

Evaluation of Construction Site Accidents Recorded in Minna Metropolis

*Mohammed, Y. D., Shittu, A. A. and Hassan, K. M.

Department of Quantity Surveying, Federal University of Technology, Minna, Nigeria.

*Corresponding Author E-mail: yaksmoves@yahoo.com, Tel: 08131842360; 09075760093

Submitted on: 14/01/2022

Accepted on: 17/05/2022

Abstract

The rate of injuries and illnesses recorded in the construction industry show that the industry is one of high-risk hazardous occupation. Studies also show that every year, new storey buildings are added to Minna Metropolis, necessitating the use of more workers and machines which makes the risk of accidents higher. The study evaluated the rate of occurrence of building construction related accidents in Minna Metropolis. Quantitative data on construction sites accidents for a period of 11 years (2010-2020) were obtained from the records at Forensic Pathology Unit of Minna General Hospital. A survey research approach was adopted and 24 copies of well-structured questionnaires were administered to project managers of 24 purposively selected construction sites about the clients' willingness to implement effective safety measures on site. The analyses of data were undertaken using frequency counts, percentage and Spearman's rank correlation analysis. The result of the correlation analysis shows a weak, positive and significant relationship between client's willingness to implement construction site safety standards and site safety management system ($p = 0.01$; $r = 0.219$). Therefore, it was concluded that as the number of construction activities increases, the rate of construction site accidents also increases, and the increasing rate of accidents could be tied to low level of willingness of clients to embrace and implement effective safety standards on their projects. It was thus recommended that the adoption and implementation of safety-conscious contractors supported by experienced and trained employees should form part of contract conditions.

Keywords: Accident, Building, Evaluation, Construction, Site.

Introduction

Construction has been defined both in terms of Management and Engineering. In terms of Management, construction is the process of assembling materials and erecting structures; the medium in which a building is built (Construction Glossary of Building Terms, 2021). In terms of Engineering, Dina (2020) defined construction as the activity of putting together different elements using a detailed design and plan to create a structure for a certain location. Putting these two definitions together, construction can be broadly categorized into three (3): building and houses; public works; and industrial type. Based on these three categorizations, 'construction' means action or operation of building something like factory, houses, highway, bridge, slope protection, landfill, dam and water supply among others. Therefore, building construction activities is the technique involved in assembly and erection of structures which is primarily to provide shelter (Sunday & Yahaya, 2019). This shows that construction activities take place on sites with several workers and equipment where there is likelihood of hazard. For this reason, it has been established that one of the most hazardous occupations in the world is working at construction sites (Idoro, 2011; Kheni and Braimah, 2014).

It has been revealed that construction accidents kill thousands of workers every year (Idoro, 2011). Therefore, Occupational Safety and Health Act of 1994 obligates each employer to provide and maintain a safe and healthful workplace for all employees (Jeffress, 1999). According to Mohammed (2014), construction is a risky business with 13 workers per 100,000 being killed as against 5 per 100,000 on the average in all other sectors. Also, construction exposes workers to a wide range of health problem ranging from asbestosis to back pain, hand-arm vibration syndrome to cement burns (Mohammed, 2014). The

consistent increase in the rate of accidents and the illnesses recorded in the construction industry tagged the industry as one of the most hazardous and high-risk occupation (Idoro, 2011; Shittu *et al.*, 2016; Eze *et al.*, 2018).

Despite the existence of laws related to safety and health at construction sites in many nations, increased rate of accidents still persists in most of these nations. In Nigeria, the construction industry loses 5 – 7 % of its workforce annually to construction accidents (Mohammed and Ajala, 2017). A similar case of significant number of construction workforce being lost to site accidents is experienced in Minna as new storey buildings (at least up to two storeys) are added to Minna Metropolis annually. Workers and machines move about in frenzy, with everyone focused on the task at hand. In such an environment, construction accidents can and do take place. Under the Occupational Safety and Health Act 1994, the responsibility of maintaining occupational safety and health lies with the employers. It has been established that construction related illnesses can occur as a result of skipping of meals which causes hypoglycaemia, which in turn results in causing fatigue, fainting on site, difficulty in concentration, tremor and excessive sweating (Danket *et al.*, 2010). Long working hours and lack of proper sleep cause fatigue (Danket *et al.*, 2010). In addition, alcohol and drug abuse have been identify to be the major factors which increase the risk of accidents, lower the quality of work and drive-up costs due to absenteeism, health issues and poor work quality (British Healthcare Trades Association, 2019). These contribute to the level of non-compliance to safety standards on site. The resultant effect is increase in the risk of accidents.

In terms of attitude of workers and/or construction firms towards safety, Makinde (2014) attributed the causes of accidents largely to lack of awareness, indiscipline, inadequate communication and site characteristics. The act of indiscipline is a measure of lack of willingness to comply with safety standards or to even wish to be informed on how to implement these standards. Therefore, the level of willingness to implement safety standards by clients has a positive influence on the safety performance of workers and/or construction firms. Hence, the need to evaluate the rate of occurrence of building construction related accidents in Minna Metropolis.

