



# **Occupational Health and Safety Management in Selected Stone Quarries in Akamkpa, Cross River State, Nigeria**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author EAE designed the study and wrote the protocol. Author CE performed the statistical analysis and wrote the first draft of the manuscript. Author EON supervised the study design, methodology, statistical analysis and result reporting. Author REO supervised the literature searches and general work arrangement. All authors read and approved the final manuscript.*

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## **ABSTRACT**

This research aims to study the management of and implementation of occupational health and safety issues associated with stone quarry work in selected quarries in Akamkpa, Cross River State Nigeria. The research objectives include to determine the types of quarrying activities carried out; to assess the occupational health and safety hazards associated with stone-quarry work; to evaluate the awareness of Quarry workers on potential health and safety hazards associated with their work; establish the level of compliance to the use of Personal Protective Equipment by the workers, and to verify the type of health care provision available to the workers. With a target population of four hundred and thirty-five (435) staff of twelve (12) quarries, A sample of two hundred and five (205) respondents was drawn from the target population through simple random sampling procedure. Questionnaires were the major instrument used for data collection and designed in a 4-point modified Likert scale based on the objectives of the study and validated to be in conformance with

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ISO 45001:2018 checklist. Data was analysed using the Statistical Package for Social Sciences (SPSS). Findings were that 61.7% of respondents are aware that quarry work is highly hazardous, 84.6% do not make use of Personal Protective Equipment. 93.5% inhale particulate materials, 60% have trouble in breathing, 63% experience back and waist pain, 67.2% experience catarrh and 66.7% experience cough at work. 91.5% of workers responded that there were no emergency provisions at site while 96.5% respondents do not have any health insurance, a large percent (85.1%) self-medicates. The totality of evidence from this research supports the conclusions that stone-quarry workers are highly exposed to health and safety hazards, they have no PPE or access to medical care. It is recommended that the Federal and State Government should establish laws and establish an agency to regulate, enforce and monitor compliance to health and safety in Quarries.

*Keywords: Occupational health and management; stone quarry; safety management.*

## 1. INTRODUCTION

### 1.1 Background to the Study

According to 1 the economic sectors that play a major role contributing to the National GDP are Agriculture (22.55%), Trade (17.57%), Information and Communication (12.68%) Mining and Quarrying (8.26%). In the past years, construction companies dealt solely in the erection of the actual infrastructure, now with diversification, Many of such Construction firms now own and run their own mining branches to provide themselves and others the raw materials such as crushed rocks from quarry sites that create the manufactured materials for the actual construction process on site.

Quarry stone is an accessible natural resource and a basic raw material for construction industries and involves quarry workers (both skilled and unskilled), quarry owners, landowners and concession owners who rent the land and extract stone for sale 2.

However, from a research carried out by<sup>3</sup>, it was found that irrespective of the benefits derivable from quarry industries, the associated risk, hazards and consequent effects of quarrying on health of workers and host communities are enormous. Air pollution is an example of such hazard. For instance, in most of the quarries, heavy-duty machineries, plants and trucks on site will lead to the release of fumes, smoke and dust. Dusts are one of the major hazards to health from substances in quarries. Dust is generated at all stages of the production process and the smallest - and invisible particles are the most hazardous due to their ability to reach the lower part of the lung (the alveoli) 4. Direct negative impact from quarrying activities of concern for the workers and the neighbouring

community is respiratory problems such as increased asthma attacks, chronic bronchitis, and lung function impairment & problems with cardiovascular systems, caused by the inhalation of airborne machine or blast dust and debris 5. Dust also causes other hazards like reducing visibility, which can be the cause of some accidents, eye irritations/allergies that occurs when dust gets to the eyes. The presence of the foreign objects causes the eye to swell, itch become red or are infected. Allergic conjunctivitis, pinkeye, and dry eye syndrome are some of eye problems associated with dust 2.

The noise from heavy machinery and transportation system is mostly the source of outdoor noise worldwide. In the case of stone quarry, the causes of noise pollution come from blasting, stone crushers, bulldozers trucks, loaders and general noise from plants within the quarry area. According to World Health Organization sound levels, less than 70 decibels are not damaging to living organism. Exposure for more than 8 hours to constant sound above 85 decibels are maybe hazardous. Problems such as cardiovascular effects in humans, an increase in stress, insomnia, a rise in blood pressure, hearing loss depending on duration of exposure and other harmful effects can be contributed by high noise. High noise levels also hinder communication of people/staff around the quarry. In a research by<sup>6</sup>, it was stated that noise can affect wildlife by causing them to move further into the forest or away from these areas into the community itself during blasting operations. Noise pollution can also have an impact on some species and affect their successful reproduction.

