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Occupational Eye Injury Among Sawmill Workers in Nigeria

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Abstract: To determine the prevalence and pattern of occupational ocular injuries in sawmill workers in Nigeria. A cross-sectional study of sawmill workers was carried out using pretested questionnaires. Ocular examination was done on site with a pen torch, portable hand-held slit lamp bio-microscope and direct ophthalmoscope. The Statistical Package for Social Sciences (SPSS 16) was used to analyze the data obtained; $p<0.05$ was taken as significant. A total of 553 sawmill workers were studied of which 449 (81.2%) and 104 (18.8%) were technical and administrative sawmill workers respectively. There were 496 (89.7%) males giving a male to female ratio of 8.7:1. The mean age and standard deviation was 38.9 years ± 12.8, respectively. The prevalence of work related ocular trauma was 10.7% with the technical worker being more likely to develop ocular injury than administrative worker (Odds ratio 15.3, $p<0.001$). Superficial foreign body, 42 (71.2%) was the most common presentation while anterior uveitis, 12 (2.2%) was the most common ocular disorder arising from trauma. Wood, 25 (42.4%) was the main agent implicated in the aetiology of the injury. Use of protective eye wear was in 7 (1.6%) technical workers while monocular blindness arising from injury at work occurred in 5 (0.9%) workers. Work related ocular injuries in sawmill workers in Nigeria can be preventable if adequate safety practices are enforced.

Key words: Occupational eye injury, sawmill workers, ocular trauma

INTRODUCTION

Sawmilling industry is a factory were wood is sawed into planks or boards by a machine. It has existed in simple forms for hundreds of years, although significant advances in sawmilling technology have been made in the last century with the introduction of electric powered mills, improvements in saw designs and automation in sorting of logs and other operations (Peterson, 1973; Demers and Teschke, 1998). However some of these technologies are not available in developing countries such as Nigeria, hence these processes are still being done manually. Sawmills are hazardous work environments because the work process involves the movement and cutting of large and very heavy pieces of wood at relatively high speeds. Wood preservatives could result in chemical injury on accidental entry to the eye (Demers and Teschke, 1998). At every stage of wood processing, the eye is at potential risk of injury. Ocular hazards in industries are preventable if there is strict adherence to safety rules and precaution (Demers and Teschke, 1998; Abiose and Otache, 1981). Factors which contribute to the risk of ocular trauma and other injury include: poor housekeeping in the work environment which increases the risk of slips and falls, the wood dust may pose a fire or explosion hazard, and the high noise level which can cause injuries due to the reduced ability of workers to communicate and hear audible warning signals (Demers and Teschke, 1998). Some common causes of fatal or very serious injuries include workers being struck by mobile equipment, falls from elevated platforms, injury resulting from failure to switch off equipment during maintenance or attempts to remove jams, injury from saws and other machineries and drowning of workers in log ponds or waterways (Demers and Teschke, 1998). Ocular trauma, blindness and even death could occur inadvertently if safety precautions are not adhered to (Demers and Teschke, 1998).

Eye injuries sustained at work have always been a source of concern to ophthalmologists since the first important survey of eye injuries demonstrated that 71% of all severe eye injuries admitted to hospitals occurred at the workplace, with more than 12% of these eyes being enucleated (Garrow, 1923). In 1982, the National Institute for Occupational Safety and Health in the United States of America (USA) estimated a total of 900,000 occupational eye injuries (Congdon *et al*., 2003). Studies show that the type of occupation and work environment is a strong determinant in the nature of ocular injury and disorders which individuals are prone to and eye injuries if not promptly and properly managed, could result in blindness (Ajaiyeoba, 1995; Ajayi and Osuntokun, 1986). The effect of injury to the eye is further worsened by use of traditional eye medication which is readily available for patronage in Nigeria (Ayanru, 1974).

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It is estimated that 2.4 million ocular injuries occur in the USA every year (Feist and Farber, 1989). The pattern and causation of eye injuries vary in different environments depending on the level of industrialization, awareness, economic development, safety measures and precautions (Ajaiyeoba, 1995). The risks of ocular trauma have been reported to have increased among small scale industrial workers in developing countries because of poor working conditions, longer hours at work and poor safety precautions (Gordon *et al*., 1993). Insufficient data base makes it difficult to presently know the incidence of work related eye injuries in Nigeria. It is however expected to be high as occupational health and safety measures are not routinely practiced or enforced by employers of labour (Ajaiyeoba, 1995; Omoti *et al*., 2008). Hence, the aim of this study is to determine the pattern of occupational eye injuries in sawmill workers in Benin, Nigeria and make appropriate recommendations.

MATERIALS AND METHODS

A cross-sectional study was carried out in Benin City, Edo State, in Southern Nigeria between January and May 2009. A list of all sawmills and their various locations were obtained from the Forestry Division, State Ministry of Agriculture. Participants were both the technical and administrative sawmill workers.

