

Examination of Causes and Effects of Accident on Construction Sites: (Case Study of Lagos, Lagos State, Nigeria)

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Abstract

The construction industry is assumed to be the most risky and hazardous of all industries due to the frequent high rates of accidents, ill-health and safety risks involving on construction sites. This becomes a perpetual concern to all the stakeholders in the construction industry. Therefore, this study investigates the various causes and effects of accidents on construction sites in Lagos State, Nigeria. Structured questionnaire was used to source the industry stakeholder's opinions and unstructured interview were used to consolidate their opinions for the data collection. Responses were analyzed and ranked using Likert scaling method. In attempt to reduce the occurrence and severity of construction site accidents to the minimum, findings from the study identify the critical causes of accidents on construction sites and its effects in Lagos State, Nigeria. This paper therefore concludes and recommends amongst others, training and education regarding health and safety, the use of Personal Protective Equipment's (PPE) by construction workers, ensuring safe working environment and enforcing effective and stricter safety rules against defaulters.

Keywords: *Construction Accident, Safety, Construction Industry, Construction Site.*

1. Introduction

The construction industry has earned a reputation of being dangerous or hazardous of all industries because of the frequent high rates of accidents and safety risks involved on construction sites around the world. Hassanein & Hanna (2007), opined that many more accidents occur in construction per every 100,000 workers than overall in the workforce of other sectors. In The United States of America (USA), the construction industry accounts for 22% of all fatal accidents (Hassan et al., 2007) and in other developed countries such as Japan, United Kingdom (UK) and Ireland, the situation is even not better. Developing countries like Nigeria, construction industry are blighted by accident related issues on construction sites unfortunately most cases were not recorded. Idubor & Oisamoje, (2013) affirm that there are no accurate data on accident and contractors on site hardly keep, release, or report accurate records of accident in Nigeria (Diugwu & Dorothy, 2012). Idoro (2011) was on the opinion that contractors see such reports as having a negative influence on their image.

Construction site workers are often exposed to risks on site due to complexities of numerous construction activities going on, the level of technology used and mishandling of construction equipment's by workers. Asan & Akasah, (2015) stressed that a great challenge is posed to the health and safety of construction workers as a result of the dynamic nature of the industry, coupled with diverse but dangerous operations carried out on construction sites. However, Al-Tabtabai (2002) further stressed that the types of activity performed on site and the nature of the tasks carried out on the site make the profession a hazardous one. However, the construction industry has historically experienced a disproportionately high rate of disability injuries and fatalities for its size when compared with other labour intensive industries. Awodele and Ayoola (2005), reported that

not less than hundreds or construction workers are being killed each year and a much more maimed on construction sites in Nigeria. This becomes a serious concern to all stakeholders in the construction industry as many construction workers have died as a result of various degrees of accidents and injuries sustained from construction sites in Nigeria. In an attempt to reduce the occurrence of accidents on construction sites in Lagos State, Nigeria. This paper aimed at identifying the root causes of accident on construction site in Lagos State, Nigeria, its effects and possible solution to reduce this menace to the barest minimum.

2. Review of Literature

Dodo, (2014) asserts that accident is an unplanned event which has the capacity to cause injury or damage and is attributed to either unsafe act or an unsafe condition. Mwombeki (2005), further stressed that accident is an unplanned and unexpected occurrence that upsets a planned sequence of work thereby resulting to loss of production, injury to personnel, damage to plant and equipment as well as eventually interrupting production flow. Accident on construction sites is one of the main problems adversely affecting construction projects in Lagos State, Nigeria. There are limited studies related with causes and effects of accidents on construction sites in Nigerian construction industry. As a result of this, the study aimed at identifying the critical causes of accidents on construction sites in Lagos State, Nigeria.

3. Cause of Accident Related Factors

There are numerous causes of accident that occurs on construction site. According to Toole (2002) construction accidents are caused due to lack of proper training, deficient enforcement of safety, safety equipment not provided, unsafe methods or sequencing, unsafe site conditions, not using provided safety equipment, poor attitude toward safety and isolated and sudden deviation from prescribed behavior. Koehn et al., (1995) and Zakaria et al., (2010) showed that construction accidents occur as a result of negligence of safety precautions by the workers or unavailability of the same.

Kadiri et al., (2014) corroborated other scholars to identify accident's causes to be lack of: protection in material carriage and storage, teamwork, attention from leaders, training, emergency measure, the experience of managers, technique guide, and putting on of PPE. Moreover, further in-depth study was made by Kadiri et al., (2014) on the accident's causes to be carelessness and negligence, failure to follow safety rules, improper use of safety items, reckless action, poor safety conscientiousness of managers, non-certified skill labour, poor equipment and maintenance, non-rigorous enforcement of safety regulations, non-definite organization commitment, non-effective operation on safety regulations, poor education of labourers, poor safety conscientiousness of labourers, non-strict operation procedures, non-perfect of safety regulations, overtime work for labour, shortage of safety management, and poor information flow. However, all these factors are interrelated.