Some of the most common types of construction accidents peculiar to the construction industry in Minna and its environment include falls, crane accidents, scaffolding accidents, electrocution, fallen objects, mechanical hazards (from machine operation), compressed gases hazards, welding, cutting and brazing accidents. Each of these mishaps can be equally tragic and equally deadly, and each of these accidents can be completely avoided through effective safety measures. Lack of safety measurements such as failure to wear helmets, goggles, gloves and putting barriers at high fall risk areas also predispose workers to construction accidents. Efforts to reduce these accidents have proven abortive over the years. In line with this, Sunday and Yahaya (2019) reported that building construction activities and accidents on construction sites are significantly rated high in Minna, Nigeria. Therefore, the number of accidents increases with the number of workforces on sites in Minna.

In the light of the background above, it is imperative to evaluate the rate of occurrence of construction sites accidents in Minna Metropolis with a view to suggesting measures for reducing the rate of such accidents. In order to achieve this aim, the study examined the trend of accidents occurrence at construction sites in Minna Metropolis from 2010 – 2020; examined the types of construction site accidents in Minna Metropolis from 2010 – 2020; and determined the relationship between clients' willingness to implement construction safety standard and construction sites safety management system (safety practices/performance). In order to address issues concerning the study's aim and objectives, an extant review of literature was undertaken. The extant review of literature carried out by the study is summarised in the paragraphs that follow and also serves as a justification for the study.

Construction industry is vital to the development of any nation, as it strongly contributes to the economic growth of the nations. As such there is need for the industry stakeholders to comply with necessary laws and regulations as regard to safety and health of workers, most especially as regard to design, construction and its facilities management. The role the construction industries play in economic development has been validated by several studies (Mohammed, 2014). In these studies, a strong statistical relationship has been established between the state of the construction industry and economic growth. The poor performances record of safety and health in construction industry has been attributed to the fact that the Occupational Safety and Health (OSH) management system is a neglected area and a function that has not been pursued systematically in the construction industry. Therefore, according to Mohammed (2014), the construction industry can benefit from an improved attitudinal change that cultivates a vision for the future which elevates safety concerns and effectively integrate them into the overall management mix and that high rate of injury are primarily due to inadequate or non- existence of an OSH management (OSHMS). Furthermore, application of effective management can lead to safer system of construction and reduce the incidence of injuries and work-related diseases.

Unfortunately, in spite of the above, studies have reported that prevention of work-related injuries still remained a major problem faced by all types of organizations and that OSHMS is an integral part of the overall management system of the organization, it facilitates the management of the OSH risks associated with the business of the organization. Safety management relates to the actual practices, roles and functions associated with remaining safe. The study of Mohammed (2014) revealed that organisations with lower accident rates were characterized by a few of the following factors: safety officers held high rank; management showed personal involvement in safety activities; superior training for new employees; frequent training for existing employees; display of safety posters for identifying hazards; well defined procedures for promotion and job placements; daily communication between workers and supervisors about health and safety; frequent safety inspections; higher priority for safety in meetings and decisions concerning work practice; thorough investigation of accidents; more frequent attendance of senior managers at health and safety meetings and empowerment of the workforce. Effective safety management has three objectives according to Geotsh (2008). These are: making the environment safe; make the job safe; and making workers safety conscious.

In line with the three objectives of effective safety management, for any accident preventive measure to be effective, there is need to identify those factors that causes the accident, and at the same time to analysis those factors so as to come up with effective preventive measures. In view of this, Yi *et al.* (2011) stated that accident prevention in the construction industry has been approached from multiple perspectives, ranging from improved safety management procedures to the adoption of safer construction technologies. Mohammed (2014) reported that without management commitment, there cannot be effective implementation of health and safety measures, as management provide all the necessary resources needed to implement the health and safety plan of action. On the other hand, Yi *et al.* (2011) reported that as construction project becomes larger and more complex (e.g. high rise buildings, long span bridges), there is a strong need to modernize and update safety procedures to prevent new type of accident, and address the changing demographics of working population. These usually prevent management from providing the required health and safety measures in order to prevent or reduce accident at construction sites is cost. If adequate funding will be made available for health and safety measures, it will surely bring about a great benefit not only to the contractors but also to others within the construction industry as this will prevent or reduce the rate of accidents on construction sites. In Europe, according to Martinez Aires *et al.* (2010), the reduction of workplace accidents is an immediate social priority and, consequently accident prevention and risk management are crucial issues for construction industries. If economic benefits of accident prevention are brought to the attention of the management, they will be more motivated to take necessary steps, which will make accident prevention more realizable.

In line with the review of literature in this section, Makinde (2014) and Adeagbo *et al.* (2019) reported that the construction industry in Nigeria needs special attention as far as safety is concerned. This is because the industry harbours a lot of quacks and questionable tradesmen, most building contracts in the rural areas both private and government contracts fall into the hands of illiterate “money bags” who have taken over construction jobs in Nigeria and as such safety standards are not implemented in construction projects. This has made safety in the construction industry which should have been a vital concern, to attract little or no attention over the years. The apparent neglect might be construed as meaning accident are infrequent and negligible on construction sites, but this is not so, as many accidents are observed daily on sites. This justifies the need for this study.

Materials and Methods

The study adopted the quantitative research approach. The use of close-ended and well-structured questionnaire with a Likert Scale response option format was employed to collect data on client’s willingness to implement effective safety measures on sites which was administered to project managers of construction sites within Minna Metropolis. The project managers were purposively selected based on the basic criteria that they must have an on-going project and the progress of the work must be within 25% to 75% completion. This was necessary because those were the period that the clients are actively engaged on the sites progress. Archival records were collected with the use of a checklist on the types and causes of accidents and injuries for a period of 11 years (2010-2020) from the Forensic Pathology Unit of Minna General Hospital. All the fatalities at construction sites were assigned to 9 categories; these were electrocution, crane accidents, scaffolding accidents, injuries due to dangerous and defective machines, falls, falling objects, welding, cutting and brazing accidents, building collapse and others. These cases were recorded in terms of time, month, and year of incident, gender, age, and types of accidents.

