Knowledge And Practice of Occupational Safety Among Quarry Workers in A Rural Community in Edo State,

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ABSTRACT
Background
The quarry industry remains one of the most dangerous industries to work in because of the enormous hazards associated with the art of quarrying which may manifest long after the worker ceases to work in the quarry. The aim of this study was to determine the knowledge and practice of occupational safety among quarry workers in Ikpeshi, a rural community in Edo State, Nigeria.
Methodology
A descriptive, cross sectional study was carried out among the quarry workers. Respondents were selected using multi-stage sampling technique. A structured, interviewer-administered questionnaire was used to collect data from the respondents. The data was analysed using SPSS version 16.
Results
A total of 410 quarry workers made up of 206 (50.2%) process operators, 68 (16.6%) drillers, 57 (13.9%) plant operators, 39 (9.5%) maintenance workers, 31 (7.6%) drivers and 9 (2.2%) shot firers were interviewed. Their mean (SD) age was 27.0 (5.9) years and 338 (82.4%) were males. Two hundred and thirty five (57.3%) were aware of safety measures in the quarries and the major source of information was from friends (67.8%). Only 137 (33.4%) used personal protective equipment at all times while working. Awareness of diseases associated with working in a quarry was poor.
Conclusion
The level of awareness of safety measures did not translate to use of personal protective equipment among the

INTRODUCTION

A quarry is an open cavity where stone or slate is extracted and is a deposit of rock such as granite which is mined for use in construction projects.[1] Quarries are found all over the world and most of them contain heavy concentration of a particular type of rock such as marble, limestone, slate and gypsum. The act of quarrying is carried out by different methods using different equipment such as hand tools, explosives, power saws, by channeling and wedging according to the purpose for which the stone is extracted.[2] Hand tools alone may be used for quarrying stones that lies in easily accessible beds mostly by artisans. The principal hand tools are the drill, hammer and wedge.[2] Explosives are commonly employed for detaching large blocks of stone which are then split and broken into smaller stones by wedges, or crushed by a heavy steel ball weighing several tons.[2-4] Sophisticated methods are now being employed in mining/quarries in most developed parts of the world. Other machines and equipment used in the quarry for mining and processing include primary and secondary crushers of the jaw or gyratory type,

channeling machines/channelers which are either gasoline or electric driven engines, tractors and heavy duty vehicles.[1,4]

Workers in the quarry industries are exposed to various hazards resulting from the inhalation of air borne particulates and the use of machines/equipment and these poses a lot of danger to their health and safety. These hazards include but not limited to cuts/injuries, falls from heights, effects and complications of noise, vibration, heat and radiation, inhalation of dust/fumes and bites from animals e.g. snakes.[1,5-7] Airborne particulates pose a potential health risk to quarry employees in the form of respiratory, dermal, ocular irritation and damage.[5,6,8,9] A particular concern in some quarries is the inhalation of dust containing silica which can lead to silicosis, an irreversible lung disease resulting in inflammation of the lungs and breathing difficulties which progresses even when exposure stops.[5,8] In the United States, it is estimated that more than one million workers are occupationally exposed to free crystalline silica dusts (more than 100,000 of these workers are sandblasters), of whom some 59,000 will eventually develop silicosis.[10] Also, during the period of 1991 to 1995, China recorded more than 500,000 cases of silicosis, with around 6,000 new cases and more than 24,000 deaths occurring each year mostly among older workers.[10] Members of the public are not spared of risks resulting from the act of quarrying if they live or work in the surrounding environment of the quarry.

In many developing countries of the world especially in Africa and Asia, health and safety practices which are systematic ways to control all possible hazards that might lead to unsafe conditions for employees of an industry are not well established.[8] Most quarry workers in these countries do not know the importance of safety equipments and healthy work environment. In addition, use of personal protective equipment (PPE) to control the job hazards is not accorded importance in these quarries.[4,5,8] It is the responsibility of the employers to ensure that a quarry is designed, staffed and equipped in such a way as to eliminate hazards or at least significantly reduce them.[1]

In Nigeria there is still paucity of literature on health and safety measures among quarry workers as the few studies carried out were in the Eastern and Northern part of Nigeria.[4,8,11] This study is therefore aimed at determining the level of knowledge as well as health and safety practices of quarry workers in a rural community located in Edo State in the South-South region of Nigeria.

