to collect data. Tricycle drivers who gave informed consent and had been operating tricycles for at least six months in the study area were interviewed.

2.3. Sampling Method and Data Collection Instrument

A 3-stage random sampling technique was used to select wards, parks and 277 commercial tricycle drivers within Ibadan North Local Government Area. A validated, interviewer administered, semi-structured questionnaire was used to collect data on respondents' socio-demographic characteristics; work related factors; and occurrence, patterns and episodes of MSDs and ergonomic hazards safety practices. Ergonomic hazards safety practices (EHSPs) among commercial tricycle drivers are the practices and behaviors followed by the drivers to reduce their exposure to ergonomic hazards during tricycle operation hours. These practices were assessed using ten items on the questionnaire. The items include: comfortability of tricycle's seat, difficulty of using handlebars during driving, discomfort experience associated with driving, experiencing pain

exclusively associated old tricycles, leaning forward as the only posture in driving tricycles, etc. Thereafter, points were assigned to each of the items.

Ergonomic hazards safety practices score was computed and categorized as poor safety practices (scores <5) and good safety practices (scores ≥5). The instrument was developed from the review of literature and was reviewed by professionals in the fields of occupational health and environmental health, and their comments were utilized to enhance its quality. Additionally, thirty commercial tricycle drivers in Ibadan Southwest Local Government area pretested the questionnaire. The completed questionnaire was subjected to reliability testing using the Cronbach Alpha technique, yielding a coefficient of 0.793. Ambiguous and misinterpreted questions were identified and modified before the commencement of data collection.

2.4. Data Collection Method

Before the commencement of data collection, a meeting was held with the tricycle drivers' association executives in the study area to obtain permission. During the meeting, investigators explained the purpose and the benefit of the study, and sought the association's support to ensure smooth data collection. Furthermore, the association's executives were encouraged to inform all the association members and stakeholder that the study would not cause any risk to their health. This is to ensure that the tricycle drivers' association executives and members understood all aspects of the study and could individually take informed consent. Interviews were carried out by seven (7) Research Assistants (RAs) who were university graduates and acquainted with survey. They were recruited and trained on efficient questionnaire administration to respondents. Completed and signed informed consent forms were collected from the association's executives and respondents before the interview.

2.5. Data Analysis

Completed questionnaire copies were checked for completeness on each day, and were assigned serial numbers. Data were subsequently cleaned, coded and entered into the Statistical Package for Social Sciences (SPSS) software (SPSS version 27) for analysis. Descriptive statistics was carried out to obtain frequency, percentages, mean and standard deviation. Chi-square test was used to test for statistical association between socio-demographic characteristics, work related information and categories of ergonomic hazards safety practices. The level of statistical significance was set at $\alpha=0.05$.

2.6. Ethical Consideration

The study received ethical approval from the Oyo State Ministry of Health Research Ethics Committee (HREC) under registration number NHREC/OYOSHRIEC/10/11/22. Permission was obtained from the association's executives while

informed consent was collected from the participants prior to the interview.

3. Results

3.1. Socio-demographic Characteristics

Table 1 presents the socio-demographic characteristics of the commercial tricycle drivers. Respondents' mean age was 37.6 ± 9.0 years, there were more male drivers (88.8%) than female (11.2%). Two hundred and thirty-two (83.8%) respondents were married while 51.3% practiced Islam. Majority (68.6%) of them had completed secondary school, 73.3% said that they earned less than ₦10,000 per day while 37.2% engaged in other income-generating activities such as trading (28.5%), artisanship (5.8%) and agency (2.9%).

Table 1. Socio -Demographic Characteristics.