Due to the difficult nature of obtaining the required number of sites that meet up with the criteria for this study, the study adopted the snowball sampling technique in order to obtain the actual number of sites that meet up with the criteria from the 25 purposively selected construction firms. Based on this, twenty-five (25) project managers and their construction sites that met the study’s criteria were identified. As such, only twenty – four (24) out of the twenty (25) construction firms have construction firms that met the criteria and hence were considered for the study. The study therefore collected data from the project managers of 24 construction sites with the use of questionnaire. The questionnaires were designed on a five-point Likert Scale format and were adapted and modified from the study of Shittu *et al.* (2016). The copies of the first draft of questionnaires were given to five professionals of health and safety and social sciences to validate. The outcome of this gave rise to the questionnaire used for the study.

The analysis of data was undertaken with the aid of the IBM Statistical Package for Social Sciences (SPSS) Version 20.0. Frequency counts, mean and percentage were used in analysing the numerical data obtained from Forensic Pathology Unit of Minna General Hospital with the aid of IBM SPSS Version 20.0 to examine the trend of accidents occurrence at construction sites and the types of construction site accidents in Minna Metropolis from 2010 – 2020. Spearman’s rank correlation analysis was used to determine the relationship between client’s willingness to implement effective safety measures on sites and site safety management system. The variables used to define site safety management system are the practices which influence site safety performance of construction projects as established by Shittu *et al.* (2016). These are: employing competent safety officer for a project, understanding of workers’ and supervisor’s competencies; organising training and certification of competency; defining supervisor’s and workers’ competencies; and organising ownership engagement and empowerment scheme. The decision rules used for ranking the opinions of respondents on the client’s willingness to implement safety standards and level of site safety management system, based on a five-point scale, are presented in Table 1.

Table 1: Decision Rule for Analysing Questionnaire Responses

Scale	1	2	3	4	5
Cut-off Points	1.00 - 1.50	1.51 - 2.50	2.51 - 3.50	3.51 - 4.50	4.51 - 5.00
Client's Willingness to Implement Safety Standards	Very High	High	Average	Low	Very Low
Level of Implementing Site Safety Management Systems	Very Effective	Effective	Average	Less Effective	Least Effective

Adapted and Modified from Shittu *et al.* (2021)

Results and Discussion

Trend of accident occurrence in Minna metropolis from 2010 – 2020

The results of the data collected on accident occurrence are presented in Figure 1. In line with the achievement of the first objective of the study, Figure 1 revealed that accidents have a fluctuating trend over the period of study. There was an increasing trend on the rate of accidents occurrence from 2010 to 2013 and there was a decreasing trend in the rate of accidents occurrence from 2014 to 2020. The rate of accidents from 2010 – 2013 varied between 10.28 – 11.20% (average = 10.62%) of the total number of accidents within the period under review while the rate of accidents between 2014 – 2020 ranged between 5.54 and 10.72% (average = 7.81%) of the total number of accidents within the period under review. This finding can be associated with the rate of development as there were more construction activities going on within 2010 to 2013. As at the period of 2010 to 2013, there were more construction activities going on. The periods between 2014 and 2020 recorded the least cases of accidents. This may be as a result of low construction activities that took place then due to COVID-19 pandemic that confronted the world.

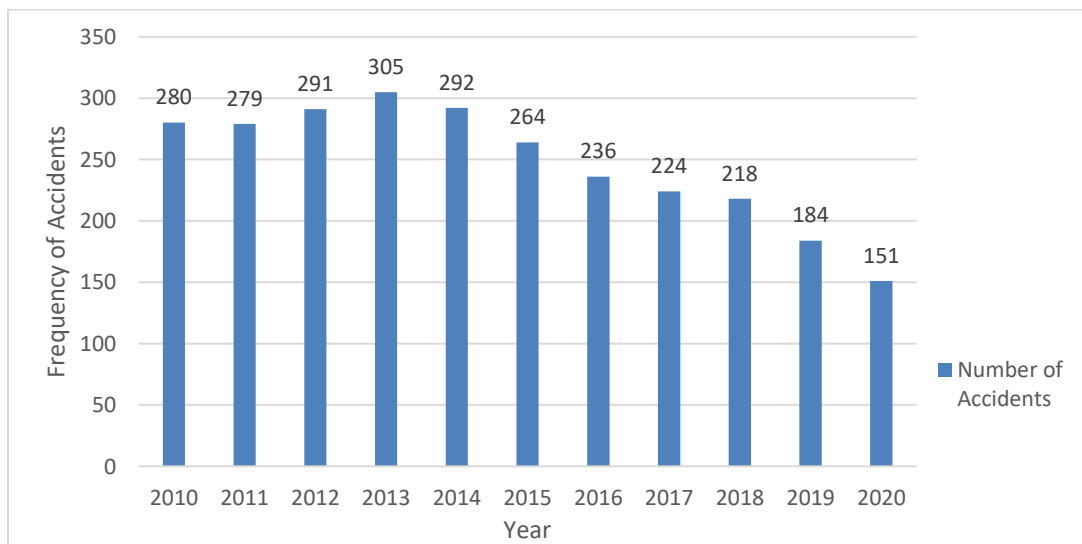


Figure 1: Frequency of the Trend of Accident Occurrence at Construction Sites in Minna Metropolis from 2010 – 2020

