**Short Title:** Safety Behaviour of Workers in Small-Scale construction industries.

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**Analysis of Safety Behaviour of Workers under Small-Scale Construction Sites: A Case Study of Anambra State**

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**ABSTRACT:**

Small-scale construction companies are predominant in developing countries and it is the most hazardous places in construction sites. Accidents mostly occur on construction sites due to a high level of safety ignorance and the nonchalant attitude of workers and management. The research aimed to investigate the actual behaviour of workers at the selected sites in terms of safety compliance, nutrition, alcohol use and smoking. This is highly necessary due to the high level of reported accidents and fatalities of the workers. And also recommend measures for improving how safety practices are implemented at a construction site. The interview and questionnaire approach was adopted to study the 150 participants. The data were analysed through SPSS. Research shows that 85% of construction workers are non-compliant with safety regulations because of their ignorance, poor safety training and lack of inspectors It was discovered that the majority of the small-scale contractors had no written health and safety policy within their companies and that made the level of understanding of the workers on safety and health policies very low. This has made the workers not care about wearing safety devices. The study was also extended to include behaviors related to food, alcohol and smoking. It was discovered that most of the workers don't observe simple hygiene and eat junk meals at the site. They smoke and share cigarettes on the site, not knowing that it was a means of sharing communicable diseases.

**KEYWORDS:** Safety Compliance, Small-scale Construction site, workers, SPSS, Safety Behaviour.

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**INTRODUCTION:**

The issues of safety analysis in construction sites have increased due to the incessant accidents associated with construction practices, the need to protect the site workers, the environment, and public health has brought about an increase in safety analysis in construction sites and to ascertain its challenges [1, 2]. The developmental role of the construction industry in the world cannot be overemphasized, it ranges from the provision of shelter for human development to the provision of amenities, employment, and ease of doing business etc yet it is regarded as a dangerous industry [3]. The social, mental, and physical health of employees make up occupational health and safety (OHS), which [2] refer to as the welfare of the "whole person." more fatalities occur at work than in battles in the entire planet [4]. The building and development industry typically receives poor safety ratings [5]. All over the world, Construction workers frequently suffer injury rates when compared with other industries. The accident and fatality records call for serious concern [6, 7]. According to [8] reports, death rates are three times higher than the population of the work force in industries, it was estimated to be more than 50% when compared with others as reported by [9]. Workers in other industries have a 2.4 times lower risk of dying at work than those in the construction industry. [10] Reported that Ineffective OHS was responsible for 6.3% of Australia's GDP in 2002–2003.The majority of construction workers are at risk from things like using heavy electrical equipment, working around moving objects, using faulty scaffolding, and electrical failures. Three Zones of risk were created based on these characteristics [11].

However, [12] suggested a new approach designed to improve a worker's capacity to work safely close to the edge of a construction site by identifying the hazard and appropriate countermeasures. [13] Studied the connection between a safe atmosphere and the productive work output of construction workers. Cognitive systems engineering (CSE) principles were examined by [14] in high-risk and highly automated complex systems on a construction site, where the emphasis was laid on the five safety management practices. [15] However, stressed the significance of determining the Owner's role in building safety. Where the correlation between the owner's experience and the project safety performance was looked at. In order to prevent accidents from happening in the first place, [16, 17] recommended including health and safety into pre-construction planning.

Due to their dynamic and unique nature in comparison to other industries, some of these strategies don't function well with construction sites. Unlike other manufacturing industries, it experiences topographic changes, and as a result, it necessitates the capacity to anticipate changing safety concerns related to the workforce's dynamic operations. [18] Created a construction job safety analysis that took into account the unique aspects of construction site safety analysis, particularly with regard to the element of loss of control and activities relating to exteriors at height.

In Anambra State, there are more unskilled labourers and small-scale contractors working on construction sites who don't care about the safety, security, or well-being of their employees. Some of the reasons for non-safety compliance are

1. Lack of inspection by safety officials
2. Lack of safety training for construction workers
3. Ignorance of construction workers
4. Lack of rules and regulations about safety measures
5. Lack of provision of appropriate personal protection equipment(PPE)
6. Low level of worker knowledge and skills
7. Harsh work environment
8. Workers believe that the use of PPE are unnecessary
9. Lack of use of standardized safety device
10. Insufficient provision of PPE

Most of these noncompliances are common with non-registered contractors. These contractors typically operate in rural areas of Anambra State, they are mainly concerned with their financial gains. The majority of these shady contractors are illiterate, but they also use retired experienced workers who are rehired in the civil carrier building firms and their apprentices. According to [19] financial concepts are involved in health and safety. He continues by stating that the best approach to implementing health and safety is by employing financial concepts.

