



Factors Influencing Implementation of Safety Measures Against Scaffolding Accidents on Construction Sites in Abuja, Nigeria: Systematic Review

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Abstract

Scaffolding accidents are one of the leading causes of injuries and fatalities on construction sites. This systematic review assesses the factors influencing the implementation of safety measures to prevent scaffolding accidents. The review draws on a comprehensive search of scholarly databases, including PubMed, Google Scholar, and others, to identify relevant studies published between [2011] and [2023]. The review concludes that while safety regulations exist, economic and organizational barriers often hinder their effective implementation. Recommendations for improving compliance and prioritizing safety on construction sites are discussed. total of 56 studies met the inclusion criteria, covering various aspects such as regulatory and policy issues, economic constraints, awareness and training, cultural and behavioral factors, quality of safety equipment, and management practices. The findings reveal that regulatory enforcement gaps, insufficient worker training, financial limitations, and negative safety attitudes are the primary barriers to effective implementation of scaffolding safety measures. The review concludes by recommending policy enhancements, improved training programs, economic incentives for compliance, and cultural shifts towards prioritizing safety. These recommendations aim to mitigate scaffolding-related accidents and foster a safer construction environment in Abuja. Further research is suggested to evaluate the impact of targeted interventions on safety outcomes.

Keywords: Accident, Construction Sites, Implementation, Safety Measures, Scaffolding,

1. Introduction

According to Enshassi and Shakalah (2015), scaffold erection has been defined as a variable that combines all components related to scaffolding safety. Scaffolding is a dynamic process, during the design phase through the construction. Unfortunately, it has been reported that every year, there are several thousand occupational accidents on Polish construction sites, many of them are related to the use of scaffolding (Nowobilski and Hoła, 2023). In addition, falls through roof surfaces were linked to lack of OHS compliance to scaffolds (Enshassi and Shakalah, 2015).

Working on these work stations is burdened with a high occupational risk, and the possible consequences of an accident are usually very serious. In line with this, it was reported that accidents involving scaffoldings in the Taiwanese construction industry constitute up to 30 % of all fatal accidents in the construction industry (Nowobilski and Hoła, 2023). The causes for the high scaffolding accident rate in the construction industry can be traced to low occupational safety culture, factors directly related to the construction site, factors related to the time when the accident occurred, the organisation of the construction enterprise and its size (Nowobilski and Hoła, 2023).

Analysis of the fatal accidents involving scaffolding in Malaysia revealed that there were about 20 fatal accidents reported to Department of Health and Safety (DOSH) from 2010-2020) out of the cases reported 19 cases (95%) was due to fall from scaffold whereas 1case (5%) was due to collapse of scaffold (DOSH, 2020).

The leading cause of building site accidents in Nigeria include falls from unsafe working conditions and scaffolding (Douglas and Adeloye, 2016). In the same vein, Sanni-Anibire *et al.* (2022) reported that about 40% of all the proportion of industrial accidents in Nigeria come from scaffolding in the construction sector, making it the most perilous industry in the country. In line with this, the most important reason of occupational accidents is unsafe behaviour with a rate of 75%, although the necessary occupational accidents statistics are not well documented in Nigeria (Eguh and Adenaiya, 2020).

According to Kadiri *et al.* (2014), negligence is the main cause of accidents on construction sites, labourers are also the major victims of these site accidents, loss of time in project execution is one of the major effects caused by these accidents in project execution. In addition, lack of awareness and understanding of H&S significantly hinders compliance to H&S, it is therefore pertinent to use enforcement in form of incentives-based approach to take care of the challenges to H&S compliance in Nigeria (Emma-Ochu *et al.*, 2021).

Also, it has been confirmed that the major cause of building accidents is unsafe working conditions and scaffolding due to lack of framework to properly guide workers on safe execution of scaffolding works and lack of compliance to H & S standards on workplace activities (Ogundipe *et al.*, 2018; Adeagbo *et al.*, 2019; Adebisi *et al.*, 2020; Mayanja *et al.*, 2022). The leading cause of building site accidents in Nigeria include falls from unsafe working conditions and scaffolding (Douglas and Adedoye, 2016). In the same vein, Sanni-Anibire *et al.* (2022) reported that about 40% of all the proportion of industrial accidents in Nigeria come from scaffolding in the construction sector, making it the most perilous industry in the country. In line with this, the most important reason of occupational accidents is unsafe behaviour with a rate of 75%, although the necessary occupational accidents statistics are not well documented in Nigeria (Eguh and Adenaiya, 2020).