Types of construction site accidents in Minna metropolis from 2010 – 2020

The results of the types of accidents at construction sites in Minna Metropolis from 2010-2020 are presented in Figures 2 – 7 in line with the achievement of the second objective of the study. The results of the data collected on the types of accidents in Minna Metropolis from 2010-2020 is presented in Figure 2. From Figure 2, welding, cutting and bracing are the leading causes of accidents in Minna and its environment. This is followed by the use of dangerous and defective machines, and then followed by

electrocution. It was also shown from Figure 2 that fall (falls from height) is ranked number 7. This result is not in line with international findings. The reason for this is that in all the international studies the project sizes are large (more than 20-storey buildings) while the structures considered for this study are less than 5-storey buildings as there are no high-rise buildings in Minna. As such, magnitude and the size of the projects determine the nature and the rate of accidents occurring if proper safety measures are not put in place.

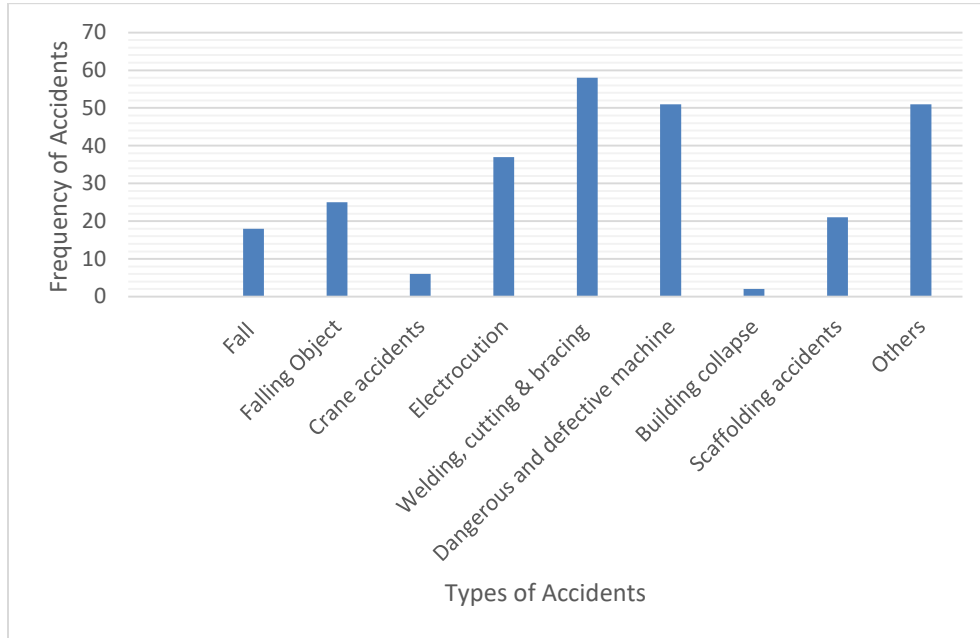


Figure 2: Frequency of the Types of Construction Site Accidents in Minna Metropolis from 2010 – 2020

The result of the data collected on accidents occurrence based on gender of victims is presented in Figure 3. Construction work is a male dominated occupation. Of the total number of accidents recorded during the period under review in this study, male accidents rate accounted for 99.42% while female accidents accounted for 0.58% as shown in Figure 3. This can be explained as a result of the fact that the construction industry is predominantly employs the male gender. As a result of this, the number of females working in the construction trade is smaller compared to the male and their accident rate is expected to be smaller as observed in this study.

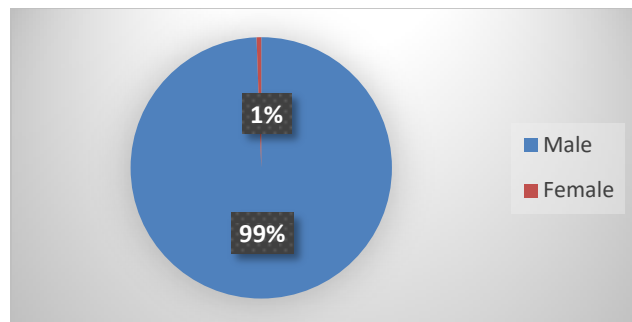


Figure 3: Accidents based on Gender

The result of the data collected on seasonal occurrence of accidents on sites is presented in Figure 4. It was shown that accidents occur more at the end of the year (third season) as shown in Figure 4. Following the third season is the second season (April - June). The high rate of accidents at the end of the year could be due to rush of work to settle payment. Another reason could be correlated to festivity period such as

Christmas, New Year, weddings and sometimes Muslim festivity. Most construction sites usually went on break during the third season (Sept – Dec). During this period, there is rush of work which results in accident occurrence on sites.

