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Source: Environmental Health Insights, 16(1)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/11786302221080829

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Occupational Injuries and Associated Factors Among Small-Scale Woodwork Industry Workers in Hawassa, Southern Ethiopia: A Cross-Sectional Study

Environmental Health Insights
Volume 16: 1–9
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DOI: 10.1177/11786302221080829

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ABSTRACT

BACKGROUND: Occupational injuries are still a major public health problem and one of the leading causes of disability, morbidity, and mortality. This study aimed to assess occupational injuries and associated factors among workers in the small-scale woodworking industry in Hawassa city, southern Ethiopia.

MATERIALS AND METHODS: An institutional-based cross-sectional study was conducted among 418 randomly selected small-scale woodworking industry workers. Questionnaires and an observational checklist were used to collect data. The data was entered into Epi data version 3.1 and analyzed using SPSS version 21. Multivariate logistic regression analysis with 95% CI and $P < .05$ was used to identify factors associated with occupational injury.

RESULTS: The prevalence of at least one occupational injury in the previous 12 months among small-scale woodworking industry workers was 41.6% [95% CI: 36.9-46.4]. Work experience 1 to 2 years [AOR = 2.8, 95% CI: 1.49-5.2], working more than 48 hours per week [AOR = 2.2, 95% CI: 1.41-3.49], lack of occupational safety and health (OSH) training [AOR = 2.5, 95% CI: 1.35-4.75], and non-use of personal protective equipment (PPE) [AOR = 3.3, 95% CI: 1.85-5.83] were factors significantly associated with occupational injury.

CONCLUSIONS: In this study, the prevalence of occupational injuries among workers in the small-scale woodworking industry was high. Lack of OSH training, non-use of PPE, work experience of 1 to 2 years, and working more than 48 hours per week were all factors that contributed to occupational injuries. Therefore, workers in the small-scale woodworking industry should receive ongoing occupational safety and health (OSH) training, and personal protective equipment (PPE) should be provided and monitored.

KEYWORDS: Occupational injuries, small-scale Industry, woodworking

RECEIVED: December 4, 2021. **ACCEPTED:** January 21, 2022.

TYPE: Original Research

FUNDING: The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors declared that a grant fund was provided by Hawassa university for data collection, not for publication.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Introduction

Work-related injuries continue to be a major public health concern, as well as a leading cause of death, disability, and disease.[1,2] Every year, an estimated 271 million people worldwide suffer work-related injuries, with 2 million dying as a result of those injuries. The estimated economic loss from work-related injuries and diseases is equal to 4% of global GDP.[3,4]

Moreover, the working conditions for the majority of the 3 billion workers worldwide, do not meet the minimum standards and guidelines set by the World Health Organization and the International Labor Organization for occupational health, safety, and social protection.[5] Most of the world's workforce lacks access to occupational health services. Occupational health services are available to only 5% to 10% of the workforce in developing countries and 20% to 50% of the workforce in developed countries.[6] The main problem with a lack of occupational health services is the constant presence of hazards on the job, such as dust, heat, noise, toxic chemicals, and dangerous machines that cause a huge burden of work-related injuries.[7]

Small-scale industries (SSI), especially woodworking industries are among the highest-ranked industries of occupational injuries.[2,6] The main issue with the lack of occupational health services is the constant presence of hazards in the workplace, such as dust, heat, noise, toxic chemicals, and dangerous machines, which lead to a massive burden of work-related injuries.[6] Rapid industrial, scientific and social development and use of non-rational natural resources led to heightened risks in the world.[2,8]

In Ethiopia's woodworking industry, health and safety have long been a big issue. According to a study conducted in North Gondar, Ethiopia, the prevalence of occupational injuries among SSI workers was 35.50% over the course of 1 year.[4] Several studies have identified factors linked to workplace injury.[1,4,9-11] Individual factors such as psychological or mental well-being, substance use such as alcohol, chewing khat, smoking cigarettes, inadequate sleep, working environment such as lighting, material arrangement, and PPE are examples of these factors.[12,13]