MATERIALS AND METHODS

This descriptive cross sectional study was carried out in Ikpeshi community, a rural settlement located in Akoko-Edo Local Government Area of Edo State. The community which is inhabited mostly by indigenous farmers, migrant traders and quarry workers is bounded in the East by Auchi, in the West by Igarra, in the North by Uneme-Nikwa and in the South by Ihiezbe-Ogbe.

It is a mountainous area richly endowed with immense deposits of mineral stones and rocks making it a place for sourcing, quarrying and mining of different types of stones. The quarries which are owned by individuals or private organizations are located in the mountainous rocks occupying a wide expanse of area in the interior part of the community.

The study population comprised quarry workers in the Community. Only workers who have worked for at least six months in the quarry were included in the study. Six months was considered enough time for the quarry worker to be adequately exposed to health and safety measures in the quarry. The calculated minimum sample size using the formulae for a simple proportion was 402. This sample size was proportionately allocated to the selected quarries because the size of the quarries determines the number of workers working in

it. A two-staged sampling method was used to recruit 410 respondents who participated in the study. First, from the list of the ten quarries operating in the community as at the time of the study, 5 were selected by simple random technique using the table of random numbers. Secondly, a sampling frame was prepared for each of these quarries and using an appropriate sampling interval derived from the staff strength and allocated sample size, final respondents were selected from each quarry using the systematic sampling technique.

A structured, interviewer-administered questionnaire containing both open and closed ended questions was used to collect qualitative information such as socio-demographic data of the workers, their knowledge and practice of health and safety measures in the quarries. The questionnaire was pretested in a quarry located in another Local Government Area (Etsako East) of Edo State, after which necessary corrections were made before the commencement of the study. Permission to conduct this study was obtained from the traditional ruler of the community and the management of the respective quarries. Verbal informed consent was also sought from the quarry workers and only those who gave their consent after full explanation that confidentiality was assured were selected for the study.

Data collected were checked for completeness before they were entered into the computer. SPSS version 16 statistical software was used for coding and analysis of data. Chi Square statistical test of association was carried out where applicable and the level of significance set at $P < 0.05$.

RESULTS

Four hundred and ten respondents were interviewed in this study. They comprised 338 (82.4%) males and 72 (17.6%) females. Their mean (SD) age was 27.0 (5.9) years; most 242 (59.0%) were in the 20 29-year age group. Two hundred and fifty (61.0%) were single and 290 (70.7%) had completed secondary education; furthermore, 236 (57.6%) had worked for 1 to 4 years in quarries while 85 (20.7%) had worked for 5 years or more. Two hundred and seventy seven (67.6%) respondents worked for 0 - 8 hours per day while 133 (32.4%) respondents worked for 9 - 17 hours per day. Respondents job categories includes process operators 206 (50.2%); drillers 68 (16.6%); plant operators 57 (13.9%); maintenance workers 39 (9.5%); drivers 31 (7.6%); and shot firers 9 (2.2%). Two hundred and twelve (51.7%) of the respondents were trained on the use of equipment/machines that they work with while 198 (48.3%) were not trained. (Table 1)

Fig. 1 shows awareness and knowledge of types of PPE required for quarrying; 235 (57.3%) were aware that safety precautions including the use of PPE were needed for quarrying while 175 (42.7%) were not. The personal protective equipment mentioned by the respondents were first aid box by 65 (27%); safety boots by 47 (19.5%); hard hats by 43 (17.8%); hand gloves by 36 (15.0%); and nose/face mask by 3 (1.2%).

Fig. 2 describes respondents' sources of information about safety measures and use of PPE by the respondents. Information was mostly obtained from friends 278 (67.8%); colleagues 214 (52.2%); work place 167 (40.7%); training workshops 84 (20.5%), safety lectures 26 (6.3%) and mass media 11 (2.7%). One hundred and five (28.6%) respondents reported that they use PPE at all the time when working, 137 (33.4%) use them sometimes and 168 (41.0%) do not use PPE at all. The main reason for not using PPE were “lack of

Table 1: Socio-demographic and work-related characteristics of respondents

Characteristics	Frequency	%
Age groups (Years)		
10 – 19	37	9.0
20 – 29	242	59.0
30 – 39	112	27.4
40 – 49	19	4.6
Sex		
Male	338	82.4
Female	72	17.6
Marital Status		
Single	250	61.0
Married	160	31.0
Educational Status		
No formal Education	5	1.2
Primary	44	10.7
Secondary	290	70.7
Tertiary	71	17.4
Years spent in Quarry		
Less than 1 year	89	21.7
1 – 4 years	236	57.6
5 or more years	85	20.7
Number of hours worked per day		
0 – 8 hours	277	67.6
9 – 17 hours	133	32.4
Job description		
Process operators	206	50.2
Drillers	68	16.6
Plant operators	57	13.9
Maintenance workers	39	9.5
Drivers	31	7.6
Shot firers	9	2.2
Trained on use of equipment/machine?		
Yes	212	51.7
No	198	48.3