A survey by 7 (involving 247 sand and stone mine workers and 250 non-mine workers was conducted by doing ocular assessments

externally and distance visual acuity measurements. While 45.7% of mineworkers used either safety goggles or sunglasses, none of non-mine workers wore safety goggles; a few (8.8%) occasionally wore sunglasses.

A significant proportion of non-mine workers (59.2%) did not show ocular symptoms relative to the sand and stone miners. Majority of non-mine workers (75.2%) had no visible ocular findings compared to the sand and stone miners (32.4%). Among quarry workers, pterygium (24.3%), pingueculae (5.7%), inflamed eyes (18.2%), and scleral pigmentation 13.8% were significant findings, which were not the case with non-mine workers.

The quarry workers carry out diverse activities on sites and each one of the activities comes with specific associated hazards and exposures to risk thus leading to a high rate of illnesses, injuries and fatalities in the Quarrying Industry, hence making it a Health and Safety issue for stakeholders to address and manage.

8 reported that work-related accidents accounted for 103,000 deaths in USA, 122,000 in European Union, 90,500 in China and 40,000 in India in 2005. According to a research by 9 in Kenya most of the workers engaged in stone quarrying, crushing, transportation etc. suffer from several occupational health & safety hazards such as severe cough, lung disorders, eye problems, skin irritations, musculoskeletal disorders and limbs dislocation. In the case of the developing countries where there is a high rate of quarry related accidents and deaths, the relevant information is either unavailable or unreliable 10.

In Nigeria, works by 3,11,12 in the South Eastern part of Nigeria and works by 13, in the Northern part of Nigeria showed that there is a small amount of information available on health and safety procedures among quarry workers. In agreement with their submission, a report by 14 states that occupational health and safety is neglected in developing countries and the informal workforce suffers the most. Occupational health program is poorly financed due to the lack of political interest, insufficient policies and strategies. Hence, the plight of the occupational workers has gone unnoticed.

### 1.2 Statement of Problem

Although stone quarrying is strategically important in the Construction Industry, it is one of

the most dangerous sectors to work due to cases of Occupational Health and Safety issues.

Over the years, there has been a number of quarry disasters in Nigeria, which were largely unreported or recorded such as caving in of the rock face, limbs amputation, cuts and crushing of workers etc.

Little is known about occupational health and safety issues in the African quarrying industry 15. There is a lack of a clear legislation, regulatory framework and enforcement of occupational health and safety laws associated with the Quarry industry hence the lackadaisical attitude of Quarry owners and operators

This study seeks to assess how the occupational health and safety issues associated with stone quarry work are managed, create awareness on these issues to employers and workers, proffer control measures to manage them and add to the existing body of knowledge. It also intends to stimulate more research in this area and stir the policy makers of the Government into action to legislate, regulate and enforce health and safety compliance in stone quarry sites.

### 1.3 Aims and Objectives of the Study

The study has the following objectives:

1. To determine the types of stone quarrying activities carried out in Akamkpa stone quarry sites in Cross River state.
2. To assess the occupational health and safety hazards associated with stone quarry work
3. To evaluate the awareness of stone quarry workers on potential health and safety hazards associated with their work.
4. To establish the level of compliance to the use of Personal Protective Equipment by the workers.
5. To verify the type of health care provision available to the workers.

### 1.4 Research Questions

1. What are the types of activities carried out in the stone quarrying sites in Akamkpa in Cross River State?
2. What are the Occupational Health and Safety hazards associated with stone quarry work?

3. What is the level of knowledge and awareness of stone quarry workers on Occupational Health & Safety issues they are exposed to?
4. What is the level of level compliance to use of Personal Protective Equipment?
5. What health care provisions are available to stone quarry workers?

### 1.5 Limitations of the Study

- i. Time constraint and stone quarry sites access approval was a limitation to the study hence a wider sample size could not be obtained because some stone quarry sites management were yet to respond to the researcher's request for access to their facilities. Hence, the study was limited to twelve (12) active sites visited.
- ii. Lack of finance was an issue as the other entire remaining stone quarry sites could not be visited due to distance and high transportation cost.

## 2. METHODOLOGY

### 2.1 Study Area

The study area is focused on Akamkpa Local Government Area of Cross River State. The area lies between Latitude: 5.3125, Lat (DMS) 5°18'45 N and Longitude: 8.3552 Long (DMS) 8° 21'19 E at elevation (Feet): 830.

According to National Bureau of Statistics 2006 census reports, the population estimated at 38742. Akamkpa is a town in Akamkpa Local Government Area (LGA), established in Cross River State, Nigeria. There are two main ethnic groups in the Local Government Area, the Ejagham and Dusauga Iyong Iyong people, who speak Ejagham and Iyong Iyong languages. English and Efik languages are also widely used for commercial and other social interactions, while Christianity is the predominant religion in the area.

