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ORIGINAL RESEARCH

Prevalence of Occupational Ocular Injury and Associated Factors Among Small-Scale Industry Workers in Gondar Town, Northwest Ethiopia, 2019

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Purpose: To assess the prevalence of occupational ocular injury and associated factors among small-scale industry workers in Gondar town, Northwest Ethiopia.

Methods and Materials: Institution-based cross-sectional study was conducted on 542 manufacturing and construction workers in Gondar town from April 23 to May 4, 2019. A pre-tested questionnaire was used to collect data using face-to-face interview. Binary logistic regression was used to identify factors associated with occupational ocular injury.

Results: A total of 542 small-scale industry workers participated with a 95.1% response rate. The prevalence of occupational ocular injury was 31.4% (95% CI, 27.2–35.5). Employment pattern (temporary workers) (AOR: 1.84, 95% CI: 1.14–2.95), health and safety training (AOR: 2.22, 95% CI: 1.06–4.66), non-use of eye safety device (AOR: 7.43, 95% CI: 4.44–12.43), and job category (woodwork (AOR: 0.56, 95% CI: 0.32–-0.97)), and brickwork (AOR: 2.19, 95% CI: 1.08–7.21) had statistically significant with occupational ocular injury.

Conclusion: This study showed the prevalence of occupational ocular injury among small-scale industry workers was 31.4%. Iron chips are the most common agent responsible for the injury. Type of employment, having health and safety training, use of eye safety devices, and job category had a significant association with occupational ocular injury.

Keywords: occupational ocular injury, small scale industry workers, Gondar, Ethiopia

Introduction

Ocular injury is a significant cause of visual impairment and blindness globally. Ocular injury is one of the most common causes of unilateral blindness worldwide.[1] Even though 90% of occupational ocular injury is preventable by using appropriate safety devices, individuals working in hazardous occupations are at high risk.[1–6]

Among all cases of the ophthalmological emergency departments, occupational eye injury ranges from 30% to 70%, and adults are more frequently affected by trauma at occupation.[7,8]

The impact of sight loss from occupational ocular injury has a direct and indirect impact on the future of workers and their family, social interaction, and inhibits the development and prosperity of the countries.[4]

About 80% of the worldwide workforce is contributed by small and medium-scale industries but there is low compliance for occupational health and safety

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standards.[2,9,10] Little is known about the epidemiology of occupational ocular injury in developing countries, but its prevalence is higher than in developed ones. This is because of less attention of priority assigned for occupational health and workplace safety.[6,11,12] According to institution-based studies in Ethiopia, the prevalence of occupational ocular injury is high.[13,14]

In Ethiopia, there are few studies conducted on occupational ocular injury among small-scale industry workers. Identifying risk factors and estimating the prevalence of occupational ocular injury is important for the establishment of local and national occupational injury prevention strategies and programs. Hence, this study is aimed at filling the gap by determining the prevalence and associated factors of occupational ocular injury among small-scale industry workers in Gondar town Northwest, Ethiopia.

Therefore, this study will serve as baseline data for further studies to generate inputs for eye care providers and policymakers to design evidence-based interventions to reduce the burden of blindness and visual impairment from an ocular injury.

Methods and Materials

Study Design and Period

An institution-based cross-sectional study was conducted from April 23 to May 4, 2019.

Study Area

The study was conducted in Gondar town, Northwest Ethiopia. Gondar is one of the historic towns in the country located 735 km Northwest of Addis Ababa. There are 148 manufacturing and construction small-scale industries with a total of 570 workers.[15]

Sample Size and Sampling

All manufacturing and construction small-scale industry workers were included in the study, giving the final sample size of 570.

Ethical Consideration

The study was conducted in accordance with the Declaration of Helsinki. Ethical clearance was obtained from the University of Gondar College of Medicine and Health Sciences and Comprehensive Specialized Hospital, School of Medicine Ethical Review Committee. There were 21 participants under 18 years of age in this study. Different literatures revealed that young people aged under 18 years with sufficient understanding are able to give their full consent to participate in research independently of their parents and guardians, providing they have sufficient maturity to understand the nature, purpose and likely outcome of the proposed research. Verbal informed consent as approved by the University of Gondar Ethical Review Board was obtained from all study participants after informed about the purpose of the study and their right to refuse and withdraw from the study at any time. The questionnaires did not have an identifier of the participants and data collection and data analysis were done with confidentiality maintained. Information was not be used for any other purpose other than the one stated. Eye health education on ocular injuries was given orally to all study participants after completion of the interview.

Operational Definition

Occupational Ocular Injury

Any eye injury occurred to the worker while working in a small-scale industry within the 12-month duration.

