Effects Of Construction Hazards on Workers' Safety on Building Projects in Orumba North Local Government Area, Anambra State, Nigeria

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Abstract: - Construction hazards have ripple effects on workers' safety thereby affecting workers' health which in turn gives rise to low labor productivity. This study is aimed at assessing the effects of construction hazards on workers' safety on building project with a view to improve safety on work sites to increase productivity. This study examines the hazards associated with construction project in the study area and determines the causes and effects of these construction hazards. As a survey design, the research used structured questionnaire, and review of related literature for data collection. 187 copies of questionnaires were distributed to the respondents and all administered questionnaire were received back from the respondents showing 100% recovery. The study therefore revealed that the most significant effect of construction hazards on workers safety compared to the other effects is electrocution. Hence the study concluded that effects of hazard on workers' safety to large extent can be minimized by the use of personal protective equipments. The study therefore recommends that policies should be formulated to compel construction practitioners and construction workers to provide and use personal protective equipment's respectively.

Key Words: - ***Hazards, Safety, productivity, safety wears and construction workers.***

I. Introduction

The construction industry has been one of the most hazardous and accident-prone working environments and one of the highest risk businesses as far as its activities are concerned. Building workers are exposed to excessive construction site dangers that can result in injuries or even death. They face different kinds of safety and health hazards whilst working in their work sites every day. Among all major industries, construction workers in construction industry face the highest number of the risks of occupational injuries and illnesses [15].

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Following a similar trend,[17] emphasizes that construction activities sometimes take place in the most uninhabitable workplace, and the fact that the work environment is constantly changing makes it difficult to control the hazards.

Globally, construction industry is often seen as one of the most hazardous industries when it comes to the safety of workers [7]. This industry has earned the reputation of being a dangerous or highly hazardous industry because of the disproportionately high incidence of accidents and fatalities that occur on construction sites around the world [35].

Comparing the situation of construction sites in Nigeria as a developing country to other countries, (17) described the vulnerability of workers to hazards as being worse, with reasons given as lack of concern by stakeholders, lack of statutory regulations on health and safety (H&S), and non-availability of accurate records. Furthermore, there was a corroboration between [28] and [17] in that workers are subjected to numerous hazards and unsafe conditions on the sites, while this is as a result of lack of medical facilities, lack of training programs for the staff and workers, lack of orientation conducted for new staff and workers, failure to hold safety meeting and inability to point out hazards. Many construction activities are inherently hazardous such as working at height, working underground, working in confined spaces and proximity to falling materials, handling load manually, handling hazardous substances, noises, using faulty plant and equipments, fire, exposure to live cables. However, this unfortunate development has been a monumental threat to productivity and the overall performance of construction projects in Nigeria, [29].

Hazards is anything (e.g condition, situation, practice, behavior) that has potential to cause harm including injury, disease, death, environmental, property and equipment damage. Most times, "hazard" and "risk "are often used interchangeably. Moreover, hazard is something that could potentially cause harm while risk is the degree of likelihood that harm will be caused. Hazards pose health and safety challenges on construction sites, adjoining properties, workers, and the general public [6]. However, workers in construction sites are generally exposed to an excessive risk of being injured at work [4]. Hazards in construction sites cannot be completely eliminated but could be controlled or reduced when there is maximum cooperation between the management and the operations within the construction site.

It is of great concern therefore to note that the moment construction hazard is present in construction site; many may not want to stop work at the site but will initiate safety consciousness in order to accommodate the prevailing situation. The commitment and devotion to duty are affected thereby reducing work productivity. Hence, this research, assess the effects of construction hazards on workers' safety on building projects in Orumba North Local Government area with a view to improve safety on work sites to increase productivity.

II. Theoretical Framework

The behavior constraint approach theory was adopted for the study. The behavior model posits three basic steps: Perceived loss of control, Reactance, and Learned helplessness. Studies have shown that excessive or undesirable environmental stimulation leads to arousal or a strain in the information processing capacity. Have you ever been caught in a severe winter storm or summer wave and felt there was nothing you could do to overcome it? This loss of perceived control over situation is the first step in what is known as behavior constraint model of environmental stimulation as postulated by [31]; [33]; [38]. The term "Constraint" here means that something about the environment is limiting and interfering with things we wish to do. According to the behavior constraint Model, the constraint can be an actual impairment from the environment such as construction hazards, threatening safety of workers, or simply our belief that the environment is placing a constraint upon us. What is more important is the cognitive interpretation of the situation, as being beyond our control. Once you perceive that you are losing control over the environment, what happens next? When you perceive that environmental events are constraining or restricting your behavior like your first experience is discomfort or negative effects.

