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ASSESSMENT OF WORKERS' COMPLIANCE WITH MEASURES FOR A SAFE ENVIRONMENT IN SOME SELECTED QUARRIES IN BWARI AREA COUNCIL OF FCT, NIGERIA

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Abstract: The safety of workers has been on the front burner since the era of industrialization and is a priority for the United Nations. It is recognized as a basic human right in the United Nations universal declaration of Human Rights, 1948. This study examined the extent of workers' compliance with measures for a safe environment in some selected quarries in the Bwari Area Council of the FCT. A descriptive survey research design was used for the study. The population of the study consisted of 2876 workers of quarry industries in the area under survey. A sample of 287 workers was chosen using a proportionate stratified random sampling technique. The instrument for data collection was a 15-item structured questionnaire tagged Measures for a Safe Environment Compliance Questionnaire (MSECQ). Internal consistency of the instrument was determined using Cronbach alpha co-efficient and the overall reliability coefficient was 0.96. Research questions were answered using mean and standard deviation while hypotheses were tested using a t-test and one-way analysis of variance. The alpha level for the test of hypotheses was set at 0.05. The results show that workers highly comply with measures for a safe environment, and exhibit low compliance with measures for a safe environment in relation to reporting safety problems and every faulty equipment to management. There is no significant difference between male and female workers in the level of compliance with measures for a safe environment. There is a significant difference in workers' compliance with measures for a safe environment based on their level of education. It is recommended that the National Environmental Standards and Regulations Enforcement Agency (NESREA) and Mines Inspectorate Department (MID) should liaise with state and local health authorities in the health education of quarry workers and general control of quarries. Also, owners of quarries should take responsibility for every act of non-compliance in quarries and should ensure regular health education and training of workers and regular hazard control in the quarries.

Keywords. Safety, Compliance, Environment, and Quarry.

INTRODUCTION

In many industrial processes, mineralogical materials are introduced into the environment as dust, fumes, ashes, or other industrial waste. Some of the elements released into the environment may be toxic and pose a health risk to humans and animals alike. In Nigeria, the greatest pollution comes from exploiting petroleum, limestone, and rocks used in construction work. Large volumes of dust from cement factories and mining operations in Nigerian quarries are discharged daily into the air. A lot of airborne particulate matter is generated by the numerous stone-crushing industries. (Ugbogu, Ohakwe, and Eoltescu, 2009)

The safety of workers has been on the front burner since the era of industrialization and is a priority for the United Nations. It is recognized as a basic human right in the United Nations universal declaration of Human Rights, 1948. One of the commonest environmental and safety issues in FCT, Nigeria emanates from the quarry industry because of the nature of its operations and the conditions under which it is managed and operated. Quarries are open cavities where stone or slate is extracted from a deposit of rock and mined for use in construction projects. It involves the making of small rocks and aggregates from big rocks used for extracting building materials, such as dimension stone, construction aggregate, riprap, sand, and gravel (Nwachukwu and Mbemene, 2012). In spite of the benefits derivable from quarry industries, the associated risk, hazards and consequent effects of quarrying on the health of workers and host communities are enormous. Environmental effects of quarrying include landscape change, change to the visual scene, erosion, habitat

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loss, loss of flora and fauna, and stability problem. Others are noise, vibration, dust; security problems, effects on the amount of quality water, and high traffic (Omasanya and Ajibade, 2011). Olusegun et al. (2009) stated that the psychological and health effects of quarry industries on workers include shock, nasal infection, asthma, predominant cough, catarrh, and sinusitis inter alia. Dust is present at all quarries and presents a differing level of risk to workers and the neighborhood.

Mining accidents and fatal Mining accidents and fatalities among Artisanal and Small-scale miners (ASMs) occur in the process of mining metals, minerals, and energy materials (i.e., not construction materials), Thousands of miners die from these mining accidents each year, especially in coal and hard rock mining (Li, et al 2015). Although surface mining is usually less hazardous than underground mining (NIOSH, 2000), the participation of artisanal and small-scale miners in barite mining fields has increased the number of mining fatalities across the upper and middle Benue Trough. Artisanal and small-scale mining (ASM) in Nigeria employed about 0.5 million as of 2015 (Daburum, et al 2019), and in 2021 over 2 million. These miners' and mining communities' contribution to societal development is vital. Both occupational and environmental health and safety issues must be addressed at the mines and workplaces objectively.

