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Original Article

Burden of Metabolic Syndrome and Associated Factors among Commercial Motor Drivers in Zaria, Nigeria

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Abstract

Background: Metabolic syndrome is a cluster of cardiometabolic abnormalities that increases the risk of cardiovascular disease, type 2 diabetes mellitus and chronic kidney disease. Commercial motor drivers are an occupational group particularly predisposed to metabolic syndrome due to sedentary work patterns, prolonged driving hours and unhealthy lifestyle practices. Data on metabolic syndrome among commercial drivers in northern Nigeria are limited. The study objective is to determine the prevalence of metabolic syndrome and its associated factors among commercial motor drivers in Zaria, Nigeria.

Methodology: A cross-sectional study was conducted among 238 commercial motor drivers in Zaria. Sociodemographic data were collected using a structured questionnaire. Blood pressure, anthropometric indices, random blood glucose and urine protein were measured. Metabolic syndrome was defined using a modified World Health Organization criterion as the presence of diabetes mellitus plus at least one of the following: hypertension, obesity or proteinuria. Data were analyzed using descriptive statistics and logistic regression, with statistical significance set at $p < 0.05$.

Results: All respondents were male, with a mean age of 42.3 ± 12.3 years. The prevalence of diabetes mellitus was 6.3%, hypertension 58.0%, obesity 16.4% and proteinuria 22.7%. Metabolic syndrome was present in 14 of 224 respondents (prevalence of 5.9%). Diabetes mellitus was significantly associated with hypertension (OR = 5.10; p = 0.028) and obesity (OR = 3.84; p = 0.011) on bivariate analysis. Metabolic syndrome was more prevalent among drivers aged over 40 years and those with more than 20 years of driving experience, although these associations were not independent predictors on multivariate analysis.

Conclusion: The prevalence of metabolic syndrome among commercial motor drivers in Zaria was relatively low using the modified WHO criteria; however, there was a high burden of individual cardiometabolic risk factors, particularly hypertension and proteinuria.

Keywords: Commercial motor drivers; Diabetes mellitus; Hypertension; Metabolic syndrome; Nigeria; Zaria.

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Introduction

Metabolic syndrome (MetS) is a clustering of interrelated cardiometabolic abnormalities, including hyperglycaemia, hypertension, central obesity, and renal or lipid abnormalities, which together markedly increase the risk of type 2 diabetes mellitus, cardiovascular disease, and chronic kidney disease [1,2]. Globally, the burden of metabolic syndrome has risen substantially over recent decades, driven by increasing urbanisation, sedentary lifestyles, unhealthy dietary patterns, and population ageing, making it a major public health concern [1,11].

Low- and middle-income countries, including Nigeria, are experiencing a rapid epidemiological transition characterised by a growing prevalence of non-communicable diseases alongside persistent infectious diseases [3,4]. In Nigeria, several studies and systematic reviews have documented a rising prevalence of cardiometabolic risk factors such as hypertension, obesity, and impaired glucose metabolism, which contribute significantly to morbidity and premature mortality [3,4,9]. Hypertension in particular has emerged as a dominant public health challenge in sub-Saharan Africa, with poor awareness, low treatment rates, and suboptimal control [4,9].

Commercial motor drivers represent a high-risk occupational group for metabolic syndrome due to prolonged sedentary work, irregular working hours, occupational stress, poor dietary habits, physical inactivity, and limited access to preventive healthcare services [5,14]. These factors predispose drivers to hypertension, obesity, and glucose dysregulation, which are central components of metabolic syndrome. Studies among commercial drivers in different parts of Nigeria have consistently reported a high prevalence of hypertension and other cardiometabolic risk factors, although reported prevalence rates of metabolic syndrome vary widely depending on diagnostic criteria used [5,8–10].

The World Health Organization (WHO) definition of metabolic syndrome places insulin resistance or diabetes mellitus as a mandatory component, with additional criteria including hypertension, obesity, dyslipidaemia, or microalbuminuria [11]. However, in many resource-limited settings, routine lipid profiling and quantitative assessment of microalbuminuria are often unavailable, necessitating the use of modified diagnostic approaches. Such adaptations, while pragmatic, influence reported prevalence rates and must be clearly acknowledged in interpretation [11].

