OCULAR HEALTH STATUS AND PRACTISES AMONG THE WORKERS OF A STEEL ROLLING MILL IN NIGERIA

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ABSTRACT: Steel rolling mills potentially present ocular hazard. However, no study is known as yet that would deal with the ocular health practices and ophthalmological status of the workers employed in this industry. In this study, 107 steel rolling workers were surveyed for eye protection practices, previous eye injuries, and present ocular status. Half of the workers possessed eye protective devices (EPD), however 31.6% of them never used it. Of the latter, 68.9% reported history of work-related eye injuries: 8 cases at drilling (12.9%), 18 at welding (29.0%), 13 at grinding (21%), and 23 cases at other work processes (37.1%). Uncorrected visual acuity (≤ 6/18) was found in 54.2% of the workers (increased to 96% by refraction correction) caused by uncorrected ametropia (20.6%), uncorrected presbyopia (11.3%), glaucoma (7.5%), and pterygium (2.8%).
In conclusion, regular ophthalmological screening and adequate treatment of the abnormalities found should be an integral part of the occupational health measures in steel industries.

KEY WORDS: Steel industry, eye protective devices, ocular pathology

INTRODUCTION

Work-related hazards have been identified as causes of ocular morbidity among industrial workers (Griffith and Jones, 1994; Lipscomb, 2000; Schoemaker et al., 2000; Okoye and Umeh, 2002). Occupational eye injuries are most likely to result from work that generates flying particles, fragments, sparks, dust, hazardous substances, or radiation. Tasks with the highest risk of eye injuries are grinding, welding, and hammering. Other high-risk activities include cutting or spraying, smelting, sanding, chipping or chiselling. People working with metal are most at risk (SafetyLine, 2004). Workers in the steel industry are exposed to various severe hazards (Shoemaker et al., 2000). Metal chips and welding arc rays were identified as causes of eye injury in steel industry (Okoye and Umeh, 2002). Ocular injuries vary from mild to severe which could threaten vision.

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In Nigeria, industrial accidents are usually under-reported, which makes it difficult to obtain an accurate number of accidents (FMLP, 1998; Musa et al., 2003). Previous studies showed that the eye accident rate varied from factory to factory (Garrow, 1973; Okoye and Umeh, 2002) and appeared to decrease over years. Garrow (1923) reported 70.7%, Ilsar et al (1982) reported 15.4% in Malawi, and Okoye and Umeh (2002) 12.5% among industrial workers in South-eastern Nigeria.

Work-related hazards are a potential source of litigation, huge compensation, economic loss, and loss of quality of life. The International Labour Office has estimated that well over 250 million non-fatal accidents cause work absenteeism and they are often accompanied or aggravated by permanent disabilities with reduced capacity of life and work (cit. by Takala, 1999). The economic losses amount to 40% of gross national product (Takala, 1999). In America, the Bureau of Labour Statistics reported that the work place eye injuries cost over $ 467 million annually. Indirect costs, such as legal fees, judgments, and training replacement workers, place the estimated total above $934 million each year (Prevent Blindness America, 2003).

Most work-related hazards could be avoided, prevented, or reduced through education (Griffith and Jones, 1994; Musa et al., 2003), public enlightenment (Canavan and Flaherty, 1980), compliance to work ethics, legislation (Okuyade, 1977; Factories Act,1990; Okoye and Umeh, 2002) enforcing provision and use of protective devices. Experts believe that proper eye protection could have prevented or reduced the severity of injury in at least in 90% of all accidents (Prevent Blindness America, 2003). Prevention of eye injury needs special attention in steel works (Shoemaker et al., 2000).

This study was carried out to determine the ocular health practices and the ocular status among the staff of a government owned steel rolling company in Nigeria. The knowledge, attitude and behaviour of the workers towards work-related eye problems were also studied.