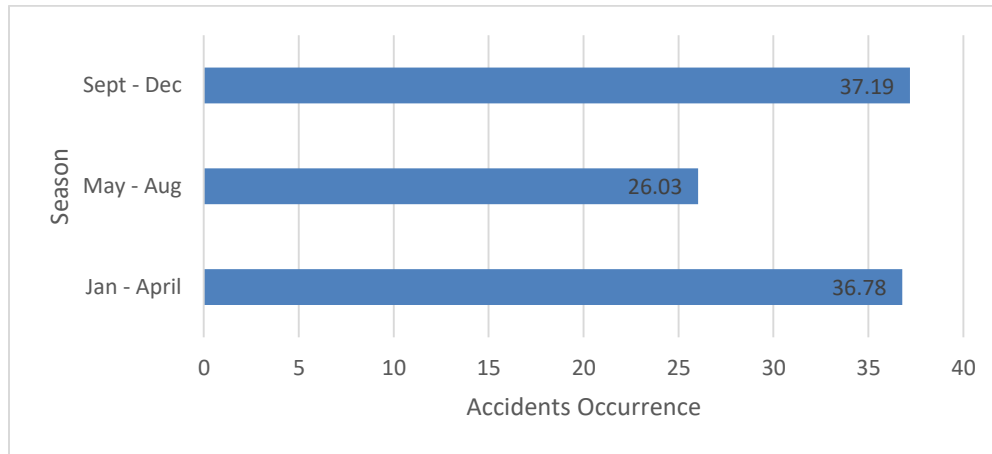


Figure 4: Seasonal Occurrence of Accidents on Sites

The result of the data collected on accidents occurrence on the basis of age of victims is presented in Figure 5. It was revealed that the highest percentage of accidents age group is between 25 – 35 years as shown in Figure 5. On the other hand, the least recorded percentage of accidents victims were recorded among workers with age group ranging from 55 – 60 years. This implies that the rate of accident tendencies decreases with the increase in the age of workers.

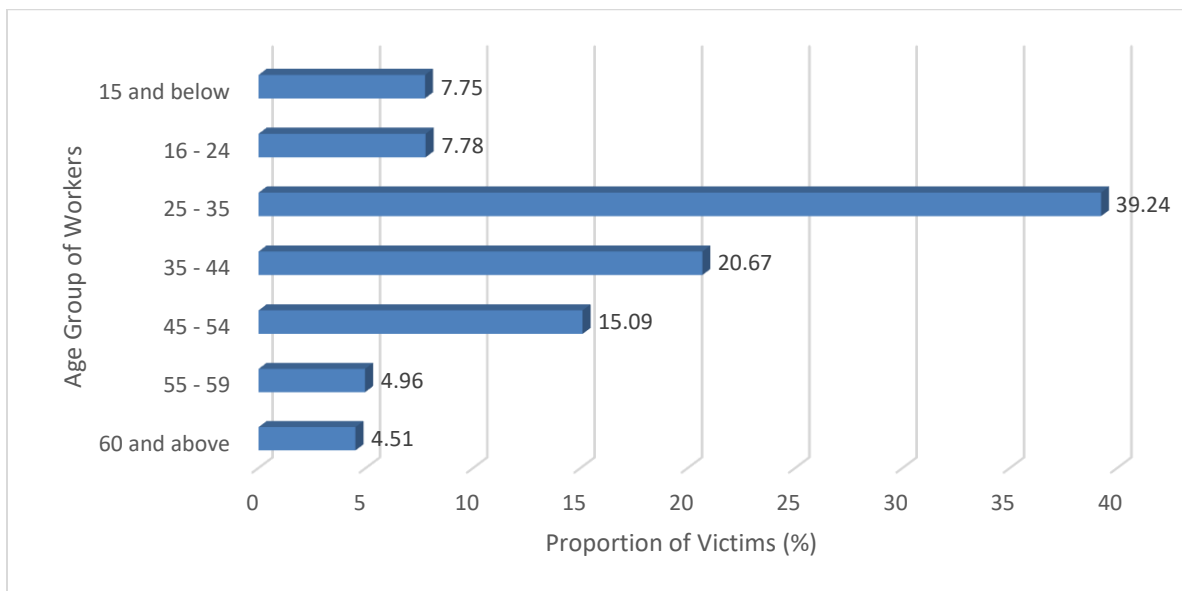


Figure 5: Ages of Accidents Victims on Sites

In addition, Table 2 indicates that of the average number of accidents that occurred at construction sites in Minna metropolis from 2010 – 2020 (270 cases), 80 accidents occurred from the age group of 25 – 35 years with 120 workers while 65 cases occurred from the age group of 45 – 54 years with 100 workers. These are the age groups with the highest cases of accidents and highest number of workers within the period under review. This probably is as a result of the fact that these are the age groups which are the most active and engage more in risky activities on construction site operations. On the other hand, the younger and older age groups with lesser number of workers record lesser number of accidents. However,

the younger age group (15 years and below; and 16 – 24 years) with a lesser number of workers record more accidents than the older ones (55 – 59 years and 60 years and above) with the least number of workers. This finding shows that workers in the middle age group who are more dominant on construction sites are more prone to accidents than the younger and older age groups. Furthermore, it can be deduced that the rate of accidents increases with increase in the number of workers. It is therefore necessary to focus accident and hazard preventive measures on the middle age group workforce.

