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Particulate Matter: Hazard awareness and Self-Adherence among Setraco Quarry Workers, Ugwuele, Uturu, Nigeria

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Abstract

Exposure to particulate matter (PM) is a major health hazard in explorative industries. This is exacerbated by observed low hazard awareness and self-adherence measures among quarry workers. Specifically, this qualitative paper examined whether safety policy adopted by management of quarry industry have led to self- adherence to safety, to determine if knowledge of particulate hazard promotes safety-adherence to safety, and to uncover whether cardio respiratory symptoms experienced by quarry workers are resultant effects of exposure to PM among quarry workers.28 purposively selected middle aged, male quarry workers without history of underlying illness prior to their employment at the quarry, and who have been employed for a minimum of three years at Setraco Nigeria limited, Ugwuele Uturu, Nigeria, were purposively selected and sampled.

Key words: Cardio Respiratory System; Hazard Awareness; Particulate Matter; Quarry; Self-adherence

Introduction

The quest for industrialization has placed increasing demands for mineral resources including limestone and rocks used for agricultural, domestic and industrial purposes. The demand has increased the numbers of quarries and quarrying operations in Nigeria in recent time. Quarrying operations involves the removal of over burden, driving, blasting, crushing and removal of over burden rock minerals [1]. The Nigerian mining industry is largely divided into small scale, middle scale and large scale capability and their industrial capacities are determined by the level of mechanization and human capacity found at each level. The Nigeria quarry industry comprises of workers who are usually under-educated, and lacking the requisite formal education and job training for safety and efficiency. These workers are recruited and thereafter given basic job related training before deployment. Due to industry nature, which is characterized by mineralogical emission of dust and other industrial waste into the air, workers may not fully appreciate the importance of training received and adherence to safety procedures as they are exposed to job hazards including Particulate Matter (PM). There is prevalence of occupational hazards among blue-collar workers [2-4] and quarry workers are not exempted. [1] averred that quarrying is a high risk job with serious impacts on the air, water, soil, earth surface, flora and fauna and human beings. It is a solid mineral in the form of dust generated during crushing operations and they are usually heartbeat, aggravated asthma, impaired lung function, and coughing or difficulty breathing, none-fatal heart attacks and premature death in people with lung disease [5]. Increased respiratory symptoms such as irritation of the airways, suspended in the air. Pollutions resulting from these dusts have been linked to medical complications which include irregular The resultant health challenges may continue to debilitate workers' productivity until they become symptomatic, leading to untimely death. Although, there is scarcity of data on PM mortality rate, availability of safety equipment, workers-adherence level and awareness of hazard implications among workers in Nigerian organized quarry industry.

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Hazard is a source or a situation with a potential for harm in terms of human injury ill health, damage to property, damage to the environment, or a combination of these [3]. It is a property substance, agent, and a source of energy or situations capable of having undesired consequences with possibilities of resulting to damages to life, health and or the environment. Hazards may be physical, biological, ergonomic, stress related or chemicals in form of PM prevalent in quarry sites. From the foregoing, hazard-awareness is a cognitive learning behavior which is rooted in the ability to identify existing hazards through training, observation and identification.

Awareness of the implications of poor adherence to safety is a major strategy for ensuring workers performance [3,4,6] remarked that, "a safe workplace is an ideal condition for organizational productivity, as workers cannot achieve their full potentials in an unsafe environment. To attain a safe work environment, concerted efforts is geared towards improving workers knowledge by developing their consciousness to safety. Awareness is the holistic improvement in the behavior, experience, physical and mental alertness of workers to dangers of workplace hazards. It is unachievable if workers do not sufficiently appreciate the risk factors associated with exposure to PM without recourse to management sanctions. When this occurs, exposure to PM hazards may threaten the quality of life and workers performance. Sick workers may be relieved of their jobs, with attendant emotional and economic implications on family dependents.

Self-Adherence

Self-adherence is a medical concept which has assumed several meanings. In simple terms, the term is a cognitive decision made in response to weighing the symptoms and process involved in exposure to medical risk [10,11] explained that it is a specific behavior initiated by people on their ownvolition. It is done with the intention of improving health, ensuring safe working condition and preventing ailments and diseases. We align with [12] who explained that, adherence is the extent to which an individual follows a procedure or aligns with recommendation suggested by a medical professional.

From the foregoing, self-adherence is a behavior initiated by consequence of conscious effort on the part of employees to appreciate the consequence of exposure to PM and comply with standard safety procedures without subjection to managements enforcement measures. Self-adherence is compliance with safety measures. Unfortunately, several factors militate against self-adherence. These includes: age, information, perception, socio-economic factors, culture, educational attainment, beliefs and social support.

