Assessing the Impact of Construction Site Factors on Perceived Public Health Challenges: A Logistic Regression Approach

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Abstract- ***The study investigates the perceived health challenges faced by construction workers on occupational health. A logistic regression analysis was conducted on a data of 210 participant from a well-structured questionnaire on the likelihood of construction workers perceiving their work as having a significant impact on their health, based on the independent variables consisting of musculoskeletal disorder, noise induced hearing loss, fall and injuries, chemical exposure, respiratory problem, eye strain vision problem, work related stress, age of the participant, and years of experience with a dependent variable of perceived health challenges. The result indicates a significant model fit of omnibus test x2=149.534, df=67, p<0.001. the model explained a substantial proportion of variance in occupational health outcomes with cox & Snell R2=0.743, Nagelkerke R2=1.000. the Hosmer Lemeshow test indicated a good model fit with x2=0.000, df=7, p=1.000. x2=showed significant predicators of occupational health challenges. The study highlights the need for targeted interventions to address perceived health challenges and improve occupational workers outcomes among construction workers.***

Indexed Terms- ***Occupation, Health Hazard, Construction Sites, Perceived Health Problems***

I. INTRODUCTION

Occupation which is a person's main activity or job that they do to earn a living is arguably one of the factors that has led to various negative impact as a result of work-related injuries, chronic diseases, mental health issues, musculoskeletal disorders, repetitive strain injuries, occupational lung diseases, cancer risk, sleep disorders, social isolation and work life balance issue. However, occupational health refers to the promotion and maintenance of physical, mental, and social well-being of workers, which involves identifying, preventing and controlling work related hazards and risk to ensure safe and healthy work environment (Mery et al., 2015). Infrastructural development has a great impact to the development and advancement of a given human society and the assets from the infrastructure constitute a considerable benchmark when the level of development of a country is to be measured. This is because its quality cum efficiency makes a physical impact on a society's level of development to different areas (Jesam *et al*., 2022). The desire of man to alter and improve on what nature has provided for his convenience is involved in construction. Construction involves creation of an object or to improve on existing facility or design a new one in to meet his satisfaction it would provide. Jude et al., (2022) noted that when an idea is translated into the creation of an object construction is involved. The desire of man to manipulate the endowments of the earth for his pleasure not minding the consequences of the manipulation revolves around creation or construction. Occupation, the long-term practice of a chosen career is acquired through contentious training over a long period of time. It involves skill acquisition and a continuous capacity building and practice by an individual. Construction workers in an industry or company be skilled and unskilled workers who carry out several construction activities such as building, road construction, maintenance, rehabilitation and demolition are all exposed to several occupational health hazard. Research has it that, there is a high rate of occupational illness and injuries. Takala et al., (2014); ILO, (2013) and Onusida, (2013) study showed, a total of 6,300

workers who died due to occupational causes daily, their statistics showed 5,500 deaths were caused by occupational illnesses and 800 deaths by occupational injuries, resulting in 2.3 million deaths annually—surpassing the deaths from AIDS (1.6 million) reported worldwide for the year 2012. Deaths due to occupational injuries and illnesses in all countries not only exceed deaths from AIDS and other public health diseases but also have high economic, social and family costs equivalent to a 4% decrease in the Gross Internal Product (GIP) and 2.8 million dollars in direct and indirect costs worldwide (Leigh et al., 2001; Moradinazar et al., 2013)

In Cross River State of which Calabar is the capital city and the selected study area, several construction companies a bound: such as those involved with road construction, maintenance, bridges, drains, houses, factories etc. These cons activities are sometimes associated with various types of hazards to include. Sean, (2021) describes various forms of hazards especially in the industrialized world. In the United States and other countries, construction workers also clean hazardous waste sites. Construction as a proportion of gross domestic product varies widely in industrialized countries. Ontario, (2023), listed some of these hazards associated with health implications, to include; Slips, trips and falls, Noise, hand-arm vibration syndrome, exposure to toxic materials, and collapsing of drenches, material handling electrocution and air borne fiber inhalation. Health-care services in Nigeria are inadequate and unevenly distributed and as such Obtaining health-care commodities are problematic. This research is aimed at assessing the impact of construction site factors on perceived health challenges. The essence is to know the likelihood of construction workers perceiving their work as having a significant impact on their exposure to certain factors during construction process. Thomas (2024) also listed the top ten risks and hazards from working on construction sites are: Working at height, moving objects, slips, trips, and falls, noise, hand arm vibration syndrome, material and manual handling, collapsing trenches, Asbestos, electricity, airborne fibers and materials. Charles and Godfrey (2004), also discussed noise from machines sound as one of the many industrial hazards that can cause damage to the ear and sometimes it could result in permanent damage. It is not uncommon to find industrial workers who are exposed to daily mechanical noise to becoming deaf. Hand and Vibration Syndrome (HAVS) has also been identified as an occupational health problem in the construction industry. Vibration has been reported to cause damage to the nerve cells and which result to nervousness. Colin, (2023), has observed that many industrial workers suffer nervousness when they are exposed to hand and vibration machines during constructions. Repetitive work is one of the many causes of the disorder. In most medical research work if a researcher wants to model the outcome of a categorical dependent variable, Logistic regression would be the most appropriate statistical tool to use. Logistics regression has special functions which include, firstly, the prediction of group membership. Since logistic regression calculates the probability of success over the probability of failure, the results of the analysis are in the form of an odds ratio and secondly, Logistic regression also provides knowledge of the relationships and strengths among the variables.