This study investigated the safety compliance of workers and the management of small-scale construction sites in Anambra state. It also studied the behaviour concerning feeding, drinking and smoking habits of the workers and possibly considers the health implications.

**MATERIALS AND METHODS**

This investigation consists of the safety analysis and a detailed study of the health and safety measures practised by construction workers on the site. The research design, the sampling technique, the order of the records, and the document analysis technique are all covered in this study. The methodology selected for this research comprises a questionnaire design, a questionnaire survey and interviews, and surveyed data analyzed by SPSS software Method (statistical package for social sciences).

**Data collection techniques**

Two methods, a literature review and questionnaires, were chosen from the many data collection options available. To find key themes from the literature, the first phase entails gathering broad information, including both first-hand and second-hand data. Important safety criteria were found in the second step using a literature study and unstructured interviews. With the help of these elements, a survey was created and carried out. Information for the study was gathered via questionnaires.

**SPSS Software**

SPSS software was utilized to evaluate the results. The software contains all of the replies collected from the questionnaires. The variables or questions are entered first in the data view, followed by the responses in the software. From the various data entered in the software, the frequency can be found, which is used to calculate the importance factor.

**ANALYSIS OF DATA**

To ensure accuracy, uniformity, and readability, the completed questionnaires were examined. The information was then set up in a way that made analysis simple. Quantitative information from the questionnaires was entered into the program for analysis. Because it is regarded as user-friendly, the Statistical Package for Social Sciences (SPSS 16.0) was chosen. After that, the information gathered from the survey was examined using the following statistical methods.

**1. Multiple Linear Regression Model**

The multiple linear regression model, which includes more than one independent variable, was used for the investigation. For this work, we will only analyze the situation of two independent variables with the model as shown in equations 1 through 5.

$Y\_{t}=β\_{0}+β\_{1}X\_{1t}+β\_{2}X\_{2t}+e\_{t} (1)$

Where Yt = time-dependent variable

X1 and X2 = the explanatory variables (or repressors)

et = The error term given as

$e\_{t}=y\_{t}-\hat{y}\_{t}=y\_{t}-\hat{β}\_{1}x\_{1t}+\hat{β}\_{2}x\_{2t} (2)$

$$\hat{β}\_{1}=\frac{\sum\_{}^{}x\_{1}y\sum\_{}^{}x^{2}\_{2}-\sum\_{}^{}x\_{1}x\_{2}\sum\_{}^{}x\_{2}y}{\sum\_{}^{}x\_{1}^{2}\sum\_{}^{}x\_{2}^{2}-(\sum\_{}^{}x\_{1}x\_{2})^{2}} (3)$$

$$\hat{β}\_{2}=\frac{\sum\_{}^{}x\_{1}^{2}\sum\_{}^{}x\_{2}y-\sum\_{}^{}x\_{1}\sum\_{}^{}x\_{2}}{\sum\_{}^{}x\_{1}^{2}\sum\_{}^{}x\_{2}^{2}-(\sum\_{}^{}x\_{1}\sum\_{}^{}x\_{2})^{2}} (4)$$

$$\hat{β}\_{3}=\overbar{Y}-\hat{β}\_{1}\overbar{X}\_{1}-\hat{β}\_{2}\overbar{X}\_{2} (5)$$

**Coefficient of Determination**: The multiple coefficients of determination is given by equation (6)

$$R^{2}=\frac{\hat{β}\_{1}\sum\_{}^{}x\_{1}y+\hat{β}\_{2}\sum\_{}^{}x\_{2}y }{\sum\_{}^{}y^{2}} (6)$$

$ $Where x1, x2, and y are said to be in deviation form. The adjusted R2 written as Ṝ2 written is defined by equation (7).

$Ṝ^{2}=1-\left(1-R^{2}\right)\frac{n-1}{n-k} (7)$

 **Test of hypothesis:** Our model simplified in equation (8) involves two explanatory variables

$Y=\hat{β}\_{1}x\_{1}+\hat{β}\_{2}x\_{2}+U (8)$

Thus, we may conclude that there is a potential of conducting two types of tests regarding the model's parameters: individual tests and joint tests.

