

Ocular disorders and compliance to protective eyewear among quarry workers in Akamkpa local government area of cross river state, Nigeria

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Abstract

The quarry industry over time has played a pivotal role in the transformation of the physical environment but with attendant negative effects on workers. This study ascertained the pattern of work related ocular disorders and compliance to protective eye devices among quarry workers in Akamkpa LGA, Cross River State Nigeria. This descriptive cross sectional study employed the use of a structured interview followed by a comprehensive external examination of the eyes of the subjects by qualified eye care practitioners. Data generated was analysed using the Statistical Product for Service Solution (SPSS) version 25.0. Results were presented descriptively using tables and figures. The study took place in 8 quarry sites located in 4 communities randomly selected and involved 184 subjects randomly selected comprising of 140 (76.09%) males and 44 (23.91%) females. The age of the participants ranged from 18-60 years with a mean age of 32.03 ± 2.23 (SD). The study revealed that predominant ocular symptoms experienced were blurry vision (31.5%), itchy eyes (27.94%), ocular irritation/ grittiness (15.55%), eye/ headaches (12.46%) and discharges (9.61%). The most common ocular surface anomalies observed were pterygium (41.80%), corneal scar/ ulceration (18.03%) and allergic conjunctivitis (16.39%), while the most frequent type of eye injuries reported were superficial foreign bodies, blunt trauma and superficial ocular abrasion accounting for 50.92%, 30.06% and 11.04% respectively. Injuries due to quarrying activities were more common among labourers (41.10% and 29.45% among stone crushers and stone processors respectively), while workers with less than 5 years work experience reported more work related eye injury (74.85%) with broken stones (80.39%) accounting for most of the injuries. Similarly, a majority (94.7%) of the participants had knowledge of Personal Protective Eye Devices (PPEs) only 26.44% had the appropriate PPEs and just 30.43% of them complied regularly with their usage during work. There was a statistically significant association between work experience and the occurrence of work related ocular injuries ($p > 0.001$) but the use of PPEs has no statistically significant association with the occurrence of eye injuries. The study concluded that workers at the Akamkpa quarry, Nigeria suffered various types of work related ocular anomalies and while a majority of them had prior knowledge of the benefits of PPEs, the level of availability and utilization is relatively low and recommended health education and strict enforcement of safety regulations.

Keywords: Disorders; Hazards; Injuries; Quarry; Ocular; Work

1. Introduction

Some occupations are inherently dangerous and pose significant threat to the health of the workers involved. For some industrial workers, daily exposure to hazardous agents like extreme temperatures, dust and radiations have become a normal experience just as others have accustomed themselves to loud noise, vibrations, heavy metals and chemicals like mercury, lead and organic solvents. The Health Safety Executive (HSE) (2011) defined a quarry as an open cavity where stone or slates are extracted from a deposit of rock such as granite which is mined for use in construction projects. Quarries are found all over the world and most of them contain heavy concentration of rocks and minerals such as marbles, lime stones, slates and gypsum. Thur & Choudhary (2009) opined that the act of quarrying can be carried out

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by different methods using different equipment such as hand tools, explosives, power saws, channeling and wedging according to the purpose for which the stone is extracted. Hand tools alone may be used for quarrying stones that lie in easily accessible beds mostly by local artisans. The principal hand tools are the drill, hammer and wedge. 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. While sophisticated methods are now being employed in mines/quarries in most developed parts of the world, this is not so in less developed countries such as Nigeria. 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 which are gasoline or electric driven engines, tractors and heavy-duty vehicles (Thur & Choudhary, 2009; HSE, 2011).

Khurana (2012) was of the view that ocular challenges faced by quarry activities are as a result of exposure of the eyes to various environmental, occupational and anthropogenic conditions. The more prevalent of the ocular anomalies include pterygium, pinguecula, conjunctivitis, cataract, corneal opacity, keratoconjunctivitis sicca, limbal infiltrates, arcus senilis etc. Several studies have reported pterygium and pinguecula as the most prevalent ocular surface disorders. Pterygium is a winged-shaped fold of conjunctiva tissues encroaching upon the cornea from either side within the inter-palpebral fissure which is relatively common among persons living in hot climates or exposed to artificial sources of heat and dry dusty environment. Similarly, Pinguecula is a relatively common degenerative condition of the conjunctiva characterized by formation of a yellowish-white patch on the bulbar conjunctiva close to the limbus. Clinically, it is considered as a precursor of pterygium.