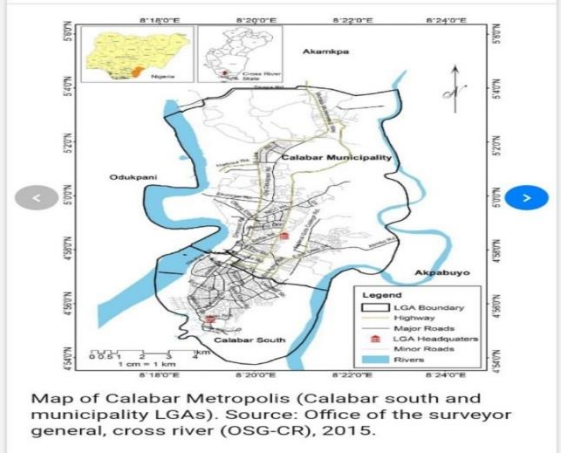
II. METHODOLOGY

2.1 Study area

From figure 1 below, Calabar is a port city in southern Nigeria, near the Cameroon border. The capital of Cross River State, it sits on a hill near the Calabar River and the Cross River delta. British colonial architecture fills the city's older sections, including Henshaw Town, Duke Town and the waterfront area. Dating from the 19th century, Duke Town Cathedral is one of Nigeria's oldest churches. The nearby cemetery offers river. Calabar is the capital of Cross River State of Nigeria, which is located in South East Nigeria. Calabar city lies to the south of Cross River State, and it has a population of 371 022, according to the 2006 national population census.15Study Area's locations (study areas) were selected in Nigeria for this research which is Cross River State (Calabar). The choice of locations was based on commercial viability, social status, economic considerations and area accessibility which provide opportunities for diverse industries like: construction, consulting, manufacturing, and technological advancement.

The decimal latitude and longitude coordinates for Calabar (Nigeria) are 4o 57'6.12''N,8o19'19.2''E. The latitude position equator of Calabar is 551km

(342mi) and 9456km (5876mi) North pole. It however has a longitude position (prime meridian) 922km (573mi) with GMT: +1



Map of Calabar Metropolis (Calabar south and municipality LGAs). Source: Office of the surveyor general, cross river (OSG-CR), 2015.

Figure 1, Map of Calabar metropolis; office of the surveyor general, Cross River (OSG-CR), 2015.

2.2 Study design

A cross sectional descriptive study was adopted to determine the occupational health hazards associated with construction sites in Calabar, In the Calabar municipality local government area, Cross River state. In this study, multistage sample procedure method was used to select ward, site, and respondent for the study, this involves taking a desire sample size in series of three stages.

2.3 Selection of wards

Simple sampling techniques will be used to select 5 wards out of the 9 wards in Calabar Municipality through balloting without replacement. The names of each political wards will be written in small pieces of paper folded and put in a basket 5 wards would be selected by a field assistant after shaking the basket. Simple sampling technique will be used to select 5 sites in each ward selected through balloting without replacement. The names of each construction sites will write in small paper folded and put in a basket. A piece of the folded paper which represent each ward to be selected by the field assistant after shaking the basket. This will be repeated until the required number of sites are selected. A simple sampling technique will be used to select 16 workers from each site through balloting without replacement. Odd and even will be written in pieces of papers folded. The even numbers represented the size of workers required; all the workers present will partake in the balloting.

2.4 Pretesting

One day test was carried out at the Zenith Construction Company Located at Calabar South using 10% of the sample size. The Location was used because it had the same characteristics with that of the Calabar municipality. Interview questionnaire was administered with the assistance of my field assistant and from the response of my respondents I was convinced that they understood the questionnaire.