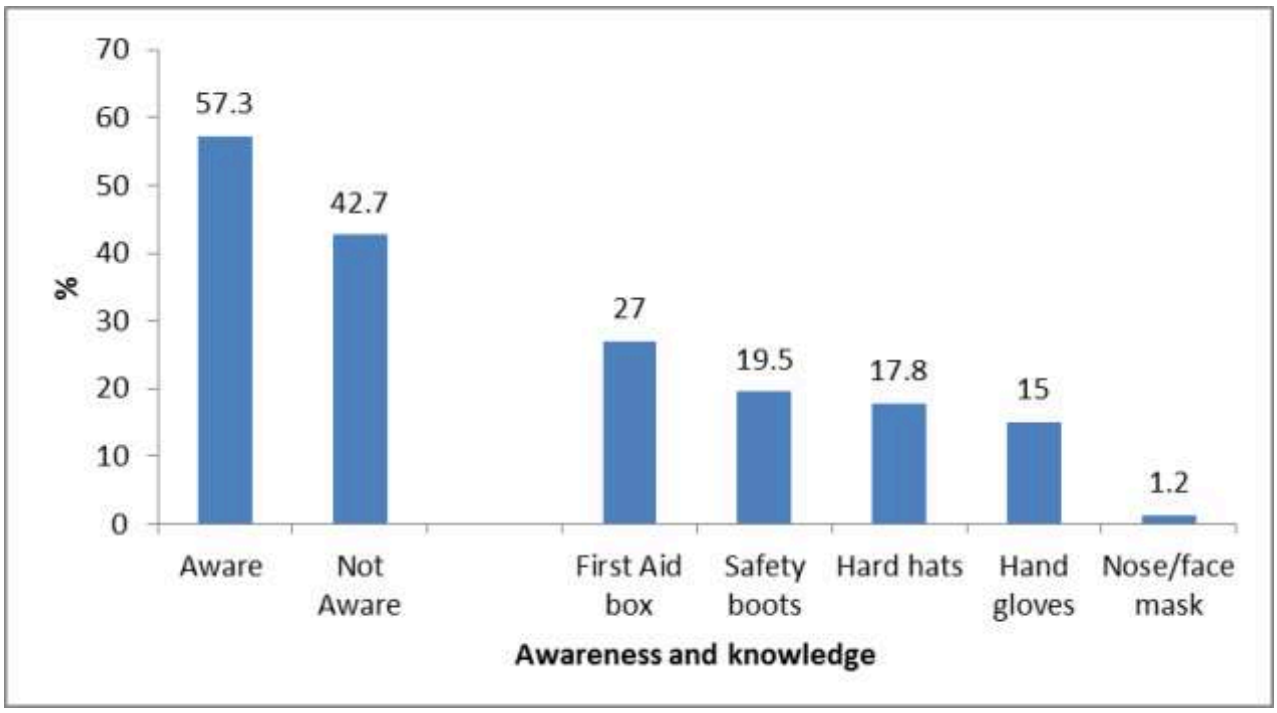

Figure 1: Awareness about safety precautions and knowledge of types of PPE required for quarrying