Other ocular conditions include conjunctivitis (inflammation of the conjunctiva resulting to itchy eyes, redness and discomfort), Keratoconjunctivitis Sicca (dryness of the ocular surface), Arcus Senilis (an annular lipid infiltration of the corneal periphery), corneal injuries, foreign body lodgment, corneal ulcer, corneal opacity, blunt trauma, cataract (opacity of the crystalline lens in the eye resulting to blurry vision), and other ocular surface anomalies, (Khurana, 2012) Several studies have been carried out to determine the ocular symptoms presented by quarry workers. Studies by Bhatnagar et al.,(2014); Shah and Jani,(2015) have reported itching and watery eyes as the major complaints among quarry workers while a study by Gupta et al., (2002) reported conjunctiva hyperemia as the most common disorder among quarry workers.

1.1. Personal Protective Equipment (PPE) and Personal Protective Eye Devices (PPEDs)

Ugbogu *et al.*, (2009), observed that in many developing countries of the world especially in Africa and Asia, health and safety practices which are preventive measures to mitigate exposures and other conditions that poses threats to the health and safety of employees in the industry are not well established. In addition, use of personal protective equipment (PPE) to control job related disorders is not accorded importance in most quarries. The HSE (2011) opined that 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. In Nigeria currently there is paucity of literature on health and safety measures among quarry workers and the few studies carried out were in the Eastern and Northern part of Nigeria. (Aliyu & Shehu, 2010).

Eye protection is achieved by wearing personal protective equipment (PPE). Suitable eye protection or face protection when there is the potential for exposure of the eyes or face to flying particles, molten metal, chemicals, gases or vapours and potentially injurious light radiation. Side protection is required when there is a potential danger from flying objects approaching indirectly. Detachable side protectors (e.g., clip-on or slide-on shields) are acceptable. Eye protection should be durable, comfortable and easy to clean. Persons whose vision requires the use of corrective lenses and who by nature of their job description require eye protection should wear goggles or a full-face shield that can be worn over the prescription lenses. Though there are four general classes of eye and face protection, namely safety glasses face shields, goggles and welding helmets, in Nigeria quarrying has a reputation for being a particularly hazardous industry. The HSE (2011) reported that the quarry industry in Nigeria is reputed to have one of the highest proportions of ocular disorders of all occupational groups worldwide. Most of the work-related injuries, illnesses and deaths linked to quarrying activities were attributed to the physical nature of the work involved, coupled with poor workplace health and safety standards and nonchalant attitude of workers.

Aigbokhaode, *et al.*, (2011) was of the view that awareness of diseases associated with working in a quarry was poor and the level of awareness of safety measures did not translate to use of personal protective equipment among the quarry workers. Similarly, Ezisi et al (2017) carried out a study aimed at assessing the occupational health disorders among quarry workers in Ebonyi State, Nigeria. The study reported significant relationship between quarry activities and health problems because exposure to gases can have major health implications and recommended that quarry workers should be encouraged to comply with personal protective equipment to protect their health.

1.2. Statement of the Problem

There are inherent hazards in almost all work environments but some have a higher potential to impact negatively on the health and wellbeing of the workers. One of such hazardous work environment in Nigeria is the quarry where workers are made to work without the appropriate protective device despite the hazardous environment. Quarry workers are exposed to extreme noise, dust haze, vibrations, chemical pollution and flying rock fragments capable of causing body and eye injury. While these hazards pose a threat to the general health and sight of the workers, the limited availability of personal protective devices, poor compliance and negative attitude to safety practices has made matters worse. Considering the fact that quarrying activities have been going on in Akamkpa for a considerable length of time, there was a need to assess their impact on the ocular health of the work force

1.3. Aim and Objectives of the Study

This aim of this study was to determine the prevalence of ocular injuries among quarry workers in Akamkpa, Cross River State Nigeria. The specific objectives of the study include;

- To determine the pattern of ocular injuries experienced at Akamkpa quarry industry.
- To determine the distribution of these ocular injuries according to work sectors.
- To determine the level of compliance of quarry workers to personal protective equipment.
- To determine the health promotion measures available to the quarry workers