4. Research Methods

Relevant data was extracted for this study through the use of structured questionnaires within the study area. The structured questionnaire was prepared using the information's gathered from literature survey and which was distributed to the stakeholders which includes consultants, contractors, site supervisors and construction site workers in the construction industry. This is with the view to seek their opinions on causes of accident on construction sites in Lagos State, Nigeria. One hundred (100) questionnaires were administered to these target respondents and a total of 82 questionnaires were completed and retrieved which represents 82% of the total number of questionnaire administered in Lagos State (Table 1). Data obtained were analyzed using 5-point

Likert Scale, to calculate and rank them numerically accordingly to individual strength (Kometa et al., 1994). The descriptive statistics can be expressed in terms of the Relative Important Index (R.I.I.) formulated using the following statistical expression:

$$\text{Relative important index (R.I.I.)} = \frac{\sum w}{A \times N} \quad (1)$$

$$\text{Relative important index (R.I.I.)} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5n} \quad (2)$$

(0 ≤ RII ≤ 1)

Where: W = weight given to each factor by the respondents (ranging from 1 to 5), N = Total number of Respondents, n = Total number of Respondents, A = Highest weight (i.e. 5 in this case), n₅ = Number of Respondent for Very important, n₄ = Number of Respondent for Important, n₃ = Number of Respondent for moderately Important, n₂ = Number of Respondent for Not important, n₁ = Number of respondent Not very Important.

Table 1: Questionnaire Distribution and Responses

Stakeholders	Consultants (Architects/Engineers/ Builders/Quantity Surveyors)	Contractors	Site Supervisors	Construction Site worker	Total
Number Distributed	30	20	25	25	100
Number of Responses	24	17	25	16	82
Percentage of Responses	80	85	100	64	82

% Responses = (Number of responses/Number Distributed) X 100%

4. Results and Discussion

Data used for the analyses were collected independently from the respondents of various designations. Table 2 shows the academic qualification and the years of work experience of the respondents including the type of project the respondent is working on at the time of collection of the data.

From the review of previous work carried out in the current study, a total of 55 causes were identified and the data collected from the respondents was ranked and analyzed using the Relative Important Index method. In order to reduce the occurrence of major construction site accident that brings about a large number fatalities, this study identify the top ten (10) high-ranked causes of construction site accident in Lagos State, Nigeria (Table 3). The graphical representation of table 3 can be seen in Figure 1.

Table 2: Summary of Characteristics of Respondents.

Demographic Characteristics	Frequency	Percentage (%)
Roles/Position of Respondents		
Consultants	24	29.27
Contractors	17	20.73
Site Supervisors	25	30.49
Construction site workers	16	19.51
Total	82	100
Respondents' Academic Qualification		

PSLC	2	2.44
SSCE	7	8.54
O.N.D	15	18.29
H.N.D	19	23.17
B.Sc./B.Tech	22	26.83
P.G.D	9	10.98
M.Sc.	5	6.10
Ph.D	3	3.66
Total	82	100
Respondent's Level of Experience in Construction Project		
0 - 5	15	18.29
5 - 10	28	34.15
10 - 15	19	23.17
15 – 20	12	14.63
Over 20	8	9.76
Total	82	100
Respondent's type of project		
Building	41	50
Roads and bridge	29	35.37
Electrical and mechanical	12	14.63
Total	82	100

Table 3: Relative important index of top ten (10) high-ranked causes of construction site accident in Lagos State, Nigeria.

TOP TEN (10) HIGH-RANKED CAUSES OF CONSTRUCTION SITE ACCIDENT IN LAGOS STATE, NIGERIA.	R.I.I.	RANK
Failure to use Personal Protective Equipment (PPE)	0.817	1
Lack of training of workers	0.788	2
Fatigue by workers because of overwork	0.768	5
Lack of effective project supervision	0.783	3
Unsafe site conditions	0.783	3
Negligence and carelessness	0.732	6
Inadequate and lack of compliance to safety regulations	0.732	6
Poor education of workers	0.727	8
Unsafe method of handling materials/equipment/operations	0.717	9
Defective/Unfit equipment	0.700	10

Lack or inadequate use of personal protective equipment (PPE) scored 0.817 on Relative Important Index (R.I.I.): The result indicates that lack or inadequate use of personal protective equipment (PPE) is ranked as the first causes of accident on construction site in Lagos State. Construction site is assumed to be risky and hazardous due to its nature, site conditions and work operation. Therefore, the use of (PPE) is very important on construction site has it prevent or minimize workers from sustaining injuries. Workers fails to use their protective equipment such as gloves helmet etc., they falls from heights, sustain injuries on the head, fingers, eyes, feet, and face.