Table 2: Comparison of Accident Occurrence among Workers’ Age Groups in Minna Metropolis from 2010 -2020

Age Group	No. of Workers	Number of Accidents
15 and below	10	45
16 - 24	50	30
25 - 35	120	80
35 - 44	100	65
45 - 54	15	47
55 - 59	10	3
60 and above	5	0
Total	310	270

The result of the data collected on accidents occurrence according to time range is presented in Figure 6. The percentage of accidents against the time range in Figure 6 shows that 36.01% of the accidents occurs in the afternoon; followed by 26.54% in the morning. Accident’s period is high in the afternoon, morning and evening as these are the peak hours of work on construction sites. Based on these findings, it is advisable to concentrate more efforts towards engaging construction site operations when the weather is more friendly (morning, evening and night). This is because the highest rate of accidents was recorded in the afternoon when the weather is usually sunny, hot and unfriendly.

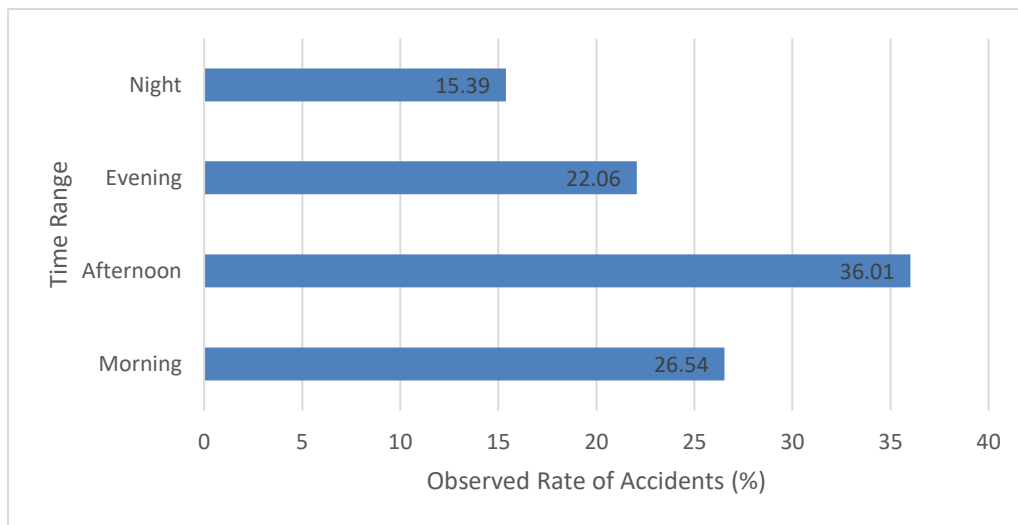


Figure 6: Accidents Occurrence According to Time Range

The result of the data collected on accidents occurrence against victim’s weeks on site is presented in Figure 7. It was revealed that accidents are increasing within 1 – 30 weeks. A construction worker needs a period of time to suit the situation on site even if the worker is experienced. Therefore, there should be connections between the entering time on the site and the accident occurring just as shown in Figure 7. The accident rate is shorter within one week and longer than half a year. This gives a scenario that new comers on the site are usually very careful to suit the circumstance and older workers are familiar with the site. Both workers are likely to be involved in accidents. Therefore, safety managers should pay much

attention to workers having served for more than one or two months on site as their accident probability is relatively high.

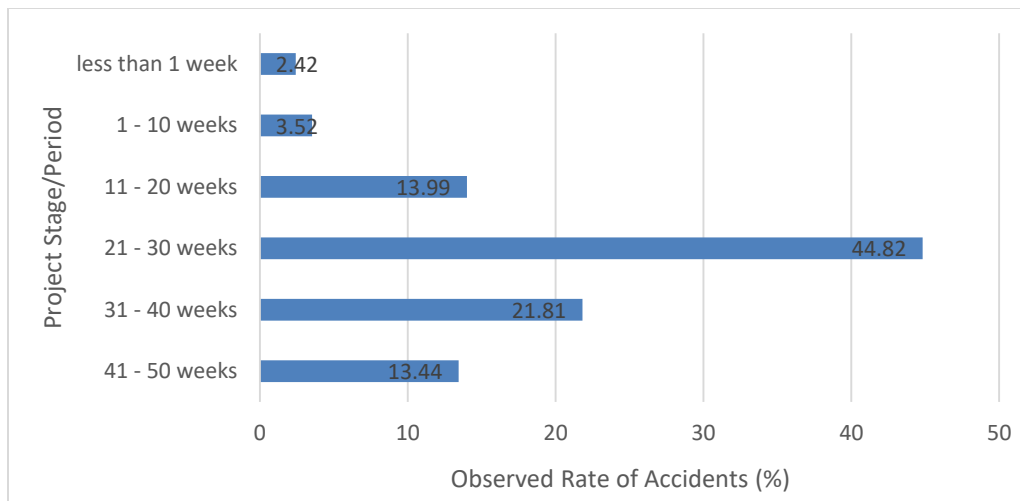


Figure 7: Accidents against Victim’s Weeks on Sites

Relationship between clients’ willingness to implement construction safety standards and site safety management system

The results of the descriptive analysis discussed earlier have shown that there is a need for improvement on the safety measures implemented on sites. Therefore, it is necessary to investigate the client’s willingness to effectively implement safety measures on construction sites. In view of this, the data collected on the level of client’s willingness to implement safety standards and site safety management system (safety practices/performance) based on a five-point scale of the opinion of respondents, were subjected to Spearman’s rank correlation analysis. This was conducted in order to determine the relationship between client’s willingness to effectively implement the construction safety standard and construction sites safety management in line with the third objective of the study. Client willingness was assigned the acronym “CWCSS” while the construction site safety management was assigned the acronym “CSSM”. The result of the Spearman’s rank correlation analysis is presented in Tables 3.