2. Methodology

2.1. Research Design

This study took place between September 2021 and June 2022, adopting a descriptive cross-sectional study design to ascertain work related ocular disorders amongst quarry workers in Akamkpa LGA, Cross River State, Nigeria. The study involved a structured interview of subjects to obtain subjective responses followed by a quick and detailed observation of the eyes and surrounding structures by qualified eye care practitioners guided by the objectives of the study

2.2. Area of the Study

The study was carried out in approved quarry sites in Akamkpa LGA, Cross River state, Nigeria. Akamkpa is a town which shares boundary with Cameroon to the West and according to National Bureau of Statistics (NBS), (2011) has a population of 168,118 at the 2010 census. The town covers an area of 5,003 square kilometres and is endowed with abundance of granite rocks which is the foundation of the quarry industry.

2.3. Sampling Technique

A multistage sampling technique was employed in selecting the subjects. Stage one involved the application of a simple random technique to select four communities out of all the communities where quarries are located. Stage two involved the application of a systematic sampling technique to select two quarry sites from each of the communities selected. The third stage involved selection of the participants by means of balloting among participants who consented to be part of the study. Selected subjects who did not meet the inclusion criteria were excluded and replaced from the sampling pool.

2.4. Reliability and Validity of Instrument

The data were primary data collected by the researchers alone with assistance from senior optometric clinicians serving as research assistants using standard instruments and charts that are routinely used in eye care practice as approved by the Optometric and Dispensing Opticians Registration Board of Nigeria (ODORBN). The structured questionnaire employed for the interview of participants was pre-tested on 20 quarry workers from the Ishiagu quarry located in Enugu state, Eastern Nigeria to ensure that the questions were clear, contents suitable, understandable and in the right sequence or flow. The procedure was repeated two weeks later on same group of subjects and the results generated were correlated using the Pearson Product Moment Correlation and a reliability coefficient of 0.75 was obtained.

Method of Data Analysis

Data collected from this study was entered into the Microsoft excel spread sheet for inspection of variables for uniformity after which it was exported to the Statistical Product for Service Solution (SPSS) version 25.0 for analysis. Results were presented in descriptive formats using tables and figures while the hypothesis was tested at the 0.05 level of significance.

3. Results

3.1. Demographic Profile of Participants

Table 1 Gender and Age distribution

Variable	Frequency	Proportion
Gender		
Male	140	76.09
Female	44	23.91
Total	184	100.00
Age (Years)		
18–27	28	15.22
28–37	60	3.61
38–47	58	31.52
48–57	24	13.04
Above 57	14	7.61
Total	184	100.00

The study involved a total of 184 subjects comprising of 140 males and 44 females with a mean age of 32.02 ± 2.23 with a male to female ratio of approximately 3:1. 15.22% of the subjects examined were between the ages of 18-27 years; 32.61% were between 28-37 years, 31.52% were between 38-47 years, 13.04% were between 48-57 years while 7.61% were above 58 years as shown in table 1.