Akamkpa has about 4930 sq km of and is bounded by Odukpani Local Government Area in the South and Akpabuyo Local Government Area in the East, Biase and Yakurr to the North-West, Ikom and Etung to the North and Republic of Cameroun to the West.

The town has rubber and oil palm estates, a large forest area and fertile land, the people are

into farming. Akamkpa has an abundance of granite rocks, which lead to the establishment of some quarrying companies 16.

### 2.2 Research Design

A descriptive quantitative research design with a cross-sectional approach was used to collect data on Occupational Health and Safety issues associated with stone quarry workers in selected stone quarry sites in Akamkpa LGA of Cross River State. This provides an efficient and accurate means of gaining useful information needed about the population while considering the cost. The survey method was applied in this research and data was gathered from a cross-section of voluntary respondents who are actively involved in stone quarrying activities within the area of study. A structured questionnaire reflecting the research questions was the main instrument used for collection of data.

### 2.3 Population of the Study

The population of this study was limited to all workers in the selected quarries sites who are actively involved in operation but excluding top management. This was because of the qualitative nature of the study. The selected stone quarry sites are listed in the Table 1.1.

### 2.4 Sample and Sampling Techniques

In this study, the sampling technique applied is probability simple random sampling. In simple random sampling, a group of subjects (a sample) is chosen for study from a larger group (a population). Each subject is chosen entirely by chance and each member of the population has an equal chance of being chosen in the sample. The logic behind the simple random sampling technique is that it eliminates bias from the selection process and results in representative samples.

With a population, size of four hundred and twenty (435) the Cochran's formula was used to calculate the sample size for the study.

#### 2.4.1 Sample size calculation

The sample size for this study is three hundred and eighty-five (385) calculated using Cochran's formulas stated below:

$$n_0 = \frac{Z^2 pq}{e^2} \quad (3.1)$$

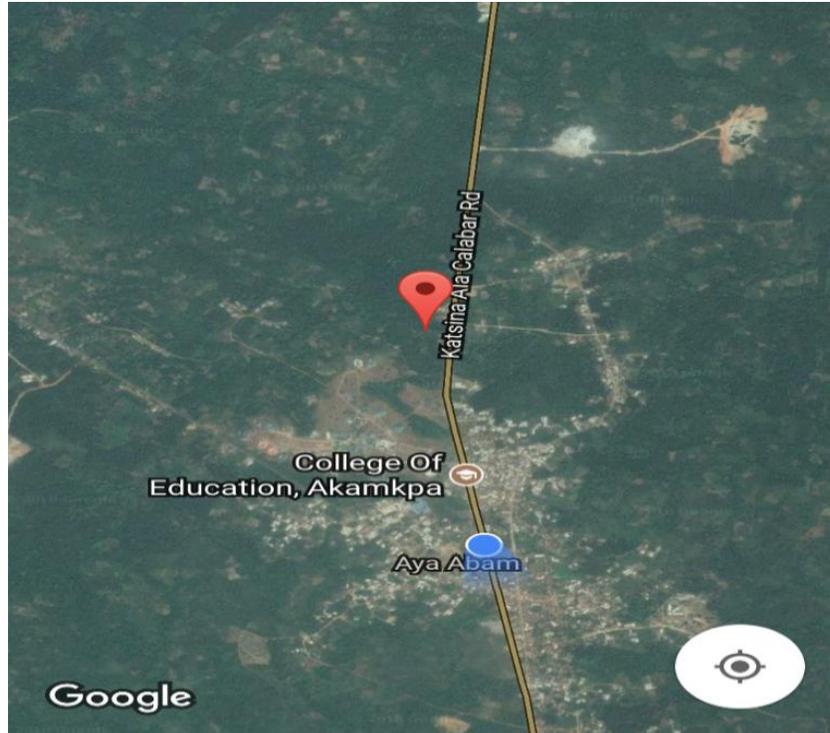
Where: e = margin of error,

p= estimated proportion of the population,

q = is 1- p,

z – Value is found in a z table = 1.96 for a 95% confidence level.

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2 (0.5)(0.5)}{(0.05)^2} = 385$$



**Plate 1. Aerial map of study area at Akamkpa. [5.3125: 8.3552]**

(Source: Google map 2018)

**Table 1.1 Population of quarry workers in the 12 selected quarries locations**

S/N	QUARRIES	POPULATION	PERCENTAGE %
1	MARKSINO QUARRY & BLOCKS LTD	45	10.35
2	SATURN QUARRY	37	8.51
3	BROTHERS QUARRY LTD	43	9.89
4	FOHA QUARRY LTD	35	8.05
5	ZING-ZING QUARRY	43	9.88
6	STAR ADVANTAGE	34	7.82
7	OBASI QUARRY	35	8.04
8	KOSEL QUARRY	33	7.59
9	PREDECO QUARRY	37	8.50
10	CCECC QUARRY	40	9.19
11	WINGS OF HEAVEN QUARRY	29	6.66
12	ZENITH QUARRY LTD	24	5.52
	TOTAL	435	100

(Source, Quarry site records 2018)

To modify the calculated sample size, further calculation was done using the equation below;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \tag{3.2}$$

Where:  $n_0$  = Cochran’s sample size recommendation = 385,  $N$ = Population size.

