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Improving the antecedents of non-compliance to safety regulations toward an optimized self-regulated construction environment in Nigeria

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ABSTRACT

The construction industry has been plagued with safety challenges, resulting in a wide occurrence of devastating accidents and fatalities. As previous studies have attributed the persistent safety challenges in Nigeria to non-compliance to safety regulations, this study builds on the existing literature by assessing the antecedents of non-compliance to safety regulations amongst construction workers. To achieve this, the study pursued two main objectives which involved the assessment of workers' safety attitude and workers' safety behavior as the antecedents of safety regulation compliance. A quantitative research approach was adopted using a questionnaire to elicit responses from randomly selected respondents. Data collected were analyzed using both descriptive and inferential statistics. Findings from the study showed relatively low levels of safety attitude and behavior amongst construction workers, which limit their ability to be comply to instituted safety regulations. Thus, improving the attitude and behavior of construction workers toward better compliance was recommended.

KEYWORDS

safety; regulations; compliance; construction; Nigeria

1. Background

The construction industry is widely regarded as one of the most dangerous industries around the globe, with a large number of hazardous activities and outcomes. The International Labor Organization (ILO) [1] reported that 16% of fatal accidents recorded at work occur on construction sites. While the effective management of safety in construction is undoubtedly a global phenomenon, evidence in previous studies shows that developing countries tend to have worse safety performance. Specifically, the Nigerian construction industry is plagued with high rates of accidents and injuries, with persistent rates of building collapse [2,3]. Abubakar et al. [4] asserted that safety is rarely a priority in the execution of construction projects in Nigeria. In addition, there is a large disparity between safety management efforts and the reality of safety performance within the nation's construction sector [4]. Earlier, Moda et al. [5] reported that contractors and consultants in the Nigerian construction industry perceive safety as an important measure of project performance, but the overall actions of such project participants contradict their perception. In furtherance, Diugwu et al. [6] observed that organizations often fail to pay adequate attention to safety management practices that present the potential for improved performance. In most cases, there is evidence that organizations hire untrained workers due to socioeconomic realities [7]. Such disregard for safety management is seen to be largely due to knowledge barrier, and the inability of such organizations to understand the implications of workers' poor safety behavior and actions [8].

Over the years, efforts have been made by both academic and professionals toward improving the safety performance of construction activities [5]. This more so in low and middle-income countries (LMICs) where a large proportion of workplace accidents go unreported and the reported remain uninvestigated. There is a general consensus around the rationale that poor safety climate, key to which is the lack of implementation/compliance of safety regulations and policies within the industry, creates a climate that encourages poor safety performance within the Nigerian construction industry [6,7,9]. Expanding on this, Graham and Woods [10] asserted that while there are numerous government regulations and policies on safety practices in Nigeria, very little effort is put in place to ensure safety compliance. In addition, Abubakar et al. [11] opined that only 17.6% of construction organizations comply with safety regulations and policies in the management of their respective projects in Nigeria, which further demonstrates the thriving poor safety climate within the industry. In this regard, Jeelani et al. [12] emphasized the need to establish safety commissions at all levels of construction activities to ensure effective enforcement of safety regulations that can enhance safety performance within organizations. While these suggestions acknowledge the significant role that government plays in improving safety performance through policy formulation and implementation, Zailani et al. [13] argued that industries in Nigeria are largely self-regulated in various forms, thus requiring different approaches aimed at improving their safety performance.

According to Umeokafor [14], self-regulation is a recognized method of safety regulation where an industry or organization designs its own regulation policies, or adopts already established regulatory standards and administers such policies and standards with little or no external involvement or supervision [15]. This is consistent with the safety regulation practices in Nigeria where the majority of construction organizations often adopt and administer legislations from developed countries or international safety organizations [16]. As a result of this dynamic and unique nature of construction operations and environments in Nigeria, the adoption of foreign safety

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legislations and regulations should be done with upmost care [14] as generic safety management systems and techniques are seen to be ineffective in addressing safety challenges in all contexts. In this regard, Feng [17] opined that the success of self-regulation in safety can only be explained by the attitude of the organization and workers toward their own safety and inclines workers and organizations to take voluntary responsibility toward safety without any external influence, by contextualizing safety requirements in their respective activities [10].