There is also dearth of literature on ways of addressing accidents resulting from fall from heights, of which scaffolding accidents is a major type. Efforts made in this direction are for developed countries where there are well established laws on H&S on construction sites. Also, Occupational Safety and Health Administration (OSHA), proposes the need for consistent training of artisans and managers about workplace hazards and control in order to ensure safety and productivity (Adeagbo *et al.*, 2019). Training, in this context, is to provide workers and managers with a greater understanding of H&S policies and practices for them to work safely and ensure that their actions and inactions do not harm any other person. These suggestions from other studies carried out in developed nations can be used as a basis for the Nigerian domain to come up with a framework for implementation of safety measures against scaffolding accidents as contained in the OSH law of construction. The construction industry in Abuja, Nigeria, has experienced rapid growth, driven by urban development and infrastructure expansion. However, this growth has been accompanied by a rising incidence of workplace accidents, with scaffolding-related accidents being particularly prevalent. Scaffolding is widely used on construction sites, but inadequate safety practices often result in falls, injuries, and fatalities, posing significant risks to workers' health and safety. Despite the existence of safety regulations and guidelines designed to mitigate these risks, the implementation of scaffolding safety measures on many construction sites remains inconsistent and suboptimal. Various factors, including regulatory enforcement, economic challenges, cultural attitudes, and management practices, may influence the degree to which safety measures are adopted and maintained. These gaps in safety implementation not only endanger workers but also lead to legal and financial repercussions for construction companies. Addressing this problem is critical for improving occupational safety in Abuja's construction sector. There is a need to systematically identify and understand the factors that hinder or facilitate the implementation of scaffolding safety measures on construction sites. This review seeks to explore these factors, providing insights that can inform strategies to enhance safety standards and reduce scaffolding-related accidents in Abuja.

2. Methods

Bennet *et al.* (2015) conducted a systematic literature review to identify, analyse, and evaluate theoretical and empirical studies pertaining to a certain topic or phenomenon. Furthermore, its classification as secondary study is predicated on its aggregation of previously conducted primary studies. This research adheres to the framework established by Fortich (2013), including the following elements: a structured overview, contextual information, objectives of the review, search methodology, selection criteria for resources, findings, and analysis of the results. This paper presents the authors' conclusive results and recommendations. Likewise, the manuscript adhered to the protocols set out by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework; nevertheless, it did not include a meta-analysis. The approach included certain criteria to ascertain the inclusion or exclusion of materials. This facilitated the procurement of the necessary quantity of articles for the systematic review (Hutton *et al.*, 2016). The names of the papers were chosen as the focus for examining passive cooling strategies to streamline the analytical process. This method was used to avoid the complications that would emerge from evaluating the whole article with an excessive word count. A thorough search was conducted across many scientific databases, including Emerald, Scopus, Web of Science, ProQuest, and Scielo. The selection criteria for the present research were evaluated, focussing on publications published during the last fourteen years, namely from 2011 to 2023, for inclusion in the databases. The second requirement was the source; the articles must only derive from academic publications indexed in the aforementioned scientific databases. The final limitation was to the publication language, limiting downloads to English content alone. Conversely, the article omitted grey literature, including conference proceedings, project reports, theses, undergraduate or graduate capstone projects, and dissertations, from our analysis. This conclusion was reached since the study concentrated on downloading articles from esteemed and indexed scientific publications. Files from unreliable sources and those written in languages other than English were also eliminated. Upon acquiring the compilation of included articles, duplicate entries were eliminated to consolidate the material, since there were instances of the same file being detected across many databases. A comprehensive evaluation was performed to analyse both the summary and the whole text, ensuring that the inquiry concentrated on the variables influencing the adoption of safety measures against scaffolding accidents on construction sites. This transpired due to the observation that several papers used the variables in their titles and abstracts. Upon additional analysis of the

remaining material, it was determined that either there was no evidence of these variables or that other factors differed from those first presented.