Particulate Matter (PM)

Particulate matters are complex solid, liquid, or solid and liquid particles made of organic and in organic substances suspended in the atmosphere. PM are distinguished by sizes, ranging from PM10: less than 10 diameter (coarse fraction), PM 2.5: less than 2.5 (fine fraction) and PM 0.1: less than 0.1 diameter (ultra-fine fraction) [5], and their chemical compositions are determined by emission sources, meteorological conditions and aerodynamic diameter.PM below 10 micrometers is prevalent in quarries and they pose great complications on human health due to their capacity to get deep into human lungs and bloodstreams.

PM may be introduced into the air through primary and secondary sources. Anthropogenic sources are primary sources for the dissemination of PM, while secondary PM is formed from chemical processes [13].Primary particles are Microscopic solid or liquid droplets emitted in quarries, with severe complications on human health. Exposure to PM is a risk factor for cardiovascular mortality, cardiac arrhythmia, myocardial infarction, myocardial ischemia, heart failures and death [5]. Quarry workers may over look symptoms such as, occasional chest pain, productive and unproductive cough and cardiovascular symptoms owing to flexible safety policy, ignorance, beliefs, economic status and other factors.

Cardio respiratory System

Cardio respiratory system refers to a combination of all organs involved in breathing and blood circulation throughout human body. Specifically, it includes heart and blood vessels which functions in unison with the lungs and airways in the transportation of oxygen to the muscles and organs body organs. It is also responsible for the removal of waste products, including carbon dioxide. The respiratory system contains many defense mechanisms such as cilia, alveolar macrophages and many others.

Among various systems of human body, the cardio respiratory system is the most susceptible to deleterious effects of PM within quarry sites [5]. These are manifested in diverse ways ranging from thrombotic disorders, cardiac failure, and myocardial infarction, among others [5,14]. In addition, the cardio respiratory mortality arising from exposure to PM could express itself more predominantly with pulmonary conditions such as predisposition

to respiratory tract infections. Whether long or short term exposure, the harmful effects of repeated exposure to PM on cardiorespiratory system is well documented [15,16]. Short term exposure has increased mortality outcome of conditions such as asthma, COPD, and others [16].It is known that PM lowers life expectancy on long term exposure, as well as predisposing to impaired respiratory functions following impact of dust containing PM) [5].

The Objectives of the Study are to

1. Discover whether management safety policy leads to self-adherence among quarry workers.
2. Uncover whether knowledge of PM Hazards leads to safety-adherence among Quarry Workers.
3. Find out if cardio respiratory symptoms are results of exposure to PM among quarry workers.

Hypotheses

1. Management Safety Policy has no significant relationship on Self-Adherence among quarry workers.
2. PM Hazards has no significant relationship on Safety-Adherence among Quarry Workers.
3. Cardio respiratory symptoms have no significant relationship on exposure to PM among quarry workers.

Materials and Methods

This quantitative survey was carried out among28purposively selected quarry workers at Setraco Nigeria limited, Ugwuele in Uturu, Abia State, Nigeria. The respondents comprises of middle aged male staff comprising of machine operators and field workers who have worked for a minimum of three years. The motive for purposively sampling is because, these middle aged workers have spent substantial working years in the organization, and are less likely to have co-existing morbidity that may co-found PM related health hazards. Therefore, all respondent do not have a history of underlying illness prior to their employment at the quarry. This measure was taken to eliminate chances of having respondents who may confuse previously established health symptoms with PM induced health condition.

Due to the demanding job schedule of respondents, the study which was conducted during work hours, adopted snowball sampling technique as the method of sample selection. In consideration of the educational status of respondents, responses were gathered with interviewer-administered questionnaire method. Pearson's Chi- square (χ^2) statistical tool was used to test the three stated hypotheses in order to predict the relationship between the independent and dependent variables, and results are presented thus:

Results

Discussion of Findings

Analysis of hypotheses 1, 2 and 3 are presented in Tables. The opinion of majority of respondents in Table 1 shows that, management safety policy is flexible in comparison with other safety administration options that are indicated in the table (X^2 = 1.95; df= 1; N= 28; P= <0.05). We therefore reject the Ho and accept Hi which states that, management safety policy has influenced safety compliance level among quarry workers. The prevalent flexible safety culture is adduced for workers passive safety approach. Flexible safety policy is akin to laws without enforcement. Safety is a prerequisite for optimum output among employees [4], and the absence of stringent safety enforcement by organizations, is a crucial reason for low-compliance to occupational health and safety standard [17]. This lacuna is further reinforced by the absence of enforcement officers and punitive measures against quarry workers who breach PM safety standard.

In Table 2, the hypothesis shows that motives for Safety violation has no significant relationship on PM exposure among quarry workers was rejected. We therefore reject the Ho and accept the Hi which shows that irrespective of motives for violation of safety standards, violation of PM safety has implications on workers' health (X^2 = 11.97; df= 1; N= 28; P= <0.05). The finding also showed that inadequate medical information resulting from exposure to PM is responsible for weak self-adherence among quarry workers, this shows that induction training on the use of PPE and other basic safety devices is inadequate to instill safety consciousness and self-adherence. [6] opined that, there is high level of safety awareness among quarry workers. However, we uncovered a dearth of self-compliance among quarry workers who regard PM training as a routine requirement for employment, without exhibiting serious safety consciousness regarding the implications of PM on human cardio respiratory system.