Considering the nature of the nation's construction sector and weakness of self-regulation toward the enforcement of existing policies and standards, it is only when the approach is properly understood and explored that self-regulation would present opportunities for improving safety performance of the construction organizations in Nigeria. In support of this thinking, recent studies in construction safety management have looked at the inherent factors that limit workers' voluntary compliance to safety regulations in the Global South, where attitude and hazard recognition capability among workers have been identified as fundamental requirements for addressing the health and safety challenges encountered on construction sites [5,11–13,18]. The frequent construction site accidents witnessed have been found to be mostly due to workers' unsafe behaviors, largely due to a nonchalant attitude toward safety hazards and non-compliance to safe work practice [17,19,20]. This is further enhanced when workers tend to underestimate safety risks on construction site, and in return limits their ability to identify hazardous situations [21]. Although Pandit et al. [22] noted that the subject of workers' attitudes and its relation to self-regulated safety performance in the construction industry is complex, attitude is a core manifestation of inherent individual traits which reflects on characteristics and behavior [23]. Thus, this study aims to present insight into the voluntary safety responsibilities of construction workers in Nigeria, toward an optimized self-regulated safe working environment. To achieve this aim, the study adopted two main objectives which involved the assessment of workers' safety attitude and the assessment of workers' safety behavior on their respective job sites, being the antecedents of non-compliance to safety regulations. Findings from the study add to existing literature that set the precedence for understanding the unique dynamics of safety management in Nigeria, toward finding the most appropriate solutions that fit the context of the construction environment.

2. Literature review

2.1. Safety legislation and compliance

Generally, there exists literature that elaborates on the various forms of legislation which underpin compliance attitude and behavior as a precursor to a safe work environment within the construction sector. On one hand, prescriptive legislation specifies to the regulated party exactly what should be done and what should be avoided by providing acceptable standards of behavioir [24]. According to Weick [25], this type of legislation is much easier to follow and allows for better compliance. Here, it is assumed that the regulated are knowledgeable on the purview of the regulations and therefore adhere strictly to the requirements without ambiguity [26]. On the contrary, principle-based legislation imposes statutory responsibilities on all parties to ensure that their respective activities are guided by regulations solely at their discretion [27]. Hinging on the latter, Winter and May [28] elaborated that such type of legislation involves specifying the desired outcomes without clearly defining the purview of the regulation. Nonetheless, evidence from past studies shows that neither of the two forms of legislation provides compelling levels of compliance in their absolute sense, but rather it is often a mixture of the two to varying degrees [29,30].

On this, Palin et al. [31] observed that despite regulatory efforts or systems and laws regarding safety, absolute enforcement and compliance still remain elusive. This, according to Scharrer [32], is largely because motivational complexity mostly exists in relation to enforcement and compliance. Such a phenomenon could be better understood through the divergent perspectives of motivational theories. Deterrence-based and cooperative-based theories underpin the motivation of an individual or entity to comply with established regulations. Deterrence theories could be traced back as far as the 1960s [33] which uphold that punitive measures make entities or individuals comply with specified laws or regulations [22]. Such theories are underpinned by the economic philosophy that the willingness to indulge in an action is directly proportionate to its consequential outcome [34]. Aptly put by Castro [35] as $U < PD$, where U = benefit of non-compliance, P = likelihood of being caught and D = cost of being caught.

The assertion of the equation is that to ensure safety compliance, the direct and indirect costs of non-compliance and the possibility that offenders would be caught should be greater than the perceived benefits of non-compliance with regulations [22,34]. Therefore, it can be asserted that deterrence theories view individual compliance to regulations as a calculated rational behavior [28]. Relatedly, cooperative theories are rooted from the philosophical perspective that compliance is best achieved through a conciliatory style of enforcement, which involves persuasion and cooperation of the regulated individual or entity as opposed to threats of punitive consequences [29]. Gunningham [36] contends that individuals or entities do not consider benefits or implications of compliance to safety, but rather indulge in compliance to regulations solely on the logic of appropriateness. Such theories assert that compliance is directly proportional to a sense of reason and appropriateness which determines whether an individual or entity would ignore or comply with regulations [25].