Secondly, anytime we feel that our freedom of action is being constrained, something within will leads us to try to regain that freedom. You probably try to reassert your control over the situation. This phenomenon is known as *psychological reactance,* or simply reactance, [8]; [9]; [37]. If crowding is a threat to our freedom, we react by erecting physical or social barriers to "shut others out". If the weather restricts our freedom, we might stay indoors or else use technological devices (eg; air-conditioned cars) to regain control. According to the behavior constraint model, we do not have to experience loss of control for reactance to set in; all we need to do is to anticipate that some environmental factors are about to restrict our freedom. More anticipation of crowding for example is enough to make us start erecting physical or psychological barriers against others.

What happens if our efforts to reassert control are unsuccessful in regaining freedom of action? The ultimate consequences of loss of control according to the behavior constraints model is *learned helplessness.* That is, if repeated efforts at regaining control results in failure, we might think that our actions have no effect on the situation; so we stop trying to gain control even when from an objective point of view, our control has been restored.

The behavior constraint theory is very much related to this subject of the research study. It is obvious that the different forms of hazards arising from construction sites have a lot to affect the workers' safety in any given site. The site workers will obviously experience threat which will lead to loss of perceived control. This may be as a result of lack of Personal Protective Equipment (PPE) or lack of safety training as it is common in most part of Nigeria including Orumba North L.G.A of Anambra State. Usually, the workers will react to the perceived loss of control leading to psychological reactance. This may be in form of complaints to the authority or other forms of agitations. When this is explored and they are given attention, they entered into learned helplessness. Since Nigeria is a place where everyone tries to survive, especially site workers even in the presence of hazards. However, many may not want to stop work at the site but will change behavior to work in order to accommodate the prevailing situation. This commitment and devotion to duty are affected thereby reducing work productivity. Until the hazard constraints are handled, expected work commitment to work will not be restored. This also leads to fraud attitudes by workers in search of survival.

III. Review Of Related Literature

Hazard is a phenomenon or a process that can endanger human being and their work environment. Hazard associated with construction can be from work, material, equipment, work method and practice among others. Numbers of authors has defined hazards as follows:

[18] defines hazard as a potential source of harm which includes ill-health and injury, damage property, plant,

products, or the environment, production losses, or increased liabilities. Hazard is further defined as a specific situation connected with a production process or a work process and is characterized by such a configuration or state of factors of this process, which may result in an accident at work or occupational disease [10].Hazard is viewed as a condition, object, activity or event with the potential of causing injuries to people, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function [19].Furthermore, [3] also defined hazard as the presence of materials or conditions that have the potential of causing loss or harm or a combination of the severity of consequences and likelihood of occurrence of undesired outcomes. Construction hazards may be present in any of the three modes. Dormant mode of hazards which refers to the hazards has latent ability to cause harm but has not been activated. Armed mode of hazards on the other hand has the necessary ingredients that could cause harm but awaits its interaction with people whereas the third mode called Active mode arises from a combination of factors that activate it and cause harm.

Construction hazards are heavily dependent on the type of construction work that is being carried out. For instance, working on scaffolding present entirely hazards to working in excavation and trench. However, types of hazards include but are not limited to the following:

Design hazards [5], Electrical hazards [11], Excavation and trenching hazards, Falls hazards [32]. Stairways and ladder hazards, Scaffolding hazards, [13], Equipment hazards, [16], Hazards due to construction materials [29]. Lockout and tagging hazards [11].

Many researchers have attributed the causes of construction hazards to many factors ranging from personal, technical, physical, to environmental factors**.** For instance, [23] was of the opinion that technical, physical, and environmental factors are responsible for hazards on construction sites. According to [1], unsafe equipment, job site conditions, unique nature of the industry, unsafe method, human element are the identified factors that are mostly responsible for construction hazards.[36] asserts that poor maintenance of equipments, poor safety awareness from top leaders, lack of strict operational procedures as factors responsible for construction hazards. Furthermore, [22] discovered some lacking features that invite the occurrence of hazards on site to be: technical training, experienced project managers, enforcement of safety regulations, Personal Protective Equipment's, organizational commitment, innovative technology on safety measures, with the inclusion of reluctance to invest in safety, poor safety consciousness of workers, low level of education of workers.