METHODS

The steel rolling factory where this study was carried out in the year 2003 is one of Nigeria's plants producing steel from raw iron. It has three basic functional units. The administrative unit is involved in the day to day running of the company. It generally implements policies such as ensuring the availability of protective devices and a safe working environment that impact directly or otherwise the health of the staff working in the other section of the company. The technology unit is concerned with the operation of the plant as well as the industrial safety. The production unit employs workers at the rolling mill, furnace, and finishing. The workers are exposed to splinters of metals, welding arc rays, and hot molten metal. The technology and production units were the potential areas for work-related hazards.

Consent to carry out the study was obtained from the management of the company. The workers run a three-shift duty in the production and technology units of the plant while the administrative unit runs only a morning schedule. All the workers were, however, mobilized to participate in the study irrespective of the shift duty

for the day. Individual consent was also obtained having explained the purpose of the study.

A questionnaire was employed to learn the knowledge, attitude, and the behaviour of the workers to work-related ocular health hazard. Their ophthalmological status was determined by an assessment of visual acuity by means of Snellen chart, Jaeger chart, and ocular examination performed with an ophthalmoscope. Intraocular pressure was measured with a Perkins tonometer. Individuals with visual acuity less than 6/18 had refraction correction done while other ocular pathologies were sent to hospital for further investigation and treatment.

The study involved a total of 107 workers divided among the 3 main functional units: production 40 (37.4%), administration 36 (33.6%), and technology 31 (29.0%). The mean age was 43 (range: 22–59 yr). There were 85 males and 22 females giving a ratio of about 4:1. The level of education among the workers showed that about 65 (60.7%) of them had tertiary education, 19 (17.8%) had secondary education, 8 (7.5%) had primary education, while 15 (14%) had no formal education.

The workers had spent between 1 and 22 years working in the industry with a mean of 11.7±7.05 yr. About 73% of the staff had worked for more than five years in the industry. About two-third (69.6%) of the workers had job specific training before starting to work. Only 20.4% of them had ever had received eye health education since joining the industry. 94.3% of the workers were aware of the fact that potential ocular hazard existed in the industry and 98.9% believed that the hazard could be prevented with the use of some eye protective device (EPD).

The data were analyzed using the Epi6 statistical package. The results are presented in frequency distribution tables.

RESULTS

The most commonly known EPDs by the workers were the welding shield or goggles. The others included dark spectacles, safety garment, safety belts, and helmets. Protection is also believed to be achievable through the provision of modern, less hazardous machinery, specific training of the workers, and random checks of the workers to ensure compliance with the use of safety devices at work (*Table 1*).

TABLE 1. Knowledge of protective devices among the employees investigated

	Number of subjects in the departments			
	Administration	**Production**	**Technology**	**Total (%)**
Welding shield/Goggles	14	27	14	55 (79.7)
Dark spectacle	5	3	–	8 (11.6)
Helmet	1	1	–	2 (2.9)
Others	3	1	1	4 (5.6)

Others = safety belts, garment, and modern machines

About two-thirds (49 subjects; 68.9%) of the workers in the production and technology units reported that they had had some work related eye injuries. Thirty-six (73.4%) of them did not use any protective device available. The injuries were said to have occurred during drilling (8; 12.9%), welding (18; 29.0%), grinding (13; 21%), and in other procedures (23; 37.1%). The latter were from exposure to red hot billet, furnace light, electric spark, explosion of liquid metals, and lubricating fluids.

Thirty-eight (53%) of the 71 employees of the production and technology units reported possessing EPD. The frequency of the use of this device is shown in *Table 2*. Those that had never used any device though did possess them reported different reasons; the most important were the following: low-level risk believed (3; 12%), discomfort of the device (5; 20%), inadequacy of protection (11; 44%), lack of practice (4; 16%), and considering it unnecessary (2; 8%).