Substituting values: Sample size ( $n$ ) =  $\frac{385}{1 + \frac{(385 - 1)}{435}}$

$$n = \frac{385}{1.88}$$

$$n = 204.7$$

$$n = 205$$

Therefore, the sample size with respect to the number of respondents for the study is 205.

Out of the 205 questionnaires distributed only 201 were retrieved, the remaining 4 were discarded because they were not properly completed hence couldn’t be used for the study.

Therefore, only 201 questionnaires were received after proper completion.

$$\text{Response rate} = \frac{201}{205} = 98\%$$

**Table 1.2 Sample size obtained from each of the 12 selected quarries locations**

S/N	QUARRIES	PERCENTAGE %	NO. OF QUESTIONAIRES
1	MARKSINO QUARRY & BLOCKS LTD	10.35	21
2	SATURN QUARRY	8.51	17
3	BROTHERS QUARRY LTD	9.89	21
4	FOHA QUARRY LTD	8.05	15
5	ZING-ZING QUARRY	9.88	20
6	STAR ADVANTAGE	7.82	16
7	OBASI QUARRY	8.04	16
8	KOSEL QUARRY	7.59	15
9	PREDECO QUARRY	8.50	17
10	CCECC QUARRY	9.19	19
11	WINGS OF HEAVEN QUARRY	6.66	13
12	ZENITH QUARRY LTD	5.52	11
	TOTAL	100	201

(Source, Researcher 2018)

**2.5 Nature/Sources of Data**

The type of data collected for this study were mainly qualitative because the information was sourced directly from the respondents based on their understanding of the aim of the study and their years of experience in carrying out stone quarry activities. Data collection for this study was from primary and secondary sources.

**2.5.1 Primary source**

This is information directly received voluntarily from the respondents over a period of one month. The questionnaires were in the English language, which is the official language of Nigeria however, for those that could not communicate in English the native vernacular of Efik/Ibibio & Ejagham was used to explain the

questionnaire to the respondents by the researcher/assistants.

**2.5.2 Secondary source**

This source of data gathering covered the collection of all existing data which includes quarry documents like manuals, incident reports, work procedures, books, articles and publications in Journals, internet etc. No names of companies or quarry workers were used to ensure the confidentiality of information disclosed with the Researcher.

**2.6 Method of Data Collection/ Instrumentation**

Prior to embarking on the fieldwork, three research assistants who could speak both English and the native languages of Efik/Ibibio and Ejagham were identified and trained on the administering of questionnaire.

A well-structured questionnaire was used as the main instrument for data collection in this research (see Appendices). The questionnaire consistently helped the researcher and assistants to ask questions and data yielded was analyzed using closed ended questions. Research participants were interviewed directly to avoid misinterpretations and ensure a clear understanding on all the issues.

The instrument was divided into 4 sections. Section A, sought to obtain information about the personal details of participants such as gender, age, years of experience, educational background. Section B, sought to determine the types of stone quarrying activities in the sites, level of job training received and work hours. Section C assessed the knowledge and awareness of workers on hazards they are exposed to at work and assessed the Occupational Health and Safety hazards in stone quarrying operations.

Section D sought to assess the safety awareness, level of compliance to the use of personal protective equipment (PPE) and health care provision available to stone quarry workers.

The researchers, under the guidance of the project Supervisors developed the questionnaire.

**2.7 Methods of Data Analysis**

The statistical methodologies employed in this work were descriptive with the use of the statistical package for social sciences (SPSS) for data collation and analysis.

**2.8 Descriptive Statistical Method**

For this research study, the instrument used under descriptive data analysis include charts, percentages, mean and standard deviation.

**2.9 Validity of Research Instrument**

The research instrument copies were given to four Data Scientist to examine the coverage of the variables and guarantee the quality of the measurement. For this study, since the primary source of data collection was a questionnaire, the supervisors scrutinized it to check for conformance with ISO 45001:2018 checklist and confirmed it to be adequate in seeking the proper range of responses.

**2.10 Reliability of the Research**

Reliability of the tool was ensured by subjecting the instrument of the study to test-retest method. A pilot study was conducted on 12 workers in a granite storage plant in Eket Akwa Ibom State, to assess the clarity, relevance and flow of the questions. The questionnaires were then modified for the final assessment in the field at Akamkpa.

