

ASSESSMENT OF PATTERN OF ACCIDENT OCCURRENCE ON BUILDING CONSTRUCTION SITES IN ABUJA, NIGERIA

ADENIYI, Kikelomo Evelyn, & MOHAMMED Yakubu Dansabe
Department of Quantity survey, Federal University of Technology, Minna, Niger State, Nigeria

The construction industry has earned the reputation of being a dangerous and highly hazardous industry because of the disproportionately high incidence of accidents and fatalities that occur on construction sites around the world (Smallwood and Haupt, 2008). Despite previous studies as regards to construction worker's accident, there has not been any study relating to the pattern of accident occurrence to construction workers most especially in Abuja, Nigeria. This goes to show that there is indeed a great need to study the pattern of accidents to construction workers. This paper views accident patterns as it occurs according to fatal and non-fatal accidents, age range of accident victims, month the accident occurred and the types of accidents. A descriptive research design was used in executing the study using 20 randomly selected companies which tick off the selection criteria for collection of archival data. Data collected were analyzed using percentile analysis. Results from the data analysis show that an up and down pattern exist in accident occurrence in the Nigerian building construction industry and recommends the creation of a construction health and safety agency that will oversee the implementation of safety laws.

Keywords: Accident, Construction, Health, Pattern, Risk, Safety and Worker

INTRODUCTION

An accident is an unforeseen event characterized by sudden and external force or violence, which may result in injuries, damages and losses to properties or people. The construction industry has earned the reputation of being a dangerous and highly hazardous industry, because of the disproportionately high incidence of accidents and fatalities that occur on construction sites around the world (Smallwood and Haupt, 2008). In many countries, the construction industry is an important part of the economy and often seen as a major part of economic growth especially in developing countries. Typically, construction industry contributes about 11% of gross domestic products (GDP) in most developing countries (Giang and Pheng, 2010). In the development of a nation, the importance of the construction industry cannot be over stressed. This is due to the fact no less than 50% of the investments in different development plans are mainly in construction. Okeola (2009) reported that all around the world, construction workers are 3 times more likely to die and twice as likely to be injured in comparison with workers in other occupations.

In Nigeria, there is no reliable data on accident cases in construction, because contractors fail to neither report accidents to the appropriate ministry nor keep proper records on accidents. In Nigeria, the challenge of health and safety in the workshop, sites, field and built facilities cannot be exaggerated, therefore, overconfidence, carefree attitudes and inability to provide healthy and safe working measures, episodic health and safety meetings for the stake holders and the public in general causes a high risk of accident in the construction industry (Okpan and Agha, 2013).

lomode60@gmail.com

Adeniyi, & Mohammed (2018). ASSESSMENT OF PATTERN OF ACCIDENT OCCURRENCE ON BUILDING CONSTRUCTION SITES IN ABUJA, NIGERIA. Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference, SETIC, 2018

Death tolls, permanent disability and serious environmental risk has been on the increase in Nigeria, especially 2005 until date caused by building collapse and major operational accidents in port Harcourt, Abuja and Lagos (Awodele and Ayoola, 2005; Olatunji and Aje; 2007). A study carried out by Idoro (2011) of 40 contractors in Nigeria, showed that the rates of injuries and accidents in the industry are high. The best safety ratios in 2006 were 2 accidents per 100 workers and 5 injuries per 100 workers. This unlucky situation has been a massive threat to the productivity and total performance of construction projects in the country. Idubor and Oisamoje (2013) stressed that it's the duty of all organizations to make sure that all employees as well as other people who may be affected by the dealings of the company remain safe at all times because ensuring and maintaining a high level of occupational safety and health is to the advantage of all. As far as safety is concerned, building industry in Nigeria needs special attention. This is because the industry houses a lot of quacks and questionable tradesmen. Most building contracts in the rural areas both government and private contracts fall into the hands of uneducated "money bags" who have control over constructing jobs in Nigeria. Statistics published by the Federal Tenders Board, (1985) in Lagos State stipulates that "this category of contractors handles a significant proportion of contracts; yearly as they make up about 70% of the contractors who handle jobs below five million naira (5,000,000.00). The other 30% of the contract involves professionals in building contraction. Since the formal possess a lot of influence and have more weight to throw around, they are always better favoured in the awarding of contract than the professional group. This has made safety in the building construction industry to attract little or no attention over the years which should have been of vital concern. The visible neglect might be interpreted as meaning accidents are rare and insignificant on construction sites, but this isn't so, as many accidents are observed daily on sites. Accidents resulting from lack of awareness occur mostly in specialized or disciplined operations. Other cause of accidents in the construction sites includes indiscipline, inadequate communication and site characteristics. It has been observed that due to insufficient technical expertise by the builder, many accidents have occurred (Ayodele, 2004).