2.2. Role of self-regulation on workplace safety

Command and control have been the most utilized methods of safety regulation across industries. According to Ayres and Braithwaite [37], such a regulation method involves the government or state setting the regulatory standards and ensuring that those standards are duly enforced. All parties in the industry are mandated to comply with the set standards in liaison with the government-instituted regulatory agencies [38,39]. However, the efficacy of a command-and-control method of regulation have been criticized over the years [22,37,38] based on non-compliance and absolute disregard of safety regulations within construction environments where such an approach is considered. Shortfall on this approach has been largely attributed to the failure of the government agencies to perform their mandate diligently. Johnson and Scott [40] opined that the command and control is deficient in uncovering errant activities due to lack of accountability from offenders. Earlier, Palin et al. [31] characterized the

approach as inadequate, illusory, hindering innovation, costly and failing to fully explain compliance behavior. Thus, there has been a paradigm shift in the approach taken for regulation, away from the traditional command and control to compliance theories-oriented approaches such as self-regulation, which offers a more flexible, open and tolerant regulatory system [10,22,32,41].

The term 'self-regulation' is used to portray any regulatory approach that allows the regulated entity or individual some degree of control in the formulation and implementation of regulatory standards for improved performance [42]. Robens [43] traced the evolution of self regulation to the 19th century, acknowledging the significant role Britain played in its adoption. Ever since the Committee Report [43] which prompted the Health and Safety at Work etc. Act 1974, other countries have gradually developed self-regulatory approaches to improve the safety performance of their respective industries [26]. The principle of safety self-regulation is based on the philosophical assumption that safety risks are better managed and controlled by their creators [35]. As such, self-regulation prompts the transfer of responsibility for safety from the government to the industrial entities where private actors such as organizations or industry set standards and administer and enforce them with little or no government involvement [41]. An advantage of this approach is that it helps to augment the deficiencies of regulatory agencies, and eliminates the time taken to institute constitutional laws and regulations through bureaucratic processes.

Generally, there is no definite approach to self-regulation as it varies with contexts [35], and largely due to the complexity in regulating safety which prompts the development of complex strategies [42]. Based on this, various approaches to self-regulation have emerged and been broadly categorized into industry self-regulation, enforced self-regulation and pure self-regulation [15]. In the case of the industry, self-regulation is based on the concept of industry members or professional organizations designing standards that will enable regulating industry-specific activities [44]. In another form, the government regulatory agencies delegate some of their powers to the industry in the realization that the survival of the industry depends on efficient collective control. Enforced self-regulation, however, involves a combination of public and private regulatory efforts, where the state through its regulatory agencies defines minimum requirements, and the regulated entities formulate adequate policies and risk management strategies to achieve compliance [15]. In an instance where the regulated fail to cooperate by formulating adequate policies, the regulatory process is overtaken by applying rules through social pressure using sanctions and fines. Lack of such rules is often seen as the overwhelming limitation of pure self-regulation which trusts the regulated entity to voluntarily set standards and administer, monitor and enforce them, which can come in the form of industry best practices or a professional code of ethics [35]. Although it is argued that pure self-regulation does not exist in practice, the economic and social context determines the choice of self-regulation approach toward an optimized safety performance [36]. Therefore, it is duly important to understand the dynamic context of the construction environment in Nigeria, toward the establishment of an optimized self-regulation mechanism that would ensure the safety of all stakeholders in the highly hazardous work environment.

3. Methodology

3.1. Population and sample

To achieve the aim and objectives of this study, a quantitative research approach was adopted using a questionnaire as research instrument. The population of the study included trade workers in the Nigerian construction environment who include masons, plumbers, carpenters and electricians. The demography of the workers was selected due to the hazardous nature of tasks involved in such trades [45], and considering that the majority of safety incidents in construction involve individuals from these trades [46]. Due to the lack of a standardized database that holds the record of the total population of workers in such trades, the *n*-omega method for the determination of the minimum sample size for a non-finite population [47] was used to derive the sample size of the study, at 95% confidence interval (CI). Overall, 224 workers who fit the study demography were sampled randomly from construction sites across Nigeria and served as respondents to the study.

3.2. Measuring attitude and behavior

Several methods and techniques have been adopted across various literature for the measurement of individual attitude and behavior in diverse contexts [40]. Green [48] classified these methods into six major categories: judgement method; the summated ratings methods; the scalogram analysis method; the rating method; the unfolding technique; and the latent structure analysis method. Considering the specific context of the study, the summated ratings method developed by Likert [49] was used to measure respondents' safety attitude and behavior on site. The measurement items used in this study as presented in Table 1 were adapted from Zailani et al. [13], which were further subjected to both academic and professional scrutiny to ascertain their validity and reliability. The items were initially sourced from various studies that have measured the attitude and behavior of workers in diverse contexts as highlighted under the 'source' column in the table. Overall, the scale recorded a reliability value ($\alpha = 0.90$) which shows strength of reliability [50], and also unanimous agreement on its validity. Respondents were asked to respond with their respective level of agreement with each item (1 = *strongly disagree* to 5 = *strongly agree*). Subsequently, an average score across all measurement items for individual worker was calculated using Equations (1) and (2). This gives aggregated safety attitude and safety behavior scores for each worker ranging from 1 to 5, with a positive score and a negative score at both extremes (1 = *positive*, 5 = *negative*) considering the negative structure of the measurement items:

$$\mathbf{SA_{worker}} = \frac{\sum_1^8 SA}{8}, \tag{1}$$

$$\mathbf{SB_{worker}} = \frac{\sum_1^8 SB}{8}, \tag{2}$$

where SA_{worker} = safety attitude of an individual worker; $\mathbf{SB_{worker}}$ = behavior of an individual worker; *SA* and *SB* = responses of individual workers to each of the survey statement items for safety attitude and safety behavior, respectively.

Table 1. Developed questions used to measure attitude and behavior among target group.

SN	Measurement item	Source
Safety attitude		
1	Provision of PPE and other safety tools on the construction site is an unnecessary effort	[11,51]
2	Pressure from other workers and supervisors on site makes me behave unsafely	[51,52]
3	I can never be involved in an accident because of my vast experience on the job	[11,21,53,54]
4	My workmate's safety on site is not very much important to me	[53]
5	Safety training prior to commencement of work is unnecessary	[53,55]
6	I am safety conscious on site only when I know management is strict on it	[53]
7	I will rather finish my work early discarding safety, than follow safety protocols that takes longer time to finish	[21]
8	I do not follow safety rules that I feel are unnecessary	[51]
Safety behavior		
1	I take drugs while on site to enable me work harder	[11]
2	While working, I get overwhelmed and I become unaware of my environment	[11,56]
3	I barely wear PPE or use other safety tools while on site	[51,56]
4	I sometimes breach safety protocols in order to finish my work on time	[11,21,51,56]
5	I hardly check the conditions of my tools and site equipment before I use them	[51,56]
6	I sometimes engage in hazardous works even when I know my safety is not guaranteed	[53]
7	I do not always stick to my workstation as I like to wander around the site	[53]
8	I do engage in works on site that I had no prior training on because I feel they are easy to do	[51,53]

Note: PPE = personal protective equipment; SN = serial number.

4. Analysis and discussion

Figure 1 shows the classification of the respondents based on their respective work trades. The majority of the respondents were either in masonry or carpentry, representing 37.5 and 33.9% of the sampled group, respectively. Only 10.7% were specialized in electrical works, while 17.9% were specialized in plumbing works.

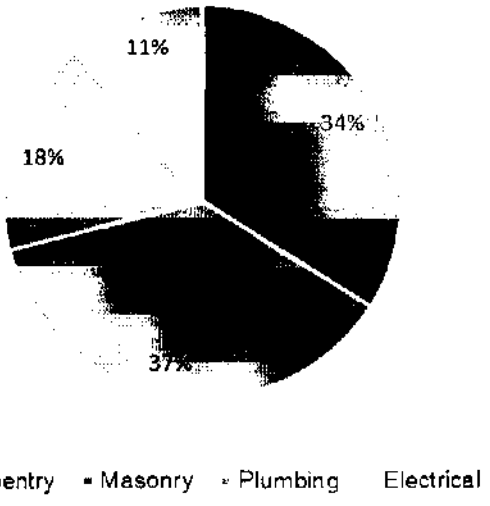


Figure 1. Classification of workers by trade.
Note: The full color version of this figure is available online.

Table 2. Demographic background.

Characteristic	Frequency	Percentage
Experience (years)		
1–5	59	26.3
6–15	123	54.9
16 and above	42	18.8
Total	224	100.0
Safety training		
Yes	136	60.7
No	88	39.3
Total	224	100.0

Relatedly, Table 2 presents the demography of the respondents in the study. The majority of the respondents have no more than 15 years' work experience, with 54.9% falling within the range of 6–15 years and 26.3% within the range of 1–5 years. Only a small fraction of the respondents representing 18.8% have above 16 years' experience in their respective trades. On having previously been involved in a safety training workshop or program, only 39.3% reported not ever been engaged in a safety training program while 60.7% responded in the affirmative.