Eye Safety Device

The equipment, worn by employees, is designed to protect the eye from hazards like goggles, face shield, and helmet.

Workplace Supervision

Regular (programmed) supervision is done by health and safety responsible bodies in a specific industry.[16]

High Power Tool

Materials that use by workers such as grinding, welding, and hammering for grinding, welding, and cutting.

Small-Scale Industry

Manufacturing and construction industry that uses manual and electrically operated machines for production.

Alcohol Intake

Registered in each subject by adding up the total number of standard drinking units (one bottle of beer, one glass of wine, or one unit of spirit, all of them approximately equivalent to 10 g of ethanol) habitually consumed per week. Subjects were classified according to alcohol intake into three groups as follows: 1. Abstainers 2. Light drinkers (consumers of one to 14 units/week) and Heavy drinkers (consumers of more than 14 units a week).

Data Collection Tool and Procedures

The data were collected using a pretested structured questionnaire. The questionnaire had items on socio-demographic

characteristics, behavioral characteristics, eye safety wear, and occupational ocular injuries. First, the questionnaire was prepared in English. Then, an English version of the questionnaire was translated into Amharic version then translated back to English by two independent local language translators to maintain its consistency and accuracy. Then, Pre-test was conducted in 5% of the sample outside the study area (Maksegnit district). After the pre-test, the necessary modifications were made accordingly on the questionnaire. Finally, the data were collected through face-to-face interview by eight trained BSc health professions in each small-scale industry.

Data Processing and Analysis

After coding, the data were entered into EPI INFO version 7 and exported to SPSS version 22 for analysis. Descriptive statistics such as frequency distribution and central tendency measures were used to summarize the descriptive part of the study. A binary logistic regression model was used to determine the association between the independent and dependent variables. The fitness of the model was checked with the Hosmer-Lemeshow model fitness test. The strength of the association was assessed using an adjusted odds ratio with a 95% confidence interval and variables with a P-value of less than 0.05 were considered statistically significant.

Results

Socio-Demographic Characteristic of Study Participants

A total of 542 adults participated in the study with a response rate of 95.1%. The median (IQR) age was 25 years [22–28] and the majority 163 (30.1%) of the respondents were in the age group 23–25 years. About 443 (81.7%) of the respondents are male Table 1.

Table 1 Socio-Demographic Characteristics of Small-Scale Industry Workers in Gondar Town 2019 (n=542)

Variables	Frequency	Percent
Age		
15–22	154	28.4%
23–25	163	30.1%
26–28	103	19%
≥29	122	22.5%
Sex		
Male	443	81.7%
Female	99	18.3%
Religion		
Orthodox	417	76.9%
Muslim	125	23.1%
Educational status		
Unable to read and write	20	3.7%
Able to read and write	93	17.2%
Primary school	80	14.8%
Secondary school	274	50.6%
College and above	75	13.8%
Marital status		
Single	347	64%
Married	195	36%
Monthly salary (ETB)		
<1500	150	27.7%
1500–2000	139	25.6%
2000–3000	159	29.3%
>3000	94	17.3%

Behavioral Characteristics of Study Participants

Three hundred ninety-seven respondents (73.2%) were wearing eye safety devices (ESD) among which 249 (62.7%) used the eye safety device sometimes. The majority of (69.3%) employees used Sunglass as an eye safety device and 205 (37.8%) of employees reported that there is not enough eye safety device at their workplace. Among those who did not wear ESD, 116 (80%) of them were reported that it is due to lack of ESD at the workplace and the expensive cost to buy the safety devices Table 2.

Workplace Characteristics of the Study Participants

Three hundred eighty-six (71.2%) of workers had < 5 years of working experience. One hundred seventy (31.4%) employees were working for more than 48 hours per week. Only 209 (38.6%) respondents had safety and health training regarding their working conditions. The majority of employees 472 (87.2%) had an awareness of occupational hazards Table 3.

Prevalence of Occupational Ocular Injury Among Study Participants

A total of 170 (31.4%) respondents faced occupational ocular injury during the last 12 months. Among those, forty-nine (28.8%) were exposed more than once for ocular injury, and 69 (40.6%) were caused by iron chips. About 96 (56.5%) of injured participants got health care services after the injury.

