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Ocular Morbidity Among Sawmill Workers in the Kumasi Metropolis

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ABSTRACT

This study sought to determine ocular morbidity and the risk associations in the activities of sawmill workers within the Kumasi Metropolis. A descriptive cross-sectional study was used to collect data on eye health and safety of 115 participants within the sawmill industry, with the aid of pretested questionnaire. Eye examination was conducted with a Welch-Allyn Finoff Transilluminator used together with an ophthalmic loupe, and an ophthalmoscope. Eight (8) of the 115 study participants recruited were females (7%) giving a female to male ratio of 1:13. Workers' ages ranged between 18-70 years; mean age of 37.28±13.39 years. The workers were grouped as Administrative (7%) and Technical (93%). The prevalence of eye injuries was determined by proportion to be 42.6%, with prevalence of 0.9% and 41.7% ($p > 0.05$) respectively among administrative and technical staff. Protective eyewear was not used by 87 (75.7%) workers. Eyewear unavailability due to non-supply by employers was the commonest reason (70.14%) ascribed by workers for non-use of protective eyewear. There is compelling evidence of work-related ocular hazards and non-adherence to eye safety in the sawmill industry in the Kumasi Metropolis. This could be curtailed if adequate eye health and safety measures at work are properly enforced.

KEYWORDS

Ocular Morbidity; Sawmill; Work-Related Eye Injuries; Protective Eyewear.

INTRODUCTION

The economic development of a country depends to some extent on industrial work. However, occupation in industries poses significant health threat to mankind [1]. Exposure to agents like dust, heat, radiations and chemicals all have debilitating implications on the health of humans and other organisms in the least. In Ghana, occupations like farming, welding, blacksmithing, sawmill and wood processing as well as other indigenous trades predispose their workforce to a variety of work-related hazards [2, 3].

The sawmill industry has gradually gained popularity over the years. It is an industry that proves to be a significant contributor to the growth of a country's economy [4]. This is achieved through provision of employment for humanity. It also serves the domestic demand of the building construction industry [5]. These benefits notwithstanding, a myriad of work-related hazards are presented to workers in the sawmill industry. The nature of the work and the types of equipment and materials used present many on-the-job hazards [6]. Such hazards include environmental hazards as a result of poor forestry practices and management, poor solid waste management and toxic emissions to air, noise, hazards due to machinery use, and menace from workstation design [7]. Again, synthetic chemicals used in the preservation of wood pose health threat to sawmill workers [8]. In addition to these hazards, other by-products in wood processing including formaldehyde and mould have debilitating health effects.

In as much as the general body system of workers in this industry is at risk of injuries from stress and or strain, the ocular health of these workers cannot be overlooked. This is especially true of developing countries where poor working condi-

tions and poor or little, if any, safety precautions at work exist or is enforced hence posing a high risk of damage to the eye [9].

There is an inevitable exposure of the eye to wood dust and projectile foreign body which could result in injuries and morbidity. Quite a number of studies have been conducted on occupational exposures in sawmills in different locations and these suggest different risks of developing an array of disorders of which the eye and visual system is strongly implicated [4, 9-11]. In a related study, the first important survey of eye injuries revealed that 71% of all severe eye injuries admitted to hospitals were workplace-related, and greater than 12% of these eyes were surgically removed from their sockets [9]. The nature of such work-related eye injuries have been linked to the type of work as well as the environment within which the respective work is being carried out [12].

Most industrial work activities are governed by policies which are meant to ensure safety of workers [4, 13, 14]. Despite existing policies on occupational safety and health, a considerable rate of work-related injuries still abound. In 1982, the National Institute for Occupational Safety and Health (NIOSH) in the United States of America (USA) estimated a total of 900,000 work-related eye injuries [15]. Ghana is no exception as regards such policies that are meant to protect workers from injuries. There is the Act 651 of the Labour Act 2003 which bids employers not to expose their employees to hazardous work conditions. This same Act entreats employees to exhibit their duty of care in ensuring that they work as per the employers' standard operating procedures which must incorporate safety and health requirements. This Act notwithstanding, sawmill workers sustain a significant number of work-related injuries though insufficient database makes it difficult to presently know the incidence of work-related eye injuries in the Kumasi Metropolis [16]. Eye injuries in sawmill workers is therefore expected to be high within the Metropolis as health and safety measures are not routinely practiced or enforced by employers of labour [17]. Hence this study sought to assess work-related ocular morbidity among sawmill workers, and to evaluate occupational eye safety among this category of persons.

