ASSESSMENT OF OCCUPATIONAL DISEASES AMONG CONSTRUCTION SITE WORKERS

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ABSTRACT

Globally, the construction industry is historically known for its associated occupational risks such as slips, trips and falls, cuts, bruises and electrocution. Construction occupational diseases such as skin diseases, back and shoulder pains, finger wrists, heart failure, arthritis, kidney disease, circulatory system disorder (CSD) present a serious threat to site workers' health and well-being. This study examines the causes of work-related diseases and its effects on construction site workers' performance in Nigeria. A structured survey questionnaire was designed from construction occupational diseases-related literature and physically administered for primary data collection to construction site workers, supervisors and managers of small, medium and large construction companies within the South-South Geopolitical Zone of Nigeria. Data was electronically manipulated using mean score and frequency aggregation and subsequently ranked accordingly. Survey findings revealed that the major causes of construction site work-related illness and diseases emanated from chemically-active and hazardous materials handling/use, repetitive motion (work), awkward posture, hand tool vibration and lifting of heavy materials, cement and drilling operations etc. The findings also indicated major effects such as skin diseases, back and shoulder pains, neck pains, ear drum and finger wrists. The study suggests that management of construction firms irrespective of size should provide the necessary personal protective equipment (PPE) and ensure strict adherence to its use by workers. The study recommends further that top management should show committed and visible leadership towards workers' health and well-beings.

Keywords: *causes, construction, effects, occupational diseases, worker performance*

INTRODUCTION

Every industrial sector has its associated health hazards, but on construction sites, the types of materials and sequences of sites activities expose workers to unimaginable illness and diseases (World Health Organization (WHO), 2010). Occupational curable or terminal diseases resulting from construction site activities have devastating effect on worker's performance, construction firms and the society at large. The WHO surveillance schemes group for 2009-2010 on respiratory disease indicates a higher incidence rate for construction than all other industries. For instance, asbestos has been reported to be responsible for 100,000 deaths worldwide annually (International Labour Organizations (ILO), 2010). It has also been estimated that about 5,000 construction workers die every week from silica-related lung cancer

(Health and Safety Executive (HSE), 2010). Cases of illness and diseases among construction site workers seem to be increasing due to expanding employment and changing construction methods. WHO (2010) reported that construction industry worldwide employs more than 3 million people who have occupational ill health or disease. It further reported that the construction industry has higher average incidence rates of occupational ill health and diseases after agriculture in a number of specific areas: 105 500 people died each year from mesothelioma and silica-related lung cancer. Consequently, workers' performance, productivity and company's profit margin are impacted negatively.

Noise-induced hearing loss (NIHL), dermatitis, occupational cancers and respiratory diseases plague the construction workforce (ILO, 2010). Almost 500,000 workers suffer from musculoskeletal injuries, while over 750 construction workers die each year due to repetitive motion disorder (RMDs) such as meniscus lesions, bursitis, tendonitis, trigger figure and osteoarthritis of the knees (WHO, 2010). The HSE (2008) reports that i*n the United Kingdom, over* 1.7 million days were lost in 2007/2008 due to work-related ill health, which equates to 0.77 days per worker. In addition, about 4% of the nation's gross domestic product (GDP) was lost through work-related diseases (ILO, 2010). The above statistics emphasizes the effects of construction site-related diseases, which directly and indirectly impact on worker performance. In addition, it reflected a failure by construction stakeholders to prevent or control workers' exposures and effectively manage construction workplace hazards.