Workplace hazards can result in fatal accident, damages to machines and equipment's, and loss of productivity. Such accident with adverse consequences can result in fatalities and disabilities. Moreover, [24] posit that no hazard has accident in it, but they are capable of causing accidents. The effects of such hazards could lead to effects like loss of motivation, Loss of money, Loss of working hour, Loss of productivity, Loss of security confidence, frequent work disengagement, and Loss of team spirit.

Personal Protective Equipment (PPE) is a preventive safety wears against the occurrence of hazards at the work place. According to the International Labor Organization (ILO) codes of practice, it is important for employers to make available Personal Protective Equipment (Safety Wears) appropriate for the nature of work to be carried out. Some contractors do overlook their workers compliance to the use of safety wears because they perceived using safety wears would increase the time taken by the workers to complete their daily output, which in turn impedes their productivity [21]. According to [25], PPE can only minimize the effect of the hazard on the workers or reduce the gravity of the injury emanating from the accident.

IV. Study Area

The study area is located in Orumba North Local government of Anambra State. it lies approximately between latitudes 63' 00' and 7'150' north of the Equator as shown in Figure 3.2 of map of Anambra State. It constitutes of sixteen communities such as Okoh, Nanka, Amaokpala, Ajalli, Ufuma, Okpeze, Awgbu, Amaetiti, Ndiowu, Ndiokolo, Ndiokpalaeze, Ndikelionwu, Awa, Omogho, and Ndiukwuenu. The study area is generally known as a region with fertile land for agriculture with prominent products like rice, yam, cassava, and palm oil. Fig. 3.1 below is the map of Nigeria showing the map of Anambra State whereas fig. 3.2 is the map of Anambra State showing the map of Orumba North LGA. In addition, fig. 3.3 is the map of Orumba North LGA showing key study areas which include: Oko, Nanka, Amaokpala, Ajalli, and Ufuma.

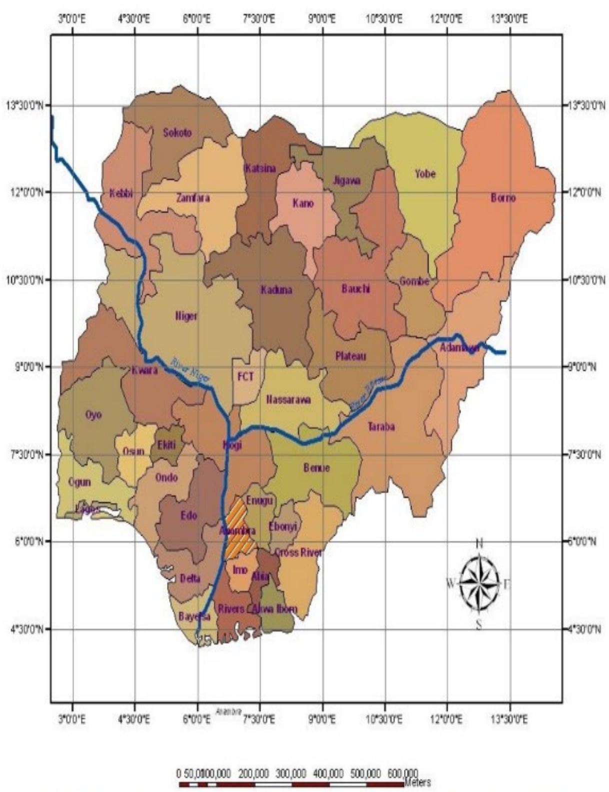

Fig. 1: Map of Nigeria showing the location Of Study Area (Anambra) Produced in National Space Research And Development Centre (NASRDA) Abuja.