MATERIALS AND METHODS

Sampling

We carried out a descriptive cross-sectional survey to determine the prevalence of eye injuries among sawmill workers in the Kumasi Metropolis and assessed workers' knowledge and attitude towards adherence to protective measures against work-related eye injuries in sawmilling activities.

The target population from which we picked our sample was the technical and administrative workers at the different sawmill sites which fell within the selection criteria through the sampling techniques employed. Administrative workers were those involved in clerical work, sales transactions and payment of salaries whereas Technical workers included machine operators, wood loaders, and saw dust packers who were involved in evacuating sawdust and clearing up bark.

Sampling techniques used included cluster sampling, purposive sampling, stratified and systematic sampling techniques. Given that the Metropolis is divided into ten political zones, these were considered clusters each of which was found to accommodate a number of sawmill stations. However, five out of the ten sub-metropolitan areas were conveniently sampled for their considerable endowment of strata of sawmill sites. The population of workers, both administrative and technical staff, within the chosen sub-metropolitan areas was obtained from the human resource management of each identified sawmill station in each stratum. The final sample was then randomly selected systematically using a defined sampling interval for the study.

Data Collection

Study participants were interviewed by means of a pretested semi-structured questionnaire developed by the investigators. The questionnaire captured participants' bio-data, ocular health data, and their knowledge on protective eyewear in occupation. The study participants were again taken through eye screening exercise which entailed distance visual acuity (VA) assessment of each eye using the Snellen's chart, and ocular examination carried out on-site. External eye examination was carried out using the Welch Allyn Finoff Transilluminator together with an ophthalmic loupe. Any abnormality or sign of ongoing or previous work-related ocular trauma was noted. Interior eye assessment was carried out with the Welch Allyn Direct Ophthalmoscope and funduscopy through undilated pupils was performed on all eyes.

Ethical Consideration

Study participants consented willingly to partake of the study after the entire study and its procedures were explained to them. We ensured that the study protocol followed the tenets of the Declaration of Helsinki.

Data Analysis

Data collected were coded for entry into and analysed with the Statistical Package for Social Sciences (SPSS) version 17.0 (SPSS, Inc., Chicago, IL, USA). Descriptive statistics of mean, standard deviation and frequency was employed. Pearson's chi-square test was carried out to compare differences be-

tween categorical groups; p<0.05% was considered significant for the study.

RESULTS

Participants' Demographics

The total number of participants recruited for the study was 115 of which 107 were males (93.0%) and 8 were females (7.0%). This showed a male to female ratio of 13:1. There were 8 (7.0%) administrative and 107 (93%) technical sawmill workers. The distribution of participants' ages is as shown in table 1. Participants' ages ranged between 18 and 70 years, minimum age being 19 years and maximum age being 65 years, with a mean age of 37.28 ± 13.39 years. Table 1 also shows the age distribution with respect to work division of participants.

Table 1: Distribution of workers' ages and their division of work.

Age of participant (years)	Work Division		Total
	Administrative [n (%)]	Technical [n(%)]	
18-30	1 (0.9%)	45 (39.1%)	46 (40.0%)
31-40	2 (1.7%)	24 (20.9%)	26 (22.6%)
41-50	2 (1.7%)	17 (14.8%)	19 (16.5%)
51-60	1 (0.9%)	17 (14.8%)	18 (15.7%)
61-70	2 (1.7%)	4 (3.5%)	6 (5.2%)
Total	8 (7.0%)	107(93.0%)	115(100.0%)

Data expressed in number of subjects, n (% of sample size).