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It is clear that most of woodworking industries lack the necessary materials and policies to prevent workplace injuries. Although there is a limited study conducted on small-scale woodworking industry Ethiopia, the epidemiology of work-related injuries is lacking due to scarce national and local data. According to Ethiopia's Labor Proclamation No.377/2003, the Ministry of Labor and Social Affairs is the body in charge of inspecting labor administration, labor conditions, occupational safety, and health.[10] However, no aggregated data on the magnitude and factors influencing work-related injury is available for small-scale industries. Furthermore, there is a contrasting and contradictory debate about the health, safety, and welfare of people working in small-scale industries. There are also studies that suggest that small-scale industries are more dangerous to work in than medium and large-scale industries.[14-16]

Rapid industrialization is occurring as a result of favorable investment policies, which can result in an increase in the number of industries and employment in Ethiopia. However, epidemiological data on the health and safety of the workforce are lacking in SSI. Despite the fact that various measures, programs, and responsible government authorities are in place, the number of woodwork accidents remains alarmingly high.

Therefore, it is important to know the prevalence, severity, and determinants of occupational injuries among these workers. The main objective of this study was to determine the prevalence of occupational injuries and the factors affecting workers in small-scale woodworking industries in Hawassa, southern Ethiopia.

Materials and Methods

Study settings

The study carried out in Hawassa, the capital city of Sidama Regional State. The city is 270 km from Addis Ababa, Ethiopia's capital. Hawassa is one of the country's most important commercial centers, serving as a center for public corporations, private, and government-owned industries. The city administration includes 8 sub-cities, 142 woodworking enterprises, and 1065 woodworkers.

Study design and period

An institutional-based cross-sectional study was carried out in selected small-scale woodworking industries of Hawassa city, southern Ethiopia, from February 1 to March 24, 2020 GC.

Populations

Source population. All employees who worked in small-scale woodworking industries in the city of Hawassa.

Study population. Employees who worked in selected small-scale woodworking industries in Hawassa city and were available during the data collection period.

Eligibility criteria

Inclusion criteria. Workers who were working in selected small-scale woodworking industries in Hawassa city and were available during the data collection period.

Exclusion criteria. Workers who were not directly involved in the production process, such as administrative workers, were excluded from the study.

Sample size determination

The sample size was calculated using a single population proportion formula based on the following assumptions: According to a study of work-related injuries in Mizan-Aman Town in the Bench Maji Zone in southern Ethiopia, the prevalence of occupational injuries in the woodworking industry is 45.2% per year.[17]

Where, n = sample size, $Z\ \alpha/2$ = confidence level, =1.96
p = proportion of anticipated population = 0.452
d = Margin of error (d^2) = 0.05

$$n = \frac{(Z\alpha/2)^2 p(1\text{-}p)}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.452 \times (1-0.452)}{0.05^2}, n = 380$$

By adding 10% for the non-response rate, the final sample size was 418.

Sampling procedure

First, 71 woodworking enterprises out of 142 woodworking enterprises were selected using a lottery method. Then, the sample size was allocated to small-scale woodworking enterprises using proportional allocations to the size to determine the numbers of study subjects required by each selected woodworking enterprise. A list of enterprises was taken from the Hawassa City Administration. The study included 418 workers who were directly involved in the woodworking production process.

Data collection tools and technique

Standardized questionnaires were developed for this study based on previously published studies and were slightly modified for this study. A semi-structured questionnaire administered by an interviewer was used to collect data. There were 4 components to the questionnaire: sociodemographic variables, injury characteristics, work environment, and behavioral variables. It was written in English, translated into Amharic, and then back to English to verify consistency. The questionnaires were pretested for understandability on 5% of the total sample size. Based on the pre-test results, the questionnaires are quantitatively, contextually, and terminologically modified before being administered to the entire sample of workers.

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Study variables

Dependent variable. Occupational injury

Independent variables. Gender, age, educational level, employment pattern, job type, working experience, and household monthly income are sociodemographic variables.

Workplace variables include working hours per week, workplace supervision, and OSH training.

Behavioral variables include alcoholic use, khat chewing, sleep disorders, and the use of personal protection equipment.

Data quality assurance

Training was provided to both the data collectors and the supervisors in order to ensure the quality of the data. The questionnaire was pretested for understandability on 5% of the total sample size. The collected data is double-entered by the principal investigator to ensure that the data clerk entered it correctly.

