ESI Preprints **Not Peer-reviewed**

Occupational Health Problems: An Assessment of the Cardiovascular Health Status of Road Construction Workers in Imo State, Nigeria

John Mark Bwala, PhDc
Agwu Nkwa Amadi, PhD
Chimezie Christian Iwuala, PhD
Federal University of Technology Owerri, Nigeria
Ugo Uwadiako Enebeli, PhD
University of Port Harcourt Teaching Hospital, Nigeria

Doi: 10.19044/esipreprint.6.2025.p408

Approved: 22 June 2025
Posted: 24 June 2025

Cite As:
Bwala J.M., Amadi A.N., Iwuala C.C. & Enebeli U.U. (2025). *Occupational Health Problems: An Assessment of the Cardiovascular Health Status of Road Construction Workers in Imo State, Nigeria.* ESI Preprints.
https://doi.org/10.19044/esipreprint.6.2025.p408

Abstract

Occupational health problems among road construction workers are a significant concern due to the hazardous nature of their work. Known to be uniquely demanding and highly stressful, road construction work has been linked to cardiovascular problems. This study assessed the cardiovascular health status of road construction workers in Imo State, Nigeria. Using a cross-sectional descriptive design, data were collected from 353 road construction workers through structured questionnaires and physical assessments, including blood pressure (BP) and pulse rate (PR) measurements. The findings revealed that all the road construction workers were males, 82 (23.2%) had systolic hypertension, 35 (9.9%) had diastolic hypertension, and 22 (6.2%) had tachycardia (elevated PR). However, 269(76.2%) did not have regular medical check-ups. Thus, a significant proportion of road construction workers had poor cardiovascular health status; however, they lacked access to regular medical check-ups and occupational health services. These findings underscore the urgent need for health education, workplace health promotion, and policy-driven interventions that aim at mitigating occupational risks and promoting

cardiovascular health among construction workers. The study recommends routine health screening and implementation of wellness programs to enhance workers' well-being. Addressing these occupational health challenges is crucial for improving productivity and safeguarding the health of road construction workers in Imo State and similar settings.

Keywords: Occupational health, Road construction workers, Cardiovascular health, Blood pressure, Pulse rate, Imo State

Introduction

Road construction work is physically demanding and often conducted under extreme environmental conditions, which places significant stress on the cardiovascular system (Kumar et al., 2025). Workers are exposed to a myriad of occupational hazards such as intense physical exertion, prolonged exposure to sunlight, vibration from machinery, noise pollution, and inhalation of particulate matter and fumes (Kamardeen, 2022). These factors have been associated with the development and exacerbation of cardiovascular health problems, particularly high blood pressure (hypertension) and rapid pulse rate (tachycardia) (Karthick et al., 2023). Previous studies have shown that strenuous physical activity, environmental stressors (e.g., noise, heat, and vibration), environmental pollution, and long working hours that are common in construction work can lead to increased blood pressure and pulse rate; the World Health Organization (WHO) recognizes occupational stress as a contributor to cardiovascular diseases (WHO, 2021); yet, there is limited health research on Nigerian road construction workers.

Cardiovascular diseases are among the leading causes of morbidity and mortality worldwide (WHO, 2021). Occupational exposure, particularly in physically demanding jobs like road construction, is a significant risk factor for elevated cardiovascular parameters. In Nigeria, especially in States such as Imo State, where infrastructure development is on the rise, road construction activities have surged. However, this progress comes with potential health risks to the labour force, which often comprises low-income workers with limited access to routine medical checkups or protective workplace policies (Agwah et al., 2025). Despite the global emphasis on occupational health, cardiovascular risk assessments specific to road construction workers in Nigeria remain limited in scope.

This study thus focuses on this largely under-researched population (road construction workers) in a developing country context, providing insights that could inform workplace health interventions and policy. With the research question: What is the cardiovascular health status – by blood pressure and pulse rate measurements – among road construction workers in

Imo State, Nigeria? This study aims to assess cardiovascular health, with a focus on blood pressure and pulse rate among road construction workers in Imo State, Nigeria. The findings could inform health interventions and policy development for occupational safety in similar environments.