Individual Test: In an individual test, it is determined whether one explanatory factor has any bearing on the dependent factor while the other explanatory factor is kept constant. Equation (9) contains the alternative and null hypotheses.

 $ H\_{0}:β\_{i}=0 (9)$

i = 1 or 2 (i.e. with the other x held constant, there is no linear relationship between xi and y).

The decision rule is to reject H0 at the $α$ level of significance if $t\_{cal}>t\_{tab}$ (thus supporting the conclusion that y and xi are related) and to accept H0 in all other circumstances.

**Joint Test:** This involves the testing of x1 and x2 if they are jointly related to y. this is the same as testing whether$β\_{1}=β\_{2}=0$. Thus, the null and alternative hypotheses are stated in equation (10);

$$H\_{0}:β\_{1}=β\_{2}= 0 (10)$$

(i.e. x1 and x2 are jointly related to y). The summary of sources of variance of the ANOVA was summarized in Table 1.

**Table 1: ANOVA Table**

|  |  |  |  |
| --- | --- | --- | --- |
| Source of variation | DF | SS | MS |
| Regression  | 2 | $$\sum\_{}^{}\hat{y}\_{i}^{2}$$ | $$\frac{∑\hat{y}\_{i}^{2}}{2}$$ |
| Error  | n – 3 | $∑Y\_{1}^{2}-\sum\_{}^{}\hat{y}\_{i}^{2}$  | $$∑Y\_{1}^{2} - \frac{∑\hat{y}\_{i}^{2}}{n - 3}$$ |
| Total  | n – 1 | $$∑Y\_{1}^{2}$$ |  |

 $F\_{cal}=\frac{\frac{∑\hat{y}\_{i}^{2}}{2}}{\frac{∑Y\_{1}^{2} -∑\hat{y}\_{i}^{2}}{n – 3}}=\frac{RMS}{EMS} (11)$

The decision rule in equation (11) is to reject H0 if Fcal$\geq $ F2n – 3, α otherwise accept H1

**RESULTS AND DISCUSSION**

Following the completion of the questionnaire survey, the responses were statistically analyzed using the social sciences statistical package outlined in the research process. Table 2 showed the Profile of the respondents.

**Table 2: Respondent profile**

|  |  |  |
| --- | --- | --- |
| **Gender** | **Frequency** | **Percentage %** |
| Male | 112 | 74.67 |
| Female | 38 | 25.33 |
| Total | 150 | 100 |
| **Age** |  |  |
| Below 19 years | 18 | 12 |
| 20-29 years | 72 | 48 |
| 30-39 years | 46 | 30.67 |
| 40 and above | 14 | 9.33 |
| Total | 150 | 100 |
| **Educational Background** |  |  |
| O level | 65 | 43.33 |
| Technician certificate | 22 | 14.67 |
| Diploma | 15 | 10 |
| Graduate | 40 | 26.67 |
| PHD | \_ | \_ |
| Masters | 8 | 5.33 |
| Total | 150 | 100 |
| **Years of Experience** |  |  |
| 0-5 years | 38 | 25.33 |
| 5-10 years | 76 | 50.67 |
| 10-15 years | 21 | 14 |
| Over 15 years | 15 | 10 |
| Total | 150 | 100 |

From Table 2, it is abundantly visible that construction site is one of the world's industries where men predominate the most. Out of the 150 workers surveyed, men made up 74.67% and women 25.33%. With regards to age distribution, the majority of the workers are within the age of 20-29 years (48%), followed by 30 – 39 years (30.67%). the sites surveyed in the construction sector have an average experience level of between 5 and 10 years (50.67%). The educational background of workers comprises of Technician certificate 14.67%, Diploma 10%, O level 43.33%, Masters 5.33%, Graduates 26.67% and no PhD.