Demographic characteristics	Fre- quency	Percent- age
Age in years		
≤ 20	7	2.5
21-30	57	20.6
31-40	121	43.7
41-50	70	25.3
51 and above	22	7.9
Mean $\pm$ SD = 37.6 ± 9.0 years		
Gender		
Male	246	88.8
Female	31	11.2
Marital Status		
Single	33	11.9
Married	232	83.8
Divorced	12	4.3
Religion		
Christianity	129	46.6
Islam	142	51.3
Others	6	2.1
Educational Level		
Primary	20	7.2
Secondary	190	68.6
Tertiary	67	24.2
Average Income		

Demographic characteristics	Fre- quency	Percent- age
Age in years		
≤ ₦10,000	203	73.3
> ₦10,000	74	26.7
Other Income generating activities		
Trading	79	28.5
Artisanship	16	5.8
Agency	8	2.9

3.2. Work-related Information

Work-related information items are presented in Table 2. Majority (61.7%) of the participants said they worked for more than eight (8) hours in a week, 65.7% had been driving tricycle for five (5) years or less while 54.2% drove brand new tricycles. Majority (74.0%) of the riders stated that they plied tarred road while 64.6% said they made use of proper seat adjustment to their tricycle.

Table 2. Work-related Information.

Variables	Fre- quency	Percent- age
Average hours worked per day		
8 hours	106	38.3
> 8 hours	171	61.7
Years of experience driving tricycle		
≤ 5	182	65.7
>5	95	34.3
Types of tricycle		
Brand new	150	54.2
Fairly used	127	45.8
Road conditions typically encountered		
Tarred road	205	74.0
Untarred road	72	26.0
Adjustment to tricycle		
Proper seat adjustment	179	64.6
Use of back support	98	35.4

3.3. Patterns of MSDs Among Tricycle Drivers

Table 3 presents results on the patterns of MSDs among respondents. Majority (96.4%) of the respondents reported that they experienced discomfort or pain in their muscles or joints while driving, 39.4% said they experienced mild discomfort, 41.2% experienced moderate discomfort while 15.8% said they usually experienced severe discomfort. Some (40.9%) of the respondents reported that they usually experienced discomfort

more in the upper limbs, 35.8% reported discomfort in the lower back while 16.6% said they experienced discomfort in the knee joint. More than half (59.4%) of the respondents reported that they always involved in particular activities that triggered MSDs during riding. The three major suggestions to reduce MSDs mentioned by the tricycle drivers were: take enough rest (45.9%), take medication (22.8%) and government should repair bad roads (12.8%).

Table 3. Patterns of MSDs Among Tricycle Drivers.

Variables	Frequency	Percentage
Ever experienced any discomfort or pain in muscles or joints while riding	267	96.4
Type of discomfort experienced		
Mild	109	39.4
Moderate	114	41.2
Severe	44	15.8
Location of the body that experienced the discomfort		
Upper limbs	190	40.9
Lower back	166	35.8
Knee joint	77	16.6
Others	31	6.7
Involved in activities that trigger musculoskeletal issues during your driving	165	59.4
Suggestions to reducing MSDs among tricycle riders		
Take enough rest	147	45.9
Take medication	73	22.8
Government should repair bad roads	41	12.8
Lots of exercise	34	10.6
Fix faulty tricycle	25	7.8

3.4. Activities That Trigger Ergonomic Hazards Among Tricycle Drivers

Information pieces on work-related activities that trigger musculoskeletal disorders among drivers are presented in Table 4. The three major activities mentioned by the respondents

were: high frequency of break application during driving shifts (78.3%), use of old tricycles (62.5%) and presence of modifications on the tricycle to improve comfort (59.2%). Other activities reported were leaning forward driving posture on the tricycle (42.2%), use of many accessories on tricycle to enhance comfort (39.4%) and difficulty in using the handle-bars of tricycles during driving (26.4%).

Table 4. Activities that Triggers MSDs among the Tricycle Drivers.

Activities	Frequency	Percentage
High frequency of break application during driving shifts	217	78.3

Activities	Frequency	Percentage
Use of old tricycles	173	62.5
Presence of modifications on the tricycle to improve comfort	164	59.2
Leaning forward driving posture on the tricycle	117	42.2
Usage of many accessories on the tricycle to enhance comfort	109	39.4
Difficulty in using the handlebars of tricycles during driving	73	26.4

3.5. Ergonomic Hazards Safety Practices

Ergonomic hazards safety practices among the respondents is presented in Table 5. It was found that 76.2% respondents reported that the seat of their tricycle was always comfortable, 26.4% said that the handlebars of tricycles were difficult to use during driving while 41.2% stated that driving brought discomfort experience. Majority (62.5%) said only old tricycles contribute to the driver experiencing pain during driving, 42.2% reported that typical driving posture on the tricycle usually characterized by leaning forward while 78.3% said they usually avoided sitting for too long without breaks.