**3. RESULTS AND DISCUSSION**

**3.1 Demography**

Results from the study revealed that majority 58.2% respondents were aged 25-35 years, 24.4% were aged 36-45 and 35,17.4% were aged 46-55 years. At Primary level of education frequency was 61 workers (30.3%), Secondary education 122 workers (60.7) tertiary education 7 workers (3.5%) and 11 respondents do not have any formal education at 5.5%.

**Table 2.1. Age bracket of stone quarry workers**

Frequency		Percent		Valid Percent	Cumulative Percent
Valid	25-35	117	58.2	58.2	58.2
	36-45	49	24.4	24.4	82.6
	46-55	35	17.4	17.4	100.0
Total		201	100.0	100.0	

**Table 2.2. Level of education of stone quarry workers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary	61	30.3	30.3	30.3
	Secondary	122	60.7	60.7	91.0
	Tertiary	7	3.5	3.5	94.5
	None	11	5.5	5.5	100.0
	Total	201	100.0	100.0	

**Table 2.3. Gender of stone quarry workers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	195	97.0	97.0	97.0
	Female	6	3.0	3.0	100.0
	Total	201	100.0	100.0	

**Table 2.4. Years of experience of stone quarry workers**

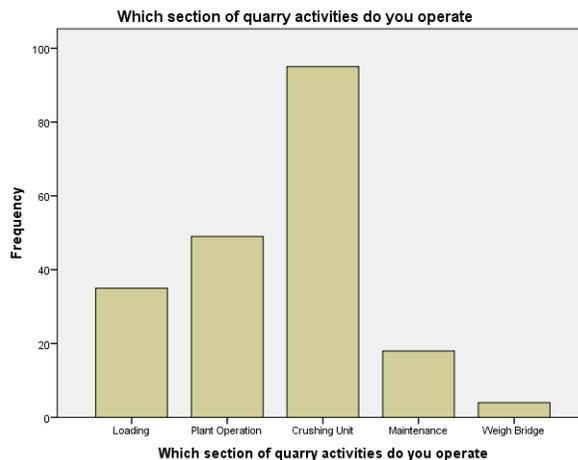
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-10	168	83.6	83.6	83.6
	11-20	30	14.9	14.9	98.5
	21-30	2	1.0	1.0	99.5
	Above 30	1	.5	.5	100.0
	Total	201	100.0	100.0	

120 respondents had received special training for the job, which is fair enough for the large respondents who do not attain tertiary education. A large percent of 97% Males are involved in the stone quarry occupation than females. these are presented in Tables 2.1,2.2, 2.3.

The Table 2.4 shows 168 respondents (83.6%) have 0-10 years' experience, 30 respondents (14.9%) had 11-20 years' experience, 2 respondents (1%) had 21-30 years' experience while 1 respondent (0.5%) had 30 and above experience.

**3.2 Objective 1: Stone Quarrying Activities, Hours of Work and Years of Experience**

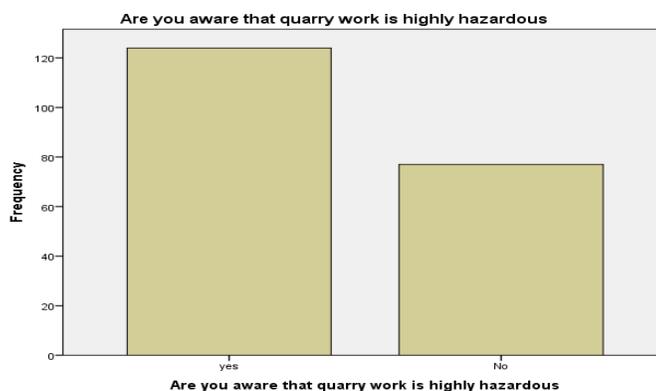
Fig. 1 shows 24.4% respondents operate the loading activity and plant operation activity, 95 respondents' carryout the crushing activity at 47.3%, 9% carryout the maintenance activity, while 2% does the weigh bridge activity. In Table 2.5 a large percent of 74.6% work above 8hours while 25.4% work less than 8 hours.



**Fig. 1. Chart of stone quarry activities**

**Table 2.5. Length of time worked in the stone quarry**

	Frequency	Percent	Valid Percent	Cumulative %
Valid	0-5 years	111	55.2	55.2
	6-10 years	82	40.8	96.0
	11-15 years	5	2.5	98.5
	Above 15 years	3	1.5	100.0
	Total	201	100.0	



**Fig. 2. Chart of quarry workers awareness of hazardous nature of quarry work**

Majority of the respondents (111) had worked 0-5 years, 82 had worked 6-10 years, 5 had worked 11-15 years and 3 had worked above 15 years in the stone quarry as shown in Table 2.7.

by 15 which revealed that 87.3% of the respondents indicated that there was presence of dangerous aspects of the work in the quarry that could harm their health.