Literature reveals that construction sites worker's health have had minimal attention over the years when compared with construction safety. Though, in the developed countries researches have been conducted in areas of workers' health, but in the developing nations like Nigeria little or research have been conducted on construction site workers' health. This is due to enhanced HSE culture that is backed by effective laws enforcement and good access to medical facilities; unlike in Nigeria where HSE laws and enforcement are weak and quality of medical facilities are not readily accessible. The relevant studies and their limitations in relative to this study are highlighted. Ezenwa (2001) studied fatal injuries in the Nigerian factories. We considered this study limited because the study populations exclude the construction industry and its workers. Consequently, its findings do not represent the Nigerian construction industry scenario. Chinda and Mohammed (2008) modeled construction safety culture in selected Asia countries. We considered this study limited because it focus on safety culture as a preventive measure to minimize accident on site unlike this research that its aim is reactive assessment of un-materialized safety cultures on workers' health. Okojie (2010) investigated the techniques used in reporting occupational diseases in the Nigerian manufacturing sector. The limitations of this study were that it did not cover construction industry and did not consider the causes and effects of the diseases on workers' health/wellbeing. Idoro (2011) assessed the effect of mechanization on occupational HSE in Nigeria construction industry. Although it focused on the Nigerian construction industry but its limitations were that mechanization makes some construction

activities less labour-intensive and may reduce accidents but it is not all construction activities that are mechanized and it has not specifically addressed the effect of workers contact with harmful and chemically-active materials on their health. Adeogun and Okafor (2013) evaluated the trends of occupational HSE in Nigeria. The thrust of the research was on government regulatory interventions since 1999 that Nigeria returned to civil rule. Its limitations were that it studied the 'upstream' component of HSE in Nigeria and its inability to address construction worker health. In the light of the foregoing, it can be argued that construction site workers health has not been given the required attentions and policy publications. Therefore, the study aims at assessing occupational diseases among the Nigerian construction site workers with a view to minimizing health challenges it poses to the workers and economic loss associated with such health challenges. Its specific objectives are to examine the causes and effects of construction site-related diseases on workers' health.

REVIEW OF LITERATURE

OCCUPATIONAL HEALTH CRISIS IN CONSTRUCTION

Construction site-related illness and diseases are caused or made worse by the use of chemical and hazardous substances (ILO, 2010 and HSE, 2010). McAleenan (2010) states that some of the materials exist as discrete substances in the form of cement, solvents, paints, and asphalt that release harmful agents on handling or application. Examples of these harmful substances include fumes from soldering and burning processes and silica dusts from cutting concrete and stone or contained within the products. Dust is an ideal medium for the transport of bacteria, viruses, and fungi that can easily be inhaled (Coke, 2010). Also, dust itself is a respiratory irritant and can cause congestion, chronic and acute respiratory infections and deaths (Hughes and Ferrett, 2010). Construction site workers are exposed to these virus-carrying agents' in everyday of their working life. It has been reported that silica dust when inhaled can lead to silicosis, bronchitis and cancer. In addition, Hughes and Ferrett (2010) reported that workers with asthmatic history are more susceptible to these diseases on shorter exposure, though it manifests after 5-10 years. Dust and air quality have been linked to cardiovascular diseases (Coke, 2010).

McAleenan (2010) conducted research on methods of controlling exposure to chemical hazards and concluded that even cement which is one of the commonest material used for all construction works poses serious health hazards such as dermatitis and severe alkali burns that may lead to amputation of hands or limbs. The chemical reaction between cement components with water produces the harmful agents. Frequent manual material lifting that includes regular lifting of heavy concrete blocks at or above shoulder level results in overexertion injuries. Hughes and Ferrett (2010) argued that cement which is commonly produced in pockets or sacks weighing from 25kg in the UK to 50kg in other countries like Nigeria are often manually lifted to a height appropriate for the contents to be tipped into a concrete mixer or wheelbarrow and this has resulted in lower back region, forearms and shoulder injuries. The practices of regular lifting of heavy materials on sites are

common in the developing countries as a result of absence or lack of the modern technologies for lifting of such materials (McAleenan, 2010, Adeogun, and Okafor, 2013). As presented in Table I, some authors have conducted research on activity/causes and workers' body organ that it directly or indirectly affects with a view to minimizing workers' exposure to this harmful activities and its effect on their health/wellbeing.