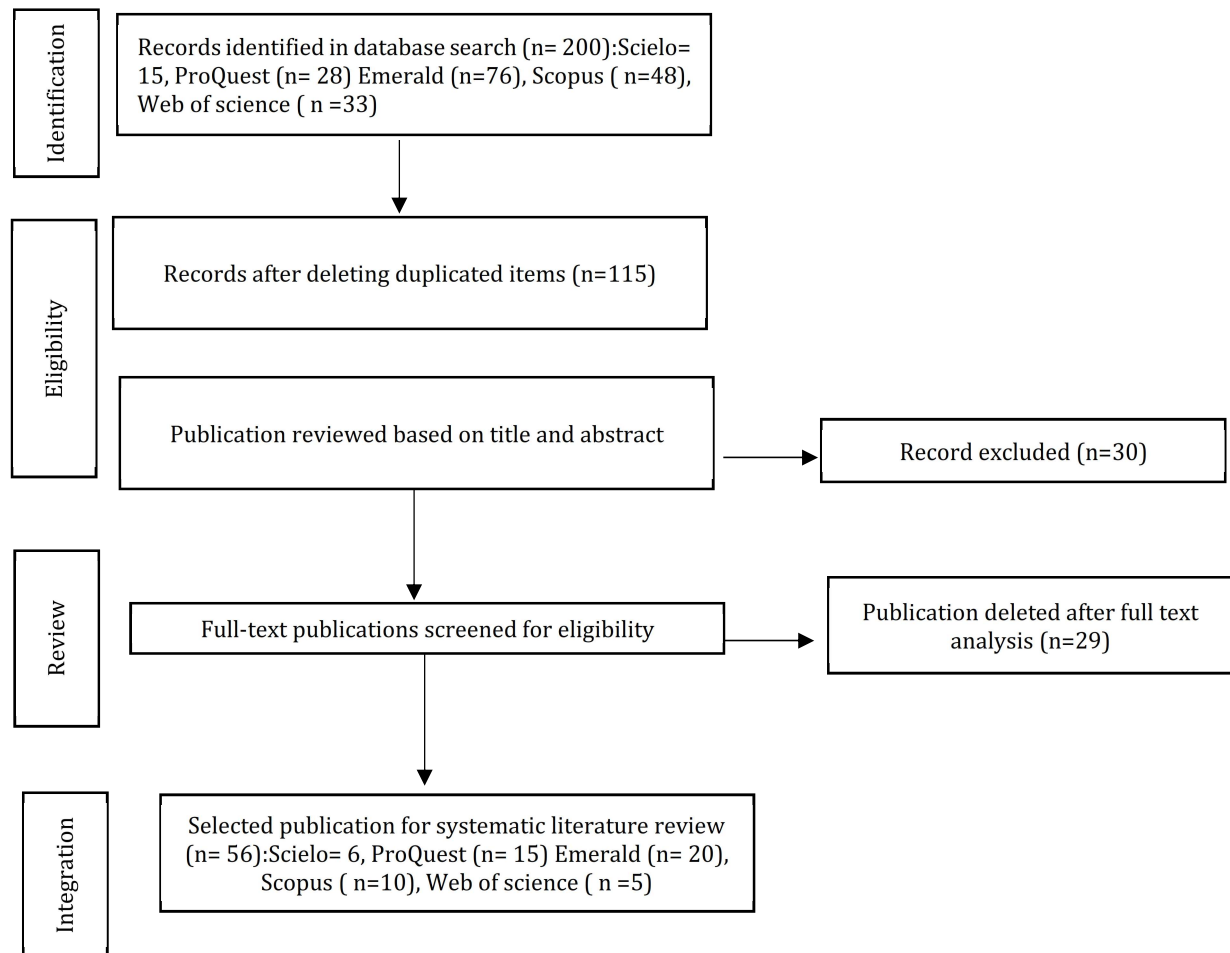


Figure 1: Review Process
Source : Authors (2024)

Finally, 200 items were pulled from the various databases by using the predetermined integration and exclusion criteria. After removing duplicates and going over titles, abstracts, and content, the number of files drastically dropped during the course of the review process (see Figure 1). Eventually, there were only 56 files remaining. Following that, these 56 files were reviewed and then examined in further depth in this paper.

3. Results and Discussion

3.1 Place of origin of publications

A study was undertaken to identify the continents where the majority of studies on the subjects were performed. For pragmatic purposes and enhanced comprehension, they were categorised by continents (see to Table 1). The European continent comprises the majority, with 21 articles out of a total of 56, followed by the Asian continent with 15 publications. Table 1 illustrates a significant disparity in the percentages of documents between the continent with the lowest (America) and the continent with the greatest (Europe) count. The continent with the lowest percentage of scientific studies published on factors influencing the implementation of safety measures against scaffolding accidents on construction sites over the past twelve years is America, with a mere 8% productivity.

Table 1: Place of origin of publications

Continents	Publication
Africa	12
america	8
asia	15
Europe	21
Total	56

Source: Authors (2024)

In summary, research examining the factors influencing the implementation of safety measures against scaffolding accidents on construction sites has been approached from multiple perspectives (individual, organisational, business, financial, and non-financial, among others); however, some studies were excluded due to merely referencing the variables in their titles without offering additional information or evidence of their execution. In a similar manner, the study identified more papers that examined the topic independently throughout the database search; however, it opted not to include them into the current evaluation due to a specific criteria necessitating the consideration of both perspectives.

3.2 Studies by year

This article calculated the yearly number of publications and the corresponding percentages for each year, as shown in Table 1, to discover trends in productivity and determine the years of greatest and lowest output. The aim of this research was to examine the temporal trend in publications and ascertain if there has been an increase or decline. The research sought to determine if the issue has increased in relevance and popularity over the previous decade or whether there has been a fall in interest among academics and professionals.