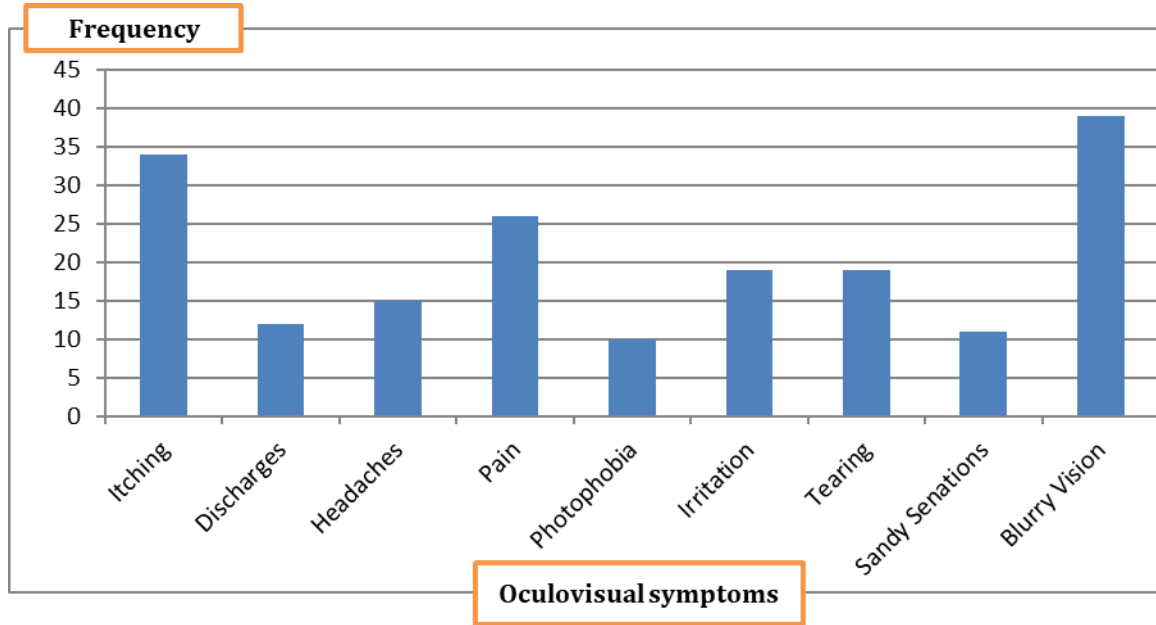
Table 2 Job Description of Participants

Job Description	Frequency	Proportion (%)
Work Section		
Stone Quarry	50	27.17
Stone Processing Unit	134	72.83
Total	184	100.00
Nature of Work		
Blasters	8	44.35
Breakers	10	55.43
Crushers	22	11.96
Drillers	4	2.17
Laborers	140	70.09
Total	184	100.00
Work Experience		
1-5	132	71.74
6-10	30	16.30
11-15	22	11.96

Total	184	100.00
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Table 2 shows the departmental distribution of subjects with the Labourers constituting the highest proportion with 70 (76.09%) workers, followed by Crushers 11 (11.96%), Breakers 5 (5.43%), Blasters-4 (4.35%), and Drillers 2 (2.17%).

3.2. Predominant Work related Ocular Disorders Experienced by Quarry Worker



(Scale: 1unit = 2 cases)

Figure 1 Predominant Work related Symptoms presented by participants

Predominant work related symptoms in descending order include blurry vision 78(31.35%), itchy eyes 64(27.94%), eye pain 52(21.48%), irritation 38(15.55%), tearing 38(15.55%), headaches 30(12.46%), discharges 24(9.61%), sandy sensation 11(8.76%) and photophobia 10(7.93%).

Table 3 Spectrum of Ocular Disorder

Ocular Anomalies	Frequency	Proportion(%)
Pterygium	102	41.80
Corneal Scar/Ulcer	44	18.03
Allergic Conjunctivitis	40	16.39
Pinguecula	18	7.38
Limbal infiltrates	16	6.56
Glaucoma Suspected	10	4.09
Bacterial conjunctivitis	6	2.46
Corneal Opacity	8	3.28
Total	244	100.00

The most prevalent ocular anomaly was pterygium with 102 (41.80%) cases, followed by corneal opacities with 44(18.03%) cases while the least was bacterial conjunctivitis (2.46%) as shown in table 3.