The Spearman’s rank correlation (r) from Table 3 is 0.219 while its probability or significance level (p) is 0.01 (i.e. $p < 0.001$) signifying positive, weak and significant relationship between the variables. This means that as the level of willingness among clients improves, there is corresponding improvement on the safety management system practice on sites or high level of safety awareness among the construction clients improve safety management standard on site. Based on the weak correlation between the variables, it can be inferred that the level of willingness/compliance by the clients fails to explain all possible variation in the construction site safety management standard. This can further be explained as thus: the clients have failed to employ competent supervisors, lack of individual competency understanding of workers and supervisors by the clients, ineffectiveness or lack of training and certification of competency, lack of ownership, engagement and empowerment of competent personnel, communication with responsibility for workers and supervisors.

Clients can improve on those explanations through commitment towards construction site safety management system in the areas of job training program and management participation in safety committee, as construction firms that have implemented effective OSH management system have reported benefit from operational efficiency, reduction in insurance cost and improvement in workers retention and satisfaction. Therefore, the level of willingness to implement safety standards has a positive influence on site safety management system.

Findings from this study show that the more sophisticated the construction activities, the more the rate of construction accidents on sites, until there is safety awareness among construction workers together with client’s commitment to implement measures to improve OSH on site as shown in Figure 2.

Table 3: Correlation Analysis between Client’s Willingness to effectively implement the construction safety standard and construction sites safety management

Variables	Components	r.	p
X ₁	AvgCSSM	0.219	0.01
X ₂	AvgCWCSS		

Listwise: 24

Where:

AvgCWCSS = Average client willingness to implement construction safety standard

AvgCSSM = Average construction sites safety management

This finding is in line with the findings of Sunday and Yahaya (2019) that the number of accidents increases with the number of workforces on sites in Minna. The finding here also agrees with the findings of Dong *et al.* (2009) and Mohammed (2014) that construction workers engaged in many activities that exposed them to serious hazard such as falling from height, falling objects and crane accidents internationally fall from height are leading causes of fatalities in construction operation.

Finding from this study shows that construction work is a male dominated occupation as shown in Figure 3. This finding is in line with the findings of Murty *et al.* (2006) and Mohammed (2014). It was also found that accidents occur more at the end of the year (third season) and following the third season was the second season (April - June). This finding coincides with the findings of Murty *et al.* (2006) and Mohammed (2014). This study also revealed that the highest percentage of accidents age group was from 25 – 35 years. The finding is similar to the work of Murty *et al.* (2006) and Mohammed (2014) where it was established that young workers face considerable occupational risk. This was because high rates of accidents in the age group were due to inattention, impulsiveness, overestimation of capacity and pride, recklessness and lack of family responsibility among the young workers (Murty *et al.*, 2006).

This study also found that the highest percentage (36.01 %) of the accidents occurs in the afternoon; followed by 26.54% in the morning as shown in Figure 6. However, this disagrees with the findings of Murty *et al.* (2006) and Mohammed (2014) where it was reported that work on site starts from 6 am to 12pm while in this study site work starts by 10am. The percentage of accidents against weeks on site before accidents occur shows that accidents increase within 1 – 30 weeks in this study. It also revealed a positive, weak and significant relationship between client’s willingness to effectively implement the construction safety standard and construction sites safety management as shown in Table 3. The finding here is in line with the study of Makinde (2014) which attributed the causes of accidents largely to lack of awareness, indiscipline, inadequate communication and site characteristics.

Conclusions

The study set out to study examine the trend of accidents occurrence at construction sites in Minna Metropolis from 2010 – 2020; identify the types of construction site accidents; and also, to determine the relationship between clients’ willingness to implement construction safety standard and construction sites safety management system (safety practices/performance) in the study area. This was carried out through empirical and quantitative study and based on the findings, it is concluded that:

- i. The as number of construction activities increases, the rate of construction site accidents also increases.
- ii. The highest percentage of accidents age group is from 25 – 35 years.

- iii. Majority of construction site accidents occurs in the afternoon.
- iv. Accidents increase within 1 – 30 weeks in Minna Metropolis.
- v. The level of willingness to implement safety standards has a positive influence on site safety management system.
- vi. However, there exists low level of willingness to implement safety standards among clients in Minna Metropolis.
- vii. Therefore, the increasing rate of accidents, in spite of existing site safety management system/site safety practices could be tied to low level of willingness of clients to embrace and implement effective safety standards on their projects.

In view of the conclusions drawn from the study, it is recommended that:

- i. The adoption and implementation of safety-conscious contractors supported by experienced and trained employees should form part of contract conditions in order to encourage clients to show more interest on issue of safety on construction projects.
- ii. The appointment of trained safety, health and welfare personnel assisted by staff whose responsibilities are to inspect, monitor and ensure compliance with safety standards on a regular basis will also assist in improving construction site safety management system and therefore reduction in the rate of accidents on site.
- iii. Finally, in order to effectively implement these recommendations, the government should ensure that Occupational Safety and Health Act (OSHAct) are properly implemented.