Pretested questionnaires designed for the study were administered. Assessment of visual acuity (VA) for each eye was done using the Snellen's chart which was placed at 6 meters outdoors. Further ocular examination was carried out on site in improvised areas with some shade. All examination was carried out during the day time. Anterior segment examination was done with a pen torch and a portable hand-held slit lamp bio-microscope (Scanoptics). Any abnormality or sign of ongoing or previous ocular trauma was noted. Corneal lesions were stained with 2% fluorescein dye and examined with cobalt blue light of the portable slit lamp to exclude ulcers. The lens was examined to check for presence of opacities using a direct ophthalmoscope. Posterior segment examination was done with a Heine direct ophthalmoscope. Fundoscopy was initially done through undilated pupils and when necessary, dilatation was done with Guttae 0.5% tropicamide or 2.5% phenylephrine. Data was analysed using the Statistical Package for Social Sciences (SPSS 16), $p<0.05$ was regarded as significant.

RESULTS

There were 62 registered sawmills of which 38 were functional during the period of study. A total of 602 sawmill workers were found of which 553 participated in the study giving a response rate of 91.9%. The technical sawmill workers were 449 (81.2%), while the administrative sawmill workers made up 104 (18.8%) of this number. There were 496 (89.7%) males and 57 (10.3%) females, which showed a male to female ratio of 8.7:1. The age distribution of the sawmill workers is shown in Table 1. The age range was between 15 and 80 years with a mean age of 38.9 years (S.D±12.8). The mean ages of the technical and administrative workers were 38.2 and 41.6 years, respectively.

There were 59 (10.7%) workers with work related ocular trauma out of which 58 were technical workers and 1, an administrative worker. Table 2 showed that the largest proportion of ocular trauma occurred in saw technicians (7) and the least in administrators (1). The most common ocular disorder arising from trauma was anterior uveitis 12 (2.2%) as shown in Table 3. The types of ocular trauma were superficial injury/foreign body entry in 42 (71.2%), blunt ocular trauma in 14 (23.7%), lid injury in 2 (3.4%) and penetrating ocular trauma in 1 (1.7%). The relationship between nature of work and

Table 1: Age distribution of sawmill workers

Age (years)	Technical workers	Administrative workers	Total no of workers
11–20	29 (5.3%)	5 (1.0%)	34 (6.2%)
21-30	118 (21.3%)	15 (2.7%)	133 (24.1%)
31-40	120 (21.7%)	30 (5.4%)	150 (27.1%)
41-50	104 (18.8%)	25 (4.5%)	129 (23.3%)
51-60	52 (9.4%)	24 (4.3%)	76 (13.7%)
61-70	26 (4.7%)	1 (0.2%)	27 (4.9%)
71-80	-	4 (0.7%)	4 (0.7%)
Total	449 (81.2%)	104 (18.8%)	553 (100.0%)

Table 2: Number of workers with work related ocular trauma

Nature of work	No of workers	Total no. of workers
Saw technician	7	31
Jack Man	8	39
Convertor	12	62
Saw dust packer	4	23
Sawyer	4	33
Machine Operator	21	190
Supervisor	2	24
Administrator	1	104
Wood loader	0	47
Total	59	553

Table 3: Trauma related ocular disorders in sawmill workers

Ocular disorder	No. (%)
Anterior uveitis	12 (2.2)
Traumatic cataract	7 (1.3)
Phthisis bulbi	2 (0.4)
Corneal opacity/ adherent leukoma	2 (0.4)
Corneal ulcer	1 (0.2)
Corneal foreign body	1 (0.2)
Lid scar	1 (0.2)

Table 4: Relationship between nature of work and development of ocular injuries

Nature of work	Yes	No	Total
Technical sawmill workers	58	391	449
Administrative sawmill workers	1	103	104
Total	59	494	553

Odds ratio =15.3, 95%CI = 2.1 - 111.7, $p<0.0001$

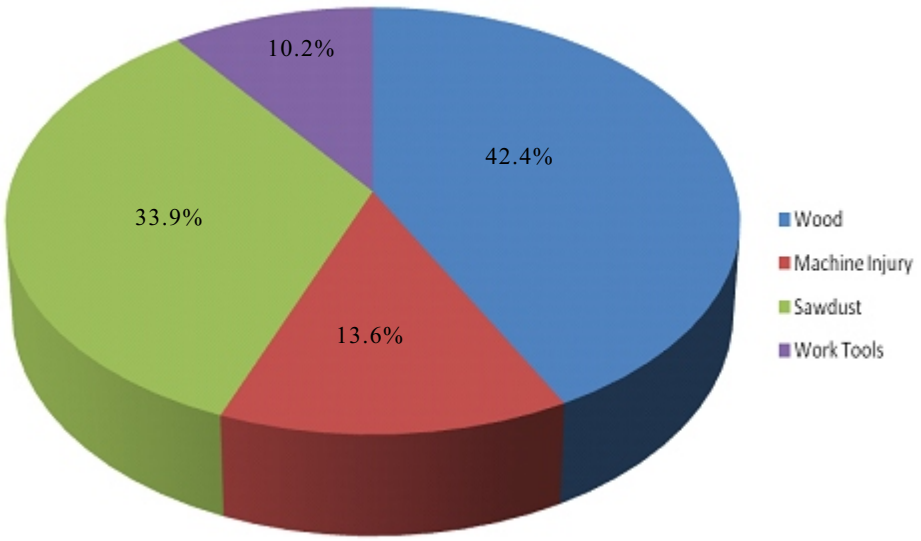

Fig. 1: Agents implicated in the causation of ocular trauma

Table 5: Visual acuity in the better eye of sawmill workers

Visual acuity	Technical sawmill workers	Administrative sawmill workers
6/4 – 6/18	446 (99.3%)	100 (96.2%)
<6/18 – 3/60	3 (0.7%)	4 (3.8%)
< 3/60	0 (0.0%)	0 (0.0%)
Total	449 (100.0%)	104 (100.0%)