The importance of mining activities to the Nigerian economy is clearly demonstrated by the fact that Nigeria is mostly concerned with exploration, exploitation and exportation of natural resources with less emphasis on processing them. Mineral mining activities provide reasonable foreign exchange earnings as most of these natural resources are sold and utilized outside Nigeria (Abdulkadir, 2014). Nigeria like most African countries today, is a by-product of European imperialism whose main purpose was for the exploration as well as exploitation of natural resources used in the economic emancipation of 19th and 20th century Europe. The colonialists were quick to explore Nigeria for mineral resources by conducting seismic surveys because they wanted to replicate their successes in the Middle East were they found large petroleum resources in the early 20th century (Owen, 2008). According to Baiyewu-Teru (2015), a British mining engineer Albert Kitson was scouting for silver in 1909 around the Udi ridge axis of present day Enugu state. He discovered coal instead and that began a new era for mining in southern protectorate. Similarly, tin mining was vital in the development of Jos plateau area in northern Nigeria even before the 1914 amalgamation. By 1909, Champion (Nigeria) Tin Field Company had obtained mining licenses in the northern protectorate and was pivotal in mining expansion as far as Bauchi province (Raji & Abejide, 2014).

Nigeria is blessed with significant quantities of mineral resources. As at June 2014, Nigeria had over 390 million metric tons of proven coal deposit and over 1.1 billion metric tons of unproven coal deposits in Anambra, Benue, Enugu and Kogi states (KPMG Report, 2014). Similarly, Bitumen/tar sands/heavy oil deposits in Southwest Nigeria (Ondo state) are estimated at over 55 billion barrels while iron ore deposits in the northcentral, north east and south eastern regions are estimated at over 800 million tons (KPMG, 2012). Despite these abundant mineral resources, Nigeria has been unable to kick-start the mineral mining sector. This is attributed mainly to overdependence on petroleum which has made the government lazy and slow in making significant success in developing an economically competitive mineral mining sector (Ogbonna & Ebimobowei, 2012). Nevertheless, the Federal Government is making the appreciable investment to turn the mining sector around as plans are currently in place to secure $150 million funding from international development partners for injection into the Nigerian mining sector (Onwuemenyi, 2017).

It is fundamental that mineral mining activities are carried out under conditions that portend the least possible harm to mining practitioners, visitors, host communities and the immediate biophysical surroundings of the mining site. This fundamentality is paramount because undertaking mineral mining activities in unsafe conditions portents a lot of risk potentials which may include; destruction of lives and properties, serious financial losses, tarnishing of the image of mining companies, expensive legal battles among other setbacks. According to an Associated Press (2014) Report, a number of mining accidents have taken place between 2005 and 2013 which resulted in the loss of lives and significant destruction of infrastructure the world over. The recent mining disaster in Iran where over 20 people lost their lives as well as other mining accidents in the past year all explicate the danger of mining under unsafe conditions (Grenfell, 2017). Furthermore, the importance of safety during mining activities is very crucial when it is realized that mining activities are some of the most dangerous procedures in exploiting the mineral resource. Therefore, any entity that wants to succeed in the mining sector must consider safety issues as an integral part of the entire process. When mining activities are safely carried out, a lot of gains are accruable to the employers and their employees.

Sufiyan and Ogunleye (2012) revealed that majority of the quarry workers in Sabon-Gari Local Government Area of Nigeria knew that their job exposes them to health hazards. They have an appreciable level of consciousness on safety protective gadgets and use a number of these gadgets, which indicates varying levels of compliance with safety measures in quarry industry. Exhaustive health education crusade and provision of sufficiently subsidized safety shielding devices for the workers by the appropriate authorities will go a long way in improving consciousness and compliance with use of safety protective devices and lessening of hazards.

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The study conducted in Zaria, Nigeria on the assessment of awareness and compliance to safety measures and use of protective devices in Sunsead Oil Company suggests partial compliance with safety measures in the establishment (Tuktur, 2017).

A common negative effect of quarrying minerals from the earth's surface is the destruction of its natural landscape, creating open space in the ground and generating heaps of rock wastes that cannot be easily disposed of. These phenomena are amply demonstrated in several parts of Nigeria, where commercial mining or quarrying had occurred in the past or is currently taking place (Eshiwani, 2014).