Operational definitions

An occupational injury: is a condition in which a worker sustains a wound or suffers bodily harm as a result of an incident at work.[18]

Small-scale industry: Any industry with fewer than 10 employees that uses power-driven machines.[17]

Personal protective equipment is used by workers to protect parts of their bodies from hazards posed by their jobs or working conditions.[15]

Injury severity: is defined as death, hospitalization for more than 24 hours, or absence from work for more than 3 days in the preceding year.[19]

Alcohol consumption: is defined as employees consuming any type of alcohol at least twice a week for a variety of reasons.[18]

Data analysis

For data entry, Epi Data version 3.1 was used, and SPSS version 21 was used for analysis. Bivariable and multivariable logistic regression were used to investigate the relationship between dependent and independent variables. Multiple logistic regression was used to control for potential confounder effects on variables with a bivariable association with the dependent variable at $P < .02$. The odds ratio (OR) with a 95% confidence interval (CI) was used in the multivariable analysis to declare the presence and strength of association.

Ethical consideration

The study was carried out with the approval of the Hawassa University Medical and Health Science College's ethical clearance committee. The data was collected after obtaining written permission from the Hawassa city administration's trade and industry department. The owners and participants in each industry provide informed verbal consent. Each industry's and study participant's data were kept strictly confidential. Each respondent was informed about the purpose of the study, and their privacy was respected throughout the interview.

Results

Socio-demographic characteristics

In this study, a total of 404 workers were included, with a response rate of 96.7%. Most of the study participants, 328 (81.2%), were male, and 225 (55.7%) were between the ages of 18 and 26 years, with a median age of 28 and a range of 18 to 50 years. More than half of the study participants 234 (57.9%) were temporary workers, with 208 (51.5%) working in the woodworking industry. In terms of educational level, 171 (42.3%) of the participants have completed primary school. The majority of the participants, 337 (83.4%), earn between 1001 and 2575 ETB per month, and 196 (48.5%) have 3 to 5 years of work experience (Table 1).

Distribution of workplace injury

In this study, 79 (47.0%) of the total reported 168 (41.6%) occupational injuries in the previous 12 months were injured and experienced more than one occupational injury. According to the study findings, the hands were the body part with the highest frequency of occupational injuries, accounting for 87 (51.8%), while the eyes were the least affected, accounting for 14 (8.3%). The most common type of occupational injury reported were cuts, accounting for 52 (31.0%). Hand tools were the most common causes in this study, accounting for 77 (45.8%). Furthermore, 66 (39.3%) of the participants were hospitalized for a serious injury (Table 2).

Work place and behavioral characteristics

In this study, only 56 (13.9%) of the workers in the small-scale woodworking industry received OSH training. According to the study results, 140 (34.7%) workers were regularly supervised at work. Additionally, 181 (44.8%) workers worked more than 48 hours per week. Furthermore, only 79 (19.6%) of the workers wore PPE, the most frequently used PPE was gloves. All study participants were interviewed for non-use of PPE and reported the most common reasons; 232 (57.4%) were claims of lack of PPE, 360 (89.1%) were claims of being uncomfortable to use (Table 3).

As shown in the graph below, 131 (32.4%) of the workers in the small-scale woodworking industry consumed alcohol, and 72 (53.3%) of these workers used alcohol on a regular basis. Furthermore, the prevalence of Khat chewing was 135 (33.4%), of which 55 (42.0%) always chewed Khat among workers in the small-scale woodworking industry Figure 1.

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Table 1. Socio-demographic characteristics of the workers in the small-scale woodworking industry.

VARIABLES	CATEGORY	FREQUENCY (N)	PERCENTAGE (%)
Gender	Female	76	18.8
	Male	328	81.2
Age	18-29 y	225	55.7
	30-40 y	132	32.7
	>40 y	47	11.6
Educational status	Elementary school	171	42.3
	High school	154	38.1
	College and above	79	19.6
Employment pattern	Permanent	170	42.1
	Temporary	234	57.9
Job category	Wood worker	208	51.5
	Machine operator	109	27.0
	Painter	76	18.8
	Other	11	2.7
Work experiences	1-2 y	81	20.0
	3-5 y	196	48.5
	>5 y	127	31.4
Household monthly income	⩽1000 ETB	67	16.6
	1001-2575 ETB	337	83.4

Abbreviation: ETB, Ethiopian Birr.