occurrence of ocular injuries is presented in Table 4. It was observed that the technical workers was more likely to develop ocular injury than the administrative workers (Odds ratio 15.3, $p<0.001$) which was statistically significant. Wood, 25 (42.4%) was the most common agent implicated in the etiology of ocular injury (Fig. 1). Five hundred and forty six (98.7%) workers had VA in the better eye of 6/4 - 6/18 (Table 5). Seven workers had bilateral low vision (VA <6/18-3/60). No worker was bilaterally blind. There were 6 (1.1%) cases of monocular blindness, of which five were work related. Three of these cases were secondary to complicated cataracts, while the other two had phthisis bulbi, in a machine operator and convertor respectively. Protective eye wear was used by 7 (1.6%) of the 449 technical sawmill workers. None of the administrative staff used eye safety devices.

DISCUSSION

Occupational injuries are disorders resulting from trauma such as lacerations, burns and could be due to mechanical factors such as lifting or bending or failures in safety measures resulting in accidents in the workplace. There was a predominance of male sawmill workers in this study with a M to F ratio of 8.7:1. This may be due to the use of manual labour in the sawmilling industry. This same findings has been previously reported (Abiose and Otache, 1981; Demers and Teschke, 1998).

The prevalence of ocular injuries among all the workers in this study was 10.7%. Prevalence rates of 12.9% and 1.0% were recorded in the technical and administrative workers respectively. A prevalence of 12.5% was found in a study of 646 industrial workers (Okoye and Umeh, 2002). Most of these injuries resulted from welding, wood fragments, cement dust and coal stones. In an analysis of 58,387 industrial ocular accidents occurring over a period of one year in seven states of the USA, the lumber and wood products manufacturing industry was one of the most hazardous industries implicated. Most of these accidents were caused by flying particles set in motion by hand tools and machinery (Resnick, 1941). In Glasgow, Macewan (1998) reported that occupational injuries were responsible for 69.9% of all the new patients seen at the casualty with ocular trauma. Schein *et al.* (1998) found that about half of the ocular injuries (48%) in over 3000 patients occurred in the work place.

The most common form of ocular trauma seen was superficial conjunctiva or corneal foreign body (71.2%). This may be due to exposure to flying wood and sawdust particles as these workers hardly ever protected their eyes at work. Penetrating ocular injury resulted in phthisis bulbi in one person. This worker was particularly unhappy as no form of compensation was given to him. He was the only worker who used protective eye wear in his workplace.

The most common agent implicated in the causation of ocular injury was wood/wood chips (42.4%). This has been previously documented (Okoye and Umeh, 2002).

The nature of work was found to play a role in the occurrence of work related ocular injuries, with those involved in technical tasks having more injuries. The saw technicians had the highest prevalence of trauma (22.6%). This may have been due to the additional risk of ocular injury from flying metal chips from the saw blade and flying stone particles while sharpening these saw blades. Some of the administrative workers occasionally assisted in carrying out technical tasks. This accounted for the one case of administrative worker with work related ocular trauma.

Anterior uveitis had a prevalence of 2.2%. All the cases seen in the technical workers were as a result of trauma. Corneal opacity /adherent leukoma were seen in 2 (0.4%) workers. One case occurred secondary to corneal foreign body from wood chip injury, while the second worker could not recall the agent implicated. The case of adherent leukoma interfered with vision, while the second case of corneal opacity did not. Corneal disorders in developing countries have been found to result from interplay of various factors such as trauma, use of harmful traditional eye medications, infections with virulent organisms, nutritional deficiencies and measles especially in children (Sandford-Smith, 2003). Thus, injury to this major refractive component of the eye could result in corneal opacity which could be visually incapacitating if dense or when the visual axis is involved.

There were 7 technical workers who used protective eye devices in this study, giving a compliance rate of 1.6%. The level of compliance in this study was very low, as workers were left on their own to decide on whether to use or not to use protective eyewear. This is similar to findings by Titiyal and Murthy (1998) in India where 96.4% of the workers studied did not use protective eye devices.

CONCLUSION

This study showed there is a high prevalence of ocular injuries among sawmill workers in Nigeria with the technical workers having a greater likelihood of ocular trauma than administrative staff. Anterior uveitis is the most common ocular mobidity arising usually from superficial foreign body entry. Wood is the most common agent responsible for trauma. This is largely preventable if the use of protective eye wear is enforced.

LIMITATION OF THE STUDY

There was no register on occurrence of ocular injuries at work. The probability of recall bias could not be ruled out.

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