**3.3 Objective 2: Safety & Health Hazards Awareness**

**3.4 Objective 3: Occupational Health and Safety Hazards Associated with Stone Quarry Work**

Fig. 2 shows that majority, 124 (61.7%) of respondents are aware that quarry work is highly hazardous while 77(38.3%) respondents were not. This is in agreement with results of a study

Respondents on Tables 2.10 to 2.17 have experienced series of health issues such as 93.5% inhale particulate materials. 51 % of respondents have trouble in breathing, 63%



**Fig. 3. Chart of population with skin infection at quarries**

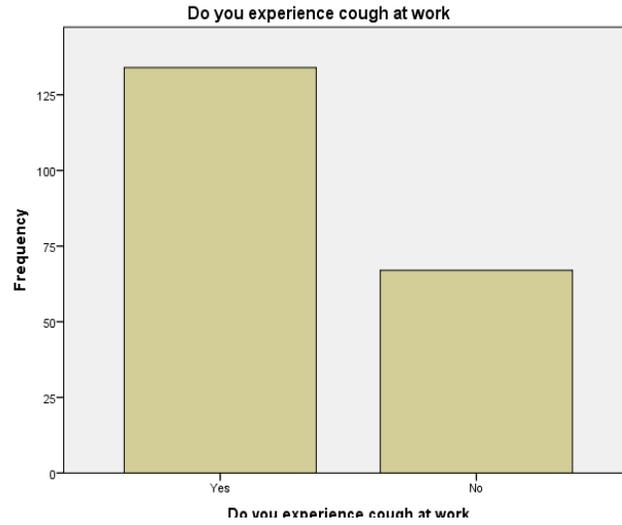


Fig. 4. Chart of population that experience cough at quarries

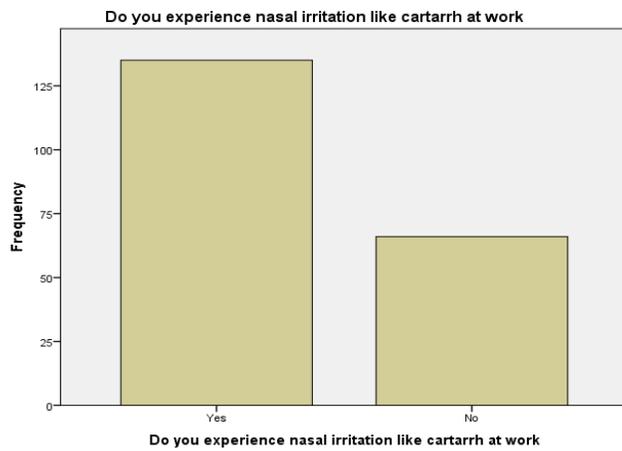


Fig. 5. Chart of population that experience nasal irritation at quarries

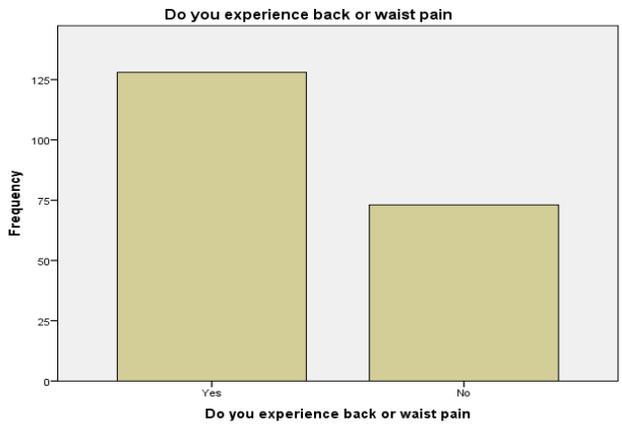


Fig. 6. Chart of population that experience back or waist pain at quarries

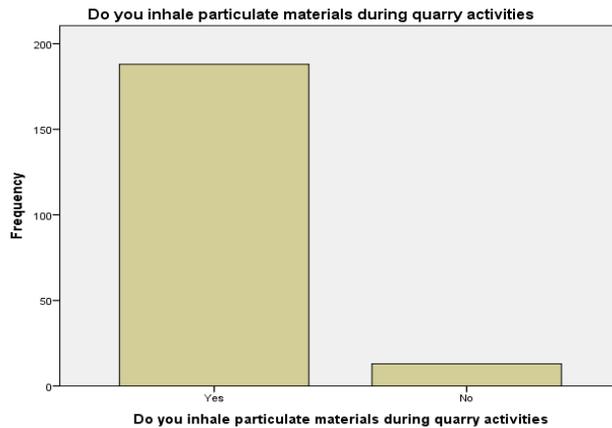


Fig. 7. Chart of population that inhale particulate materials at quarries

Table 2.6. Stone quarry workers who experience tightness of chest/difficulty in breathing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	102	50.7	50.7	50.7
	No	99	49.3	49.3	100.0
	Total	201	100.0	100.0	