Methods

A cross-sectional study was conducted, involving 353 male road construction workers selected with a multi-stage sampling technique from different construction sites across the 3 senatorial zones of Imo State, Nigeria. There were 121, 122, and 110 respondents in Imo West, Imo East, and Imo North senatorial zones respectively. Structured questionnaires were used to collect sociodemographic data. The blood pressure (systolic and diastolic) and pulse rate were measured using a digital sphygmomanometer. The readings were taken under standardized conditions, with participants in seated positions after a ten-minute rest. Each parameter was measured thrice with two-minute intervals and averaged for accuracy. Data was uploaded into the Statistical Package for Social Sciences (SPSS) software (version 23). Descriptive technique was used to compute the mean of the measured variables which frequency distribution table was constructed for class variables.

Results

A total of 353 road construction workers were surveyed across all three senatorial zones of Imo State, Nigeria. The results show that 82 (23.2%) road construction workers had systolic hypertension and 35 (9.9%) had diastolic hypertension. Almost half 171 (48.4%) of the road construction workers had high-normal systolic blood pressure and 70 (19.8%) had high-normal diastolic pressure. Only 100 (28.3%) of the workers had optimal and normal systolic BP (Table 1). The differences across the classes of BP were statistically significant, $p<0.001$ (Table 1). The occurrence of systolic hypertension was 32 (26.4%), 31 (25.4%), and 19 (17.3%) in Imo West, Imo East, and Imo North zones respectively; and the difference across the zones was not statistically significant ($p=0.348$) (Table 2).

Thirty-five (10%) of all the workers had diastolic hypertension, and this was 12 (9.8%), 13 (10.3%), and 11 (10%) in Imo West, Imo East, and Imo North, respectively. The difference between the senatorial zones was not statistically significant ($p=0.11$) (Table 3). Twenty-two (6.2%) workers had tachycardia (raised pulse rates): 10(8.3%), 6(4.9%), and 6(5.5%) %) in Imo West, Imo East, and Imo North zones respectively; and the difference across the zones was not statistically significant ($p=0.45$) (Table 4).

Up to 70(19.8%) workers were ignorant that road construction work could predispose to cardiovascular problems, 14(13.3%) had ever been diagnosed with a cardiovascular condition, 103(29.2%) responded they always wore PPE, 269 (76.2%) did not go for regular (at least annual) medical check-ups, and 210(59.5%) did not have easy access to healthcare services (Table 5)

Table 1: Summary Distribution of Systolic and Diastolic Blood Pressure Classes of Road Construction Workers in Imo State

	Systolic Blood Pressure (SBP)			**Diastolic Blood Pressure (DBP)**		
BP Category	SBP (mmHg)	n	%	DBP (mmHg)		
Optimal & Normal BP	<130	85	28.3	<85	48	0.3
High-normal BP	130 – 139	171	48.4	85 – 89	0	9.8
Hypertension, Grade 1	140 – 159	62	17.6	90 – 99	5	.1
Hypertension, Grades 2 & 3	160 & above	20	5.7	100 & above	0	.8
Total		353	100.0		53	00.0
Min (Max)		*90 (178)*			*50 (113)*	
Mean ± SD		*128.9 ± 17.4*			*75.4 ± 11.2*	
P-value		*< 0.0001*			*< 0.0001*	

n=Number; Min=Minimum value; Max=Maximum value; SD=Standard Deviation

Table 2: Comparison of Systolic Blood Pressure values of Road construction workers at the different Senatorial zones of Imo State

Systolic Pressure (mmHg)	**Imo West**		**Imo East**		**Imo North**	
	n	**%**	**n**	**%**	**n**	**%**
Optimal & Normal BP (<130)	31	25.6	35	28.7	34	30.9
High-normal BP (130-139)	58	47.9	56	45.9	57	51.8
Hypertension, Grade 1 (140-149)	22	18.2	24	19.7	16	14.6
Hypertension, Grades 2 & 3 (160 & above)	10	8.3	7	5.7	3	2.7
Total	*121*	*100.0*	*122*	*100.0*	*110*	*100.0*
Min (max)	*90*	*173*	*102*	*178*	*98*	*177*
Mean ± SD	*127.3 ± 17.5*		*128.98±17.1*		*129.2±17.6*	
P-value	*0.348*					

n=Number; Min=Minimum value; Max=Maximum value; SD=Standard Deviation

Table 3: Comparison of Diastolic Blood Pressure values of Road construction workers at the different Senatorial zones of Imo State