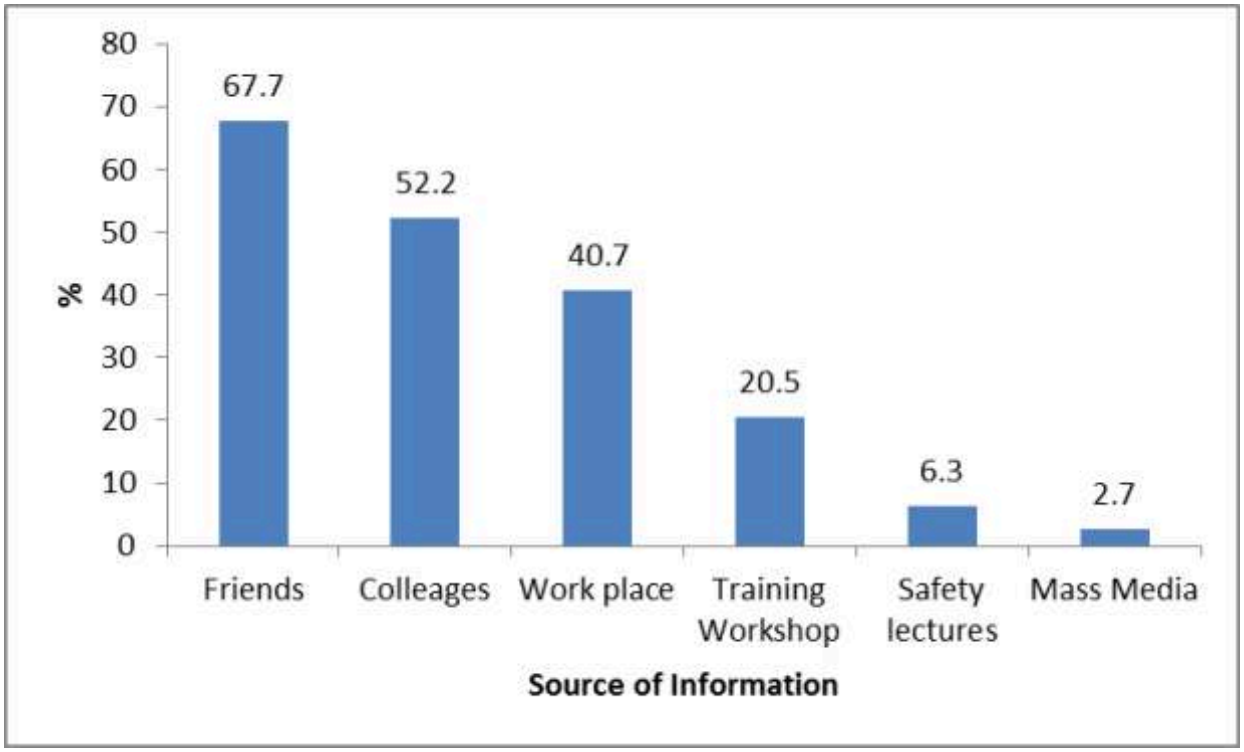

Figure 2: Sources of information about safety and PPE

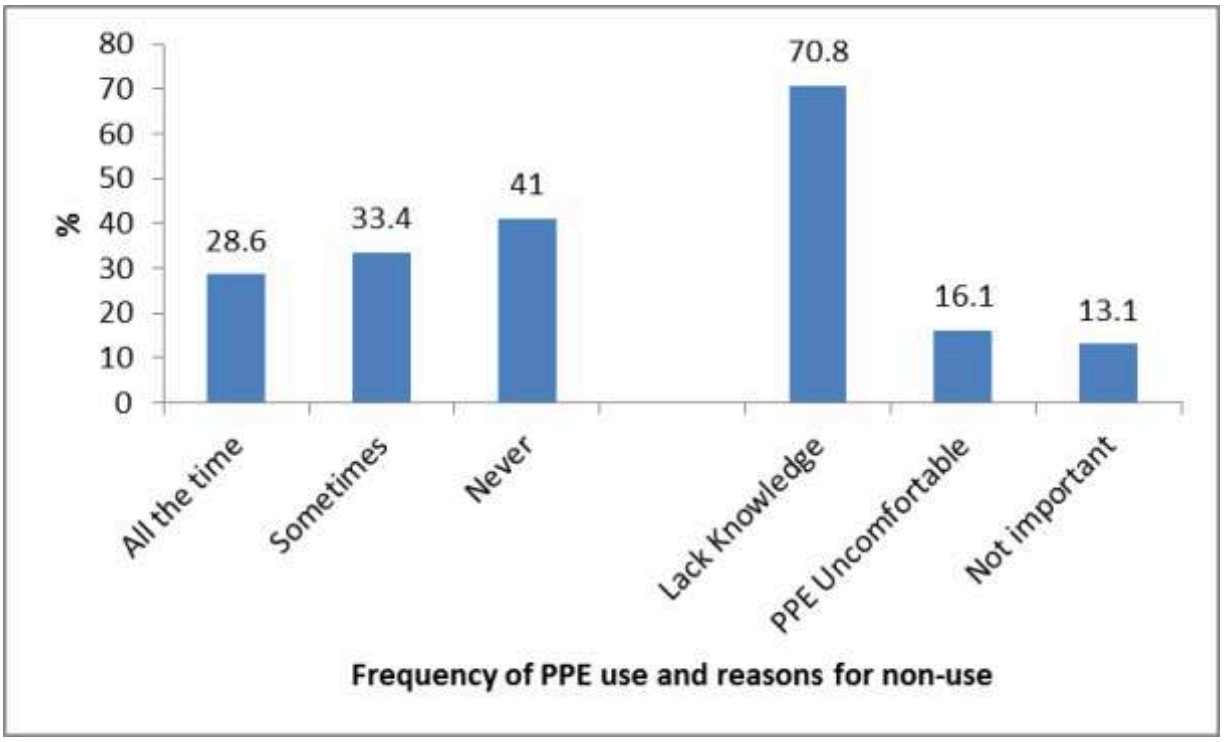

Figure 3: Frequency of PPE use and reasons for non-use

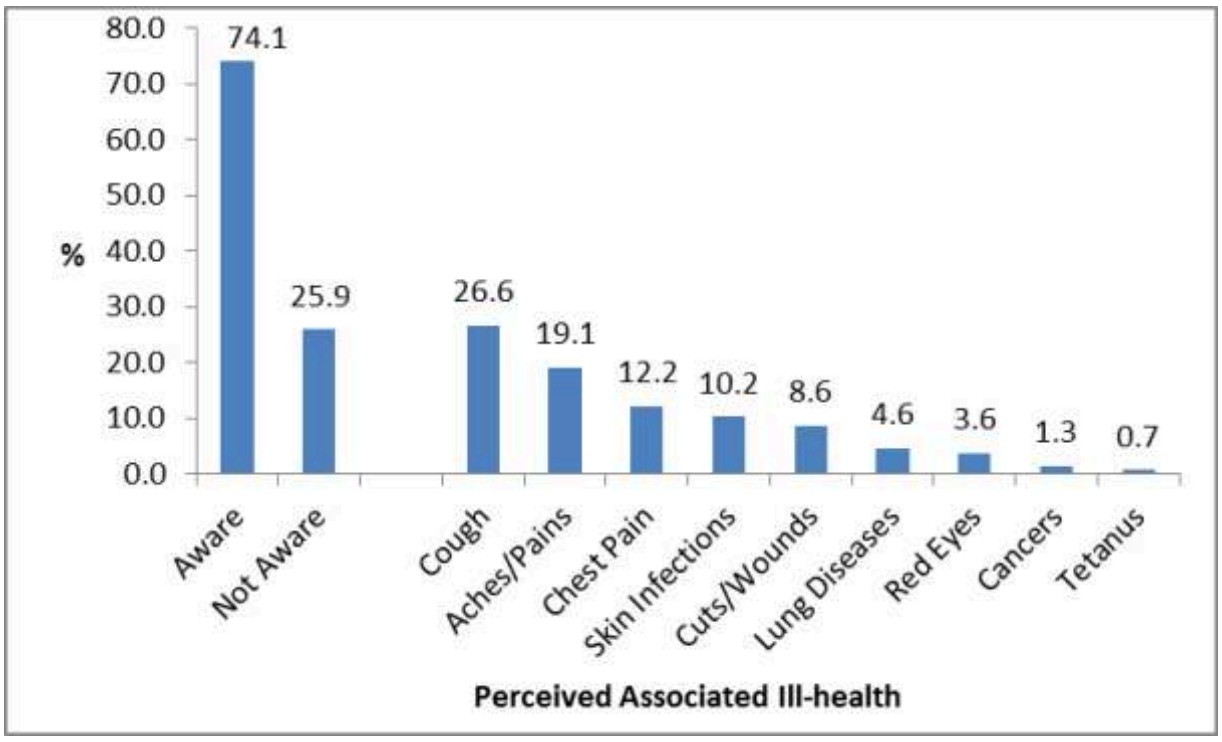

Figure 4: Awareness and ill-health perceived to be associated with quarrying

DISCUSSION

The quarry workers in Ikpeshi community were predominantly young people. This finding was consistent with studies in other parts of the country[6,8,11] and also with a study conducted in India in which majority of the workers were in the age group of 20 29 years.[12] It is not surprising that the quarry was dominated by male workers since quarrying activities involve the use of heavy machines and tedious physical activity like chiseling and breaking of rocks. The finding that majority of respondents are single in this study was not unconnected with the fact that those within the age bracket of 20 - 29 years are mostly single in Nigeria. The observation that only a few of the workers had worked for 5 or more years may reflect a high turnover of manpower in the quarrying industry. This may also be due to the fact that the predominant age-group are highly mobile, moving from one location to another in search of greener pastures or to further their education. However, this situation is not good for the quarry industry because the longer the workers stayed in the industry, the better their awareness of safety measures and use of safety equipment/machines as seen in this study. This observation is similar to that of a study conducted in Hong Kong which reported that frontline workers who had worked for six years or more in the quarries had more site experience on safety measures and use of safety equipments.[13]The fact that majority of the respondents had one form of formal education can be utilized as an opportunity for an effective training programme to improve their knowledge of health and safety practices as it pertains to their work.