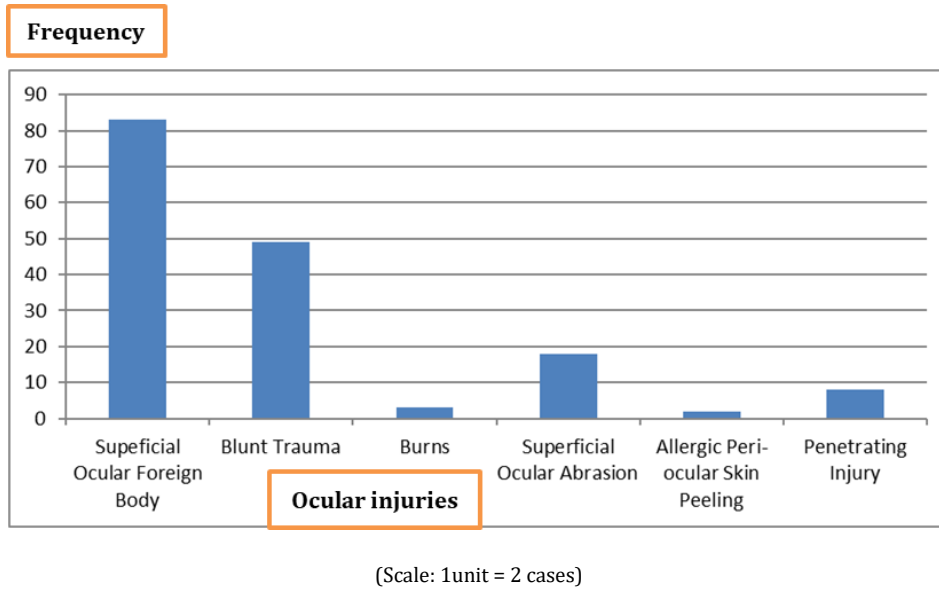


Figure 2 Pattern of ocular injuries

Of the 166 (90.21%) workers who had a past history of work-related eye injury resulting to an accumulation of 326 cases, the most common types of injuries reported were superficial ocular foreign 166 (50.92%) cases, followed by blunt trauma 98(30.06%), superficial ocular abrasion 36(11.04%), cases of penetrating injury 16(4.91%), burns 6(1.2%) and allergic peri-ocular skin peeling 2(1.23%) as shown in figure 2.

Table 4 Ocular injuries sustained by different workers according to their work sectors

Eye Injury	Stone Crushing				Stone Processing			Total
	Blasters	Drillers	Breakers	Laborers	Crushers	Breakers	Laborers	
Abrasion	0	8	0	28	2	0	12	36(11.04)
Allergic eyelid skin peeling	0	0	0	2	0	0	2	4(1.24)
Blunt trauma	8	12	10	34	6	4	24	98(30.06)
Eyelid burn	4	0	0	0	0	2	0	6(1.84)
Foreign body	12	10	6	68	0	0	54	166(50.92)
Penetrating eye injury	2	2	4	0	2	2	4	16(4.91)
Total	26(7.98)	32(9.82)	20(6.14)	134(41.10)	10(3.07)	8(2.45)	96(29.45)	326(100.00)

Table 4 shows that of all categories of workers employed in the two major sections of the quarry industry, the laborers suffered the highest proportion of work related eye injury.

Table 5 Distribution of Ocular Injuries in relation to Duration of work experience

Duration of work experience(years)	Frequency	Proportion (%)
1-5	244	74.85
6-10	48	14.72
11-15	34	10.43
Total	326	100.0

Table 5 above shows that workers with 1- 5 year work experience who constituted the larger workforce are more prone to eye injury accounting for 74.85%, while the more experienced workers suffered less eye injuries. This suggests that an increase in work experience is linked to a corresponding decrease in the amount of eye injuries suffered.

Table 6 Causes of Ocular Injuries

Causes of Ocular Injuries	Frequency	Proportion (%)
Broken Stones	164	80.39
Explosives	10	4.90
Stone pit	10	4.90
Processing Machine	8	3.92
Dust	8	3.92
Processing plant	4	1.96
Total	204	100.00

The major causes of work related eye injury at the quarry sites were pieces of broken stone (80.39%), explosives (4.90%), stone pit (4.90%), Processing Machine (3.92%) and the least being processing plants with 1.96% of cases as shown in table 6.

3.3. Personal Protective Eye Devices (PPEDs)

Table 7 Usage of PPEDs

Variable	Response	Frequency (Proportion)
Knowledge of PPEDs	Yes	174 (94.57%)
	No	10(5.43%)
Total		184 (100%)
Possession of PPEDs	Yes	46 (26.44%)
	No	128 (73.56%)
Total		174 (100%)
Frequency of PPEDs Usage	Always	14 (30.43%)
	Occasionally	28 (60.87%)
	Rarely	4 (8.70)
Total		46 (100.00)

Table 8 Health Safety Measures

Variable	Response	Frequency (Proportion)
Prior Training on safety	Yes	46 (25.0%)
	No	138 (75.0%)
Total		184 (100.0%)
Availability of Health post/ emergency arrangements	Yes	66 (35.87%)
	No	118 (64.13%)
Total		184 (100%)

Majority of the participants 94.56% had prior knowledge about the use of PPEs during quarrying activities however despite their knowledge about PPEs an overwhelming 73.56% of the study participants did not own PPEs. Of the participants who possess PPEs, only 30.43% employ them regularly despite educational status, duration of work experience, and history of job related eye injury.