The study, therefore, aims at assessing the level of workers' compliance with measures for a safe environment in quarry industries in the Bwari Area Council of the FCT, Nigeria. This will be achieved by determining the workers' level of compliance and by comparing compliance by the socio-demographic of gender, level of education, and length of service in the quarry industry.

METHODOLOGY AND MATERIALS

The descriptive survey research design was used for the study. The population of the study consists of 2876 workers of quarry industries in the Bwari Area Council of the FCT. A sample of 287 workers was drawn using a proportionate stratified random sampling technique. The instrument for data collection was a 15-item structured questionnaire tagged Measures for Safe Environment Compliance Questionnaire (MSECQ). The response columns of the questionnaire were graded as follows: Never = 1, Rarely = 2, Sometimes = 3, and Always = 4 as the case may be. Internal consistency of the instrument was determined using Cronbach alpha co-efficient and the overall reliability coefficient was 0.89, which is higher than a coefficient of 0.60 for good instruments (Ogbazi and Okpala, 1994). In order to establish the extent of compliance, the criterion mean was set at 2.50 indicating that any mean below 2.50 was considered a low level of compliance while any mean score of 2.50 or above was considered a high level of compliance. A 100 % return rate (287 copies) was achieved because of on-the-spot retrieval of the questionnaire on completion by the respondents and these copies of the questionnaire were used for analysis. Research questions were answered using mean and standard deviation while hypotheses were tested using a t-test and one-way analysis of variance (ANOVA) at 0.05 alpha level.

ANALYSIS AND RESULTS

Demographic analysis of the respondents

The result in Table 1 indicates that there are more males (60%) than females among the respondents. Analysis of the educational attainment of the respondents indicates that most of the respondents have primary education (51%) and secondary education (35%) while a small proportion (5%) attained post-secondary education. On the length of service in the quarry industry, the majority of the respondents (69%) have served between 1-4 years, while 21% have served for 5 years and above, and others have served for less than one year.

Table 1: Demography of the respondents

Variable	N	%
Gender:		
Male	172	60
Female	115	40
Education Level:		
No-formal education	27	9
Primary	145	51
Secondary	100	35
Post-secondary	15	5
Length in Service Years		
<1	30	10
1 -4	197	69
5 – above	60	21

Source: field survey 2023

Analysis of worker compliance with measures for a safe environment

The data in Table 2 shows that some of the respondents' mean scores on compliance with measures for a safe environment including checking whether fire extinguishers were in the right places, defecating into the toilet within the quarry, urinating into the toilet/urinal within below the criterion mean set for the study, indicating low compliance. The respondents' mean score on other compliance including keeping my work area clean, cleaning my personal protective equipment after every use, reporting every accident to my supervisor, and reporting safety problems to the supervisor is

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above the criterion mean set for the study. Other variables that have a mean score above 2.50 include ensuring that caution signs are put at necessary places and work only when there is proper lighting. It suggests that the variables have high compliance with measures for a safe environment. The respondents' mean score for workers' compliance with measures for a safe environment is above the criterion score set for the study and this indicates high workers' compliance with measures for a safe environment in quarry industries in the Bwari Area Council of the FCT. Cajetan et al, (2018) observe the same trend in Abakaliki.

The result in Table 2 shows that the worker's compliance with occupational health and safety measures for a safe environment is high. This result is similar to the findings of Garcia et al. (2013) which showed that industrial workers they studied in Castellon, Spain had high compliance with occupational health and safety measures for a safe environment. Nzuve and Lawrence (2012) presented a result of 66.05 % compliance with hygiene regulations, which had the possibility of encouraging a safe environment among registered workers in Nairobi. In spite of similar findings in related industries, the finding of this study was not expected. Physical observation of the quarries visited showed many unsanitary activities among workers. This study result shows that workers neither urinate nor defecate in any sanitary convenience within the quarry environment. The implication is that workers defecate and urinate indiscriminately, an unsanitary behavior that may promote a fecal-oral disease outbreak.
It equally suggests the absence of sanitary conveniences in quarries in the study area. The absence of sanitary convenience in any industry will normally lead to pollution of air and water sources, and contamination of other items in the environment. Approving, and supervising agencies should ensure that sanitary convenience is provided in all quarry industries.