Table I: *Causes and possible effects of construction materials on site worker health*

Causes/Activity	Organs affected	References
Water, paints, cement	Skin diseases, dermatitis	McAl eenan (2010)
Drilling operations	Ear drum (Hearing)	Hughes and Ferrett (2010)
Asbestos, dust, silica, quarry	Lung, pneumoconiosis	Coke (2010)
Hazardous chemical substances	Kidneys, liver, productive systems	HSE (2008)
Hazardous chemical substances	Circulatory system	ILO (2010)
Lifting	Lower back, shoulders	McAleenan (2010)
Awkward postures	Knee, hip, shoulders, lower back	Haupt (2010)
Repetitive motion (work)	Shoulder, neck, wrists	Coke (2010)
Hand-tool vibration	Fingers, wrists	Haupt (2010)

Source: *Authors work (2018)*

Haupt (2010) studied controlled exposure to physical hazards and identified the following factors as causes of ill health to workers on site: vibration, constants and loud noise, exposure to air pollutants, working from/at heights, working with mobile equipment, and working in awkward posture. In addition, HSE (2010) has linked ear drum inflammation to constant use of vibrating hand tools and noisy equipment. Thus, it could be argued that many case of diseases-induced absenteeism among site workers leads to poor performance on the long run. Table I presents the causes and effects of some construction materials. Beside the notable causes of ill health by some construction materials, it has been found that environmental factors also contribute to workers' illness and diseases. The WHO (2010) reports that diseases such as malaria, schistosomiasis, and intestinal worms can cause anemia that reduces energy levels of the infected persons. These tropical diseases have severe effect on the health of construction site workers' and their job performances.

HEALTH AND SAFETY (H&S) REGULATION IN CONSTRUCTION

According to Idoro (2011), H&S legislation is an important aspect of the construction H&S management. Poor construction H&S performance is often attributed to non-compliance to H&S legislation and inadequate enforcement of H&S rules and regulations (HSE, 2010). The HSE argues further that the poor performance record of the construction around the world has been attributed to inconsistent and inadequate enforcement of H&S regulations by the H&S

inspectors. The H&S legislation all over the world is a means by which work environment can be controlled to ensure safety, health and well- being of the workers and persons likely to be adversely affected by the work environment (Hughes and Ferrett, 2010). Contractors under the Regulations are required to ensure that the site is supervised by a competent person who should be appointed in writing and that hazard identification and risk assessments have been carried out. They are also required to take suitable and sufficient steps to prevent, as far is reasonably practicable, any sites hazards; or permit any person to work under conditions that impose danger to lives. In the Nigerian construction industry, improvement of construction H&S practice cannot be said to be hampered by a lack of regulations, rather it is the implementation that needs attention. This is where awareness creation through formal and informal training of all construction personnel becomes imperative.

EFFECT OF WORKERS' ILL HEALTH ON SITE PERFORMANCE

Ezenwa (2001) and Hughes and Ferrett (2010) point out that one of the major effects of workers' ill health on site performance could be visible through continuous absenteeism and low production. A recent report from the ILO (2010) and HSE (2010) showed that 30,000 man hours are lost daily due to occupational diseases. Notably, this has a significant negative impact on a national economy. It has been argued that workers' ill health and work-related diseases can reduce contractors' profit margin (Hinze, 2006). On the national scale, the estimated costs of workers' ill health can be as high as 4-7% of the gross national product (ILO, 2010). The other potential effect is the high compensation paid to the workers or to their families. Indeed, one obvious effect of workers' ill health is the human suffering caused to the workers' families, which cannot be compensated with money. There are grievous economic consequences on the families for losing their dear ones and the bread winner. Furthermore, poor site H&S management tarnishes contractors image (Hinze, 2006). The tarnished image is often accompanied with adverse publicity, which resulted in the contractors being less attractive to prospective clients and employees. Workers' ill health is also usually characterised by long legal disputes and litigation that may end with huge claims that is paid to workers or their families. Given the economic and social cost of the ill health of workers, all hands must be on deck to prevent its manifestation in construction.