This is one of major contributor to construction site accident and the most ranked causes of accident on construction site in Lagos State.

Lack of training of workers (R.I.I= 0.788): This type of variable can be associated with the contractors. Contractors who are the employer of these workers fails to conduct regular training programs to all construction workers and orientation for new staff to introduce them to the site conditions, equipment and operation and also point out hazards on site. This variable is ranked 2nd on the table 3 among the top ten (10) high-ranked causes of construction site accident in Lagos State.

Unsafe site conditions scored 0.783 on (R.I.I): Construction workers are subjected to numerous hazards, fire hazards, chemical hazards and unsafe conditions on the sites like working in muddy or slippery areas, caving into excavations, excessive noise, inadequately guarded site, poor illumination and ventilation. Among the top ten most important causes of construction sites accident in Lagos State, unsafe conditions scored 0.783 and ranked third as seen in table 3.

Lack of effective project supervision (R.I.I = 0.783): Lack of effective project supervision scored 0.783 on Relative Important Index (R.I.I.) and this factor is considered as the third most important factor causing accident on construction sites in Lagos State. This can be adduced as site supervisors/managers do not adequately oversee workers on construction site most especially on safety matters, some even fail to give them technical guidance assuming they are conversant with both the site condition and the equipment's.

Fatigue by workers because of overwork scored 0.768 on (R.I.I): Fatigue by workers is ranked as the fifth causes of accident on construction site in Lagos State. This problem is attributed to contractors who over use their worker most especially when their contract duration is short or speeding in order to complete the project on time, some workers work day and night just to earn more money. They get tired and still force themselves to work, some even operate with equipment recklessly and at an unsafe speed. This is one of the leading cause of accident on construction sites in Lagos State.

Negligence and carelessness scored 0.732 on (R.I.I): In this scenario most of the construction workers do take safety matters with less concern thinking they have spent a whole lot of years working in the construction industry and they have an ample working experience and knowledge in engaging in construction activities and handling of equipment's. In some case workers disregard PPE and pay no attention to safety precautions. Some are even adamant to corrections from the site supervisors. This factor is considered as the sixth most important factor causing accident on construction sites in Lagos State.

Inadequate and lack of compliance to safety regulations scored 0.732 on (R.I.I): This problem is associated to construction workers who do not obey safety laws and regulations out of ignorance or speed to complete a given job. Majority of this workers lack safety consciousness. This factor is considered as the sixth as above the most important factor in which the construction workers get involved in an accident on site in Lagos State.

Poor education of workers (Laborers) scored 0.727 on (R.I.I): Most of the construction workers engaged on construction site in Nigeria are unskilled and with low level of education. This situation explains that site workers carry out operations with no regards to regulations on safety,

most essentially in small and medium-scale firms. Some can't even read or write let alone to read any precautions or procedure of use on the equipment manuals making the activities unsafe for them. This is the eight ranked major contributor to accidents on construction site in Lagos State.

Unsafe method of handling materials /equipment/operations (R.I.I= 0.717): Unsafe method of handling materials and equipment by construction workers contribute to construction site accident in Lagos State This factor is considered as the ninth most important causes of building collapse in Lagos State. This type of variable can be associated with both the client and contractors weakness

Defective/Unfit equipment scored 0.700 on (R.I.I): Defective/Unfit equipment is ranked 10th amongst the top ten (10) high-ranked causes of construction site accident in Lagos State. This challenge is associated with construction workers and contractors. Contractors fail to repair faulty equipment or provide a new one. They indulge the workers to continue using the faulty equipment's while workers make use of some equipment's in an improper manner, they use an equipment meant for a particular job for several jobs. This is one of the critical causes of accidents that occur on construction sites in Lagos State. Figure 1: Top ten (10) high-ranked causes of construction site accident in Lagos State, Nigeria.