Table 3 presents the accident background of the respondents through the conduct of their respective work trades over the years. The majority of the respondents representing 94.2% reported having experienced an accident on the job site either directly or indirectly, with only 5.8% reporting not ever being engaged with an on-the-job accident. With regards to the severity of accidents, 44.6% of the incidents were deemed severe by the respondents which translates into major injuries, with 34.8% deemed not severe involving minor injuries. However, the respondents reported that 20.5% of the incidents resulted in very severe consequences leading to fatality.

Relatedly, the most prominent nature of accident experienced by the respondents as shown in Figure 2 was 'fall from height', accounting for 54.9% of the responses. Whereas 'stepping on sharp object' represents 17% of the incidents, 'falling objects' represents 9.4%, 'fall into an open pit' accounts for 8%, 'electrocution' represents 6.7% and 'chainsaw cut' represents only 4%.

A one-sample t test was conducted to ascertain the significant difference between the means of the safety attitude and safety behavior of respondents across all work trades, as presented in Table 4. A test value of 3 was used to denote a threshold for positive attitude and good behavior amongst construction workers in diverse work trades. Results of the

Table 3. Accident background.

Background	Frequency	Percentage
Accident experience		
Yes	211	94.2
No	13	5.8
Total	224	100.0
Severity of accident		
Not severe	78	34.8
Severe	100	44.6
Very severe	46	20.5
Total	224	100.0

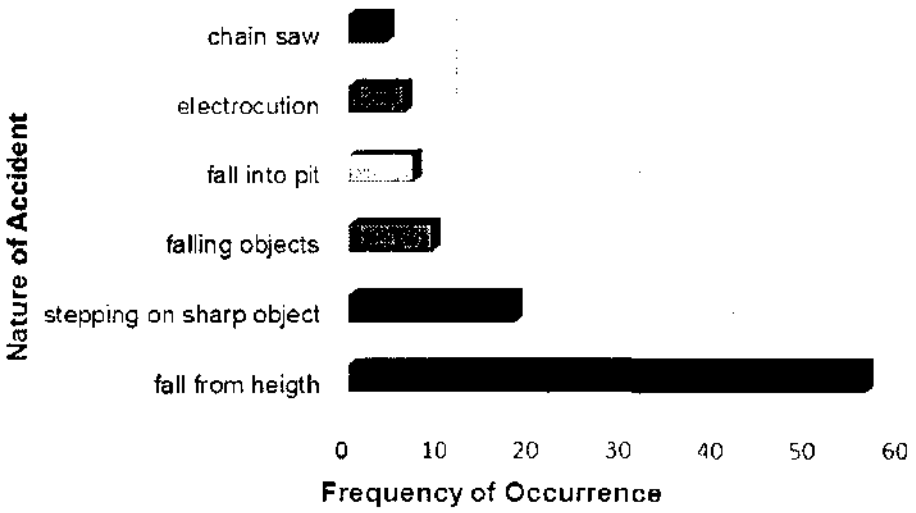


Figure 2. Nature of accident experienced.

Table 4. One-sample *t* test on safety attitude and behavior of construction workers.

								95% CI of the difference	
Variable	Mean	*SD*	*SEM*	*t*	*df*	*p* (two-tailed)	Mean difference	Lower	Upper
Safety attitude of workers	2.38	0.62	0.04	−15.14	223.00	0.00**	−0.63	−0.71	−0.54
Safety behavior of workers	2.80	0.80	0.05	−3.78	223.00	0.00**	−0.20	−0.31	−0.10

analysis shows that construction workers have a relatively negative attitude toward construction safety (M 2.38, SD 0.62), coupled with a low level of safety behavior on the job site (M 2.8, SD 0.80). Similarly, the one-sample t test revealed that the mean scores of trade workers on safety attitude and behavior are significantly different from the t value ($p < 0.05$). This means that the safety attitude and behavior of the construction workers is farfetched from the requirement for an optimized safety performance.