About twenty-eight percent (28.2%) said driving during rainfall affected their comfort and well-being, 24.2% stated that extreme heat impacted their comfort and well-being during driving, 39.4% said that they had utilized accessories on their tricycle to enhance comfort and reduce musculoskeletal strain while 59.2% reported that currently, they had modifications on their tricycle to improve comfort and minimize musculoskeletal strain. The mean ergonomic hazards safety practices was 5.4 ± 1.7 ; seventy-one percent (71.1%) had poor

safety practices as depicted in Figure 2.

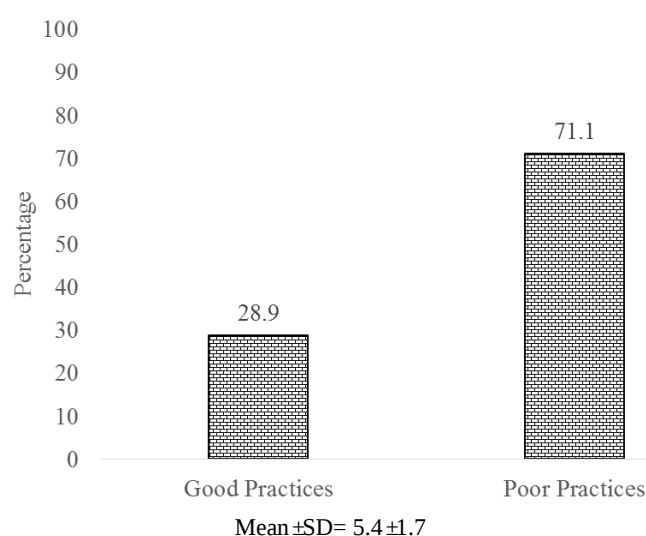


Figure 2. Category of Ergonomics Hazard Safety Practice.

Table 5. Ergonomic Hazards Safety Practices.

Practices	Yes (%)	No (%)
Seat of my tricycle is always comfortable	211 (76.2)	66 (23.8)
Handlebars of tricycles are difficult to use during driving	73 (26.4)	204 (73.6)
Driving brings discomfort experience	114 (41.2)	163 (58.8)
Only old tricycles contribute to the driver experiencing pain during driving	173 (62.5)	104 (37.5)
Leaning forward is the only driving posture on the tricycle	117 (42.2)	160 (57.8)
I usually avoid sitting for too long without breaks	217 (78.3)	60 (21.7)
Driving during rainfall affects comfort and well-being	78 (28.2)	199 (71.8)
Extreme heat impacts your comfort and well-being during driving	67 (24.2)	210 (75.8)
I have utilized accessories on my tricycle to enhance comfort and reduce musculoskeletal strain	109 (39.4)	168 (60.6)
Currently I have modifications on my tricycle to improve comfort and minimize musculoskeletal strain	164 (59.2)	113 (40.8)

3.6. Comparison Between Socio-demographic Characteristics, Work-related Information and Ergonomic Hazards Safety Practices

Association between socio-demographic characteristics, work-related information and category of ergonomic hazards safety practices is presented in Table 6. There were no significant association between respondents' gender, educational level and average income and category of ergonomic hazards

safety practices. Similarly, respondent's working hour per day and years of experience driving tricycle were not significantly associated with category of ergonomic hazards safety practices. However, 80.3% of respondents who rode fairly-used tricycle significantly had poor ergonomic hazards safety practices compared to 69.3% of their counterparts who drove brand new tricycle. Significantly, 81.0% of the respondents who used back support during operation had poor ergonomic hazards safety practices compared to 69.2% of those who used proper seat adjustment during operation.

Table 6. Comparison Between Socio-demographic Characteristics, Work-related Information and Category of Ergonomic Hazards Safety Practices.