References

- Adeagbo, D. O., Dakas, A. I. I. and Izam, Y. D. (2019) Safety Practices on Building Construction Sites for Sustainable Development in Nigeria. *Journal of Sustainable Development in Africa*. Clarion University of Pennsylvania, Clarion, Pennsylvania 21(4):111-120. ISSN: 1520-5509
- Ahmad, H. I. (2019) *Effect of Site Sanitation on the Safety Performance of Workers on Construction Sites in Minna*. An Unpublished B. Tech Thesis. Department of Quantity Surveying, School of Environmental Technology, Federal University of Technology, Minna – Nigeria.
- Baker, C. C. (1987) Ethnic differences in accident rates at work. *British Journal Industrial Medicine*. 44(1): 206-11.
- British Healthcare Trades Association (2019) Drug and Alcohol Abuse in the Construction Industry. British Healthcare Trades Association. UK.
- Construction Glossary of Building Terms (2021) Residential Reports. Available online at: www.residentialreport.com.au.
- Danket, Mann and Northrop (2010) *Hour of work*. New York, Harper and Row.
- Dina, E. C. G. (2020) Construction: Definition & Type. Available online at: www.study.com
- Dong, X. S., Fujimoto, A., Ringen, K. and Men, Y. (2009) Fatal falls among hispanic construction workers. *Journal Accidents Prevention*, 41(2): 6-14.
- Eze, C. J., Ayuba, P. and Shittu, A. A. (2018) Assessment of Accidents Hazard Impact in Nigerian Building Industry. *Centre for Human Settlement and Urban Development Journal (CHSUDJ)*. Centre for Human Settlement and Urban Development, Federal University of Technology, Minna; May, 2018. 7(1): 208 – 226. ISSN NO: 2141 – 7601.
- Fact (2014) European Agency for Safety at Work. Bilbao, Spain. 1(1): 1 – 73.
- Geotsh., D. L. (2008) *Occupational Safety and Health for Technologist, Engineers and Managers*. International Edition (Ed.). New Jersey: Pearson Education Inc.
- Idoro, G. I. (2011) Comparing Occupational Health and Safety (OHS) Management Efforts and Performance of Nigerian Construction Contractors. *Journal of Construction in Developing Countries*, 2011. 16(2): 151–173.
- Jeffress, C. N. (1999) Women in Construction Workplace: Providing Equitable Safety and Health Protection. A Study and Recommendation Submitted to Occupational Safety And Health

- Administration (OSHA). National Advisory Committee on Occupational Safety and Health. Washington DC. Available online at: www.OSHA.gov
- Kheni, N. A. and Braimah, C. (2014) Institutional and Regulatory Frameworks for Health and Safety Administration: Study of the Construction Industry of Ghana. *International Refereed Journal of Engineering and Science (IRJES)*. 3(2): 24 – 34.
- MaCann. (2002) When is a fall not a fall? *Proceeding in 12 Annual Construction Safety and Health Conference*; Rosemont, IL. May: 21-3. 3(1): 57-64
- Makinde, J. K. (2014) Assessment of Safety Measures n Building Sites (A Case Study of Minna, North Central Nigeria). *Greener Journal of Environment Management and Public Safety*. 3(1), 001-008. ISSN: 2354-2276
- Martínez Aires, M. D., Rubio Gámez, M. C. and Gibb, A. (2010) Prevention Through Design: The Effect of European Directives on Construction Workplace Accidents. *Journal of Safety Science*, 48(2): 248-258.
- Mohammed, Y. D. (2014) *Assessment of performance compliance to construction site safety management system in Klang Valley, Malaysia*. Thesis submitted to School of Graduate Studies Universiti Putra Malaysia in fulfillment of requirement for Degree of Doctor of Philosophy.
- Mohammed, Y. D. and Ajala, J. O. (2017) Validation of predictive construction safety behaviours model. *International Journal of Engineering and Applied Science (IJEAS)*. 10(1): 7-15.
- Murty, O. P., Chung, B. S. K., Yin, L. Y., Loo, T. C. and Nurul, I. P. (2006) Pattern of Injuries in Fatal Accidents of Construction Workers: A Retrospective Study of 10 Years (1996-2005). *Malaysian Journal for Pathology Science*. 2(1): 44-57.
- Shittu, A. A., Ahmad, H. A., Isah, A. M., and Mohammed, N. M. (2021) Effect of Site Sanitation on the Safety Performance of Workers on Construction Sites in Minna, Nigeria. *Nigerian Journal of Technological Research (.NJTR)*. Federal University of Technology, Minna, Nigeria. December Edition. Volume 16(1): 21 – 32.
- Shittu, A. A., Ibrahim, A. D., Ibrahim, Y. M., Adogbo, K. J. and Mac-Barango, D. O. (2016) Impact of organisational characteristics on health and safety practices of construction contractors. *Nigerian Journal of Technological Research (.NJTR)*. Federal University of Technology, Minna, Nigeria. 11(1): 60 – 67.
- Sunday, A. U. and Yahaya, A. N. (2019) Determinations of the Effects of Building Constructions on the Health of the Workers in Minna, Nigeria. *International Journal of Civil Engineering Construction & Estate Management*. European Centre for Research. 7(2): 42-47. Available online at: www.eajournals.org
- Wu, T. C., Chen, C. H. and Li, C. C. (2007) Correlation among Safety Leadership, Safety Climate and Safety Performance. *Journal of Loss Prevention Process Industry*. 6(3): 261 –272
- Yi, J., Kim, Y., Kim, K. and Koo, B. (2011) A Suggested Color Scheme for Reducing Perception-Related Accidents on Construction Work Sites. *Accident Analysis & Prevention*. 7(2): 203-227