IMPROVING WORKERS' ILL HEALTH

The responsibility for providing good working conditions by construction firms is dependent upon its leadership at all levels of management (Krause, 2003). The management of construction firms create the conditions for good H&S by defining her H&S policies, procedures and allocating the necessary resources for H&S programmes implantations (Lugard and Rowlinson, 2005). Effective H&S management by top management have been linked to a positive workplace H&S culture that promotes workers' well-being (Krause, 2003). Hinze (2006) advocated a training programme called 'one hour for H&S management' for top management. The training programme will be of

immense importance in drawing management attention to H&S issues. Geller (2008) reported that proactive H&S practices such as the provision of requisite Physical

PE to workers, provision of site welfare facilities and above all maintaining competent H&S supervisors on sites should not only been seen as a legal responsibility by construction firms but as a moral obligations (Hinze, 2006). Okojie (2010) reported that personal protective equipment (PPE) and site welfare facilities have been linked to a significant performance improvement on workers' health and well-being. Client's H&S leadership roles particularly during the projects early planning stage through the appointment of competent contractors in H&S could positively impact on workers' health and well-being. Behm (2005) maintained that the causes of construction site ill health and diseases can be reduced through clients' visible H&S leadership and commitment to workers' welfares. Client should be actively involved in prequalifying contractors as one of interventions in promoting construction site H&S performance and culture. Construction firms with a good H&S culture in place would exude a commitment to H&S that percolates down the entire organisation (Chinda and Mohammed, 2008).

RESEARCH METHOD

Quantitative research method was adopted to achieve the aim and objectives of the study. The assumption underlying quantitative method to research is that it seeks to gather factual data and study the relationships between them. According to Leedy and Ormrod (2010: 102), the information gathered is therefore coded in the form of numbers that can be quantified, statistically manipulated and summarised. Thus, the analysis of data collected yields empirical results and conclusions are drawn from the observation of the results based on theory and surveyed literature. A survey questionnaire was used to elicit the perception of the respondents on occupational diseases associated with construction work sites operations. Stratified method of population sampling was used. Consequently, the respondents were randomly selected from site workers, supervisors, and managers of small, medium and large construction firms within the South-South Geopolitical Zone of Nigeria. The states in South-South geopolitical zones are Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers. Hence, the data analysis was based on the responses. The research made use of the 156 completed and returned questionnaire out of the 210 administered, this represents 74.23% response rate. The questionnaire consists of two parts; the first part deals with the demographic data of the respondents and the second part concerns the causes and effects of occupational-related activities on construction site workers' health in the study area.

DATAANALYSIS

Analysis of the responses indicates that (45%) were received from the construction site workers, (27%) from supervisors, (21%) and managers (7%). The average year of construction workers' experience for all the respondents is ten (10) years. It was found out that 45% of the supervisors have higher National Diploma Certificates in the built environment disciplines and 55% have Ordinary National Diploma and all the managers have degrees and Higher

National Diploma in built environment-related discipline. The respondents rated the variables which they perceived to be the likely contributing factors to the causes and effects of construction site related illness and diseases on an equidistance scale ranging from 1 (insignificant) to 5 (extremely significant). The five-points Likert scale rating were in order of: 1 insignificant, 2 slightly significant, 3 moderately significant, 4 very significant and 5 extremely significant. The ratings were used to calculate the mean score for each causative factor and percentage-based aggregate of effects, which is then used to determine the relative ranking of each factor by assigning ranking to the mean score. Accordingly, mean score with low magnitude is assigned a low rank while those with the highest score is allocated the highest rank. The mean score (MS) for each causative factor and effect is computed by using the following formula:

$$MS = \frac{\Sigma(fs)}{n} \quad (1)$$

Where *s* is the score given to each factor by respondents and it ranges from 1 to 5, *f* is frequency of responses to each rating (1 to 5) for each factor; and *n* is the total number of responses concerning that factor. Also, percentile-based aggregate (PbA) method was used to analyze the effect of construction operations and materials on construction site workers' health. It involves collecting the frequency of each response and determines its percentage equivalence. Response that has the highest is considered as the most significant; the higher the PbA of a response the more significant is the response. The figures in bracket in Tables III are the percentage equivalence of the frequency (outside the bracket).