Ogunjobi (2003) opined that under normal circumstances, there should be a person specifically in charge of safety in a contracting organization; but this practice is almost non-existent in Nigeria. On the contractor's part, ensuring that the building is situated in the most effective manner is an important part of a good planning process. The proper position of items such as site accommodation, material sheds, storage area, temporary roads, mechanical plants, scaffolding, services and hoarding should be shown on a proper site layout. In order to ensure the prevention of accidents, easy movement of labour, materials and plant should be provided for. Temporary services like electricity should be provided electrocution is unlikely to occur. To provide a safe method of working and means of easy access, scaffolding should be properly erected. Hoarding is a safety measure that can help ward off unwanted interference of work by the public, including children.

Aim of Research

The aim of this research is to assess the pattern of accidents occurrence to construction workers on building construction sites in Abuja, Nigeria.

Objectives of Research

- To examine the pattern of occurrence of fatal and nonfatal accidents to the construction workers over the period of study.
- To determine the frequency of occurrence of types of accidents to the construction workers.
- To determine the frequency of periodic occurrence of accidents to the construction workers.
- To determine the occurrence of accidents according to age range of the construction workers.

Methods and Suggestions to Improve Safety on Construction Site

Due to the alarming state of construction site safety in the world, most in particular the developing countries, several researches have been carried out on the methods and ways of improving safety on construction site (Foad, 2011). To reduce the hazardous physical condition on construction site, the following arrears where identified.

a. Safety and Health Management Systems

One way to avoid unplanned happenings is through planning and management. Effective and efficient safety management can help avoid injuries while working and since these injuries and accidents are unplanned events. Safety management must be detailed and applied to all aspects of the job. It must start from the estimating phase of the project till the completion of the project, and the last worker has exited the surroundings. All parties to a construction project must be included and responsible to the safety program. Virtually all respondents in Australia, agreed with the statement "safety is the responsibility of both workers and management" (Hassouna, 2005). Hassouna, (2005), in his study concluded that clients as part of safety responsibility must ensure that project designs are of a safe nature. He should ensure that the contractor has a safety program and the client, includes the safety program as part of the bidding technicalities.

b. Safety Programs

For a safety program to have the most effect on site safety, it must consist of managerial discussions on safety, safety booklets provision, provision of safety equipment's, provision of a safe environ and appointment of trained safety representatives on site (Aksorn et al., 2009). Hassanien (2007), surveyed the nature of safety programs in the largest 100 construction firms in the USA, and resolved that larger firms had more formal safety program. Companies that afforded workers with formal safety orientation, companies were safety representatives were employed full time, and companies that provided incentives to foremen and workers, were found to have lower injury rates. Safer performance was noted to occur when safety representatives were hired and trained by safety directors (Hassanein et al. 2007). Safety programs though do not need extensive elements, but should include at least critical elements such as safety policy, safety inductions, safety committees, safety inspections and safety training (Aksorn et al, 2009).