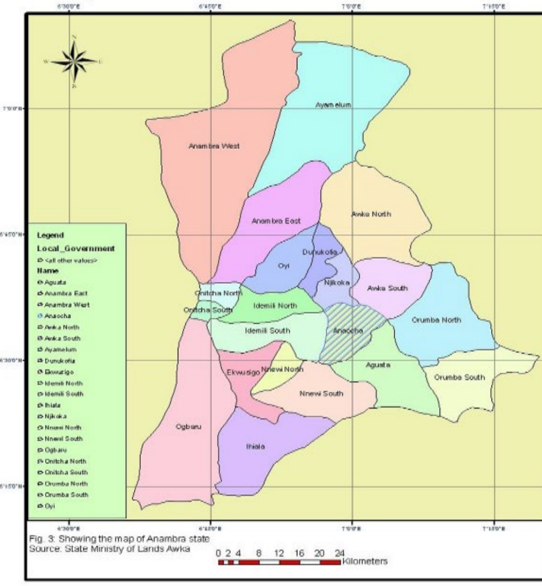

Fig 3.2 is Map of Anambra State Showing the Map of Orumba North L.G.A
Source: State Ministry of Land Awka

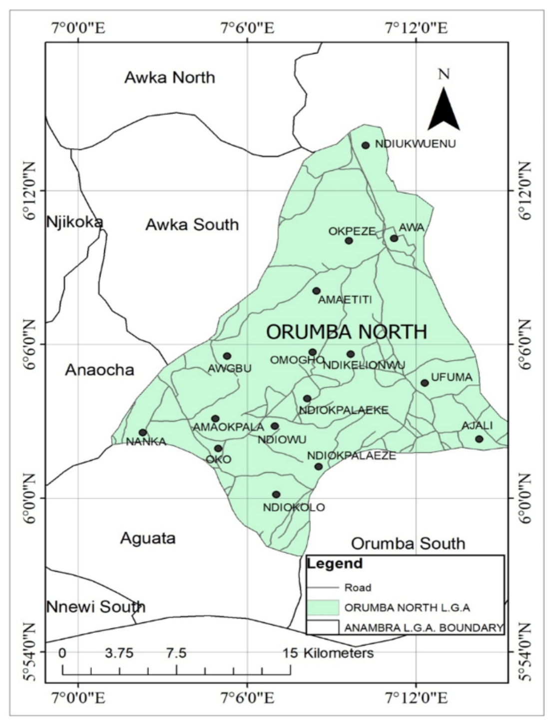

Fig.3.3: The Map of Orumba North L.G.A Showing the Key Study Areas
Source: *Department of Surveying and Geoinformatics, NAU, Awka (2018)*

V. Research Methodology

A questionnaire survey research design approach was adopted for the study. Questionnaire as the instrument for data collection standardizes and organizes the collection and processing of information. [24]. The approach involves the use of structured questionnaires which was considered to be the most appropriate tool to reach the population of the study especially when data required for the study can be obtained by the instrument. The questionnaire was divided into two main sections. Section A was designed to collect respondents' personal data such as Gender, Age, Marital status, Occupation, Site work experience and Academic qualification.

Section B contained structured questions for the respondents that were meant to provide answers to research questions. Total of 187 questionnaires were administered to the respondents at workers' union converging points located in the study area. All administered questionnaire were received back from the respondents showing 100% recovery. This was possible because the questionnaire was filled by the researcher and his field assistants on the spot, using the oral feedback of the respondents because of their low literacy level.

Descriptive statistics was used to determine the demographic details and types of hazards experienced by construction workers. Result was displayed and presented in frequency and percentages. Mean scores and Relative Importance Index (RII) rank statistics were used to determine the causes of construction hazards and the effects of construction hazards on workers' safety using Microsoft Excel 2016 version. The extent of usage of safety wear by construction workers was also analysed by Relative Importance Index rank statistics. Mean scores of items in the domains of cause and effect higher than 3 was considered as positive for cause and effect while lower than 3 is considered negative for cause and effects. The RII value ranks the items in order of impact for cause of construction hazard, effect of construction hazards on workers' safety and extent of usage of safety wears by construction workers.

VI. Result And Discussion

6.1 Descriptive frequency statistics of Construction hazard Witnessed

Table 4.1 showing descriptive frequency of statistics of Construction hazard Witnessed by Workers in the Study area.