The Percentage Response with respect to a particular factor is computed as

$$\frac{n\,(100)}{N} \quad (2)$$

Where n = number of responses with respect to each score and N = Total number of responses of that factor.

PRESENTATION OF SURVEY RESULTS

CAUSES OF CONSTRUCTION SITE ILLNESS AND DISEASES

Table II indicates that the three most significant causative factors of construction site-related illness and diseases were chemical/hazardous substance handling, repetitive work (motion) and hand tool vibration. Chemical/ hazardous substances handling with 4.23 MS was the most significant cause of occupational illness and diseases among construction site workers investigated. Chemical and hazardous substances exist in majority of the construction materials used on sites such as cement, solvents, paints, asphalts and asbestos that releases it harmful agent on handling or during application (McAleenan, 2010). The second most highly rated factor was repetitive motion (work) with and has 3.76 MS. Most construction works are one-off; they are specially associated with a particular construction project. Consequently, continuous repetition of same site operation on multi-storey or serial contracts would strain the workers' health. The third highly rated factor was hand tools vibration with 3.69 MS. Increasing

use of hand-held machines by construction site workers for metal, wood and masonry works could be responsible for this scenario. Most of the manually executed site operations are becoming mechanized using hand-held machines which make the site workers' hand to vibrate/move as the machine works.

Table II: *Construction operation and materials causing construction site illness and diseases [Respondents (N=156)]*

Factors	Mean score (MS)	Ranking
Chemical and hazardous substances	4.23	1
Repetitive motion (work)	3.76	2
Hand tool vibration	3.69	3
Awkward posture	3.59	4
Lifting of heavy materials	3.53	5
Drilling operation	3.50	6
Cement	3.28	7
Dust	2.76	8
Asbestos	2.54	9
Water	2.24	10

Source: Authors' Fieldwork (2018)

These are followed by awkward posture with 3.59 MS and lifting heavy materials with 3.52 MS. Construction works are hardly sedentary and are done at high altitudes. This makes awkward posture to be prevalent on construction sites. Frequent manual material handling that includes, regular lifting of heavy concrete blocks, 50kg bag of cement at/above shoulder level results in back and shoulder pains (Fewings, 2010). Haupt (2010) identified the causes and effects of awkward posture and repetitive motion (work) on workers' health. The practices of regular lifting of heavy materials on sites are common in the developing countries due to absence or lack of the modern technologies for such operations (McAleenan, 2010).

Other causes which were rated relatively low by the respondents were: drilling operations with 3.50 MS, cement with 3.28 MS, dust with 2.76 MS, asbestos 2.54 and water with MS of 2.24. Cement which is one of the commonest material used for all construction works poses serious health hazards such as dermatitis and severe alkali burns that may lead to amputation of hands or limbs (ILO, 2010). The chemical reaction between cement components with water produces the harmful agents (McAleenan, 2010). The relatively low ranking of dust (8), asbestos (9) and water (10) could be attributed to wearing of dust mask by site workers, reduction in usage of asbestos in construction works and good water is usually recommended for construction works respectively. In general, the findings corroborated Hughes and Ferrett (2010)

that drilling operation results in dust which may cause respiratory diseases if inhaled. McAleenan (2010) also established the cause-effect relationship of cement, paints, water and lifting of heavy materials on worker's health.