c. Safety Training

For each project, it is a requirement that anyone working on site should receive a minimum of eight hours of safety training (Huang and Fang, 2003). Many researchers in the construction industry have addressed the importance of safety training to improve safety performance (Aksorn et al., 2008). One sure way of improving construction site safety performance of construction workers is effective training.

d. Accident Investigation

Meaningful information that can be used effectively to reduce and eliminate foreseeable hazards can be derived from the investigation of an accident (Hassouna 2005). The majority of respondents in a survey carried out in USA agreed that the investigation of accidents were vital to improved safety performance. In Hong Kong, the most significant contributor to reducing the frequency rate of site accident was found to be accident reporting and investigation program (Poon Ma and Ho, 2003).

Safety Meeting

Hassanein (2007), concluded that, projects which employed safety officer, conducted job site safety inspections, and included safety in coordinated meetings were noted to have lower injury rates. To communicate safety information to all parties, regular safety meetings are necessary. In a study, 36% of the respondents claimed that they participated in regular safety meetings, and the other indicated that safety issues were presented and discussed at construction planning meetings. However 87% of the respondents in a survey carried out in china argued that safety meetings are rarely attended by top management (Tam et al, 2004).

RESEARCH METHODS

For the purpose of this study, quantitative method was be used. The study is criteria based, in which certain criteria were outlined for the selection of the construction companies. Which formed the study's population. These criteria are:

The construction firm or site must be a firm concerned with building construction.

The construction firm/ site must be located in Abuja, Nigeria.

Construction firm must have a history of not less than 10 years in the building construction industry.

The construction firm must have a project execution capacity of not less than 100 million Naira.

Primary sources of data collection were employed in the course of this research work through a well-structured table used for archival data collection which was administered to relevant and appropriate firms which suite the selection criteria above in Abuja, Nigeria. The population size for this study comprised of registered contracting firms. The sample size is a representative number from the population. The samples were drawn from a list containing the information of the contracting firms to be studied. The use of simple random sampling technique was employed to draw the representative number (sample size) from the total population. A total of twenty (20) contracting companies were selected for this study, this selection is similar to that of Yakubu (2016). A well formulated table was used in collecting archival data from the 20 selected companies over a period of 10 years (2004-2013).

RESULT AND DISCUSSIONS

Fatal and Non-Fatal Accidents

A wide range of activities such as repairs, alterations and constructions are the kind of activities that take place in a construction industry, making it a really hazardous industry. Fig 1.1 shows the up and down pattern of fatal and nonfatal accident occurrence for each company for a period of 10 years. This can be attributed to the fact that as human beings in general, we tend to relax when things happen as we want it to. Thereby, attaining a lackadaisical attitude and ensuring its possible decline. It shows that nonfatal accidents occur more frequently than fatal accidents. Below is a graphical breakdown of fatal and nonfatal accident occurrence based on its year of occurrence.

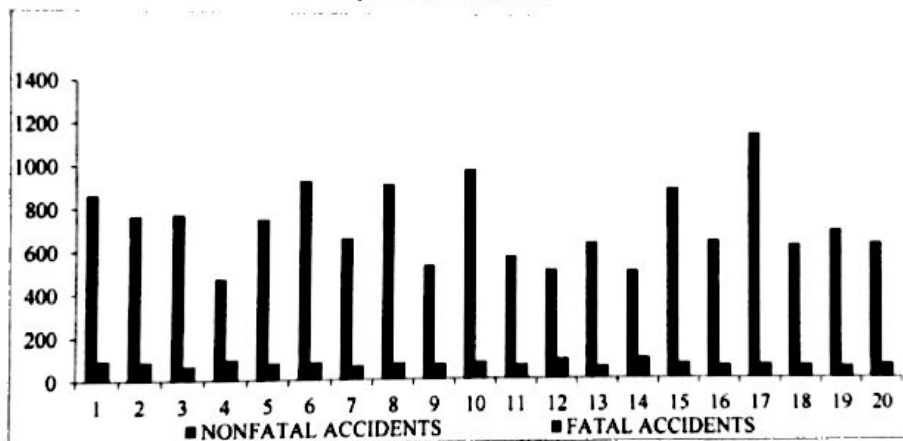


Figure 1.1 Chart Representing Record of Fatal and Non-Fatal Accident Occurrences Against Companies