Ocular health information and oculo-visual characteristics of participants

In the better eye of 95.7% of study participants, a visual acuity (VA) between 6/6 - 6/18 was recorded. Similarly, a high proportion (89.6%) of the respondents had VA measured for the bad eye to lie within 6/9 - 6/18. Very few had significant unilateral reduced vision, one (1) respondent recording a VA of 6/60, and six (6) with either Counting Fingers (CF) or Hand Motion (HM) acuity level. None of the study participants had a VA as worse as Light Perception (LP) or No Light Perception (NLP).

Participants reported an array of ocular symptoms and signs and these were distributed as shown in table 2. The symptoms and signs were invariably reported to be work-related.

Table 2: Distribution of participants' work division with defined ocular associations.

Age of participant (years)	Work Division		
	Administrative [n (%)]	Technical [n(%)]	TOTAL [n (%)]
Ocular Symptoms/Signs			
Itchiness	6 (5.2%)	54 (47.0%)	60 (52.2%)
Tearing	3 (2.6%)	27 (23.5%)	30 (26.1%)
Redness	2 (1.7%)	47 (40.9%)	49 (42.6%)
Foreign body sensation	3 (2.6%)	30 (26.1%)	33 (28.7%)
Near task difficulty	2 (1.7%)	20 (17.4%)	22 (19.1%)
Others	8 (7.0%)	67 (58.3%)	75 (65.3%)
TOTAL	24 (20.9%)	245 (213.0%)	269 (233.9%)
Ocular Conditions			
Allergic conjunctivitis	1 (0.9%)	15 (13.0%)	16 (13.9%)
Pterygium	0 (0.0%)	7 (6.1%)	7 (6.1%)
Pinguecula	0 (0.0%)	3 (2.6%)	3 (2.6%)
Bacterial conjunctivitis	0 (0.0%)	5 (4.3%)	5 (4.3%)
Dry Eyes	0 (0.0%)	9 (7.8%)	9 (7.8%)
Presbyopia	3 (2.6%)	17 (14.8%)	20 (17.4%)
Refractive eror	3 (2.6%)	5 (4.3%)	8 (7.0%)
Others	3 (2.6%)	17 (14.8%)	20 (17.4%)
TOTAL	10 (8.7%)	78 (67.8%)	88 (76.5%)
Work-related Eye Injuries			
Foreign body	1 (0.9%)	43 (37.4%)	44 (38.3%)
Trauma	0 (0.0%)	4 (3.5%)	4 (3.5%)
Other ocular injuries	0 (0.0%)	1 (0.9%)	1 (0.9%)
TOTAL	1 (0.9%)	48 (41.7%)	49 (42.6%)
Protective Eyewear Use			
Yes	1 (0.9%)	27 (23.5%)	28 (24.4%)
No	7 (6.1%)	80 (69.6%)	87 (75.7%)
TOTAL	8 (7.0%)	107 (93.0%)	115 (100%)

Data expressed in number of subjects, n (% of cases); 95% CI with Pearson's chi-square test.

The ratio of workers who had never had an eye check-up to those who had had any since they began working in the industry was 9:1. Twelve (12) respondents out of the 115 participants, representing 10.4%, had undergone one form of an eye test or another since they started work in the sawmill industry. Fifty percent (50%) of these participants had had an eye exam only once (Table 3).

Table 3: Distribution of eye exam frequency among sawmill workers.

Work Experience (years)	Frequency of Eye Check [n (%)]			Total [n (%)]
	Once	Three times	>Three times	
1-3	3 (25.0%)	0 (0.0%)	2 (16.7%)	5 (41.7%)
4-6	1 (8.3%)	1 (8.3%)	1 (8.3%)	3 (25.0%)
7-10	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
>10	2 (16.7%)	0 (0.0%)	2 (16.7%)	4 (33.3%)
Total	6 (50.0%)	1 (8.3%)	5 (41.7%)	12 (100%)

Prevalence of Eye Injuries among Workers

According to the study, work-related eye injuries were defined under three headings, and their distributions were as shown in Table 2. This study recorded, by proportion, a prevalence of 46.2% of work-related eye injuries.