**Table 3. Does your company have a written health and safety policy?**

|  |  |  |
| --- | --- | --- |
|  | **FREQUENCY** | **PERCENTAGE** |
| **YES** | **28** | **18.67** |
| **NO** | **122** | **81.33** |
| **TOTAL** | **150** | **100.0** |

**Table 3 displays the respondents to the documented health and safety policy of construction works. The respondents that choose NO were more with a percentage of 81.33% and YES has 18.67%. This shows that most construction companies do not have health and safety policies guiding the workers.**

Figure 1: Rate of Understanding of Health and Safety Policy

Figure 1 shows the level of understanding of workers on safety and health policy. The result shows that the percentage of people who have a high understanding has much percentage (39.33%) when compared with others. From the result gotten, most of the workers understand the meaning of health and safety policy but yet they rarely apply it on construction sites.

**Table 4: Responses on the company that undertakes health and safety policy**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS**  |  **YES** |  **NO**  |
| Does your company have a written health and safety policy? | 8 | 28 |
| Does your company keep a record of the accident on-site? | 4 | 17 |
| Does your organization consult its employee on health and safety matters? | 6 | 27 |
| Does your company Undertake formal site health and safety inspections? | 7 | 30 |
| Does your company have formal health and safety Program for your employees? | 5 | 18 |
| **Total** | 30 | 120 |

The response from the workers at the site in Table 4, shows that most small-scale companies do not participate in health and safety measures in a construction site in Anambra State. This is mostly because no organization comes to inspect if they are applying the policy for health and safety on building sites. The number of companies that apply health and safety policies is very poor compared to the ones that do not apply them. Thus, the reason rate at which accidents/hazard occurs in the small-scale construction industries is higher.

**Table 5: SAFETY PRACTICES PERFORMED ON SITES**

|  |  |  |
| --- | --- | --- |
| Questions |  Frequency | Percentage |
| Provision Ear muffs | 7 | 4.67 |
| Provision Hand gloves | 40 | 26.67 |
| Provision Hard hat | 35 | 23.33 |
| Provision safety boot | 38 | 25.33 |
| Provision safety goggles | 10 | 6.67 |
| Provision Safety overall | 13 | 8.67 |
| Respiratory protection | 7 | 4.67 |
| Total | 150 | 100.0 |

Table 5 shows various safety practices on sites, of which safety hats (23.33%), safety boots (25.33%) and Hand gloves (26.67%) are the ones mostly used on the sites, Which sums up to 75.33%. In small-scale construction sites, the protective equipment that is readily available for workers is hard hats, safety boots and hand gloves which are mainly provided by the workers to protect themselves.

**Table 6: FACTORS AFFECTING PERFORMANCE OF HEALTH AND SAFETY MANAGEMENT**

| Factors | Frequency | Percentage |
| --- | --- | --- |
| Factor 1 | 38 | 25.33 |
| Factor 2 | 67 | 44.67 |
| Factor 3 | 10 | 6.67 |
| Factor 4 | 21 | 14.0 |
| Factor 5 | 14 | 9.33 |
| Total | 150 | 100.0 |

Where;

FACTOR1: Lack of site safety and health inspection

FACTOR2: Lack of personal protective equipment

FACTOR3: Lack of temporary keeping of accident record

FACTOR4: Absence of safety and health policy

FACTOR5: Absence of safety and health programs for employees

Table 6 shows the various factors that affect performance in health and safety management. Factor 2 with a percentage of 44.67% affects it mostly more than other factors.

The greatest factor affecting the effectiveness of health and security management is the absence of personal protective equipment for workers, which is also a major contributor to accidents on building sites. This is due to the fact most of the substances used at the development sites are harmful if not handled with care. For instance, the reaction of cement when you put your bare foot or hand in concrete when mixing, placing and compacting it, causes sores and peeling of the skin, hence, the need for protective equipment for the workers.

**EATING HABITS**

Table 7: **Do you wash your hands before and after eating?**

|  |  |
| --- | --- |
| Yes |  No |
| 81 | 69 |

Table 8: **Type of food workers eat on the site**

| Food | Frequency | Percentage |
| --- | --- | --- |
| Bread and soft drinks | 55 | 36.67 |
| Beans cake and soft drinks | 14 | 9.33 |
| Snacks and soft drinks | 25 | 16.67 |
| Cassava flour and soup | 30 | 20.00 |
| Rice and tomato stew | 16 | 10.67 |
| Others | 10 | 6.67 |
| Total | 150 | 100 |

The environment and how a person eats affect his/her health. Most construction workers rarely wash their hands before eating as can be seen in Table 7. With how dirty their hands might be, they still use them to eat without properly washing them. This may cause some kind of illness in the long run which will affect their performance on the construction sites. The kind of food they eat also affects their health and performance. Most (40%) of the workers eat break and carbonated drinks for lunch while some (10%) eat bean cake and soft drink, about 20% eat cassava flour and soup, 15% eats snacks and soft drink and the remaining eats Rice and stew as illustrated in Table 8. This goes to show that construction workers rarely eat good food when working at the construction sites which affects their stamina and agility when performing their tasks at construction sites.