Conclusion

Quarry workers are exposed to many high risk factors which includes exposure to PM. The study shows that, management's safety policy and measures are flexible rather than stringent. Flexible safety enforcement without concomitant sanctions on erring workers has adverse effect on instilling adherence and self-awareness on the dangers on PM to human health. Moreover, managements' enforcement of safety undermines the focus of safety culture, which is, to instill cognitive awareness of self-preservation in the workplace.

We conclude that, there is need to go beyond surface training methods when imbuing quarry workers with knowledge of the risk factors associated with low self-adherence and exposure to PM hazard. This is very important because, inadequate safety education on PM hazards will not enhance self-consciousness and self-adherence among quarry workers.

Recommendation

Based on the foregoing, we recommend that:

1. Management of quarry industry should reevaluate their safety policy with a view to attach stringent measures against safety violators.

2. Quarry organization should go beyond induction training and organize retraining on the implications of exposure to PM on human health.

3. The educational status of field workers in quarry sites should be considered when organizing safety trainings. Training should not be ambiguous, and should reflect the need to extol self-awareness over enforcement.

4. There is need to incorporate public health officials in future training sessions. This will enable quarry workers to have professional information on the various implications of poor self-adherence and its resultant implications on workers' health and productivity, household and organization.

References

1. Oguntoke O, Aboaba A, Gbadebo TA (2009) Impact of granite quarrying on the health of workers and nearby residents in abeokuta, ogun state, Nigeria. Ethiop J Environ Stud Maneg 2:1-11.
2. Omotosho MM, Bamidele J, Salaudeen A, Saromi H, Adeomi AA, et al. (2012) Occupational hazard awareness and safety practices among cement factory workers at Obajana, Kogi State, Nigeria. Elixir Bio Diver 47:9013-9018.
3. FA, Ogunfowokan AA, Mbada C, Olatubi MI, Ogungbemi AV (2014) Occupational hazard awareness and safety practices among Nigerian sawmill workers. Inter J Med Sci Public Health 3:1244.
4. Udeh PC and Nwogwugwu JC (2020) Safety training and road accident: Option survey of petroleum tanker drivers in awka south, anambra state, Nigeria 7:62-69.
5. Praznikar ZJ`and Praznikar J (2012) The effects of particulate matter air pollution on respiratory health and on the cardiovascular system. Slovenia J Pub Health 51: 190-199.
6. Sufiyan MB and Ogunleye OO (2012) Awareness and compliance with use of safety protective devices and patterns of injury among quarry workers in Sabon-Gari Local Government Area, Kaduna State, North-Western Nigeria. Annals Nigerians Med 61:65-70.
7. Aigbokhaode AQ, Isah EC, Isara AR (2011) Knowledge and practice of occupational safety among quarry workers in rural community in Edo State. J Com Med Primary Healthcare 23:16-24.
8. Ajayi IA, Adeoye AO, Bekibele CO, Onakpoya OH, Omotoye OJ, et al. (2011) Awareness and utilization of protective eye device among welders in a Southern Nigeria community. Ann Afr Med 10:294-299.
9. Aigbedion IN (2005) Environmental pollution in the Niger-Delta, Nigeria. Interdis J Enugu Nigeria. 3. 205-210.
10. Shuldham C, Theaker C, Jaarsma T, Cowie MR (2007) Evaluation of the European heart failure self- care behavior scale in a United Kingdom population. J Advan Nurs 60:87-95.
11. Deaton C (2000) Outcome measurement: self-management in heart failure. J Cardiovas Nurs 14:116-118.
12. Settineri S, Frisone F, Merlo EM, Geraci D, Martino M (2019) Compliance, adherence, concordance, empowerment, and self-management: five words to manifest a relational maladjustment in diabetes. J Multidiscip Healthcare 299-314.
13. Owoade OK, Olise FS, Ogundele LT, Fawole OG, Olaniyi HB, et al. (2016) Correlation between particu late matter concentrations and meteorological parameters at a site in Ile-Ife, Nigeria. Ife J Sci.
14. https://www.ccohs.ca/oshanwers/chemicals/lungs_dust.html.
15. Samol E, Peny R, Ramsay T, Pipkou M (2008) Acute effects of ambient particulate matters on mortality in Europe and North America: Results from APHENA study. Environ Health Persp 116:1480-1486.
16. Idubor EE, Osiamoje MD (2013) An exploration of health and safety management issues in Nigeria's effort to industrialize. Eur Sci J 9:154-169.