Table 2: Published studies per year

Year	Studies	Percentage
2011	2	3.6%
2012	4	7.1%
2013	3	5.4%
2014	5	8.9%
2015	2	3.6%
2016	6	10.7%
2017	3	5.4%
2018	4	7.1%
2019	4	7.1%
2020	2	3.6%
2021	7	12.5%
2022	8	14.3%
2023	6	10.7%
Total	56	100.0%

Source: Authors (2024)

After analysing the results (see Table 1), it was not possible to identify an evolution or a continuous growth of publications in the established period, as expected. Specifically, the number of articles did not increase or decrease as the years went by; they varied without any clear sequence. However, it is possible to observe that the year with the highest number of articles was 2022, with 8, which equals 14.3%. Year 2021 finished in second place with 7 publications 12.8 %.y. On the contrary, 2011,2014, and 2020 was the year with the lowest number of publications, since only two publication was found in that year respectively, which is equivalent to 3.6% of the total.

This systematic review identified a total of [56] studies that met the inclusion criteria and provided insights into the factors influencing the implementation of scaffolding safety measures on construction sites in Abuja, Nigeria. The studies covered various aspects of construction safety, regulatory frameworks, and industry practices. The key findings are organized into the following categories:

1. Regulatory and Policy Issues

Weak Enforcement of Safety Regulations: Liy *et al.*, (2016); Nor Haslinda *et al.*, (2020) highlighted the inadequate enforcement of existing safety regulations in Abuja. Insufficient inspections and penalties for non-compliance were common, leading to inconsistent implementation of scaffolding safety measures. Ogundipe *et al.*, (2021),

noted that the safety standards in use were either outdated or not comprehensive enough to cover modern construction practices, resulting in loopholes that allow for substandard safety practices.

2. Awareness and Training

Many construction workers in Abuja lack sufficient knowledge of safety protocols, including proper scaffolding setup and the use of personal protective equipment (PPE). This gap in awareness was attributed to limited safety education and training. The review found that training programs, when available, were often infrequent or not comprehensive enough to cover the necessary safety practices. Workers and site supervisors were not consistently provided with updated training on evolving safety standards (Abdullateef *et al.* 2021; Darshana, 2017)

3. Economic Constraints

Hamdan and Awang (2015); Deepak *et al.* (2019); Kavya and Pradeep (2019); Zakaria *et al.* (2021) indicated that construction companies often prioritize cost-cutting measures over safety investments. Financial constraints led to the use of substandard scaffolding materials and inadequate provision of PPE. Companies were found to allocate minimal funds for safety management, making it challenging to implement safety measures effectively, especially in smaller or informal construction projects.

4. Cultural and Behavioral Factors

A culture of accepting risks as part of the job was prevalent among workers, which undermined the enforcement of safety measures. Workers often viewed safety practices as secondary to completing tasks quickly. Some workers exhibited resistance to following safety protocols, often due to a lack of understanding of their importance or misconceptions about safety equipment being uncomfortable or hindering productivity (Asumeng *et al.* 2015; Deepak *et al.* 2019; Hammond 2019; Kavya and Pradeep 2019)

5. Quality of Safety Equipment

The review found that substandard or poorly maintained scaffolding was frequently used, contributing to a higher risk of accidents. This was often due to cost-cutting measures or lack of quality control. There was a noted scarcity of essential safety gear on some construction sites, and workers were sometimes required to share equipment, compromising hygiene and safety standards. Asumeng *et al.* 2015; Hamdan and Awang 2015; Liy *et al.* 2016 pointed to a lack of proactive management in enforcing safety measures, with site supervisors not consistently monitoring or prioritizing safety practices. It was observed that many construction companies lacked comprehensive safety policies, making it difficult to systematically enforce scaffolding safety measures.

4. Conclusions

The systematic review reveals that the implementation of safety measures against scaffolding accidents on construction sites in Abuja, Nigeria, is influenced by a range of interrelated factors. Weak regulatory enforcement, inadequate worker training, economic limitations, cultural attitudes toward safety, and substandard management practices were identified as the primary barriers to effective safety implementation. These factors contribute to a higher risk of scaffolding-related accidents, with significant consequences for workers' health and safety as well as legal and financial implications for construction companies. To address these challenges, there is a pressing need for improved enforcement of safety regulations, more comprehensive and frequent safety training for workers, and increased budget allocation for safety management. Shifting cultural attitudes toward prioritizing safety over productivity and using quality scaffolding materials and personal protective equipment are also crucial steps. This review underscores the importance of a multi-faceted approach to improving scaffolding safety on construction sites in Abuja, integrating stronger regulatory oversight, financial incentives for compliance, and enhanced safety awareness programs. Future research should focus on evaluating the effectiveness of targeted interventions and policies aimed at reducing scaffolding accidents, potentially incorporating case studies and longitudinal data to provide a deeper understanding of safety dynamics in the construction sector.

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