Diastolic BP (mmHg)	**Imo West**		**Imo East**		**Imo North**	
	n	**%**	**n**	**%**	**n**	**%**
Optimal & Normal (<85)	86	71.1	84	68.8	78	70.9
High normal (85 – 89)	23	19.2	25	20.8	21	19.1
Hypertension, Grade 1 (90 – 99)	9	7.2	10	7.9	7	6.4
Hypertension, Grades 2 & 3 (100 and above)	3	2.5	3	2.5	4	3.6
Total	*121*	*100.0*	*122*	*100.0*	*110*	*100.0*
Min (max)	*50 (110)*		*52*	*113*	*53*	*105*
Mean ± SD	*74.7 ± 11.6*		*76.1 ± 10.0*		*75.9 ± 11.7*	
P-value	*0.11*					

n=Number; Min=Minimum value; Max=Maximum value; SD=Standard Deviation

Table 4: Comparison of Pulse Rate at different Senatorial zones

Pulse Rate (beats/min)	**Imo West**		**Imo East**		**Imo North**	
	n	**%**	**n**	**%**	**n**	**%**
41 – 60	10	8.2	11	9.0	8	7.2
61 – 80	61	50.4	62	50.8	58	52.7
81 – 100	40	33.1	43	35.3	38	34.6
>100 (Tachycardia)	10	8.3	6	4.9	6	5.5
Total	121	100.0	122	100.0	110	100.0
Min (max)	*53 (115)*		*52 (109)*		*55 (112)*	
Mean ± SD	*79.5 ± 12.4*		*76.7 ± 12.6*		*78.0 ± 12.5*	
P-value	*0.45*					

n=Number; Min=Minimum value; Max=Maximum value; SD=Standard Deviation

Table 5: Response of Road Construction Workers on Cardiovascular Health

Information on Cardiovascular Health	Yes (%)	No (%)	Total (%)
GENERAL (ALL THREE ZONES)			
Do you think road construction work can predispose to cardiovascular health problems?	283 (80.2)	70 (19.8)	353 (100.0)
Have you ever been diagnosed with any cardiovascular condition?	47 (13.3)	306 (86.7)	353 (100.0)
Do you always wear PPE at work?	103 (29.2)	250 (70.8)	353 (100.0)
Do you go for regular (at least annual) medical check-ups, including BP and PR?	84 (23.8)	269 (76.2)	353 (100.0)
Do you have easy access to healthcare services?	143 (40.5)	210 (59.5)	353 (100.0)
IMO WEST			
Do you think road construction work can predispose to cardiovascular health problems?	97 (80.2)	24 (19.8)	121 (100.0)
Have you ever been diagnosed with any cardiovascular condition?	16 (13.2)	105 (86.8)	121 (100.0)
Do you always wear PPE at work?	37 (30.6)	84 (69.4)	121 (100.0)
Do you go for regular (at least annual) medical check-	29	92	121

ups, including BP and PR?	(24.0)	(76.0)	(100.0)
Do you have easy access to healthcare services?	49	72	121
	(40.5)	(59.5)	(100.0)
IMO EAST			
Do you think road construction work can predispose to	98	24	122
cardiovascular health problems?	(80.3)	(19.7)	(100.0)
Have you ever been diagnosed with any cardiovascular	17	105	122
condition?	(13.9)	(86.1)	(100.0)
Do you always wear PPE at work?	35	87	122
	(28.7)	(71.3)	(100.0)
Do you go for regular (at least annual) medical check-	31	91	122
ups, including BP and PR?	(25.4)	(74.6)	(100.0)
Do you have easy access to healthcare services?	53	69	122
	(43.4)	(56.6)	(100.0)
IMO NORTH			
Do you think road construction work can predispose to	88	22	110
cardiovascular health problems?	(80.0)	(20.0)	(100.0)
Have you ever been diagnosed with any cardiovascular	14	96	110
condition?	(12.7)	(87.3)	(100.0)
Do you always wear PPE at work?	85	79	110
	(28.2)	(71.8)	(100.0)
Do you go for regular (at least annual) medical check-	24	86	110
ups, including BP and PR?	(21.8)	(78.2)	(100.0)
Do you have easy access to healthcare services?	41	69	110
	(37.3)	(62.7)	(100.0)