Workers Attitude to Eye Protection in Sawmill Activities

Workers who affirmed the use of protective eyewear were 28 (24.4%). Protective eyewear was used by 27 (23.5%) of the 107 technical sawmill workers whereas only 1 (0.9%) administrative worker used a protective eyewear (Table 2). Eye protective gear usage at work was distributed among use of one or more of the following: goggles, 20 (71.14%); face shields, 2 (7.1%); safety glasses with side protection, 3 (10.7%); and any others, 8 (28.6%). All other workers (75.7%) had varied reasons for protective eyewear non-use. Notably, this was attributed to one or more of the following: eyewear unavailability, 61 (70.14%); interference with work process, 2 (2.30%); eyewear not comfortable to wear, 2 (2.30%); and use of protective eyewear not deemed consequential, 21 (24.14%).

DISCUSSION

Activities of sawmill workers predispose them to diverse work-related hazards. The survey revealed that employees in the study area were exposed to especially physical hazards which included sawdust and noise. A major hazard identified was sawdust and wood shavings among wood workers. Other studies have shown similar findings [4, 18].

Population Characteristics

In the study area, there was a male predominance in the industry. Majority of the subjects were males. Similar report was given by Adei and Kunfaa in their study of occupational safety and health policy in the operations of the wood processing industry in Kumasi [4]. Other related studies have reported similar findings [9, 19]. We ascribed this to the fact that the profession necessitates manual labor and hence, physically strength-demanding. These earlier studies have identified the same reason as ours for this observation. Therefore this trade requires more males than females with the plausible assumption that males are the physically stronger sex, especially within the technical division.

The survey showed that the greatest proportion of workers (40%) was within the age range 18-30 years, and this proportion decreased with increasing age. Our results show that most of the workers were in their youthful age. Again, the manual nature of the profession, in which physical strength is required, could explain this observed trend. In order to enhance effective productivity, workers must demonstrate an ability to carry out such physical duties which in one way or another is a function of youthfulness, at which age physical strength is anticipated.

Participants' Oculo-Visual Characteristics

Visual acuity assessment among respondents did not reveal that much significant compromised vision. A rather high ratio (9:1) of workers who had never had an eye examination to those who had had any was recorded. This could be due to the assumption that certain individuals may endure mild ocular discomforts especially if an eye condition is asymptomatic. A person may likely ignore the possible morbidity of an eye condition due to the fact that the compensatory action of the better eye predominantly overshadows sub normalcy of the poor eye. Again, it is presumed by many that eye care costs are high which scares them away [20]. Moreover, in most third world countries such as Ghana, sawmill workers in the technical division mostly comprises individuals with low socioeconomic status. This is a category of workers who exhibit poor healthcare seeking behavior [21]. Such persons tend to live with ill-health conditions till end-stage when their health and/or lives are threatened before seeking healthcare interventions [22]. This could explain why as many as 103 (89.6%) would not seek routine eye checkup on their own accord.

Eight (8) respondents (6.9%) reported no eye symptom or sign. The highest singly reported ocular symptom was eye itchiness with a prevalence of 52.2% of all cases recorded. However, none of the symptoms/signs showed statistical significance between administrative and technical staff ($p > 0.05$). Other symptoms of eye irritation in addition to itchiness that we did not only anticipate to prevail but we also confirmed by the study were eye tearing, redness, and foreign body sensation as shown in Table 2. Other related studies have documented similar findings [19].

