Work related ocular injuries in small scale industries

Mulugeta D[1], Bejiga A[2]

[1]Department of Ophthalmology, Dessie University, Ethiopia
[2]Department of Ophthalmology, Addis Ababa University, Ethiopia

Corresponding author: Dr. Abebe Bejiga, Department of Ophthalmology, Addis Ababa University, Ethiopia. Email: abbejiga@yahoo.com

ABSTRACT

Background: The risks of ocular trauma are reported to have increased among small scale industrial workers in developing countries.
Objective: The aim of this study was to evaluate the magnitude and causes of ocular injuries as well as the use of personal protective devices in small scale industries in Woliso town, central, Ethiopia.
Methods and subjects: This cross sectional study design was carried out over one month, August 22-September 16, 2011 in Woliso town. Technical workers of forty one small scale industries were traced and participated in the study. Data collection and ocular examination were performed by the principal investigator on site.
Results: Of the total 233 technical workers in 41 small scale industries, 224 participants were included in the study making a response rate of 96.1%. Seventy seven (34.4%) of them had history of ocular injuries. Majority of ocular injuries, 32/77 (41.6%), occurred among metal workers. The main causative agents were iron chips in 24 (31.2%) cases. Most study participants, 128 (57.1%), did not use personal protective devices at all. Regardless of its appropriateness, only 13 (16.9%) cases with ocular trauma used some kind of protective devices at the time of injury.
Conclusion: Work-related eye injuries are found to be common (34.4%) among small scale industry workers. More than half of the workers do not use personal protective equipments. These necessitate the need for health education focused on appropriate health and safety training for workers and employers. Provision of appropriate personal protective devices and strict supervision of workplace is strongly recommended.

Key words: Injury, Industry, Work-related

INTRODUCTION

Ocular trauma has recently been highlighted as a major cause of visual morbidity. Ocular injuries are common and largely preventable causes of monocular visual impairment and blindness[1]. Globally more than half a million blinding injuries occur every year, there are approximately 1.6 million people blind from eye injuries, 2.3 million bilaterally visually impaired and 19 million with unilateral visual loss[2]. Ocular injury is a significant cause of monocular visual impairment in Ethiopia[3,4] whose prevalence accounted for 5.1% according to a community based study[5].

Small scale industries are considered as the backbone of the private sector all over the world, which assures their role in production, employment and sales[6]. Small Scale enterprises have a dominant place in the Ethiopian economy. The sector is the second largest source of employment next to agriculture[7]. 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[8]. Ninety percent of all eye injuries can be prevented by using appropriate protective eye wear [9,10].

Almost 100 years ago, more than 70% of all serious injuries occurred at the workplace[2]. There is significant shift from workplace to home as a place of eye injuries as most studies show but the workplace remains the most important site in the developing countries[3,4,11]. Extension of on-the-job safety to the home environment and the application of modern principles of surgical salvage also contribute to prevention of ocular trauma and minimizing the effects of ocular trauma on vision respectively[9,10].

Although small scale industries are expanding in Ethiopia in recent years, not much data is available on occupational health and workers practice. The objective of this study was, therefore, to evaluate the magnitude and causes of ocular injuries as well as the use of personal protective devices in small scale industries in Woliso town, central Ethiopia.

MATERIALS AND METHODS

This cross sectional study was carried out over 1 month, August 22nd-September 16th, 2011, in Woliso town. Woliso is a town in central Ethiopia located at 115 km southwest of Addis Ababa. Woliso has an estimated total population

of 45,537 of whom 21,940 were male and 23,597 were female. The town has 5 medium scale industries (soap, oil and flour factories) employing more than 500 workers and more than 50 small scale industries (grain mills, metal work, wood work, cement brick production and garages) in the town employing more than 350 workers.

The study was carried out after getting permission from the ethical clearance committee of the Department of Ophthalmology, Faculty of Medicine, Addis Ababa University. Data was collected after getting written consent from Woliso Town administration. Informed verbal consent was obtained from the owners of each industry and study participants. Non-technical workers and absentees during the whole period of data collection were excluded.

Information and addresses of small scale industries were obtained from micro finance and small scale industries bureau and trade bureau in the town. Then, with the help of programme coordinators, 41 small scale industries were traced and participated in the study. All technical workers in these industries were included in the study. Data was collected by the principal investigator with face to face interview using standardized questionnaire which includes socio-demography, type of work, use of personal protective devices and history of work related injury.

Ocular examination was done on site. Visual Acuity (VA) was taken using Snellen's chart at 3 mts and pinhole test was applied when VA was less 6/18. Anterior segment examination was made using portable slit-lamp while fundus evaluation was made using direct ophthalmoscope. When there was more than one injury, the most frequent or more severe one was taken. At each site, the participants were provided with brief information about how to prevent work related injuries and individual participants with minor ocular disorders were treated on site.

The following operational definitions were used. Small scale industries are establishments employing less than ten persons and using motor operated equipment[12]. Work related injury is a condition sustained by a worker in connection with the performance of his or her work on site or as assignment[13]. Data were analyzed using SPSS for Windows version 16.0. Associations between variables were checked by Chi-Square test and significance considered when $p < 0.05$.