Table 2.7. Stone quarry workers who experience eye irritation at work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	81	40.3	40.3	40.3
	No	120	59.7	59.7	100.0
	Total	201	100.0	100.0	

Table 2.8. Stone quarry workers who experience body vibration at work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	64	31.8	31.8	31.8
	No	137	68.2	68.2	100.0
	Total	201	100.0	100.0	

experience back and waist pain, 67.2% experience catarrh at work. 66.7% experience cough at work this agrees with a similar study carried out by 17 on the impact of granite stone quarrying on the health of workers in Abeokuta Ogun State, Nigeria where it was observed that, 26% of the workers suffered predominantly from cough. 20% suffered from catarrh and 15% from sinusitis. However, 91.5% of workers experience skin irritation at work while 81 respondents 40.3% suffer eye irritation this is a different

finding from the study by 18, where eye irritations were reported in 14.9% of them and skin irritations in only 10.8% of respondents.

### 3.5 Objective 4: Compliance with PPE Use

Table 2.9 shows if the respondents receive special training for job majority 140(69.7%) response was Yes while 61(30.3%) response was No.

Table 2.9. Special training given to stone quarry workers for the job

		Frequency	Percent	Valid Percent	Cumulative %
Valid	Yes	140	69.7	69.7	69.7
	No	61	30.3	30.3	100.0
	Total	201	100.0	100.0	

**Table 2.10. Safety training for stone quarry workers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	43	21.4	21.4	21.4
	No	158	78.6	78.6	100.0
	Total	201	100.0	100.0	

**Table 2.11. Provision of personal protective equipment (PPE)**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	51	25.4	25.4	25.4
	No	150	74.6	74.6	100.0
	Total	201	100.0	100.0	

**Table 2.12. Use of PPE by stone quarry workers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	31	15.4	15.4	15.4
	No	170	84.6	84.6	100.0
	Total	201	100.0	100.0	

**Table 2.13. Awareness of the importance of the use of PPE**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	150	74.6	74.6	74.6
	No	51	25.4	25.4	100.0
	Total	201	100.0	100.0	

Table 2.10 indicates that majority 158(78.6%) has not being trained on safety by their employer while 43(21.4%) have been trained on safety by their employer.

Table 2.11 depicts personal protective equipment and revealed that 150(74.6%) does not have personal protective equipment while 51(25.4%) have personal protective equipment.

Table 2.12 reveals that majority 170(84.6%) do not often make use of personal protective equipment (PPE) while 31(15.4%) often make use of personal protective equipment.

Table 2.13 shows the respondents awareness of the importance of the use of personal protective equipment and reveals that 150(74.6%) knows the importance of PPE while 51(25.4%) do not know the importance of PPE

It was observed on Table 2.19, 2.20 and 2.21 that 74.6% respondents do not have personal protective equipment.

A total number of 150 respondents know about the importance of Personal protective equipment (PPE) though 84.6% do not often make use of it. This agrees with a study by [15] who reported that 74.8% indicated that they do not use personal protective clothing while at work and while 74.6% do not have Personal protective equipment (PPE) the few seen on sites visited where disposable dust mask

### **3.6 Objective 5: Health Care Provision Available to Workers**

Table 2.14 reveals the provision for emergency preparedness and majority 184(91.5%) responded No, which indicate that there is no

**Table 2.14. Provisions for emergency preparedness**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	8.5	8.5	8.5
	No	184	91.5	91.5	100.0
	Total	201	100.0	100.0	

