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THE USAGE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) AMONG QUARRY WORKERS IN ABIA AND EBONYI STATE, SOUTH EAST, NIGERIA

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ABSTRACT: ***Background:*** *Personal protective equipment is a lifesaving equipment which helps in protecting the health of workers. Quarrying activity which is an economic/money marking activity requires workers to be well protected due to the various activities in the quarry sites.* ***Aim:*** *The aim of this work is to assess the usage of personal protective equipment (PPE) among quarry workers in Abia and Ebonyi States, South East, Nigeria.* ***Method:*** *A cross sectional study on the usage of personal protective equipment (PPE) among the quarry workers in Abia and Ebonyi State, South East Nigeria was conducted between May 2019 to June 2021 with the aim of determining the usage of personal protective equipment (PPE) among the quarry workers and to know if their level of education influences their use of PPE. Interviewing of workers with well-structured questionnaires was used for the study. The study population consists of seven registered quarries in both states. The multi-stage random sampling technique was employed in the study. The first stage was the selection of quarry sites, in which seven quarry sites were randomly selected through balloting. In the second stage, a total number of 406 quarry workers were selected for the study. Data was collected using a well-structured questionnaire. The data were analyzed using Statistical Package for Social Science (SPSS) version 20, percentages and mean were also used.* ***Results:*** *On the usage of personal protective equipment (PPE) by respondents, the result shows that 20.1% (49) out of 246 quarry workers in Ebonyi state use their PPE while 13.0% (21) out of 162 workers use theirs in Abia State. 61.2% (30) in Ebonyi and 7.4% (15) in Abia always used PPE regularly, 38.8% (19) and 28.6% (6) said "sometimes." 46.9% (23) and 42.9% (9) in both states used nose masks, 22.5% (11) and 9.5% (2) helmets, 18.4% (9) and 19.1% (4) boots, glove users amounted to 8.2% (4) and 4.3% (3) in both states, 4.1% (3) and 4.3% (13) in Abia used body overall respectively. On the usage of PPE based on the level of education, it was found that among those with no formal education, 11.4% used PPE while working and 19.6% do not use it, 25.7% of those with primary education did while 48.8% did not. Among those with secondary and tertiary education 34.6% and 24.3% utilized PPE while 28.3% and 3.3% did not use PPE. This study found a statistically significant association between level of education and usage of personal protective equipment in both States (p= 0.0231).* ***Conclusion:*** *Information obtained from the study revealed that the majority of quarry workers in Abia and Ebonyi state knew that their job exposes them to health hazards. But there was a low turnout of usage among them. Despite these varying levels of compliance, intensive health education campaigns and provision of adequately subsidized safety protective devices for the workers by the relevant authorities will go a long way in improving awareness and compliance with use of safety protective devices and reduction of hazards.*

KEYWORDS: Personal protective equipment, Quarry sites, Air pollution, Usage, Quarry workers, Level of education.

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INTRODUCTION

Personal protective equipment (PPE) is an equipment worn to minimize exposure to hazards that can cause injury in the workplace. Its use (PPE) is an important strategy to prevent occupational injuries and illnesses resulting from exposure to workplace hazards. These injuries and illnesses may result from direct contact with chemicals, physical, electrical, mechanical, or other workplace hazards (19).

Stone quarrying and crushing have been known to be hazardous to workers which can lead to death or occupational diseases. Most of the quarry process involves activities like drilling, blasting, stone cutting, rock crushing and aggregate manufacturing which can generate dust and also pollution of different areas of the quarry site exposing workers to different levels of quarrying dust (15).

According to Kim *et al*. (11), chemically, air pollutants in quarry sites can be in form of gaseous (volatile) inorganic pollutants, such as nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and ozone (O_3); gaseous organic pollutants like polycyclic aromatic hydrocarbons (PAHs) produced as by-products of fuel burning, monocyclic hydrocarbons or volatile organic compounds (MAHs/VOCs) such as toluene, benzene and xylene, and aliphatic chemicals (6). There are equally the solid forms of air pollutants, otherwise called particulate matter (PM) which occur in varying size iePM_{10} (<10 µm in aero-dynamic diameter), $PM_{2.5}$ (< 2.5µm), and ultrafine particles (<0.1µm or 100nm); they can penetrate the respiratory system via inhalation causing respiratory and other health diseases (13).

Health issues including asthma, otitis media, tuberculosis, nasopharyngeal cancer, cataracts, blindness, cardiovascular disorders, low birth weight, and neonatal mortality are all made more likely by ambient air pollution due to quarrying activity (14).

One of the most significant methods for protecting workers' health and safety in the workplace against potential risks or hazards is the use of PPE (8). This is evidenced by an improvement in worker's efficiency as a result of increased worker confidence as a result of a sense of security in their workplaces, as well as a reduced rate of employee absenteeism and turnover among those who have adopted proper health and safety measures (18). PPE such as helmets, gloves, face shields, respirators, dust masks, safety shoes, and safety glasses are often very effective in preventing foreign body, chemical, hot particle, and radiation exposure or impact to various body parts and reducing the severity of exposure or impact when exposure or impact occurs when used and well fitted (20).

The majority of ambient air pollutants have direct effects on the respiratory and cardiovascular systems, and the degree of those effects vary depending on the population exposed, the intensity and length of exposure, and their overall health which may be due to workers in quarry sites not using personal protection equipment, prolonged exposure, and their socioeconomic standing, which includes their income and degree of education (3; 7). This study therefore explores the usage of personal protective equipment (PPE) among the quarry workers Abia State.