Table 2 Behavioral Characteristics of Small-Scale Industry Workers at Gondar Town 2019 (n=542)

Variable	Frequency	Percent
Use of Eye Safety Device		
Yes	397	73.2%
No	145	26.8%
Which type of ESD do you use		
Face shield	122	30.7%
Sunglass	275	69.3%
When you wear ESD		
Always	148	37.3%
Sometimes	249	62.7%
Availability of ESD at workplace		
Yes	337	62.2%
No	205	37.8%
Alcohol drinking status		
No	329	60.7%
Lighter drinker	156	28.8%
Heavy drinker	57	10.5%
Khat chewing		
Yes	89	16.4%
No	453	83.6%

Table 3 Workplace Characteristics of Small-Scale Industry Workers in Gondar Town 2019 (N= 542)

Variables	Frequency	Percent
Working Experience in year		
1–2	205	37.8%
3–4	181	33.4%
≥5	156	28.8%
Employment pattern		
Permanent	328	60.5%
Temporary	214	39.5%
Job category		
Metalwork	186	34.3%
Woodwork	164	30.3%
Cobblestone work	149	27.5%
Brickwork	43	7.9%
Working hour per week		
≤48	372	68.6%
>48	170	31.4%
Workplace Supervision		
Yes	129	23.8%
No	413	76.2%
Health &Safety training		
Yes	209	38.6%
No	333	61.4%
Awareness about occupational hazards		
Yes	472	87.1%
No	70	12.9%

Factors Associated with Occupational Ocular Injury

The result of multivariable binary logistic regression analysis showed that type of employment, job category, training on health and safety measures, and use of eye safety devices were independent predictors of occupational ocular injury.

Workers who did not use an eye safety device were more than 7 times more likely to face occupational ocular injuries than those who wear the eye safety device (AOR: 7.43, 95% CI: 4.44–12.43).

Those workers who do not get health and safety training were 2.22 times more likely to have an occupational ocular injury than those who got health and safety training (AOR: 2.22, 95% CI: 1.06–4.66).

Temporary workers were1.84 times more likely to have occupational ocular injury than permanent workers (AOR: 1.84, 95% CI: 1.14–2.95).

The job category was also found to be one of the significant factors. The odds of having occupational ocular injury among woodworkers were 44% less likely than metal workers (AOR: 0.56, 95% CI: 0.32–0.97); however, brick workers were 2.19 times more likely to have occupational ocular injury as compared to metal workers (AOR: 2.19, 95% CI: 1.08–7.21) Table 4.

Discussion

This institution-based cross-sectional study determined the prevalence of occupational ocular injury and associated factors among small-scale industry workers in Gondar Town, Northwest Ethiopia.

In this study, the prevalence of occupational ocular injury was 31.4% (95% CI: 27.2–35.5). This finding is higher than the study conducted in New Zealand 20.7%,[17] Benin City, Nigeria 10.7,[18] Washington, USA 11%,[19] and Scotland 19.6%.[20] This might be due to the difference in the availability of eye safety devices, safety, and health training, and regular workplace supervision. There are limited eye safety devices in the current study area and the majority of the participants did not take training on eye health and safety. The difference in the socio-economic status of these counters might be the other reason for the

Table 4 Factors Associated with Occupational Ocular Injuries in Small Scale Industry Workers in Gondar Town, 2019 (N= 542)

Variables	Occupational Ocular Injury		COR (95% CI)	AOR (95% CI)
	Yes	No		
Age				
15–22	53	101	1.85(1.07–3.17)	2.52(1.09–5.84)
23–25	53	110	1.70(0.99–2.91)	2.14(1.08–4.27)
26–28	37	66	1.97(1.10–3.55)	1.41(0.71–2.81)
≥29	27	95	1	1
Sex				
Male	145	298	1	1
Female	25	74	0.69(0.42–1.14)	1.08(0.53–2.20)
Educational status				
Unable to read and write	6	14	1.26(0.43–3.75)	1.24(0.35–4.42)
Able to read and write	23	70	0.97(0.48–1.95)	1.52(0.64–3.59)
Primary school	37	43	2.56(1.28–5.01)	2.11(0.92–4.85)
Secondary school	85	189	1.34(0.74–2.37)	1.41(0.71–2.81)
College and above	19	56	1	1
Monthly salary (ETB)				
<1500	36	114	0.39(0.23–0.68)	0.31(0.13–0.74)
1500–2000	38	101	0.47(0.27–0.81)	0.56(0.26–1.22)
2000–3000	54	105	0.64(0.38–1.07)	0.58(0.29–1.14)
>3000	42	52	1	1
Working Experian's				
1–2 year	55	150	1	1
3–4 year	55	126	1.19(0.77–1.85)	1.06(0.61–1.84)
≥5 years	60	96	1.71(1.09–2.66)	1.64(0.84–3.20)
Employment pattern				
Permanent	93	235	1	1
Temporary	77	137	1.42(0.98–2.05)	1.84(1.14–2.95)*
Job category				
Metalwork	69	117	1	1
Woodwork	46	118	0.66(0.42–1.04)	0.56(0.32–0.97)*
Cobblestone work	35	114	0.52(0.32–0.84)	0.49(0.22–1.12)
Brickwork	20	23	1.47(0.76–2.88)	2.19(1.08–7.21)*
Working hour per week				
≤48	130	242	1	1
>48	40	130	0.57(0.38–0.57)	1.43(0.71–2.87)
Health & Safety Training				
Yes	40	169	1	1
No	130	203	2.71(1.80–4.07)	2.22(1.06–4.66)*
Alcohol drinking Status				
No	114	215	1	1
Lighter drinker	39	117	0.63(0.41–0.96)	0.56(0.34–0.94)
Heavy drinker	17	40	0.80(0.44–1.48)	0.84(0.41–1.74)