Similarly, one-way analysis of variance (ANOVA) was conducted to ascertain the effect of 'nature of job', 'work experience', 'safety training' and 'accident experience' on respective safety attitude and behavior of workers. The results as presented in Table 5 revealed that there was a statistically significant difference in safety attitude and behavior of workers based on their distinct nature of trade [$F(3,220) = 4.800$, $p < 0.01$]; [$F(3,220) = 6.273$, $p < 0.01$] and work experience [$F(2,221) = 25.410$, $p < 0.01$]; [$F(2,221) = 21.761$, $p < 0.01$], respectively. There was statistical difference in the safety attitude of workers based on previous safety training [$F(1,222) = 7.893$, $p < 0.01$], whereas no statistical difference in the safety behavior of workers based on previous training [$F(1,222) = 0.112$, $p > 0.05$] was established. In addition, no statistical difference was found between safety attitude and behavior based on previous accident experience [$F(1,222) = 2.754$, $p > 0.05$]; [$F(1,222) = 0.402$, $p > 0.05$].

Post hoc analysis using the Turkey Honestly Significant Differences (HSD) indicates that the safety attitude mean score for workers specialized in carpentry works was significantly different from those specialized in plumbing (SD 0.12, $p < 0.05$) and electrical works (SD 0.14, $p < 0.05$). More so, there was statistical difference between the means of masonry workers and electrical workers on safety attitude (SD 0.13, $p < 0.05$). With regards to safety behavior, statistical difference between

Table 5. One-way ANOVA for safety attitude and behavior.

Scale	Safety attitude	Safety behavior
Nature of job	$F = 4.800, p = 0.003$**	$F = 6.273, p = 0.00$**
Work experience	$F = 25.410, p = 0.00$**	$F = 21.761, p = 0.00$**
Safety training	$F = 7.893, p = 0.005$**	$F = 0.112, p = 0.739$
Accident experience	$F = 2.754, p = 0.098$	$F = 0.402, p = 0.527$

the mean scores of carpentry workers and electrical workers (SD 0.18, $p < 0.05$) existed, and between masonry workers and electrical workers (SD 0.18, $p < 0.05$), respectively. While there was no other statistical difference found between distinct job trades, years of work experience was found to have an effect on individuals' safety attitude and behavior. There was significant difference on safety attitude amongst workers with 1–5 and 6–15 years' experience (SD 0.09, $p < 0.01$), 1–5 and more than 16 years' experience (SD 0.11, $p < 0.01$), and 6–15 and more than 16 years' experience (SD 0.10, $p < 0.01$). However, no statistical difference mean scores were found for safety behavior amongst workers with 1–5 and 6–15 years' working experience (SD 0.12, $p > 0.05$), while other comparisons showed statistical difference ($p < 0.01$).

4.1. Discussion

Considering the paucity of related studies in Nigeria, the present study has added to the debate around the voluntary safety responsibilities of construction workers and the organization at large toward the enhancement of workers' safety attitudes and behavior. As Umeokafor [15] posits that the construction industry in Nigeria is largely self-regulated with very little or no efforts from the government to ensure that safety standards and regulations are strictly adhered to, it becomes

paramount to explore measures that will improve the inherent dynamics of individuals involved in the industry toward an optimized self-regulation of safety. Pandit et al. [21] opined that the likelihood and magnitude of the occurrence of risks exponentially declines when individuals involved in hazardous activities become self-conscious of the risks involved in their respective jobs, and make selfless efforts toward ensuring their safety. In this regard, findings from this study provide insights into the inherent dynamics of construction workers in Nigeria as it relates to their readiness to be fully self-regulated.

Demographic data from this study showed that 94.2% of the respondents were at one point in their career involved in a job site accident that included fall from height, injury/cut as a result of contact with sharp object, work-related musculoskeletal disease (WMSD), etc. The finding is consistent with that reported by Namian et al. [55], who revealed that the majority of accidents on construction sites involve trade workers, with masonry and carpentry tradesmen being more prone to job site accidents, while plumbing and electrical workers are often exposed to medium-level risks. Similarly, 'fall from height' is seen to be the most prominent type of accident that occurs on construction sites with synonymous data from this study and that by Namian et al. [55]. While Vigneshkumar and Salve [57] observed that the increasing rate of falls from height on construction sites is a global phenomenon, Robson et al. [58] reported that enforcing a regulatory training standard for construction workers using fall protection equipment resulted in a significant decrease in the rate of falls in Canada. It can therefore be asserted that when similar efforts in construction environments around the globe are encouraged, this could prove a lasting solution to the problem. However, the case of most LMICs including Nigeria is that the use of a safety harness at height and other personal protective equipment (PPE) is not actively being enforced even where such devices are supplied [59]. Notably, 60.7% of respondents in this study reported having been engaged in at least one safety training program that focused on improving their health and safety practices on the job site. The results reveal positive signs of curbing the persistent involvement of construction trade workers in job site accidents – however, in reality there is anecdotal evidence that reveal work-related injury on construction sites, especially in developing countries, is still high with a limited number of frontline employees gaining access to relevant training and awareness that is likely to strengthen workplace safety behavior.