Demographic characteristics	Category of ergonomic hazards safety practices			χ^2 (p-value)
	Poor (%)	Good (%)	Total (%)	
Gender				
Male	183 (74.4)	63 (25.6)	246 (100)	0.001 (0.981)
Female	23 (74.2)	8 (25.8)	31 (100)	
Educational Level				
Primary	15 (75.0)	5 (25.0)	20 (100)	0.831 (0.660)
Secondary	144 (75.8)	46 (24.2)	190 (100)	
Tertiary	47 (70.1)	20 (29.9)	67 (100)	
Average Income				
≤ ₦ 10,000	155 (76.4)	48 (23.6)	203 (100)	1.573 (0.210)
> ₦ 10,000	51 (68.9)	23 (31.1)	74 (100)	
Average hours worked per day				
8 hours	126 (75.9)	40 (24.1)	166 (100)	0.512 (0.474)
> 8 hours	80 (72.1)	31 (27.9)	111 (100)	
Years of experience riding tricycle				
≤ 5	61 (72.6)	23 (27.4)	84 (100)	0.194 (0.660)
> 5	145 (75.1)	48 (24.9)	193 (100)	
Types of tricycle				
Brand new	104 (69.3)	46 (30.7)	150 (100)	4.351 (0.037)
Fairly used	102 (80.3)	25 (19.7)	127 (100)	
Road conditions typically encountered				
Tarred road	166 (74.1)	58 (25.9)	224 (100)	0.042 (0.838)
Untarred road	40 (75.5)	13 (24.5)	53 (100)	
Adjustment to tricycle				
Proper seat adjustment	108 (69.2)	48 (30.8)	156 (100)	4.945 (0.026)
Use of back support	98 (81.0)	23 (19.0)	121 (100)	

4. Discussion

This study documented musculoskeletal disorder and ergonomic hazards safety practices among urban commercial tricycle drivers in Ibadan North Local Government Area, Oyo State, Nigeria. The study found that there were more male drivers than female. This finding reflects the male-dominated nature of the driving profession in Nigeria. A previous study has reported similar findings among commercial motorcyclists in Nigeria [13]. A large percentage had completed secondary education. This is relatively high level of schooling compared to some earlier report [14]. Higher educational attainment among commercial tricycle drivers may also affect their awareness of risks, safety behaviors, or openness to regulation/training.

A great proportion of the participants worked for more than eight (8) hours in a week. A previous study on occupational hazards among tricycle drivers has established association between working 5-8 hours per day and high incidence of back pain [15]. The finding thus suggests that a large portion of the workforce is under significant temporal working pressure, which may compromise both their safety and wellbeing. Extended working hours among commercial drivers and repetitive movements might be linked to a heightened risk of MSDs, emphasizing the importance of ergonomic interventions and regular breaks.

More than half of the respondents drove brand new tricycles. This is a notable statistics as new vehicles are likely to have fewer mechanical issues, better reliability, potentially better safety features (depending on model) and may reflect investment/income capacity of the driver. A large proportion made use of proper seat adjustment to their tricycle. Seat ergonomics and correct seating posture are important for driver's comfort, fatigue reduction, musculoskeletal health, and indirectly for safe vehicle control. Proper seat adjustment has been reported to contribute to better driver posture, less fatigue, better view/control, and potentially lowers the risk of accidents related to discomfort or loss of control [16].

Data analysis from the study reveals that most of the respondents experienced discomfort or pain in their muscles or joints while driving. Many respondents usually experienced discomfort more in the upper limbs, lower back and the knee joint. This findings is consistence with a recent study that reported high MSDs burden among tricycle-type drivers in Ethiopia [17]. The lower back might be vulnerable due to improper lifting techniques, awkward driving postures, and repetitive movements. These findings align with the report of previous studies that documented pattern of distribution of discomfort by body region among motorcyclists/tricycle drivers [8, 9, 18]. Mismatched seating leads to leg/back pain and driver's discomfort which can impair driving performance [16].

The study found that more than half of the respondents always involved in particular activities that triggered MSDs during driving including: high frequency of brake application

during driving shifts; use of old tricycles; and presence of modifications on the tricycle to improve comfort. The use of fairly-used vehicles could be a potential contributor to ergonomic challenges. Also, poor road conditions, including stony and uneven surfaces, could exacerbate whole-body vibration and fatigue, and further increase the risk of MSDs. Commercial tricycle drivers had been reported to be prone to the risk of developing musculoskeletal disorders due to awkward posture because of prolonged sitting, long-term exposure to whole-body vibration, and driving over bumps on rough road surfaces [15].