Data on metabolic syndrome among commercial motor drivers in northern Nigeria, particularly Zaria, remain limited. Moreover, few studies have incorporated renal markers such as proteinuria, despite growing evidence linking early kidney damage to increased cardiovascular risk [7,12,13]. Understanding the burden and pattern of metabolic syndrome and its components in this occupational group is essential for informing targeted screening, prevention, and workplace health interventions. This study, therefore, assessed the prevalence of metabolic syndrome and its associated factors among commercial motor drivers in Zaria, Nigeria, using a modified WHO criterion that excluded lipid parameters due to resource constraints.

Methodology

Study design and setting

This was a cross-sectional descriptive study conducted among commercial motor drivers in Zaria, Kaduna State, north-western Nigeria. Zaria is a major urban center with a large population of commercial drivers engaged in intra- and inter-city transportation.

Study population

The study population comprised registered commercial motor drivers operating within designated motor parks in Zaria. All participants were adult males aged 18 years and above who had been actively engaged in commercial driving for at least one year.

Sample size and sampling technique

A total of 238 commercial motor drivers participated in the study. Eligible respondents were recruited using a multistage sampling technique involving the selection of motor parks followed by systematic recruitment of drivers who consented to participate.

Data collection

Data were collected using a structured interviewer-administered questionnaire capturing sociodemographic characteristics, driving history and self-reported history of diabetes or hypertension.

Clinical and laboratory measurements

Blood pressure was measured using a standard mercury sphygmomanometer after the participant had rested for at least five minutes. Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or a prior diagnosis of hypertension.

Anthropometric measurements included weight, height and waist circumference. Obesity was defined as body mass index (BMI) ≥ 30 kg/m² and/or waist circumference > 102 cm.

Random blood glucose was measured using a glucometer. Diabetes mellitus was defined as a known diagnosis of diabetes and/or random blood glucose ≥ 11.1 mmol/L.

Proteinuria was assessed using a urine dipstick test, with any positive result (≥ 1+) regarded as abnormal.

Definition of metabolic syndrome

Metabolic syndrome was defined using a modified WHO criterion as the presence of diabetes mellitus plus at least one of the following: hypertension, obesity or proteinuria. Lipid parameters were not included due to resource limitations.

Data analysis

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize variables. Associations were assessed using chi-square tests and odds ratios with 95% confidence intervals. Binary logistic regression was performed to identify independent predictors of diabetes mellitus and metabolic syndrome. Statistical significance was set at $p < 0.05$.

Ethical considerations

Ethical approval was obtained from the Ethical and Scientific review panel of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria (Ref No ABUTH/HREC/JOS/2013) and that of the Ministry of Health, Kaduna, Kaduna State. Written informed consent was obtained from all participants, and confidentiality was maintained throughout the study.

Results

Sociodemographic characteristics of respondents

A total of 238 commercial motor drivers participated in the study. All respondents were male, with a mean age of 42.3 ± 12.3 years (range: 20–76 years). The majority (90.0%) were between 20 and 59 years of age, with the highest proportion in the 40–49-year age group (30.3%). Most participants were married (91.6%). Detailed sociodemographic characteristics are presented in Table 1.

Table 1: Demographic characteristics of commercial motor drivers in Zaria

Age group	**Frequency (%)**
20-29	35 (14.7)
30-39	63 (26.5)
40-49	72 (30.3)
50-59	44 (18.5)
60-69	17 (7.1)
70 and above	7 (2.9)
Gender	
Male	238 (100.0)
Female	0 (0.0)

Prevalence of components of metabolic syndrome

Using the modified WHO criteria, the prevalence of diabetes mellitus—defined as known diabetes and/or random blood glucose ≥ 11.1 mmol/L—was 6.3%. Hypertension—defined as blood pressure ≥ 140/90 mmHg and/or known hypertension—was present in 58.0% of respondents. Obesity—defined as body mass index ≥ 30 kg/m² and/or waist circumference > 102 cm—was observed in 16.4%, while proteinuria detected by urine dipstick was present in 22.7% of the drivers (Table 2).

Table 2: Frequency distribution of components of metabolic syndrome among commercial motor drivers in Zaria

Variable	**Frequency**	**Percentage**
Diabetic	15	6.3
Hypertension	138	58.0
Obesity	39	16.4
Proteinuria	54	22.7
Metabolic syndrome	14/224	5.9

Prevalence of metabolic syndrome

Metabolic syndrome, defined as the presence of diabetes mellitus plus at least one additional abnormality (hypertension, obesity, or proteinuria), was identified in 14 out of the 224 respondents with complete data, giving an overall prevalence of 5.9%.