RESULTS

A total of 224 participants were included in the study. The majority of study participants 215 (95.9%) were males. The mean (SD) age of respondents was 23.9(±6.63) years, ranging from 15 to 54. Ninety four (40.0%) respondents were high school graduates. One hundred and sixty six (74.1%) respondents had five years and below service duration (Table 1).

Table 1: Socio-demographic characteristics of the study population

Variables	No. (%)
Sex	
Male	215(95.9%)
Female	9(4.1%)
Age (years)	
15-24	162 (72.3%)
25-34	45 (20.4%)
35-44	11 (4.9%)
>44	6 (2.7)
Educational status	
Illiterate	1 (0.4%)
Read & write	27 (12.1%)
Primary school(1-8)	72 (32.1%)
Secondary school	94 (42.0%)
12+	30 (13.4%)
Service duration (years)	
≤ 5	159 (71.0%)
>5	95 (29.0%)

Male dominance is clearly revealed from this table

Majority of the study participants 66 (29.5%) were working in grain mills followed by 54 (24.1%) who were working in metal workshops. Seventy seven (34.4%) participants had history of ocular injuries, of which 47(61.0%) had more than one ocular injuries. Majority of ocular injuries, 32 (59.3%), occurred among metal workers, followed by workers in blocket production 7 (38.9%) (Table 2). The relative risk of ocular trauma among workers in metal workshop and blocket production compared to grain mill workers were 3.26 and 2.14 respectively.

Table 2: Distribution of work related eye injuries by type of industry

Type of industry	Total number of workers	Cases with eye injury (%)	Relative risk
Grain mills	66	12(18.2)	1
Wood work shops	50	14(28.0)	1.54
Garages	36	12(33.3)	1.83
Blocket production	18	7(38.9)	2.14
Metal work shops	54	32(59.3)	3.26
Total	224	77(34.4)	

Workers of metal work-shops are relatively at higher risk of getting eye injuries

The main specific activities the workers were doing at the time of injury were grinding 23 (29.3%), welding 16 (20.7%), saw mill 13 (16.8%), stone shaping 9 (11.7%), mixing 8 (10.4%), drilling 5 (6.4%) and others 3 (3.9%). The main causative agents were iron chips in 24 (31.2%), followed by welding light and smoke in 16 (20.8%) of the injured cases (Table 3).

Table 3: Causes of ocular injuries in small scale industries in Woliso town

Causative agents	Cases with eye injury	
	No.	(%)
Iron chips	24	31.2
Welding light and smoke	16	20.7
Sand and stone	16	20.7
Wood chips	11	14.6
Hand tools	5	6.5
Chemicals	2	2.3
Others	3	4.0
Total	77	100

Trauma with iron chips was more common among small scale industries.

Most study participants, 128 (57.1%), did not use personal protective devices at all and only 17 (7.6%) used any kind of protective devices available all the time. Frequent personal protective devices use was higher among metal workers 43(79.6%), followed by garage workers 22 (61.1%) (Table 4). The main reasons given for not using personal protective devices were negligence in 93 (45.0%, absence of the devices in 51 (24.5%), lack of awareness in 38 (18.5%) and decrease of clarity and work performance in 25 (12.0%) of workers.

Table 4: Use of personal protective devices (PPD) by type of industry

Type of industry	Frequency of PPD,N (%)			Total (100%)
	Always	Occasionally	Never	
Metal work shops	16(29.6%)	27(50%)	11(20.4%)	54
Garages	1(2.8%)	21(58.3%)	14(38.5%)	36
Wood work shops	0	22(44%)	28(56%)	50
Cement brick production	0	2(11.2%)	16(88.9%)	18
Grain mills	0	7(10.6%)	59(89.4%)	66
Total	17(7.6%)	79(35.3%)	128(57.1%)	224

Although metal workers sustained more trauma to their eyes, they seem to use protective devices often compared to workers of other categories.

Majority of participants, 193 (86.2%), had neither training on occupational health and safety nor training in connection to the work they were doing in 194 (86.6%). Sixty four (83.1%) did not use personal protective devices at the time of injury. Chi-square test was used to see the association between ocular injury and certain socioeconomic and work environment variables. As a result, educational level, type of industry, duration of service and failure to use personal protective device was statistically significantly associated with ocular trauma (P-value <0.05). However, sex, age, occupational health and safety training did not show significant association with ocular injury (Table 5).