(*Continued*)

Table 4 (Continued).

Variables	Occupational Ocular Injury		COR (95% CI)	AOR (95% CI)
	Yes	No		
Khat chewing				
Yes	29	60	1.07(0.66–1.74)	1.15(0.64–2.08)
No	141	312	1	1
Use of ESD				
Yes	83	314	1	1
No	87	58	5.68(3.76–8.56)	7.43(4.44–12.43)***
Awareness about occupational hazards				
Yes	138	334	1	1
No	32	38	2.04(1.22–3.39)	1.25(0.65–2.38)
Workplace supervision				
Yes	41	88	1	1
No	129	284	0.98(0.64–1.49)	1.43(0.84–2.45)

Notes: *p-value<0.05, ***p-value< 0.001.

difference. Since most of this study participants did not afford to buy eye safety devices, they were highly vulnerable to occupational ocular injuries.[3,6,11–13,16,18,21]

On the other hand, occupational ocular injury in this study was lower than reports from the United Kingdom 70%,[20] Nwala Onyinye, Nigeria 84.5%,[22] Port Harcourt, Nigeria 52.2%,[2] Mansoura, Egypt 36.7%.[12] This might be due to the difference in study designs and inclusion criteria. The present study includes all small-scale industry workers (wood, metal, brick, and cobblestone workers) while the former studies consider mainly metal workers or welders.

Regarding health and safety training, participants who did not have health and safety training were more likely to have occupational ocular injury than those who had training. This might be due to the fact that as workers have health and safety training, they may have information on how their working environment predisposes them to different ocular injuries, when to use protective devices and which specific type must be used to prevent ocular injuries. These will help them to use different protective measures to reduce their risk of having ocular injuries. This result was in agreement with studies done in Arba Minch, Ethiopia,[16] Eastern India,[23] and in the South West Region of China.[3]

The occurrence of occupational injury was significantly associated with the employment pattern of workers. Those participants employed temporarily had a higher risk of having occupational ocular injury as compared to those who were employed permanently. This might be because temporary workers usually have a low safety consciousness, poor work quality, and less training which exposes them to different ocular injuries.[24] This result is consistent with a study done in the Eastern Part of India.[23]

The job categories of workers were statistically significant. Woodworkers were less likely to have occupational ocular injuries as compared to metalworkers. Metalworkers were believed to be actively engaged in work that required the application of moving parts of machines that predispose them to a risk of injury. The most frequently reported cause of ocular injury in this study was also iron chips. This study was supported by North Gondar Woreda.[10] On the other hand, brick workers were more likely to have occupational ocular injuries than metalworkers.

From behavioral factors, failure to use appropriate eye safety devices was significantly associated with occupational ocular injuries. The result of this study revealed that those workers who did not use ESD were more than 7 times more likely to face occupational ocular injuries. This could be due to inadequate awareness about occupational hazards, lack of eye safety devices in the workplace, and expensive to buy by workers. This finding is supported by other findings.[13,18,21,22,25,26]

A study done in Bosnia and Herzegovina[21] showed that the prevalence of work-related ocular injuries is significantly

associated with educational level stating the highest proportion of work-related eye injuries among those with more than a college education. However, the educational level and prevalence of occupational ocular injuries did not show a statistically significant association in the current study.

Being a cross-sectional study, this study has a limitation secondary to recall bias. The history of ocular injury in the past 12 months was exposed to recall bias since participants will not remember minor injuries.

Conclusions

The current study revealed a significant number of small-scale industry workers had occupational ocular injury, which is significantly associated with health and safety training, type of employment, job category, and use of eye safety devices. This study will serve as baseline data for further studies to generate inputs for eye care providers and policymakers to design evidence-based interventions to reduce the burden of blindness and visual impairment from occupational ocular injuries.

Data Sharing Statement

All data are fully available without restriction within the manuscript.

Disclosure

The authors received no specific funding for this work and report no conflicts of interest in this work.

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