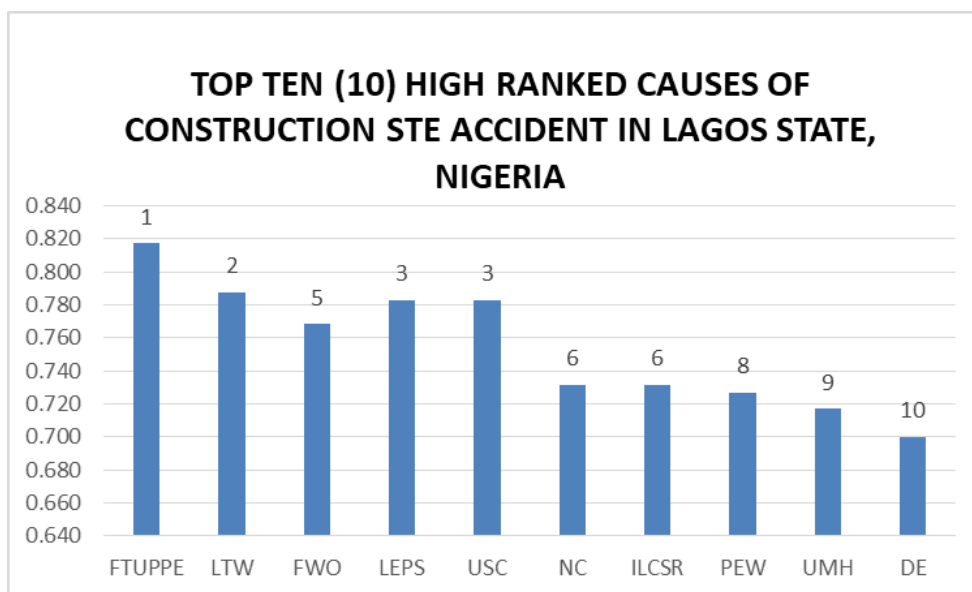


Figure 1 indicates the top ten (10) high-ranked causes of construction site accident in Lagos State, Nigeria.

FTUPPE: Failure to Use Personal Protective Equipment (PPE).

LTW: Lack of Training of Workers.

FWO: Fatigue by Workers Because of Overwork.

LEPS: Lack of Effective Project Supervision.

USC: Unsafe Site Conditions.

NC: Negligence and Carelessness.

ILCSR: Inadequate and Lack of Compliance to Safety Regulations.

PEW: Poor Education of Workers.

UMH: Unsafe Method of Handling Materials/Equipment/Operations.

DE: Defective Equipment.

EFFECTS OF ACCIDENTS ON CONSTRUCTION SITES

The effects of accidents in construction sites are as follows:

- Injuries, deformity of part of the body or even death.
- Cost and time overrun on construction projects and in some cases total abandonment.
- Psychological effects of individual associated to it.
- Damage of properties e.g. plants and equipment's.
- Loss of reputation of the construction industry.
- Negative impact on the national safety.

5. Conclusions

Construction site accident is a huge challenge to the construction industry and if not properly controlled the impact of accident will spell danger to the conduction industry. Based on the above results and discussion, this paper reviewed 55 related causes of accident on construction sites and this paper further identify the top ten (10) high-ranked causes of construction site accident in Lagos State, Nigeria, these includes; lack or inadequate use of personal protective equipment (PPE), poor education of workers (Laborers), fatigue by workers because of overwork, lack of effective project supervision, unsafe site conditions, negligence and carelessness, inadequate and lack of compliance to safety regulations, lack of training of workers, unsafe method of handling materials/equipment/operations, defective/unfit equipment respectively. Likert scaling method was use to analyze the level of criticality of influence each of the variables exerted on the subject matter as perceived by the respondents. The study holds on to the higher the value of R.I.I the higher the level of criticality of influence each of the variables exert on the subject matter. The study therefore concludes an exigent need to address the top ten (10) high-ranked causes of construction site accident in Lagos State identified in the study so as to, avoid and reduce construction site accident to the minimum.

6. Recommendations

In order to minimize the occurrence of construction site accident in Lagos State, the following recommendations are suggested;

1. The use of personal protective equipment (PPE) must be mandatory to all workers on construction sites.
2. Contractors should provide adequate safety training and workshop programs to workers and site staff.
3. Experts should be employed in operating construction equipment and skilled workers should be engaged on construction works.
4. Site supervisors should continuously supervise, monitor construction workers on construction sites and take action when necessary.
5. Contractors and site supervisor should create safe and productive working environments for their workers and provision of first aid facilities on each construction site.
6. The Occupational Safety and Health Administration (OSHA) in Nigeria should review, enforce and implements safety laws and regulations.
7. Contractors are recommended to continuously monitor and control the standard, quality and schedule of construction equipment, materials and procedures continuously in order to avoid any mistakes that may lead to the risky, hazardous and unsafe situation.
8. Site supervisors should stick to the contracted commitment and inspect and test the equipment and materials used in the construction projects and contractors should provide and repair any defective equipment's.

9. Workers should work with consciousness in relation to handling materials, objects, equipment, and other construction elements.
10. The Nigeria government should simplify administrative procedures for construction firms to reduce accidents and to improve the safety in the construction industry and strict laws for violating safety and relative regulations should be implemented.

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