Data analysis reveals other activities to include leaning forward driving posture on the tricycle, use of many accessories on tricycle to enhance comfort, and difficulty in using the handlebars of tricycles during driving. Previous study had linked tricycle design and modification to ergonomic hazards [4]. A large proportion of the respondents reported that currently, they had modifications on their tricycles to improve comfort to minimize musculoskeletal strain. This is an indication that imported tricycle manufacturers might not consider the body size of local users during production. A study has highlighted that vehicle design not tailored to the anthropometry of Nigerian riders contributes to stress and discomfort [18].

A great percentage of the respondents had poor ergonomic hazards safety practices. This suggests that though many drivers reported some comfort measures, the majority (71.1%) still exhibited poor safety practices regarding ergonomic hazards. Poor safety/ergonomic practice is a major contributor to musculoskeletal risk in occupational settings. This is in consonance with a previous study among Nigerian physiotherapists where knowledge of ergonomic principles was high but poor safety/practice was exhibited [10].

The study found no significant association between respondents' gender, educational level and average income and category of ergonomic hazards safety practices. Furthermore, respondent's working hour per day and years of experience driving tricycle were not significantly associated with category of ergonomic hazards safety practices. This suggests that these socio-demographic and basic work-exposure variables may not be the primary determinants of whether a rider adopts good ergonomic safety practices in this population. However, several respondents who drove brand new tricycles significantly had good ergonomic hazards safety practices compared to their counterparts who drove fairly-used tricycles.

Brand new tricycles may offer better ergonomics, more adjustability, better controls, less vibration, making it easier for riders to adopt safe ergonomic practices. This finding supports the notion that equipment condition and design significantly influence ergonomic behavior and risk. This is in line with the finding of a previous study of commercial mini-bus drivers in Nigeria which found that constrained working posture and vehicle design were key determinants of musculoskeletal disorders [19]. Also, more respondents who drove tricycles using proper seat adjustment had good ergonomic hazards safety

practices compared to those who used back support during operation. Proper seat adjustment may be a more holistic, proactive ergonomic behavior (adjusting the vehicle to fit the driver) rather than simply adding a back support accessory. The finding suggests that when drivers engage in the foundational ergonomic practice of adjusting their seating workstation, they may also be more likely to practice other favorable ergonomic behaviors.

However, the authors acknowledge the study was limited by its reliance on self-reported information, which could include recollection or response bias with relation to musculoskeletal complaints and ergonomic practices. Establishing causal links between occupational risks and musculoskeletal illnesses is further limited by the cross-sectional approach. Furthermore, the study's focus on commercial tricycle drivers in Ibadan North LGA may restrict the findings' applicability to other regions with distinct road conditions or work schedules. The accuracy of the results may also be impacted by differences in respondents' comprehension of ergonomic principles and the possible impact of unmeasured variables such as pre-existing medical issues.

5. Conclusion

This study has revealed a high prevalence of musculoskeletal discomfort and poor ergonomic hazards safety practices among urban commercial tricycle drivers in Ibadan North LGA. Despite moderate awareness of ergonomics, most drivers reported activities and postures that predisposed them to musculoskeletal strain, particularly from prolonged sitting, frequent braking, and the use of modified or fairly-used tricycles. The condition and design of the tricycle, rather than socio-demographic factors, were key determinants of ergonomic practices, underscoring the influence of equipment ergonomics on occupational health outcomes. There is a need to enforce ergonomic standards for tricycle design and usage, while encouraging periodic health screening and ergonomic assessments for drivers to identify and manage early symptoms of MSDs and promote preventive measures.

Abbreviations

LGA	Local Government Area
EHSP	Ergonomic Hazards Safety Practices
MSDs	Musculoskeletal Disorders
HREC	Health Research Ethics Committee

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Author Contributions

Mumuni Adejumo: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – review & editing

Damilola Olagbenjo Abiodun: Conceptualization, Data curation, Formal Analysis, Investigation, Resources, Software, Validation, Visualization, Writing – original draft

Shade John Akinsete: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

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