The present study outcome around safety attitude and behavior further highlights the limited direct impact of safety training on the attitude and behavior of the respondents. This finding further elaborates on the poor safety performance of the Nigerian construction industry [60,61], partly due to lack of or insufficient enforcement of safety standards and regulations. As Umeokafor and Isaac [62] observed that the construction industry in Nigeria is relatively self-regulated, it boils down to construction firms and individuals involved in the industry to selflessly adhere to safety regulations and standards without being forced to do so. It has been widely argued that, for construction stakeholders to achieve such a level of safety consciousness and practice, they need to possess the right attitude and learn to exhibit good safety behaviors on the job site [63,64]. The results from the one-sample *t* test conducted based on the data that informed the present study showed the mean scores for safety attitude (*M* 2.38, *SD* 0.62) and safety behavior (*M* 2.8, *SD* 0.80) among the participants as far-fetched from the minimum requirement for optimized safety performance. Hence, the low-level attitude and behavior as witnessed in the study outcome further strengthens the call for the promotion of better safety climate of the Nigerian construction sector just as tradesmen are viewed as lacking the capacity to be self-regulated, thereby requiring an external force to enforce their compliance to safety regulations and standards.

More so, the ANOVA and post hoc results showed significant difference between safety attitude and behavior of the participants across distinct work trades. While the post hoc test showed no significant difference in safety attitude of carpentry workers when compared to their counterparts in the masonry trade ($p = 0.995$), significant difference was observed across workers in the carpentry, plumbing and electrical trades ($p < 0.05$). With regards to the safety behavior of the workers, no significant differences were observed across carpentry, masonry and plumbing ($p > 0.05$). However, significant difference was found amongst carpentry workers when compared to electrical workers ($p = 0.00$). This provides empirical support for previous studies that argue on the need for context-based safety management systems and techniques [14,51]. As nature of activities and levels of safety risks vary across distinct work trade and construction environments, there is need for specific design of safety management systems that will fit the context of work and level of risk. Similarly, statistical difference on levels of safety attitude and behavior was found across varying years of work experience amongst construction workers. The implication of this finding demonstrates that Nigerian construction workers are likely to have the tendency of better safety attitude and behavior in their early years, with declining levels of safety attitude and behavior as they become more experienced with the work. While one might presume the opposite, it might be that the persistent disregard for safety in the construction environment [8] grows among the construction workers and distorts their attitude and behavior in the long run. This could certainly be possible as Lindenberg [65] reported the empirical effect of environment on normative attitude and behavior.

5. Conclusion

This study built on the growing body of knowledge, by providing empirical evidence for the need to develop the safety attitude and behavior of workers toward an optimized safety regulations compliance and performance especially in LMICs. The study provided insight into the cognitive dynamics of construction workers and how it is contributing to the persistent abysmal performance of the construction industry in Nigeria, while also opening up novel areas of academic curiosity especially among researchers from the Global South. Previous studies have rightly described the regulatory regime and legislation in Nigeria as inadequate, fragmented and dysfunctional, hence the need to promote positive safety behavior and attitude within the industry. To add to this debate, findings from this study showed that workers in the Nigerian construction industry generally have poor attitudes and behavior toward safety on their respective job sites. Certainly, this finding is limited by the preferred means and methods adopted in the study, and the extent of interpretation and understanding which is not immune in any regard to further academic scrutiny and improvements. Nonetheless, it is asserted that the paucity around the regulatory regime and legislation in Nigeria

leaves the construction organizations prone to increased rate of accidents and safety challenges. Failure of the government to enforce safety through its agencies exposes the unaware and unconscious workers with low levels of safety attitude and behavior to engage unregulated in hazardous activities. Simply put, the construction industry in Nigeria is not yet matured to be left to operate a fully self-regulated standards and policies, but rather there is the need for a certain level of external enforcement required at the moment to complement the low attitude and behavior levels among construction workers toward safety. In addition, consistent efforts should be made at improving workers' safety attitude and behavior in the construction sector for better safety consciousness and awareness that would yield optimized safety regulation compliance and performance.

Disclosure statement

No potential conflict of interest was reported by the authors.

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