The findings from table 8 above showed that majority of the participants 69 (75%) have not been trained on safety measures or what to do in the case of injuries in the quarry. Most of the participants also responded that the emergency preparedness in place at the quarry were inadequate. However, there are first aid boxes and over the counter medications.

Table 9 Univariate test for association of work related injuries

Variable	OR	95%CI	P value
Work sector			
Crushing	0.39	0.23–0.67	0.001
Processing	Reference		
Work experience(years)			
<10	2.95	1.39–6.27	0.003
>10	Reference		
PPE use			
Yes	1.01	0.001	0.99
No	Reference		

Engagement in stone crushing ($p=0.001$), and work experience ($P=0.003$) were significantly associated with the occurrence of work-related eye injury among participants. The use of PPEs ($P=0.99$) had no significant effect on the occurrence of work related eye injury.

4. Discussion

This study was carried out in eight quarry sites in the area of study and was aimed at ascertaining the pattern of ocular disorders and injuries among quarry workers, majority of which were adult males with minimal work experience. The major symptoms presented by the participants were blurry vision (31.35%), itching (27.94%), pain (21.94%) and tearing (15.82%). Studies by Bhatnagar et al., (2014); Shah and Jani, (2015) reported complaints of itching and watery eyes among quarry workers as predominant symptoms experienced. This could be attributed to sustained exposure to particulate matter of various sizes, heat, mineral dust causing eye irritation, infections, discoloration, denaturing of the ocular surface and subsequent ocular surface abnormalities. This agrees with findings by Gupta et al., (2002) which reported conjunctiva hyperemia as a consequence of long-term exposure to particulates among quarry workers.

Findings from this study revealed that the most prevalent ocular surface disorders were pterygium (41.80%), allergic conjunctivitis (16.39%), pingueculum (7.37%), limbal infiltrates (6.56%) among others. The observed pattern of eye disorders correlates with assertion by Koffuor *et al.*, (2011) which reported pterygium as the leading ocular disorder among quarry workers. The high prevalence of pterygium, a degenerative conjunctiva disease and conjunctivitis might be attributed to the lack of environmental dust control measures and the limited availability or non-utilization of protective eye devices and inherent exposure to ultraviolet radiation by quarry workers. A similar predominance of degenerative ocular surface disorders was reported by Okoye & Umeh., (2002). Therefore, provision of preventive and therapeutic industry eye care interventions should receive priority for the appropriate management of these common eye disorders.

About 90.21% of quarry workers suffered work related injury within a span of one month. This high incidence has been corroborated by a retrospective study by Fong and Taouk, (1995). The reasons for the high prevalence could be attributed to factors such as low level of industrial technological innovation, poor knowledge and limited availability of eye-safety measures and policies in addition to lack of enforcement of safety regulations. The most prevalent types of injuries were ocular foreign body (50.92%) and blunt trauma (30.06%). This is not surprising as there were no

environmental dust control measures in place to prevent occurrence of these work-related accidents. The laborers were the subgroup with the highest proportion of work-related injury resulting from blunt trauma directly from pieces of broken stones. At the stone crushing and stone processing site, stone dust was implicated as a potential occupational hazard and the major cause of ocular discomfort.

Quarry workers in Nigeria are exposed to varying degrees of atmospheric pollutants like dust and other particulate matter, predisposing them to eye irritation, inflammation and surface disorders however, the crushers at the stone processing site were found to be exposed to the greatest risk of fragments of crushed stones. Similarly, Umeh and Okoye (2002) in their study observed dust as a potential danger and probably the most difficult problem that the workers were facing at work. This finding agrees with observations made at the stone processing site in this survey. Most workers examined, were found to have a practice of copious irrigation of affected eyes with clean water following excessive contact.

Quarry workers particularly drillers were exposed to fast moving particles of stone, smoke, or fire from explosives used to bore holes into rocks while the breakers were exposed mostly to flying pieces of stones, which the potential to lodge as ocular foreign body or blunt trauma. Mine explosion accidents, operating machine accidents, trips over stones, and falls resulting from deep gully created by continuous excavation, emission of noxious gases from operating machine, and drills were some of the hazards the workers were exposed to.