Association between diabetes mellitus and other components of metabolic syndrome

On bivariate analysis, diabetes mellitus was significantly associated with hypertension (OR = 5.10; 95% CI: 1.12–23.11; p = 0.028) and obesity (OR = 3.84; 95% CI: 1.28–11.50; p = 0.011). There was no statistically significant association between diabetes mellitus and proteinuria (OR = 0.23; 95% CI: 0.03–1.78; p = 0.126) (Table 3).

Table 3: Relationship between Diabetes and other markers of metabolic syndrome in commercial motor drivers in Zaria

Variable		**Variable**		**Odd ratio**	**95% CI**	**P value**
	Responses	**No**	**Yes**			
	Hypertension					
Diabetes	No	98	25	5.096	1.124-23.114	0.028
	Yes	2	13			
	Obesity					
Diabetes	No	190	33	3.838	1.281-11.498	0.011
	Yes	9	6			
	Proteinuria					
Diabetes	No	170	53	0.229	0.029-1.783	0.126
	Yes	14	1			

Binary logistic regression analysis showed that none of the variables independently predicted diabetes mellitus after adjustment. Obesity demonstrated a borderline association (adjusted OR = 3.02; p = 0.054), while hypertension and proteinuria were not statistically significant predictors (Table 4).

Table 4: Binary logistic regression showing the relationship between Diabetes and other markers of metabolic syndrome in commercial motor drivers in Zaria

Variable	B	SE	Wald X^2	Df	P value	Exp (B)
Proteinuria	-0.685	1.159	0.350	1	0.554	0.504
Obesity	1.104	0.573	3.717	1	0.054	3.017
Hypertension	1.180	0.859	1.890	1	0.169	3.256
Constant	-4.865	1.050	21.471	1		

Sociodemographic correlates of metabolic syndrome

Bivariate analysis revealed that metabolic syndrome was significantly more prevalent among drivers aged 40 years and above compared to those younger than 40 years (OR = 4.50; 95% CI: 0.98–20.58; p = 0.035). Similarly, respondents with 20 years or more of driving experience had higher odds of metabolic syndrome compared with those who had driven for less than 20 years (OR = 4.23; 95% CI: 1.15–15.58; p = 0.020). Daily driving duration was not significantly associated with metabolic syndrome (p = 0.331) (Table 5).

Table 5: Relationship between metabolic syndrome and sociodemographic characteristics among Commercial motor drivers

Variable		Variable		Odd ratio	95% CI	P value
	Responses					
	Age	**< 40 years**	**≥ 40 years**			
Metabolic syndrome	No	96	128	4.500	0.984-20.578	0.035
	Yes	2	12			
	Duration of driving	**< 20 years**	**≥ 20 years**			
Metabolic syndrome	No	120	104	4.231	1.149-15.576	0.02
	Yes	3	11			
	Hours of driving	**≤ 8 hours**	**> 8 hours**			

Metabolic syndrome	No	114	110	0.576	0.187-1.772	0.331
	Yes	9	5			

However, on multivariate logistic regression analysis, age and duration of driving were not independently associated with metabolic syndrome after adjustment for potential confounders (Table 6).

Table 6: Binary logistic regression showing the relationship between metabolic syndrome and sociodemographic characteristics among Commercial motor drivers

Variable	B	SE	Wald X^2	Df	P value	Exp (B)
Age	0.737	1.005	0.538	1	0.463	2.090
Duration of driving	-1.073	0.868	1.528	1	0.216	0.342
Constant	-3.682	2.763	1.777	1	0.183	0.025

Discussion

This study assessed the prevalence of metabolic syndrome and its components among commercial motor drivers in Zaria using a modified WHO definition. The overall prevalence of metabolic syndrome was 5.9%, which is relatively low compared with reports from other Nigerian studies conducted among commercial drivers and the general adult population [8–10]. This lower prevalence is largely attributable to the diagnostic criteria employed, as the WHO definition requires diabetes mellitus as a mandatory component, and lipid parameters—which significantly increase prevalence estimates—were excluded in this study [11].