TABLE 2. Frequency of use of eye protective devices among those who possessed them (n=38)

	Department		
	Technology	**Production**	**Total**
Never	6 (15.8)	6 (15.8)	12 (31.6)
Sometimes	6 (15.8)	11 (28.9)	17 (44.7)
Always	2 (5.3)	7 (18.4)	9 (23.7)

n = number of subjects

Other modalities applied and believed useful by some of the workers to reduce ophthalmic hazard from factory work included regular intake of balanced diet (2 subjects; 14.3%), partial closure of eyes when exposure to high light intensity was imminent, and when operating switches (2; 14.3%), use of prescribed glasses (4; 28.6%), temporary absenteeism from work (3; 21.4%), and (in 7.1%) other considerations, as yearly visiting the ophthalmologist, shielding the eyes with hands, or leaving the area of hazards.

Less than half of the participants, i.e, 43 subjects (40.1%) had previously had their eyes checked while the remaining 64 (59.9%) had never undergone ophthalmological examination. The workers examined gave the following reasons for visiting the ophthalmologist: routine care 9 subjects, (20.9%), impaired visual acuity following exposure to workplace hazard (30; 69.8%), eye ache (1; 2.3%), and on advice (3; 7%).

The result of the present ophthalmological examination (*Table 3*) showed that uncorrected ametropia and presbyopia shared the major part (33.7%) of the ocular pathologies found. Refraction correction increased the number of the workers with normal visual acuity to 96%.

TABLE 3. Result of ophthalmological investigation of employees of a steel rolling mill

	Number of cases in the departments			
	Administration	**Production**	**Technology**	**Total**
Normal	17 (47.3)	22 (55.0)	19 (61.3)	58 (54.2)
Uncorrected ametropia	6 (16.7)	7 (17.5)	9 (29.0)	22 (20.6)
Uncorrected presbyopia	4 (11.0)	9 (22.5)	1 (3.2)	14 (13.1)
Glaucoma	2 (5.5)	2 (5.0)	–	4 (3.6)
Pterygium	2 (5.5)	–	1 (3.2)	3 (2.9)
Other	3 (8.3)	–	1 (3.2)†	4 (3.6)
Total	36	40	31	107

Other = maculopathy, optic atrophy, squint, and † hypertensive retinopathy

DISCUSSION

Occupational accidents affecting the eyes are common and are major causes of morbidity and disability. This is the case in spite of the well publicized standards for industrial eye protection even in the developed and industrialized countries.

It has been found that subjects working longer in their current job, reporting to have received job safety training before employment, or whose machines or equipment are maintained or repaired regularly by the employer are at lower risk of experiencing eye injuries (Yu et al., 2000). Unfortunately this was not the case in the plant studied.

The potential risk of unprotected exposure to some of the hazardous objects such as metal chips, hot liquid metals and electric sparks in activities such as welding, grinding, cutting, and moulding was well known by the workers. There was also a high awareness of some protective devices among the different categories of workers including those of administration. This is important because to be effective the prevention of ocular accidents must be comprehensive and must necessarily involve the management of the industry as well as the employees (Abiose and Otache, 1981). The welding shield/goggles, the most popular EPDs mentioned by the workers were the most available ones in the plant. The need to have modern well maintained machinery, specific training in safety measures and insistence on compliance with the use of eye protective devices while at work as important factors to reduce risk of ocular injury was also recognized by the workers.

Despite the high awareness and that about half (52%) of the workers in the production and technology units had EPDs, they did not often wear them. The fact that most of the employees agreed not to wear any protective device on ground of the false reasons listed in the Results clearly showed the attitude of the workers to EPD which was probably considered to be optional. This attitude has to be modified by continuous eye health education and supervision of the workers.

The work-related injuries found in the present study are in good agreement with the findings of Voon et al. (2001), who specify grinding, cutting of metals, and drilling as the cause of more than 90% of work-related eye injuries.

In conclusion, beyond appropriate educational, institutional, and technical measures, regular follow-up of the ophthalmological status of the workers is also needed to ensure individual and collective safety in steel rolling mills.

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