Figure 1.2 shows the rate of accident occurrence between the years 2004-2013. It shows that as the year progresses, the number of accident occurrences reduce due to continuous study of the causative factors of accidents and the illumination on ways in which accidents on site can be stopped or drastically reduced. The diagram drawn from the research findings portrays an increase in the number of fatal and non-fatal accident occurrence in the year 2008, this is due to the relaxation of both management and site personnel's as the continuous reduction of the rate of accident caused a lax in managements and labourers attitude to accident prevention and safety insurance.

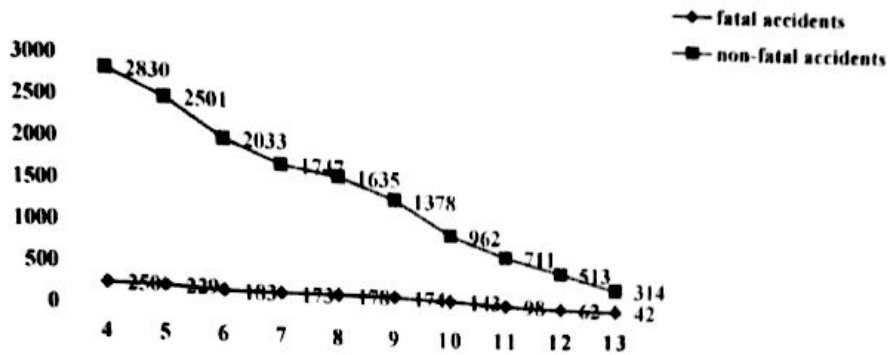


Figure 1.2 Chart Representing Record of Fatal and Non-Fatal Accident against Year of Occurrence

The causes of fatal and non-fatal accident occurrence from the research findings have been deduced to be:

Improper inspection of site equipment's: it is to be insured that all equipment's are in a good working condition. Unusual noises, jerky movements and other unusual concurrences should be looked out for, put in writing and forwarded to the management.

Insufficient safety and operating process: it is imperative that all personnel's be properly and adequately trained for proper execution of work (mechanical equipment operators, most especially). This training can be carried out either on site or at a designated training facility.

Improper and inefficient personnel protective equipment (PPE): personal protective equipment (PPE) should be provided by employers for employees. Sometimes there is a lack of PPE at most sites and where available, worn out. These PPE include safety goggles and boots, hard hats, earplugs, work gloves and face masks.

- Standards of the Occupational Safety and Health Administration (OSHA) are not adhered to in some sites. All mandates, standards and recommendations from occupational health and safety inspectors are expected to be followed.
- Absence of walk through site: this is a process that involves a periodic walking around site premises, identifying and noting down workplace hazards for managerial notification for proper action.
- Lack of readiness for emergency: first aid training should be giving to site personnel's in case of an emergency especially in regards to power failures, electrical and mechanical accidents.

Frequency of Occurrence of Types of Accident

Figure 1.3 shows the percentile distribution of the types of accident that occur in a construction industry. Falls from height with a percentage of (55.93%) stands as the most occurred accident type, hit from a falling object follows with a percentage of (23.35%), slips and falls with a percentage of (10.57%), welding, cutting and bracing accidents follow next with a percentage of (4.55%), electrocution (3.86%), and crane accident (1.74%).