S/N	Statement	Mean	SD	Remark
1	Keep my work area clean	3.45	0.75	HC
2	Clean my personal protective equipment after every use	3.32	1.02	HC
3	Keep my work equipment in safe working condition	3.61	0.61	HC
4	Report every faulty equipment to my management	1.23	1.21	LC
5	Defecate into the toilet within the quarry	1.48	1.12	LC
6	Urinate into the toilet/urinal within the quarry	1.54	1.09	LC
7	Report safety problems to the supervisor	2.51	1.15	HC
8	Report every accident to my supervisor	3.23	1.03	HC
9	Check whether fire extinguishers are in the right places	2.34	0.87	LC
10	Ensure that caution signs are put at the necessary place (s)	2.43	1.23	LC
11	Work only when there is proper lighting.	2.56	0.66	HC
12	Compliance with measures for a safe environment	1.81	1.11	LC

Source: field survey 2023 * HC = High compliance, LC = Low compliance

Analysis of Compliance by socio-demographic variable Respondents

The result in Table 3 indicates that there is a difference by gender in compliance with measures for a safe environment. Females have higher compliance than males and this difference was found to be significant. With regard to the level of education, respondents who have post-secondary education have the highest mean compliance score, followed by those with secondary education. Those with non-formal education have the least mean compliance score. When ANOVA was run the difference was significant. For education, as expected, there was a progressive increase in compliance with measures for a safe environment in the quarries with a higher level of education. Regarding the length of service, the workers that are below 1 year in service have higher mean compliance than older workers. When ANOVA was run, the difference that exists in their mean compliance was not significant. The finding that there is a difference in compliance by gender supports the position of Cruz et al. (2017) that men and women face different levels of workplace risk and there is a need to design gender-specific safety interventions that provide specific protections, especially for women in a non-traditional occupation like quarry industries. Bamidele et al. (2011) identified a significant association between the level of education and years of service; this finding differs from the finding of this study, which reported no significant association between years of service and compliance. The finding that older workers had lower compliance might be accounted for by beliefs of having gained enough experience and the carelessness that comes with such assumptions. This calls for interventions to improve knowledge of environmental safety practices and closer supervision to improve compliance. The intervention could be in the area of education and training, which, of course, has been suggested, in a previous study (Egba et al., 2017).

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Table 3: Distribution of compliance with measures for the safe environment by gender, level of education, and length of service in the study area

S/N	Variable	N	X	SD	Statistic	p-value	Decision
1	**Gender:**						
	Male	175	3.34	0.45	T = 0.61	0.05	NS
	Female	112	3.02	0.34			
2	**Education Level**						
	No- education	27	2.11	0.42			
	Primary	145	3.14	0.55	F = 12.53	0.000	S
	Secondary	100	3.02	0.48			
	Post-secondary	15	3.00	0.44			
3	**Length in Services Years**						
	<1	30	3.89	0.41			
	1 -4	197	3.76	0.56	F = 0.18	0.08	NS
	5 – above	60	3.01	0.44			

Source: field survey 2023

CONCLUSIONS

The health of workers in any industry is of paramount importance to owners of such industries. That may be the reason for the adoption of safety measures for a safe environment. Measures adopted for a safe environment include and may not be limited to reporting dangerous activities around and within any industrial environment in quarries. Since workers in quarry industries in the area under survey exhibited an overall high level of compliance with measures for a safe environment, it could be suggested that the environment within and around the quarries would be friendly.

It was observed that there are no conveniences in and around some of the quarries where the workers defecate or urinate. The consequence of the lack of conveniences could be open and surface defecation among the workers. It was shown in the study that workers who had post-secondary and secondary education reported a higher level of compliance with measures for a safe environment. Intervention through workshops and training should target those with lower levels of education. Due to the limitation of survey research of this nature, the results of this study may not be used to make a sweeping generalization to quarries outside the area of study.

It is recommended that the National Environmental Standards and Regulations Enforcement Agency (NESREA), and Mines Inspectorate Department (MID) should liaise with state and local health authorities in the health education of quarry workers and general control of quarries. Also, owners of quarries should take responsibility for every act of non-compliance in quarries and should ensure regular health education and training of workers and regular hazard control in the quarries.

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