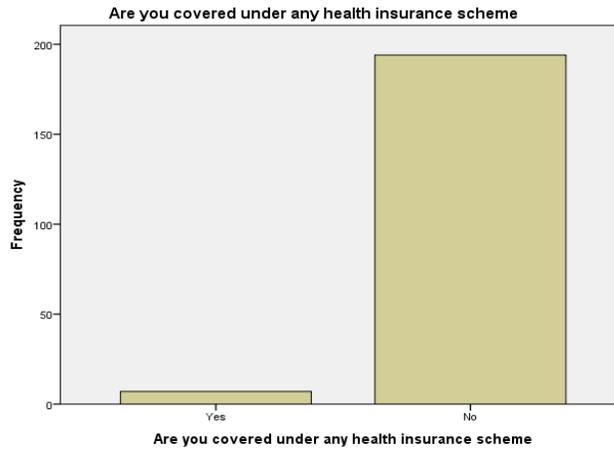


Fig. 8. Chart of population covered under health insurance scheme quarries

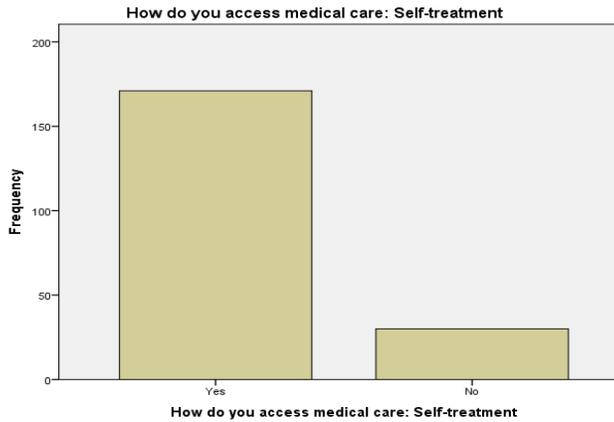


Fig. 9. Chart of population that carry out self-treatment

Table 2.15. Assessment of medical care: hospital/clinic?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	20.9	20.9	20.9
	No	159	79.1	79.1	100.0
Total		201	100.0	100.0	

provision for emergency preparedness while 17(8.5%) responses was yes indicating that there are provision for emergency preparedness.

Fig. 8. shows the coverage of the respondents on health insurance scheme and depicts that majority, 194(96.5%) are not covered under any health insurance scheme while 7(3.5%) are covered under health insurance scheme.

Fig. 9 shows majority, 171(85.1%) access medical care through self-treatment and

30(14.9%) do not access medical care through self-treatment.

Table 2.15 shows the access medical care majority 159 (79.1%) do not access medical care through hospital /clinic while 42(20.9%) access medical care through hospital/ clinic occurred amongst.

In response to emergency response provision at work 184 workers 91.5% responded that there were no emergency provisions at site, while 96.5% of the respondents are not covered under any health insurance.

This finding is different from a study by 15 where 65.2% of the respondents were insured and the most appropriate way emergencies were handled was through giving first aid to the casualty.

In Akamkpa it was observed that 98% do not undergo periodic medical examination but a large percent do self-medication at 85.1% commercial drivers.

## **4. CONCLUSIONS AND RECOMMENDATIONS**

### **4.1 Conclusions**

- ❖ This study confirms that there are occupational health and safety hazards associated with stone quarrying activities at quarries in Akamkpa.
- ❖ The level of awareness of the workers on occupational health and safety hazards especially dust and the related problems associated with stone quarrying activities is high.
- ❖ The stone quarry workers at Akamkpa were not equipped with the required PPE to comprehensively mitigate the occupational health and safety hazards only a few workers were observed using disposable dust mask
- ❖ It was observed that there was no medical retainer-ship between the stone quarry companies and the nearby clinics in Akamkpa hence a high proportion of the respondents sought to taking care of themselves (self-medication) in case of health problem or emergencies instead of accessing treatment in available clinics there were no trained first aiders on site.

### **4.2 Recommendations**

To mitigate the occupational health and safety related problems associated with stone quarrying activities amongst the stone quarry workers, the following measures should be adopted at the National, State, LGA, Company and individual levels.

- ❖ The Federal Government through the Senate should pass into law the Occupational Health and Safety bill, which will bring about the National Commission to regulate, monitor and enforce compliance to Health and Safety laws including quarries and as a matter of urgency should increase

the number of existing Factory Inspection Officers in the Federal Ministry of Labour & Employment.

- ❖ The above should be replicated by the State Houses of Assembly to establish Safety Commissions in the respective States to regulate monitor and enforce compliance at all sites in collaboration with the Local Government Area Councils.
- ❖ The owners and managers of the various quarries should ensure that they adhere to regulations on occupational hazards, which provides for the rights of every worker to fair labour practices, reasonable working conditions and a clean and healthy environment.
- ❖ Personal Protective Equipment though the last line of defence after Engineering and Administrative controls should be provided to all workers free of charge.
- ❖ Workers should be informed, instructed, trained and supervised on Safety and critical aspects of their jobs and they should be made aware of the benefits of compliance with the use of protective clothing and equipment, which should be provided to them.
- ❖ There should be implementation of a yearly medical surveillance programmes and a retainer-ship between the quarry companies and the nearest health clinics within the quarry location for early diagnosis and prompt treatment of any health issues
- ❖ Proper risk assessments and guideline should be developed for quarrying and mining activities, more research should be encouraged with perspective on impact on the environment and communicated to the public on the laws and regulations to be adhered to in order to enhance safety of workers, the stone quarry host communities and the environment.

### **DISCLAIMER**

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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