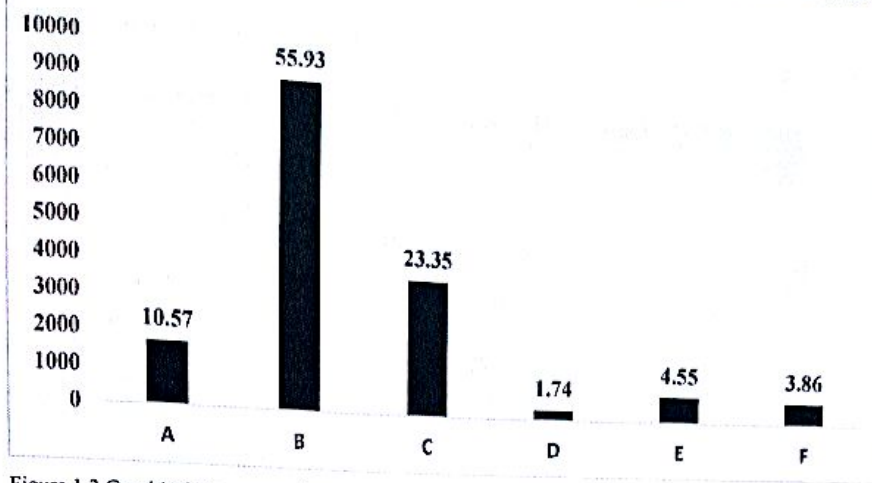


Figure 1.3 Graphical Representations of Frequency of Occurrence of Accident Types

LEGEND: A. Slips and falls
 B. Fall from height
 C. Hit from falling from object
 D. Crane accident
 E. Welding, cutting and bracing incident
 F. Electrocution

Really, it is unrealistic to totally and absolutely prevent falls in the construction field, but the use of safety methods should be encouraged. The use of safety nets, security platforms and belts help to reduce the injuries that accrue from these falls (Murty et al, 2006). This research finding is in correspondence with other research which show that falls from height is one of the major types of accidents that occur in the construction site. These include 51.95% of Yakubu, (2016). Hit from falling object with a percentage of 23.35% and slips and falls with 10.97% also prove to a cause for concern. This goes to show that construction workers are exposed to great risks and this should be a great concern to construction practitioners. Under this period of study, crane accidents fell under a percentage of 1.74%. Though one of the lowest shouldn't be neglected. In a research by Murty et al (2006), crane fatal accidents is at a percentage of 8.29%, and fatal crane accidents at 1.94% and non-fatal crane accidents at 14.19% (Yakubu, 2016). This surely shows that crane operators are at risks. Suruda, et al., (1997), opined that 13% of the victims of construction deaths related to crane where crane operators. This was discovered in an investigation of 502 crane related deaths carried out by occupational safety and health (OSHA). Therefore, crane safety research should cover risk factors for crane operators and those working near the crane (Richard, et al, 2001). In an effort to reduce the crane accidents fatalities amongst workers and ensure the safety of construction sites, a guideline has been released by OSHA. These guidelines include prior to using a crane, an inspector must confirm that the crane machine is indeed in a good condition and more comprehensive inspection must be carried out regularly to determine if there is a crack, faulty wiring, worn out ropes and other damaged parts that could lead to possible accidents (MacCollum, 1993). Electrocution lies at a percentage of 3.85% among the types of accidents that occur in the construction sites. In comparison with 5.99% and 10.08% according to previous research carried out by Yakubu (2016) and Abdul et al Rahim (2008).

This research stands slightly above the research carried out by Yakubu (2016) and more than half the finding of Abdul et al Rahim (2008). Absence of ground fault protection, power line, non-compliance with manufacturer's guidelines and instructions, improper grounding of electric equipment's and wrong use of flexible cords and extension are according to OSHA, the most common cause of electrocution accidents. On site, electrocution accidents can be done by:

Power cords and electrical equipment of construction companies should be inspected regularly for problems that need to be corrected.

Proper training on the safe handling of power lines should be given to all workers and not just electricians.

All construction companies should adhere to OSHA guidelines and regulation for ensuring safety of construction workers on site.