2.5 Data collection procedure

A well-structured questionnaire was designed to collect data on some specific variables which include the following independent variables, Age of the construction workers, Musculoskeletal Disorder, Noise Induced Hearing loss, Falls and injuries, Chemical Exposure, Respiratory problem, Eye strain vision problem, Work related stress and a dependent variable of perceived health challenges. With a population size of 210 participant, the questionnaire was administered through a random sampling method on site. However, responses were collected over a period of one week. The collected data was reviewed for completeness and accuracy in accordance with (Phillips & Stawarski, 2008)

SPECIFICATION OF THE PARAMETERS OF THE MODEL

$$\text{Logit}(P) = \log[P(x)/1\text{-}P(x)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 \ldots (1)$$

$$P = \frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9}} \ldots (2)$$

Where:

X_1=Age the construction workers, X_2=Musculoskeletal Disorder, X_3=Noise Induced Hearing loss, X_4=Falls and injuries, X_5=Chemical Exposure, X_6=Respiratory problem, X_7=Eye strain vision problem, X_8=Work related stress and Y=Perceived health challenges (Fox and Weisberg, 2011).

III. RESULTS AND DISCUSSION

3.1 Demographical characteristics

The figure 2,3 and 4 below represent the demographical characteristics of this study, which indicates the years of experience, age of the respondent and occupation of the respondent respectively. From figure 2, years of experience from 1-10 (0ne to ten) indicates a high rate of younger professionals in the construction industry with a high percentage of 56.7%, while 11-20 and 21 and above have a percentage of 29.7% and 13.6% respectively. From figure 3, the age of the respondent from 24-29, 30-36, 37-42 and 43-48 indicates a high patronage from professionals who are not elderly with a percentage of 18.8%, 13.5%, 28.8%, and 11.7% while the age from 49 -54, 45 and above indicates a lower patronage of professionals who are older, indicating not really fit for the job with a percentage of 15.3% and 11.9% respectively. However, figure 4 indicates a high patronage for skilled and unskilled personnel ranging from the labourers, mason, and welders with a percentage of 28.5%, 8.1%, 6.7% while the civil engineers, builder, architects, surveyor, electrical engineer and mechanical engineer have a percentage of 18.9%, 4.5%, 9.9%, 2.7%, 5.4%, and mechanical engineers with 1.8%. while others whose job description was not captured in the questionnaire showed a percentage of 9.0% as recorded by AlSehaimi and Koskela (2008).

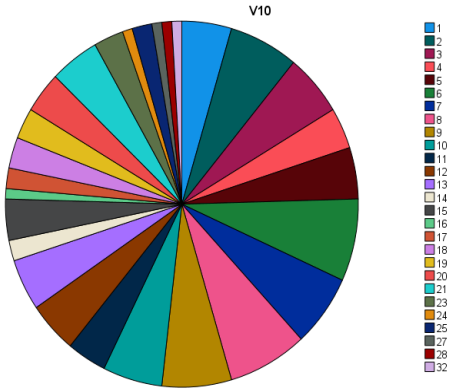


Fig.2 Years of experience

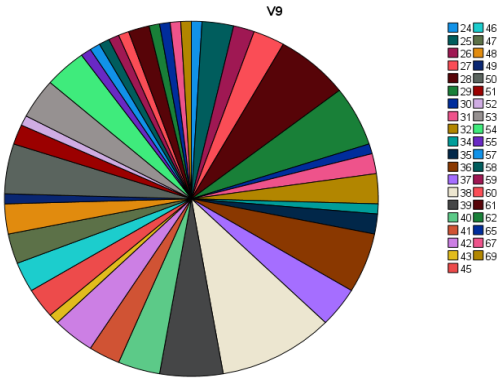


Fig 3 Age of respondent

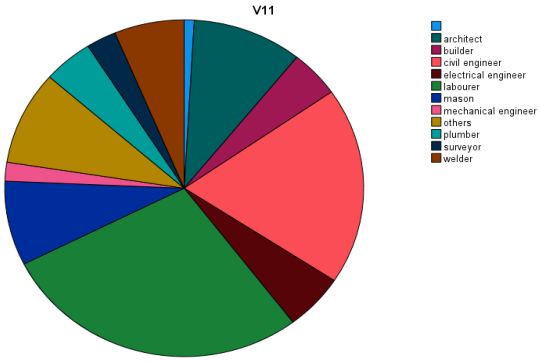


Fig.4Occupation.