With reference to work related eye injuries, this study showed that working in the stone processing unit was a significant factor for sustaining work-related eye injuries considering that the most common agent of injury was broken pieces of stone. Thus, it was not surprising that workers in the stone processing unit were more at risk though the stone processors accounted for majority of the work force. Relating eye injuries to work experience the study showed that comparatively, workers with less than five years of work experience suffered the highest proportion (74.85%) of work related eye injuries and the association was statistically significant. This implies that work experience leads to mastery of the work process and reduce incidence of work-related eye injury. Therefore this study speculates that there is a significant relationship between work experience and work related ocular injury.

A striking observation from this study was that while a clear majority (94.57%) of quarry workers had fair knowledge of the benefits of PPEs, just a few (26.44%) have the appropriate task specific PPE and only 30.43% use them regularly. This could be attributed to personal negligence, non-adherence to safety regulations and failure of relevant authorities to enforce compliance to the use of protective devices during work. This was in agreement with Ezisi *et al.* (2017) which revealed that workers were aware of the need for utilization of eye protective devices; however, 98.7% declined its use for various reasons. In some situations, the employers did not provide the employees with the PPEs needed just as they did not demand for it for obvious reasons. Lastly, the study revealed that only 25% of quarry workers had undergone safety training organized by their employers and only 35.87% of the quarry sites have organized set ups/ arrangements that can provide emergency health care services and first aid to workers on site.

5. Conclusion

This study showed that there is high incidence of work related ocular disorders among quarry workers in Akamkpa LGA, Cross River State, Nigeria. Pterygium, corneal scar/ulcer and conjunctivitis were the most prevalent ocular disorders presented by quarry workers. Most of the subjects complained of blurry vision, pain and itchy eyes. Other common ocular problems found in this study include pinguecula, arcus senilis, superficial foreign body, blunt trauma and corneal abrasion. Quarry workers are regularly exposed to work place hazards with the potential to cause ocular injury, thus there is need to employ the use of eye protective devices, training, and retraining of workers to achieve mastery of job specification to minimizing injuries. There is equal need for maintenance of the work environment according to stipulated guidelines, best practice and strict enforcement of safety regulations to make the work place safe for all workers.

Recommendations

The following recommendations were made from the findings of the study;

- Quarry site managers should provide safety training to workers and ensure that safety regulations are strictly enforced to enhance compliance among workers to PPEs and other safety gears.
- Quarry site owners should introduce modern technology in quarrying activities like stone crushing and processing to minimize workers exposure to dust, flying debris and other noxious particulate matter thereby ensuring a safer work environment for workers..

- The government should ensure that an environmental impact assessment (EIA) is carried out on new and existing quarry and mining sites and make available the findings to the public particularly the host communities impacted by mining activities.
- Employers should provide health insurance schemes for quarry workers to help reduce the cost of treatment and also help reduce self-medication and attendant negative consequences.
- Quarry workers should take responsibility for their protection by obtaining safety training, safety gears and imbuing safety attitudes to ensure work safety.
- Quarry owners should make provision for health facility on site to take care of emergency situations, routine eye/ health examination of employees as well as pre-employment assessment of intending employees to ensure early detection and management of work related disorders and other health events that could pose a threat to general health and sight of workers.

Contribution to Knowledge

The study revealed that workers in the Nigerian quarry industry are prone to a variety of ocular surface disorders and injuries. Despite the appreciably high level of knowledge of the benefits of protective eye devices, the level of availability and compliance is relatively low among quarry workers. Knowledge gained from this study will help to shape government policies, work place safety regulations, workers attitude and eye care practitioners competence with a view to prevent ocular disorders, eye injuries and informed management of cases when they occur.

Compliance with ethical standards

Disclosure of conflict of interest

The researchers hereby declare that there was no conflict of interest in the study and its reported findings

Statement of ethical approval

Approval for the study was obtained from the Research Ethics Committee of the department of Optometry, Madonna University, Elele Campus Rivers State Nigeria and a letter of introduction was obtained from the Head of department. A copy of the letter was handed to the managers of the quarry sites to grant the researchers access to the sites. Informed and written consent was also obtained from each participant and information obtained was kept confidential and domiciled with the record unit of the senior clinic of the department of Optometry, Madonna University, Nigeria.

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