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MATERIALS AND METHODS

A cross sectional study design and interviewing of workers with well-structured questionnaires was used for the study. The study was conducted in Abia State which is among the five states in South Eastern Nigeria. This study was conducted between May 2019 to June 2021 The study population consists of four registered quarries in Abia North Senatorial district of Abia state. The multi stage random sampling technique was employed in the study. The first stage was the selection of quarry sites, in which seven quarry sites were randomly selected through balloting. In the second stage, a total number of 406 quarry workers were selected for the study. Data was collected using a well-structured questionnaire. The data was then analyzed using Statistical Package for Social Science (SPSS) version 6 Percentages and mean were used.

RESULTS

Usage of Personal Protective Equipment (PPE) by Respondents

Table 1 shows the responses concerning use of protective equipment by respondents. 20.1% (49) out of 246 quarry workers in Ebonyi state use their PPE while 13.0% (21) out of 162 workers use theirs in Abia State. 61.2% (30) in Ebonyi and 7.4% (15) in Abia always use PPE regularly, 38.8% (19) and 28.6% (6) said "sometimes." 46.9% (23) and 42.9% (9) in both states used nose masks, 22.5% (11) and 9.5% (2) helmets, 18.4% (9) and 19.1% (4) boots, glove users amounted to 8.2% (4) and 4.3% (3) in both states, 4.1% (3) and 4.3% (13) in Abia used Body Overall respectively.

Table 1: Usage of Personal Protective Equipment (PPE) by Respondents

Variables	**Location**		**P-value (p=0.05)**	**Decision**
	Ebonyi State (n=244) %	**Abia State (n=162) %**		
Do you use your PPE ?				
Yes	49 (20.1)	21 13.0)	0.4128*	**NS**
No	195 (79.9)	141 (87.0)		
Total	**244 (100%)**	**162 (100%)**		
How often do you use it?				
Always	30(61.2)	15(71.4)		
Sometimes	19(38.8)	6(28.6)		
Total	**49**	**21**		
Which of the PPE do you use?			0.3610*	**NS**
Nose masks	23(46.9)	9(42.9)		
Helmets	11(22.5)	2(9.5)		
Boots	9 (18.4)	4 (19.1)		
Gloves	4 (8.2)	3 (14.3)		
Body Overall	2(4.1)	3(14.3)		
Total	**49 (100%)**	**21(100%)**		

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In table 2 below, it was found that among those with no formal education, 11.4% used PPE while working and 19.6% did not use it, 25.7% of those with primary education did while 48.8% did not. Among those with secondary and tertiary education, 34.6% and 24.3% utilized PPE while 28.3% and 3.3% did not use PPE**.** This study found a statistically significant association between level of education and usage of Personal Protective Equipment in both States (p= 0.0231).

Table 2: Association between Level of Education and Usage of Personal Protective Equipment in both States (Ebonyi and Abia)

Level of Education	**Usage of PPE**		**P-value (p=0.05)**	**Decision**
	Yes(%)	**No(%)**		
No formal Education	8(11.4)	66(19.6)		
Primary	18(25,7)	164(48.8)		
Secondary	27(35.6)	95(28.3)	0.0231*	**S**
Tertiary	17(24,3)	11(3.3)		
Total	**70**	**336**		

***Fischer's Test**

DISCUSSION

Use of PPE

Findings concerning the use of PPE among the site workers revealed that 20.1% of the workers in Ebonyi and 13.0% in Abia use their PPE. Although 20.5% and 9.5% of the site workers in both states used helmets, the most utilized PPE among the workers were nose masks amounting to 46.9% and 42.9% respectively. This is in agreement with Manish et al. (2019) who reported that workers rarely use personal protective equipment in quarry sites. It is not in agreement with Sufiyan (2012) in his work who recorded 89.2% compliance which was due to the workers experiencing one or two injuries in the quarry site.

In terms of the level of education and usage of PPE, this study according to table 2 demonstrated that among those with no formal education, 11.4% utilized PPE while working, however 19.6% did not. 25.7% of those with primary education used theirs while 48.8% did not. Among those with secondary and tertiary education, 34.6% and 24.3% utilized PPE while 28.3% and 3.3% did not utilize PPE**.** This could be due to lack of adequate information on the adverse effects of the pollutants present on site and its surroundings. This is in line with the work of Nwazuku et al. (2022) who reported high usage of PPE among those with higher education qualifications but in disagreement with Sufiyan's (2012).

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CONCLUSION

Quarry activities which are economic generating activity release large air pollutants into the environment which have consequential health effects. Air pollutants such as particulate matter ($PM_{2.5}$ and PM_{10}) and greenhouse gasses like CO were detected including SO2 and NO_2. These pollutants were significant in the different sections of the quarry site. Information obtained from the study revealed that the majority of quarry workers in Abia and Ebonyi state knew that their job exposes them to health hazards. But there was a low turnout of usage among them. Despite these varying levels of compliance, intensive health education campaigns and provision of adequately subsidized safety protective devices for the workers by the relevant authorities will go a long way in improving awareness and compliance with the usage of safety protective devices and reduction of hazards.

Consent

Informed consent was gotten from participants in the quarry site.

Ethical Approval

The ethical approval was obtained from the Federal University of Technology Owerri's ethical committee.

Competing Interest

Authors have declared that no competing interest exists.

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