Fig 4 Pie chart for demographical characteristics

Table 1.0 Classification Table[a,b]					
Observed					
			Predicted		Percentage Correct
			0	1	
Step 0	V1	0	0	46	.0
		1	0	64	100.0
	Overall Percentage				58.2

a. Constant is included in the model.

b. The cut value is .500

3.2 Statical evaluation of variables

from table 2.0 below, the B coefficient 0.330 signifies a change in the log odds of the outcome variable for a one unit change in the predictor variable. This means that, the predictor variable is associated with an increased likelihood of the outcome. The standard error (SE) =0.193 measures the variability of the coefficient estimate. The value of Wald =2.919 evaluates the significance of the coefficient while the number of parameters estimated in the model =1 which is known as degree of freedom (df). Finally, significance (sg) and the Exponentiated coefficient 1.391 signifies the realness of the data and an odd ratio greater than 1 indicates an increased likelihood of the outcome variable (Rivera *et al.,* 2020*)*

Table 2.0 Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.330	.193	2.919	1	.088	1.391

3.3 Omnibus Tests of Model Coefficients

The omnibus tests of model coefficients in table 3.0 below, are a likelihood ratio test that assesses the overall significance of the model. The omnibus test indicates that the model is a significant improvement over the null model with Chi-square=149.534, degree of freedom (df)=67 and p-value less than 0.001 which is considered extremely statistically significant. The result signifies evidence that the model is fit and the predictors are in line with outcome variable (Henrique *et al*., 2021)

Table 3.0 Omnibus Tests of Model Coefficients

		Chi-square	Df	Sign.
Step 1	Step	149.534	67	.000
	Block	149.534	67	.000
	Model	149.534	67	.000

3.4 Model Summary

Table 4.0 below shows a -2 Log likelihood of 0.000 indicating an almost perfect fit of the model to the data. The Cox & Snell R-Square of 0.743 indicates that the model explains approximately 74.3% of the variance in the dependent variable. Nagelkerke R-Square of 1.000 suggests that the model explains almost 100% of the variance in the dependent variable, which is an excellent fit for the model, while the model estimation process terminated at the 20th iteration, this indicates that, maximum number of iterations was reached (David,1993)

Table 4.0 Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	.000[a]	.743	1.000

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

3.5 Hosmer and Lemeshow test.

From table 5.0, Hosmer and lemeshow test evaluate the goodness of fit of a logistic regression model. The result showed a chi-square =0.000, degree of freedom =7, and significance of 1.000 signifying the difference between the observed and expected frequencies, which 0 indicates a good fit. The df represent the number of categories used in the test while sig. indicates the probability of observing the chi-square (Akaike, 1974)

Table 5.0 Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	.000	7	1.000

3.6 Contingency table

Table 6.0 indicates the goodness of fit of a logistic regression model. The table cross classifies the observed and expected frequencies for the outcome variable (Henrique *et al*., 2021)

Table 6.0 Contingency Table for Hosmer and Lemeshow Test

		V1 = 0		V1 = 1		
		Observed	Expected	Observed	Expected	Total
Step 1	1	11	11.000	0	.000	11
	2	13	13.000	0	.000	13
	3	11	11.000	0	.000	11
	4	11	11.000	0	.000	11
	5	0	.000	11	11.000	11

	6	0	.000	11	11.000	11
	7	0	.000	11	11.000	11
	8	0	.000	4	4.000	4
	9	0	.000	27	27.000	27

IV. CONCLUSION AND RECOMMENDATIONS

The study investigated the impact of construction site factors on perceived health challenges among construction workers using logistic regression approach. The findings revealed significant factors between various construction site and perceived health challenges. The result indicates that the significant predictors which consist of musculoskeletal disorder, noise induced hearing loss, fall and injuries, chemical exposure, respiratory problem, eye strain vision problem, work related stress, age of the participant, and years of experience are significant predictors of perceived health challenges. Finally, the study's findings support the fact that construction site factors have a substantial impact on workers' health and well-being.

4.1 Recommendations

From my study, I will recommend the implementation of comprehensive safety training programs to educate workers on potential health hazards and preventive measures, develop and implement evidence-based health policies to address specific health challenges faced by construction workers. To conduct a regular health risk assessment to identify and mitigate potential health risk on construction and enhance personal protective equipment, ensuring consistency in usage.

Finally, future research should focus and explore the impact of construction sites factors on specific health outcomes and explore longitudinal study designs.

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