Types of Hazards witnessed	N	Witnessed percentages
Electrical hazards	73	39.7%
Building collapse	43	23.4%
Stairway and ladder hazard	157	85.3%
Scaffolding hazard	114	62.0%
Hazard due to construction materials	172	93.5%

Source: Researcher's Work 2019

From the table 4.1, 73(39.7%) of construction workers in the survey have experienced electrical hazards in the course of their work. 43(23.4%) of construction workers in the survey have experienced hazards due to building Collapse. 157(85.3%) of construction workers in the survey have experienced Stairway and ladder hazards. 114(62.0%) of construction workers in the survey have experienced Scaffolding hazards.172(93.5%) of construction workers in the survey have experienced hazards due to construction material. Therefore, data above shows that the most common construction hazards witnessed by workers in the study area is hazards due to construction materials while the least are those from building collapse. This finding is consistent with [29], that stressed that almost all primary construction material like cement, water, glass, metals, timbers, paints, aggregate, asphalt, asbestos, to mention but few poses very severe health hazards during site application than during manufacturing.

6.2 Causes of Construction Hazard in the study area

Table 4.2 showing mean score and relative importance index of Causes of Construction Hazard

S/N	Causes of Hazards	SA (5)	A (4)	UN (3)	D (2)	SD (1)	Mean score (3)	RII	Rank
1	Lack of safety training	120	54	3	10	0	**4.5**	**0.90**	1
2	Poor safety consciousness of worker	73	107	0	4	3	**4.3**	**0.86**	2
3	Removal of formwork before time	60	97	29	1	0	**4.2**	**0.83**	3
4	Faulty/Unsuitable scaffolding	55	103	7	22	0	**4.0**	**0.80**	4
5	Faulty plant and equipment	84	40	29	34	0	**3.9**	**0.79**	5
6	Lack of Personal Protective Equipment's	21	97	0	64	5	**3.2**	**0.67**	6
7	Low level of education of workers	3	10	104	70	0	**2.7**	**0.54**	7

From the table 5.2 above the items are categorized into 5 with their codes as follows; Strongly agree (5), Agree (4), Undecided (3), Disagree (2), Disagree (1). The analysis presents the mean scores and relative importance indices of the 7 items considered in the survey as causes of construction hazards. The mean scores were calculated using the formula.

$$M = \frac{\sum(nSA*5)+(nA*4)+(nUN*3)+(nD*2)+(nSD*1)}{N}$$

Where n is the individual number response for the categories and N is total survey =187. Items with mean score greater than 3 shows cause of construction hazard while items lesser than 3 are not considered as a cause of construction hazards. The mean scores result show that items 1 to 6 have mean scores higher than 3 and therefore are considered causes of construction hazards. Only item 7 are not considered as a cause of construction hazard having a mean score of 2.7.

The relative importance index (RII) of the items shows the rankings of the causes relative to each other and is calculated as

$$RII = \frac{\sum(nSA*5)+(nA*4)+(nUN*3)+(nD*2)+(nSD*1)}{5\ x\ N}$$

Where n is the individual number response for the categories and N is total survey =187. The items have been ranked in order of importance.

The highest relative importance index score is posited as the most important cause of construction hazards. The RII result shows that lack of safety training (0.90) ranks highest as the most significant cause of construction hazards compared to the other items and is followed by *Poor safety consciousness of workers* (0.86), and *Removal of formwork before time* (0.83). Low level of education of workers (0.54) ranks lowest among the causes of construction hazards. This underscores the overriding importance of exposing site workers to safety training from time to time in order to create safety consciousness in them. This is in agreement with [17] findings that stressed the need for Construction Company to provide adequate safety training on each project; this will reduce hazards amongst workers and promote sustainable development.

6.3 Effects of Construction Hazards

Table 4.3 showing Mean score and Relative Importance Index of the Effects of Construction Hazards on workers' safety

S/N	**Effects of Hazards on workers safety**	SA (5)	A (4)	UN (3)	D (2)	SD (1)	Mean score (3)	RII	Rank
1.	Electrocution	123	64	0	0	0	**4.7**	**0.93**	1
2.	Falling from height	102	85	0	0	0	**4.6**	**0.91**	2
3.	Mental health repercussion from stress	100	87	0	0	0	**4.5**	**0.91**	3
4.	Partial disability and death	80	105	2	0	0	**4.4**	**0.88**	4
5.	Injurious to workmen	105	61	13	8	0	**4.4**	**0.88**	5
6.	Loss of motivation to work	73	57	33	14	10	**3.9**	**0.78**	6
7.	Loss of trained and skillful workers	70	35	47	14	21	**3.6**	**0.73**	7