Most of the respondents had multiple ocular conditions prevailing simultaneously. Allergic conjunctivitis and Dry eye conditions were diagnosed with prevalence of 13.9% and 7.8% respectively. Conjunctiva degenerative conditions that were predominantly detected were Pterygium (6.1%) and Pinguecula (3.0%). For each of the eye conditions diagnosed among respondents, there was a difference in the prevalence figures recorded for the two major work divisions defined for the study. A technical worker was more likely to develop an ocular condition than an administrative worker was. For example, the prevalence of allergic conjunctivitis among technical workers was 13.0% while it was 0.9% among administrative staff. None of the conditions Pterygium, Pinguecula and

Bacterial conjunctivitis was found among the administrative workers. This difference was attributed to the higher exposure periods to irritants among the technical workers since their duties were predominantly undertaken outdoors. However, the difference was not significant ($p > 0.05$) perhaps due to the limited sample that we used. A similar account was given by Njinaka, Uhumwangho [19]. Moreover, a positive association was derived between exposure and disease onset - a finding commensurate with the fact that technical workers suffer more exposure to irritants (RR = 1.12). Though our study protocol did not allow for discussion of refractive error and presbyopia, we do not doubt the significance of such conditions among this population. As inconsequential as refractive error may seem regarding this study, on the contrary, there was a significant difference between administrative and technical workers ($p < 0.05$)

Prevalence of Eye Injuries among Respondents

An overall prevalence of eye injuries was determined to be 42.6%, with a prevalence of 0.9% in the administrative group and 41.7% among the technical staff. A higher prevalence was observed among the technical staff compared to the administrative staff, though not statistically significant ($p > 0.05\%$). This could be due to the limited sample size we used in this study. However, in a similar study, comparisons of conjunctiva disorders between administrative and technical sawmill workers showed a significant relationship between the nature of work and the development of conjunctiva degenerative disorders [19]. Again, the worker is more prone to eye injuries when directly involved in the manual activities of wood processing in which the worker is directly exposed to hazards.

Physical agents including sawdust and wood shavings were the most implicated in ocular morbidity situations. Foreign body entry onto the ocular surface tissues was the highest recorded work-related hazard. A finding we ascribed to failure to comply with eye safety measures at work and/or the non-use of protective eyewear.

Eye Protection Against Work-Related Hazards

The survey revealed that 28 (24.35%) of the 115 workers used one form or another of a protective eyewear when working. The remaining 87 (75.65%) worked unprotected from ocular hazards. A similar report was given by a study in which 73.9% of cases of occupational eye injury were due to non-use of protective eyewear [10]. Among the technical workers in our study, 80 (74.80%) used no protective eyewear during work. Other studies have documented similar findings [6, 23, 24].

In this study, one major factor which could be considered as contributing to this observation was the non-availability of protective eye devices to the sawmill workers. We found that workers in the industry mainly relied on provision of protective eyewear by their employers. Sixty-one [76.25%] participants admitted that protective eyewear was not made available to them. Even when available for use, a few considered it uncomfortable or a hindrance to the work process. This may be attributed to a rather incorrect concept of the use of protective eye devices in occupation and/or the concept of occupational hazard in the sawmill industry. Our assumption is commensurate with a study by Faremi, Ogunfowokan in which a majority of respondents (58%) exhibited high awareness but a rather incorrect understanding of occupational hazards [11]. Though no comprehensive data on respondents' educational background or level of education was collected, it may be said that, a low rate of formal training for sawmill work among the respondents accounted for this observation.

CONCLUSION

Despite the socioeconomic impact of the wood processing industry, its hazardous nature to the workers' ocular health necessitates the need to pay attention to the potential morbidity it presents. Attention to ocular safety in the sawmill occupation is not enough. Protective eyewear is not adequately provided for workers and even when so, there is relatively high rate of nonuse.

Workers in the sawmill industry should be effectively sensitized through education on the hazards and their effects, and the need to preserve ocular health. Employers of labor in the wood processing industry should be responsive to the need of providing a safe work environment for their employees among which include the adequate supply of protective eyewear.

Finally managers and supervisors must get adequate training in risk assessment to identify hazards so that preventive measures can be put in place to avoid or minimize eye injuries. In addition to ensuring provision of protective eyewear to workers, management can mount strategies to promote safety consciousness among workers. If this is done, eye health and safety would be ensured as safety consciousness would generally be inculcated into the workforce.

CONFLICT OF INTEREST DISCLOSURE

The authors declare the absence of any conflict of interest regarding the publication of this manuscript.

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