*PPE: Personal Protective Equipment

Discussion

The high prevalence of systolic hypertension (23.2%), diastolic hypertension (9.9%), and tachycardia/elevated pulse rate (6.2%) among road construction workers in Imo State underscores a critical occupational health concern. The elevated cardiovascular parameters suggest that intense physical exertion and environmental exposure in road construction work significantly affect cardiovascular health. Chronic exposure to physical stress, high temperatures, and pollution in construction zones can activate the sympathetic nervous system, leading to sustained increases in heart rate and blood pressure(Li et al., 2024). Additionally, the physical demands of carrying heavy loads and operating machinery may predispose workers to long-term cardiovascular strain (Dias et al., 2023). Compared to other studies of road construction workers, the prevalence of systolic hypertension was lower at 17.9% in Jakarta (Debora & Widanarko, 2020) but higher than the 38.4% prevalence in Hongkong (Yi & Chan, 2016).

These cardiovascular risks appear linked to both work-related stressors and behavioural health access factors.The low usage of PPE (29.2%) and low medical monitoring among the participants (24%) point to systemic gaps in occupational health management. The PPE usage of this

study was higher than among building construction workers in Kampala Uganda (Izudi et al., 2017), similar to the 27.8% among auto-technicians in Uyo Nigeria (Johnson & Motilewa, 2016), and the 31% among road transport workers in Imo State Nigeria (Nwakamma et al., 2025).This multifactorial risk environment signifies the necessity for comprehensive health monitoring and intervention strategies tailored to this vulnerable population. Discuss the significance of the results here and relate the results to the available literature. Discuss any study limitations.

The findings of this study align with global research that links physically demanding labour with increased risk of hypertension and tachycardia. They support WHO's assertion that occupational stress, physical strain and the work environment can compromise cardiovascular health. The limitations of this study are its male-only sample as findings may not generalize to female workers, and the cross-sectional design which does not allow causal inferences.

Conclusions

Road construction workers are exposed to physical stress and pollution in construction zones can activate the sympathetic nervous system and leading to sustained increases in heart rate and blood pressure which may predispose workers to long-term cardiovascular strain. However, there is low reported usage of PPE and low medical monitoring among the participants. There is an urgent need for routine health monitoring and the implementation of workplace wellness programs to mitigate cardiovascular risks among road construction workers in Imo State and similar environments.

Recommendations

Based on the findings, the following recommendations are proposed:

- Policy Intervention: State health departments and labour ministries should enforce occupational health regulations in the construction industry, including guidelines on cardiovascular risk assessment.
- Health Education Programs: Awareness campaigns should be conducted to educate workers on the dangers of hypertension, benefits of healthy lifestyles, and the importance of regular health assessments.
- Routine Cardiovascular Screening: Employers should implement mandatory annual health checks focused on blood pressure and pulse monitoring to enable early detection and management.
- Worksite Health Clinics: Mobile clinics or onsite medical services should be considered, especially for large construction sites, to provide immediate health interventions and counseling.

- Provision of PPE and Structured Work Hours: Employers must ensure the availability of PPE and enforce scheduled work-rest cycles to reduce prolonged cardiovascular strain.

Declaration for Human Participants: Ethical approval was obtained from the Ethics and Research Committee of the Federal University Teaching Hospital Owerri, Imo State. Permissions were obtained from the heads of the road construction, and informed consent was obtained from the surveyed road construction workers.

Conflict of Interest: The authors reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

Funding Statement: The authors did not obtain any funding for this research.

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