It was quite commendable to find out that majority of the respondents complied with the International Labour Organization (ILO) recommended average of eight hours of work per worker per day in this study. The awareness of safety measures which was better among the older quarry workers was encouraging. This could be due to the fact that they might have worked for a longer period in the quarry industry, since duration of years spent in the quarry improves awareness of safety measures as seen in this study. Other contributing factors may be the seemingly high level of education and perhaps experiences gained from friends and colleagues who had been on the job for a longer time. This was consistent with a study in Lokpa, Abia State, Nigeria[8] where the workers had predominantly better awareness of the hazards of the job, working environment and the negative impact of the work on their health, but contrasted the Hong Kong study in which health and safety awareness was low.[13] Although, the educational status of these workers influenced their awareness of safety measures in the quarries, it was surprising that this did not influence their awareness of diseases likely to be developed while working in these quarries. While majority of the respondents are aware of symptoms such as cough, aches and pains, only very few mentioned more serious diseases such as lung diseases and cancers. This again contrasted the India study where educational status positively influenced the awareness of diseases likely to be developed and improved the use of safety equipments.[12]

The use of personal protective equipment as a way of preventing hazards and diseases in the quarries was poor in this study as only one third of the workers used these equipments all the time. This is consistent with a study in Singapore in which less than half of quarry granite workers used respiratory protective devices.[14] This finding could be attributed to the fact that a higher proportion of workers had no training in the use of these equipments, and were not aware of any diseases they are likely to develop in these quarries. Another reason could be as a result of the unskilled nature of the job and the operating system in the quarry which involves subcontracting of the quarries to operators whose major interest would be to maximize profit and so they would not bother to train or educate the workers of the dangers associated with working in the

Table 2: Awareness of safety measures by socio-demographic characteristics of the respondents

Variables	Awareness of Safety Measures Yes n (%)	No n (%)	X^2	P value
Age group in years				
10 – 19	1 (2.7)	36 (97.3)	98.33	0.001*
20 – 29	120 (49.6)	122 (50.4)		
30 – 39	97 (86.6)	15 (13.4)		
40 – 49	17 (89.5)	2 (10.5)		
Sex				
Female	8 (11.1)	64 (88.9)	76.22	0.001*
Male	227 (67.2)	111 (32.8)		
Marital Status				
Single	109 (43.6)	141 (56.4)	49.27	0.001*
Married	126 (78.7)	34 (21.3)		
Educational status				
None	0 (0)	5 (100)	28.99	0.001*
Primary	24 (54.5)	20 (45.5)		
Secondary	152 (52.4)	138 (47.6)		
Tertiary	59 (83.1)	12 (16.9)		
Years spent in Quarry				
Less than a year	41 (46.1)	48 (53.9)	11.95	0.003*
1 – 4 years	133 (56.4)	103 (43.6)		
5 years and above	61 (71.8)	24 (28.2)		

*Statistically significant

Table 3: Use of personal protective equipment (PPE) by socio-demographic characteristics of respondents

Variables	Use of PPEs Yes n (%)	No n (%)	X^2	P value
Age group in years				
[illegible]	4 (10.8)	31 (89.2)	59.91	0.001*
[illegible]	135 (55.8)	107 (44.2)		
[illegible]	85 (75.9)	27 (24.1)		
40 – 49	16 (84.2)	3 (13.8)		
Sex				
Female	20 (27.8)	52 (72.2)	35.26	0.001*
Male	222 (65.7)	116 (34.3)		
Marital Status				
Single	133 (53.2)	117 (46.8)	8.99	0.003*
Married	109 (68.1)	51 (21.9)		
Educational status				
None	2 (40.0)	3 (60.0)	3.42	0.332
Primary	24 (54.5)	20 (45.5)		
Secondary	168 (57.9)	138 (42.1)		
Tertiary	48 (67.6)	23 (32.4)		
Years spent in Quarry				
Less than a year	36 (40.4)	53 (60.6)	23.44	0.001*
1 – 4 years	141 (59.7)	95 (40.3)		
5 years and above	65 (76.5)	20 (23.5)		

*Statistically significant

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