EFFECT OF CONSTRUCTION SITE ILLNESS AND DISEASES ON WORKERS' HEALTH

Table III indicates the respondents' perceptions of the effects of factors causing site illness and disease on construction site workers. Five out of the seven effects were rated to be extremely high. These were skin diseases, back and shoulder pains, neck pains, ear drum disorders, tuberculosis, circulatory system disorder, and arthritis (with finger/wrist pains). Skin disease (dermatitis) was rated as the most common effect of work-related diseases among construction site workers in the study area with 42.9%. The finding corroborated McAleenan (2010) that cement, solvents and paints can cause skin disease that can lead to amputation of hands or limbs. The second effect was back and shoulder pains with 41.6%. Fewings (2010) studied working at high altitudes and concluded that lifting of heavy materials such as concrete blocks or 50kg bag of cement to different height in buildings leads to on worker's ill health such as back and shoulder pains.

Table III: *Effect of diseases on workers' health [Respondents (N=156)]*

Factors	Frequency Aggregation (Rating of Factors)				
	1	**2**	**3**	**4**	**5**
Skin diseases (dermatitis)	2(1.3)	5(3.2)	24(15.4)	58(37.1)	**67(42.9)**
Back and Shoulder pains	0	7(4.5)	29(18.6)	55(35.2)	**65(41.6)**
Neck pains	5(3.2)	12(7.7)	36(23.0)	43(27.5)	**60(38.4)**
Ear drum disorders	12(23.1)	10(21.6)	31(23.2)	48(23.1)	**55(35.3)**
Tuberculosis	7(4.5)	17(10.9)	31(19.8)	46(29.4)	**52(33.33)**
Circulatory system disorder	10(6.4)	36(23.1)	**50(32.1)**	29(18.6)	31(19.8)
Arthritis (and finger/wrists pains)	10(6.4)	22(14.1)	**46(29.4)**	41(26.2)	37(23.7)

Source: Authors Fieldwork (2018)

The third highly rated effect was neck pains with 38.4%. An awkward posture of work has been linked to neck pains (Fewings, 2010). Other effects identified were ear drum disorders with 35.3% and tuberculosis with 32.2%. However, the two lowest rated effects were circulatory system disorder with 23.7% and finger wrists with 19.8%. Though, these factors were rated low by the respondents, some authors (McAleenan, 2010, Hughes and Ferrett, 2010) have found that drilling operation (in siliceous materials) and use of hazardous chemical substance on construction sites have been linked to the causes and effects of circulatory system disorder and tuberculosis which is common among construction industry workers.

CONCLUSIONS AND RECOMMENDATIONS

The study has improved on the existing knowledge in Nigeria by evaluating the causes and effects of some construction activities on construction site workers' health in Nigeria using the South=South Zone as a study area. Based on the analysis and interpretation of the survey results, it shows that ten

factors were identified as causes of worker's illness and diseases on construction sites and seven factors were also identified as the effects. Thus, the construction operations and materials that cause construction site workers' ill health and diseases in the study area were rated in the descending order of: chemical/hazardous substances, repetitive work, hand tool vibration, awkward posture, lifting of heavy materials, drilling operation, cement, dust, asbestos and water. The most severe effect of construction operations and materials on construction site workers' health were rated in the descending order of: Skin diseases (dermatitis), Back and Shoulder pains, Neck pains, Ear drum disorders, Tuberculosis, Circulatory system disorder and Arthritis (and finger/wrists pains). The identified causes and effects of workers' illness and diseases in construction industry need to be addressed by the construction companies, workers and government at all levels, through the enactment and enforcement of H&S legislation. The study therefore, recommends that:

- Construction firms irrespective of size should provide the necessary personal protective equipment (PPE) and ensure strict adherence to its use by workers.
- The governments through its H&S Inspectorates enforce H&S legislation and takes proactive measures to ensure that all construction companies adhere.
- Construction firms irrespective of size should strictly adhere to H&S legislation as well as educate and train their workers in H&S, regardless whether they are temporary or permanent workers.
- Construction site H&S training such as induction, weekly toolbox talks and site H&S meetings should be conducted on regular interval in all applicable languages to ensure that rural migrant workers understand the essence of the training.
- Management of construction companies should demonstrate a serious commitment to site workers' H&S, and recognize that it is only a sound mind and body is efficient at work.

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