**Smoking Habit**

Table 9**: Do you share cigarettes with another worker?**

|  |  |
| --- | --- |
| Yes | No |
| 102 | 48 |

Figure 2: **How regularly do you smoke?**

The response in Table 9 and Figure 2 show that most construction workers smoke during lunch breaks at the construction sites and 72% share a stick of cigarette with others workers. This means that by sharing the same stick of cigarette with a fellow worker you are both putting your mouth on the same stick and whatever mouth infection one has the other gets infected with it. Sharing of cigarettes by workers is one of the causes of illnesses among construction workers.

 The response shows that 30% of the workers smoke frequently while the rest do so occasionally. Smoking affects the lungs which are why most workers who smoke are likely to have issues with their lungs in the nearest future.

**Table 10: Drinking Habit**

|  |  |  |
| --- | --- | --- |
|  | Yes | No |
| Do you share alcohol/drink with other workers | 22 | 17 |
| Do you share containers for drinking with other workers | 40 | 29 |
| Do you drink alcohol on the construction sites | 30 | 12 |
| Total | 92 | 58 |

**Table 11: Do you drink water from the tank at the construction sites?**

|  |  |
| --- | --- |
|  Yes | No |
| 99 | 51 |

Drinking alcohol on construction sites is a habit most construction workers like to do as illustrated in Table 10 which is very wrong. This happens due to peer pressure and ignorance of most of the workers on the impact of alcohol on their health. Most of the workers share a bottle of alcohol with their fellow workers thereby passing mouth infections from one worker to another. Taking alcohol during working hours can cause drunkenness which may lead to a fight. Alcoholic drinks also affect both the lungs and intestines when taken excessively. They also take unhygienic water as seen in Table 11 [20, 21]

**Table 12: Which of the following illness have you encountered among workers on the site?**

| Illnesses | Yes | No |
| --- | --- | --- |
| Asthma | 5 | 55 |
| Skin allergies | 54 | 25 |
| Tuberculosis | 15 | 30 |
| STD | 30 | 15 |
| Urinary tract infection | 26 | 8 |
| Others | 20 | 17 |
| Total | 150 | 150 |

Table 12 shows the illnesses that mostly affect construction workers. From the response gotten, skin allergies/irritation is more common in workers especially the ones in charge of casting and Mason. This mostly occurs because they were exposed to cement and other materials for a long without protective equipment. Other illnesses occur due to their misconduct.

**CONCLUSION AND RECOMMENDATION**

**Conclusion**

This study successfully examined the safety behaviour and Safety management in small-scaled construction project sites, which are the most dominant construction companies in the study area. The researchers moved from site to site to understand the actual safety compliance of the artisans and unskilled labourers at the site. The interview and questionnaire method was used to examine the respondents. There were 150 people tested, with 112 men and 38 women. Most of the workers are between the ages of 20 and 29 and stopped their formal education at O'Level. Workers with Diplomas and Degree certificates are few and are there because of the lack of professional jobs at the moment.

It was discovered that the majority of the small-scale contractors had no written health and safety policy within their companies and that made the level of understanding of the workers on safety and health policies very low. This has made the workers not care about wearing hand gloves, Hard hats, safety belts, safety overall, respiratory protection devices, Ear muffs, safety goggles and safety boots. The study was also extended to eating, drinking and smoking behaviour. It was discovered that most of the workers don't observe simple hygiene such as washing hands, cups, and spoons and eating poor/ junk meals at the site. They smoke regularly at the site and believe it gives them more strength. Majority share cigarettes at the site, not knowing that it was a means of sharing communicable diseases.

**RECOMMENDATION**

1. Distribution of personal protective equipment to workers to be used during construction work
2. Setting up orientation and training for construction workers in safety
3. The establishment of safety awards to encourage workers in the construction industry
4. Assigning duties for safety to all levels of management and employees
5. Informing the factory inspectorate of the location new construction site.

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