Frequency of Periodic Occurrence of Accident

Accidents occur more at the end of the year i.e. the third quarter of the year, followed by the first quarter of the year. This research does not coincide with previous researches carried out

by Yakubu (2016) and Murty et al (2006). Which show that accidents occur more at the last quarter year followed by the second quarter of the year.

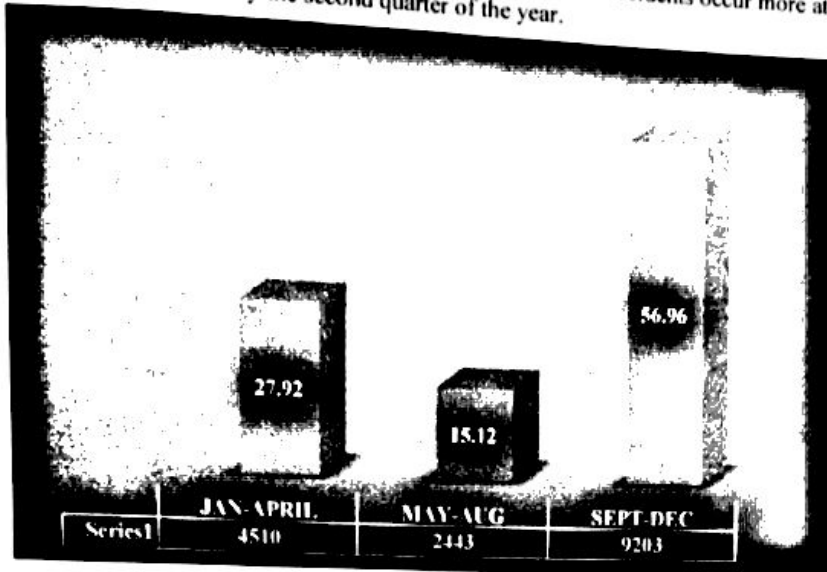


Figure 1.4 Charts Representing Periodic Occurrence of Accident

The high rate of accident at the end of the year could be attributed to the need to settle payments before the year closes and due to the festive periods (Murty et al, 2006). In Nigeria, these festive periods include the Eid-el-fetri and the Christmas celebration, (September - December). During this period, workers usually rush engagements so as to complete as much jobs as possible. Thereby, ensuring better financial supply to participate in the festivities. This research also shows a high percentage of accident occurrences during the first quarter of the year (January - April). This is due to the desire of the workers to offset debts accrued during the festive period and pay bills due at this time of the year such as school fees, house rents, among others. This leads to an increase in speed of work, taking up much work than necessary, recklessness and poor decision making which in turn leads to an increase in the occurrence of accident.

Accident According to Age Group

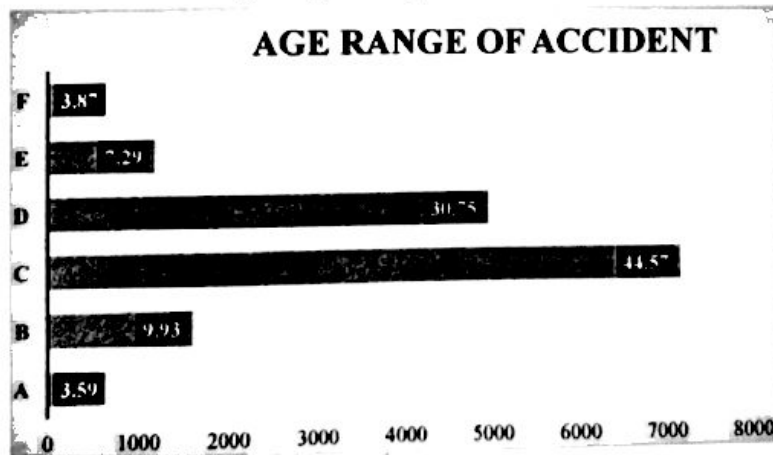


Figure 1.5 Representing Percentage of Accident Occurrence against Age Range

LEGEND - A 0-15years
 B 16-25years
 C 26-35years
 D 36-45years
 E 46-55years
 F 56 and above