Hypertension was the most prevalent cardiometabolic abnormality, affecting 58.0% of respondents. This finding aligns with previous Nigerian studies and regional systematic reviews that have consistently reported a high burden of hypertension among commercial drivers and other adult populations in sub-Saharan Africa [5,9]. Occupational stress, prolonged sedentary behaviour, unhealthy dietary practices, and poor health-seeking behaviour are commonly observed among drivers and may account for this high prevalence. The finding underscores the need for routine blood pressure screening and targeted hypertension control programmes within motor parks.

The prevalence of diabetes mellitus (6.3%) observed in this study is comparable to reports among similar occupational and urban populations in Nigeria [10,12]. Diabetes mellitus was significantly associated with hypertension and obesity on bivariate analysis, highlighting the clustering of cardiometabolic risk factors characteristic of metabolic syndrome. Although these associations did not remain statistically significant after multivariate adjustment, obesity demonstrated a borderline association, reinforcing its central role in the pathophysiology of metabolic abnormalities [1,11].

Proteinuria was detected in 22.7% of respondents, indicating a substantial burden of possible early renal damage. This finding is concerning and is consistent with reports of a high prevalence of undiagnosed kidney disease in Nigeria [12]. Although proteinuria was not significantly associated with diabetes mellitus

or metabolic syndrome in this study, its presence may reflect underlying hypertensive nephropathy, early diabetic kidney disease, or other renal pathologies [7,13]. Incorporating simple urine dipstick testing into routine health screening for commercial drivers may facilitate early detection and referral, potentially reducing long-term renal and cardiovascular complications.

Metabolic syndrome was more prevalent among drivers aged 40 years and above and among those with 20 years or more of driving experience on bivariate analysis. This observation is biologically plausible, as cumulative exposure to occupational and lifestyle risk factors increases with age and duration of employment [6,14]. However, these variables were not independently associated with metabolic syndrome on multivariate analysis, possibly due to the relatively small number of respondents with metabolic syndrome, which may have limited statistical power.

Overall, the findings highlight the occupational vulnerability of commercial motor drivers to individual cardiometabolic risk factors, even in the context of a relatively low prevalence of metabolic syndrome when defined using strict WHO-based criteria. The study also underscores the significant impact of diagnostic definitions on reported prevalence rates and supports the need for context-appropriate but standardized screening approaches in resource-limited settings.

Limitations

The cross-sectional design precludes causal inference between metabolic syndrome and its associated factors; only associations can be described. Second, metabolic syndrome was defined using a modified WHO criterion due to resource constraints, with lipid parameters and quantitative microalbuminuria not assessed. This modification likely resulted in an underestimation of the true prevalence of metabolic syndrome and limits direct comparison with studies that applied other diagnostic definitions.

Third, the relatively small number of respondents with metabolic syndrome reduced the statistical power of multivariate analyses, leading to wide confidence intervals and limiting the identification of independent predictors. Fourth, diabetes mellitus was diagnosed using random blood glucose measurements rather than fasting plasma glucose or oral glucose tolerance testing, which may have resulted in misclassification. The diagnosis of Hypertension was also based on previous diagnosis and/or screening blood pressure record ≥ 140/90 mmHg, which longitudinal studies might need to have repeated readings. Finally, the study population consisted exclusively of male commercial motor drivers in Zaria, which limits the generalisability of the findings to female drivers, other occupational groups, or drivers in different geographic regions.

Recommendations

Despite the relatively low prevalence of metabolic syndrome observed using the modified WHO criteria, the high burden of individual cardiometabolic risk factors—particularly hypertension and proteinuria—underscores the need for targeted preventive interventions among commercial motor drivers. Routine health screening programmes incorporating blood pressure measurement, blood glucose testing, anthropometric assessment, and urine dipstick analysis should be implemented at motor parks to facilitate early detection and referral.

Health education programmes focusing on lifestyle modification should be integrated into occupational health initiatives for drivers. Collaboration between transport unions, public health authorities, and healthcare providers could enhance participation and sustainability of such interventions.

Future studies should employ longitudinal designs to better elucidate causal relationships between occupational exposures and cardiometabolic outcomes. Comprehensive assessment of metabolic syndrome using standardized criteria, including lipid profiling and quantitative measures of albuminuria, is recommended to improve accuracy and comparability. Larger multicentre studies involving diverse occupational groups and geographic regions would further enhance generalisability and inform national policy development.

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