Table 5: Risk factors for work related eye injuries

Variables	Yes N(%)	No N(%)	p-value
Sex			0.43
Male	75(34.9)	140(65.1)	
Female	2(22.2)	7(77.8)	
Age (years)			0.62
15-34	72(34.8)	135(65.2)	
>35	5(29.4)	12(70.6)	
Educational status			0.01
Primary school and below	22(22)	78(78)	
Secondary school (9-12)	42(44.7)	52(55.3)	
12+	13(44.3)	17(56.7)	
Type of industry			0.001
Metal work	32(59.3)	22(40.7)	
Blocket production	7(38.9)	11(61.1)	
Garage	12(33.3)	24(66.7)	
Wood work	14(28.0)	36(72.0)	
Grain mill	12(18.2)	54(81.8)	
Service duration			0.01
≤5 years	46(28.9)	113(71.1)	
>5 years	31(47.7)	34(52.3)	
Job training			0.13
Yes	14(46.7)	16(53.3)	
No	63(32.5)	131(67.5)	
Occupational health and safety training			0.08
Yes	15(48.4)	16(51.6)	
No	62(32.1)	131(67.9	
PPE use at time of injury			0.001
Yes	13(16.9)		
No	64(83.1)		

Among the 77 injured participants, 41(53.2%) had treatment by untrained friends, 19 (24.7%) had self-treatment and (22.1%) had treatment in a health institution. Treatment by one self or friend was done using paper tips to remove foreign bodies in 21 (35%), water flushing in 16 (26.7%), eye drops in 14 (23.3%), fine wood sticks in 6 (10%) and other methods in 3 (5.0%) cases. Residual corneal opacity was detected in 11(14.3%) of injured patients. Best corrected visual acuity in the injured eyes was better than 6/18 in 72 (93.5%) participants and between 6/18-6/60 in 3 (3.9%) cases. There were two patients, (2.6%), with severe injuries; the first had evisceration while the second one had severe visual impairment from corneal opacity due to work related trauma.

DISCUSSION

Occupational eye injuries are common and preventable. Despite well publicized standards for industrial protection in developing countries, eye injuries in the workplace are a major cause of socioeconomic damage, morbidity, and disability[1]. In our study, 77 (34.4%) of participants had history of ocular injuries. Majority of ocular trauma 32 (59.3%) occurred among metal workers, followed by workers in blocket production 7(38.9%) and garages

12 (33.3%). This is because grinding and hammering is commonly involved in these categories of jobs.

Our study showed that the main specific activities at the time of injury were grinding (29.3%) and welding (20.7%). Other studies from Pakistan[14] and Victoria, Australia[15] also reported grinding as the main activity at the time of injury. The main causative agents found were iron chips 24 (31.1%), followed by welding light and smoke 16 (20.7%) which is in agreement with other reports[14,16]. Consistent use of personal protective devices was found to be 7.6% and this was also reported from Gondar, Ethiopia (unpublished data), Pakistan[14] and Nigeria[16].

Majority of participants 89 (92.7%) used plano or non plano (prescribed for refractive error) safety glasses while only 5 (5.2%) used goggles and 2 (2.1%) used face shield. Better use of goggles and face shield was reported previously[15,17] which is determined by the economic standard, level of awareness, commitment of employers and supervisors.

We found that small scale industries are dominated by young male workers. In our study, age and sex did not show significant association with ocular injury although the proportion of females was small (4.1%) for comparison. A study done in Nigeria by Iyiade *et al*[16] showed similar results. Another study by Dupesa *et al*[18] also showed that young males are prone to eye injuries which may be because of male population dominating the industry.

As level of education increases, the magnitude of ocular trauma increases in our study. This may be because highly educated ones are assigned to more risky jobs or more tasks which may increase the risk of ocular injury. In addition, education only cannot eliminate injury when the level of hazards is high and when the use of reliable techniques and safe work organization are limited. A study from Nigeria by Iyiade *et al*[16] showed similar results where educated ones were less aware of personal protective devices. A study from Gondar, Northern Ethiopia[19], however, reported that educated individuals are less prone to eye injury.

Occupational health and safety training did not show any significant difference with regard to ocular injury in our study. This is not in agreement with another study conducted in Gondar, Northern Ethiopia[19]. This may be due to the fact that occupational health and safety training does not necessarily mean practice which is influenced by attitude, negligence, availability of personal protective devices and commitment of employers and supervisors.

Eye injuries are common among more experienced workers because the longer one works, the more likely the ocular trauma. With experience, negligence and fatigue to use personal protective devices may also occur. Type of industry showed statistically significant association with the occurrence of eye injuries. Given the low utilization of personal protective devices in our study, jobs which require hammering and grinding becomes a high risk for eye injuries. A report from Gonda, Ethiopia[19] showed similar results.

Failure to use appropriate personal protective devices is significantly associated with eye injuries. This is in agreement with many other studies[14,17]. There was poor eye care seeking behaviour among workers. Only a quarter of the individuals who sustained eye injuries obtained treatment at health institutions by an ophthalmologist or ophthalmic nurses with low payment. A study from Gondar[19] showed similar results. However, a Korean study by Jinky and Leilanie[20] revealed injured cases to be treated at health institutions. This could be due to differences in culture, economy, occupational health and safety regulations.

In conclusion, work-related eye injuries are common among small scale industrial workers. Majority of the workers do not use personal protective equipments and there is a very low eye care seeking behaviour as well. Based on these, we strongly recommend provision of health education and appropriate health and safety training for workers and employers. In addition, provision of appropriate and affordable personal protective devices, strengthening strict supervision of workplace and working conditions will reduce work related eye injuries.

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