In a research work carried out by Murty et al (2006) and Yakubu (2016), 21 - 50 years had the highest percentage of accident occurrence. This research tallies considerably with both research works. This age group holds a high rate of accident occurrence because of short attention span, little or no family responsibilities, impulsive attitude and overestimation of capacity that young workers suffer (Murty et al, 2006). Other studies however reveal that

older workers are prone to accidents more due to poor coordination, poor mental ability, inability of older workers to learn easily when put in to an unfamiliar situation, the probability of serious complications and difficulty to heal after injury (MaCann, 2002).

CONCLUSION AND RECOMMENDATION

It can be concluded that the rate of accident occurrence in Abuja is on the increase, but no clear and conclusive pattern can be mapped out. It has been discovered that laws and regulations alone cannot guarantee practices on the construction sites that are safe and healthy. The engagement of Contractors who are safety conscious, supported by well experienced and trained employees should be embraced and put into practice. In order to reduce the level of construction sites accidents, it is necessary to effectively assess safety and health on construction sites. This research shows that notwithstanding the involvement of the construction companies in the practice of safety and health policies, accidents still occur at a very high rate. It was also observed that accident does occur in a pattern which relates to the type of accident, calendar time of occurrence, age range of victim, workers factors, site factors and equipment factors. In Abuja, the construction sector is organized but could be better. The rate of accident occurrence in Abuja can be reduced by imbibing some precautionary steps and measures but bringing its rate to a complete stand still would be impossible due to factors which cannot be fully controlled.

It is recommended that a construction health and safety agency that will oversee the implementation of safety laws should be created, in order to improve safety management on site, contractors must educate their workers as well as outsiders affected by the work that safety is a responsibility for all and first aid training should be given to all workers as this might very much save lives in a situation whereby professional help cannot be accessed on time.

REFERENCES

- Abdul Rahim Abdulhamid, Muhdzaimi Abdmajid, & Singh, B., (2008). Causes of Accident at Construction Sites. *malaysian Journal of Civil Engineering*, 20(2), 242 - 259.
- Aksorn, T. and Bonaventura, (2009), Measuring effectiveness of safety programmers in Thailand Construction, 25 November, (2009).
- Aksonm, T., and Hadikusumo, B.H.W (2008), Critical Success Factors Influencing Safety Program Performance in thai Construction Projects', *Safety Science*, Volume 46, PP 709-727 (2008).
- Awodele, O.A. & Ayoola, A.C (2005). An Assessment of Safety Programmes on Construction sites. In: *Journal of land use & Development studies*. Federal University of technology, Akure, Nigeria. 1(1): 1-13.
- Bentley, T. A., Hide, S., Tappin, D., Moore, D., Legg, S., Ashby, L. & Parker, R. (2006). Investigating risk factors for slips, trips and falls in New Zealand residential construction using incident-centred and incident-independent methods *Ergonomics*, 49, 62-77.
- Chan, A.P.C., Wong, F.K.W., Chan, D.W.M., Yam, M.C.H., Kwok, A.W.K., Lam, E.W.M. and Cheung, E. (2008). Work at height fatalities in the repair, maintenance, alteration and addition works. *J of Construction Engineering and Management – Asce*, 134, 527 – 535.
- Chang, D. O. (2008). Global construction and asian workers: Expansion of TNCs in Asia and implications for labor.
- Dong, X.S., Fujimoto, A., Ringen, K and Men, Y. (2009). Fatal falls among hispanic construction workers. *J. Accidents Prevention*, 41.
- Foad M.A, (2011), Improving Safety Performance in Construction Projects in Libya, Master thesis, Diponegoro University Libya.
- Giang D.T & Pheng S.L. (2010) Role of construction in economic development, review of key concepts in the past 40 years. *Habitat international*.
- Hassanein and Ragaa S.H, (2007), Safety Programs in Large size construction firms Operating in Egypt, *journal of SH&E Research* (2007), vol.4, Num 1.
- Hassouna, M.A (2005) "Improving Safety Performance in Construction Projects in Gaza Strip Thesis (98), (2005).
- Idoro (2011). G.I. Effect of Mechanization on Occupational health and Safety Performance in the Nigerian Construction Industry: *Journal of Construction in developing countries*.
- Idubor, E. E. & Oisamoje, M. D. (2013). An Exploration of Health and Safety Management Issues in Nigeria's Effort to Industrialize. *European Scientific Journal*; April, 2013 Edition. (12): 154-169. ISSN: 1857-7881(Print) e-ISSN 1857-7431.