From the table 5.3 above the items are categorized into 5 with their codes as follows; strongly agree (5), Agree (4), Undecided (3), Disagree (2), Disagree (1). The analysis presents the mean scores and relative importance indices of the 7 items considered in the survey as the effects of construction hazards on workers safety. The mean scores were calculated using the formula

$$M = \frac{\sum(nSA*5)+(nA*4)+(nUN*3)+(nD*2)+(nSD*1)}{N}$$

Where n is the individual number of responses for the categories and N is total survey =187. Items with mean score greater than 3 shows the effects of construction hazard on workers safety while items lesser than 3 are not considered effects of construction hazards on workers safety. The mean scores result show that all the items 1 to 7 have mean scores higher than 3 and therefore are considered effects of construction hazards on the workers. The relative importance index (RII) of the items shows the rankings of the effects relative to each other and is calculated as

$$RII = \frac{\sum(nSA*5)+(nA*4)+(nUN*3)+(nD*2)+(nSD*1)}{5\ x\ N}$$

Where n is the individual number response for the categories and N is total survey =187. The items have been ranked in order of importance. The highest relative importance index score is posited as the most notable effect of construction hazards on construction workers. The RII result shows that *electrocution* (0.93) ranks highest as the most outstanding effect of construction hazards on workers safety compared to the other items and is followed by low productivity of labour (0.91) and loss of trained and skilful workers (0.73) ranks last as an effect of construction hazards on workers' safety. The finding of the study is in consistent with a study of workplace electrocutions conducted by the Federal Ministry of Labor and Productivity which revealed that 73 % of the workers had a high school education, 30% had less than one year of experience on the job to which they were assigned at the time of the fatal accident while 47% of the victims had some type of safety training, according to their employers [2].

6.4 Extent of Personal Protective Equipment Usage

Table 4.4 showing Description on the Extent of Personal Protective Equipment Usage Among Site Workers

S/N	Safety wears	Not used (1)	Less used (2)	Some times used (3)	Moderately used (4)	Always used (5)	RII	Rank
1	Safety boot	0	8	39	83	57	**0.80**	1
2	Handglove	93	0	0	31	63	**0.57**	2
3	Helmet	63	53	40	0	31	**0.47**	3
4	Coverall	128	21	33	3	2	**0.31**	4
5	Ear muff	92	0	95	0	0	**0.40**	5
6	Respirator	106	8	69	4	0	**0.37**	6
7	Eye Goggle	118	38	7	24	0	**0.33**	7
8	Safety belt	118	22	40	7	0	**0.33**	8

From the table 4.4 above the items marked to determine the extent of Personal Protective Equipment usage among construction workers are categorized into 5 with their codes as follows; Always used (5), Moderately used (4), sometimes used (3), Less used (2), Not used (1). The analysis presents the relative importance indices of the 8 items considered to present the degree of Personal Protective Equipment usage among construction workers. The relative importance index (RII) of the items shows the rankings of *the* extent of the usage relative to each other and is calculated as

$$RII = \frac{\sum(nSA*5)+(nA*4)+(nUN*3)+(nD*2)+(nSD*1)}{5\ x\ N}$$

Where n is the individual number response for the categories and N is total survey =187. The items have been ranked in order of importance. The highest relative importance index score is posited as the most preferred protective wear used by construction workers. The RII result shows that Safety boot (0.80) ranks top as the most used protective equipment among construction workers compared to the other items and Safety belt (0.33) ranks lowest in the extent of usage by construction workers. This finding is agreement with [11], who observed that the Personal Protective Equipment is designed to protect against hazards in a construction site.

VII. CONCLUSION

In view of the above findings, the following conclusions were reached

- Majority of the site workers are male, therefore highlighting the fact that the construction sites only attract more males than females because of the strenuous requirement of the work.
- Site workers are obviously susceptible to site hazard on account of the nature of the site work unknown to some of them.
- Two key contributory factors associated with these hazards are lack of safety training and little or non-usage of Personal, Protective Equipment among site workers in the study

Numbers of site workers are exposed to injuries, mental health repercussion from stress and also partial disability and death. However, this challenge needs to be handled urgently to reduce mortality on sites.

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