- Ikpe, E. O. (2009). Development of cost benefit analysis model of accident prevention on construction projects. A thesis submitted in partial fulfillment of requirement of the university of wolver hampton for the degree of Doctor of Philosophy.
- Kaskutas, V., Dale, A.M., Nolan, J., Patterson, D., Lipscomb, H.J. and Evanoff, B. (2009). Fall hazard control observed on residential construction sites. *J. American Industrial Medicine*, 52.
- Lancaster, R., Ward, R., Talbot, P., & Brazier, A. (2003). Costs of Compliance with Health and Safety Regulations in Small and Medium Enterprises (SME): HSE Research Report 174.
- McCann, (2002). When is a fall not a fall? Proceeding in 12th Annual Construction Safety and Health Conference; Rosemont, IL. May: 21-3.
- MacCollum, D.V. (1993). Crane Hazards and Their Prevention. American Society of Safety Engineers, Des Plaines, IL.
- Mohammed Y.D. (2016). Pattern of accident occurrence on construction sites. A thesis submitted to the institute of safety professionals of Nigeria, Abuja.
- Murty, O. P., Chung, B. S. K., Yin, L. Y., Loo, T. C., & Nurul, I. P. (2006). Pattern of injuries in fatal accidents of construction workers: A retrospective study of 10 years (1996-2005). [journal article]. *Mal. J for Path Sci.*, 44-57.
- NIOSH, (2007). Preventing Falls of Workers through Skylights, Roof and Floor Opening. DHHS (NIOSH) Publication.
- Okeola, O. G. (2009). Occupational Health & Safety (OHS) Assessment in the Construction Industry. In: 1st Annual Civil Engineering Conference. University of Ilorin, Nigeria. 26-28 August. Pp236-246.
- Okpan, A. & Agha, K. A. (2013). Assessment of Health and Safety Management of Building and Infrastructure Projects in South East Geo-political Zone. In: A. D. Ibrahim, K. J. Adogbo & Y. M. Ibrahim (Eds). Proceedings of Nigerian Institute of Quantity Surveyors: 1st Annual Research Conference – AnReCon. 3rd – 5th September, 2013. Ahmadu Bello University Press Limited, Zaria. 190 – 198.
- Olatunji, O. A., Aje, O. I., & Odugboye, F. (2007). Evaluating health and safety performance of Nigeria construction sites. CIB World Building Congress.
- Richard, L., Neitzel, N.S., Seixas and Kyle, K.R. (2001). A Review of Crane Safety in the Construction Industry Applied Occupational and Environmental Hygiene. Vol. 16 (12). 1106 – 1117.
- Smallwood J., Haupt T. & Shankantu. (2008). Construction health and safety in South Africa: Status and recommendations. CIDB report.
- Suruda, A., Egger, M. and Lui, D. (1997). Crane-Related Deaths in the U.S Construction Industry 1984 – 1994. The Centre to Protect Workers' Rights (Report No. D2-97).
- Tam, C. M., Zeng, S. X. and Deng, Z. M., (2004). Identifying Element of Poor Construction Safety Management in China. *Safety Science*, 42.