Table 2. Characteristics of occupational injury of respondents in the small-scale woodworking industry.

VARIABLES	CATEGORY	FREQUENCY (N)	PERCENTAGE (%)
Frequency of incident at job in last 12 months	One time	89	53.0
	More than one	79	47.0
Part of the body affected	Eye	14	8.3
	Hand	87	51.8
	Leg	43	25.6
	Finger	24	14.3
Type of injury	Abrasion	30	17.9
	Cut	52	31.0
	Burn	14	8.3
	Puncture	12	7.1
	Fracture	37	22.0
	Dislocation	23	13.7

(Continued)

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Table 2. (Continued)

VARIABLES	CATEGORY	FREQUENCY (N)	PERCENTAGE (%)
What were you doing at the time of injury	Operating the machine	62	36.9
	Lifting the heavy objects	44	26.2
	During hammering	27	16.1
	Painting	14	8.3
	During cutting	21	12.5
Causes of injury	Machinery	19	11.3
	Hit by falling objects	30	17.9
	Electricity	3	1.8
	Splintering objects	13	7.7
	Hand tools	77	45.8
	Falls& lifting heavy	23	13.7
	Collision with objects	3	1.8
Time of injury	Morning	63	37.5
	Afternoon	50	29.8
	Evening	55	32.7
Have you hospitalized	Yes	66	39.3
	No	102	60.7

Table 3. Work place and behavioral characteristics of the workers in the small-scale woodworking industry.

VARIABLES	CATEGORY	FREQUENCY (N)	PERCENTAGE (%)
Had OSH training	Yes	56	13.9
	No	348	86.1
Ever been supervised at work place	Yes	140	34.7
	No	264	65.3
Number of hours worked/ week	⩽48 h	223	55.2
	>48 h	181	44.8
Had any work place PPE	Yes	79	19.6
	No	325	80.4
Type of PPE	Gloves	24	30.4
	Ear plug	1	1.3
	Respirators	12	15.2
	Helmet	14	17.7
	Goggles	9	11.4
	Face shield	12	15.2
	Boots	7	8.9

(Continued)

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Table 3. (Continued)

VARIABLES	CATEGORY	FREQUENCY (N)	PERCENTAGE (%)
Lack of PPE	Yes	232	57.4
	No	172	42.6
PPE Not comfortable to use	Yes	360	89.1
	No	44	10.9
Create safety and health hazards	Yes	159	39.4
	No	245	60.6
Had sleeping disorder	Yes	151	37.4
	No	253	62.6

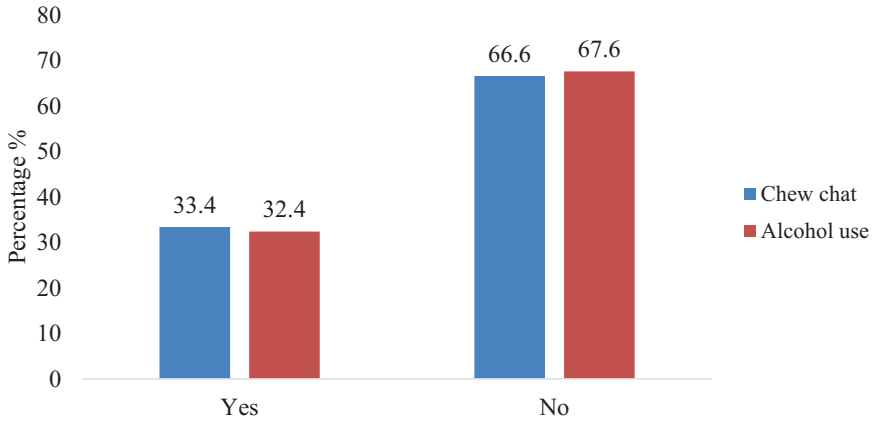


Figure 1. Behavioral characteristics of the respondents in the small-scale woodworking industry of Hawassa city, South Ethiopia, 2020.

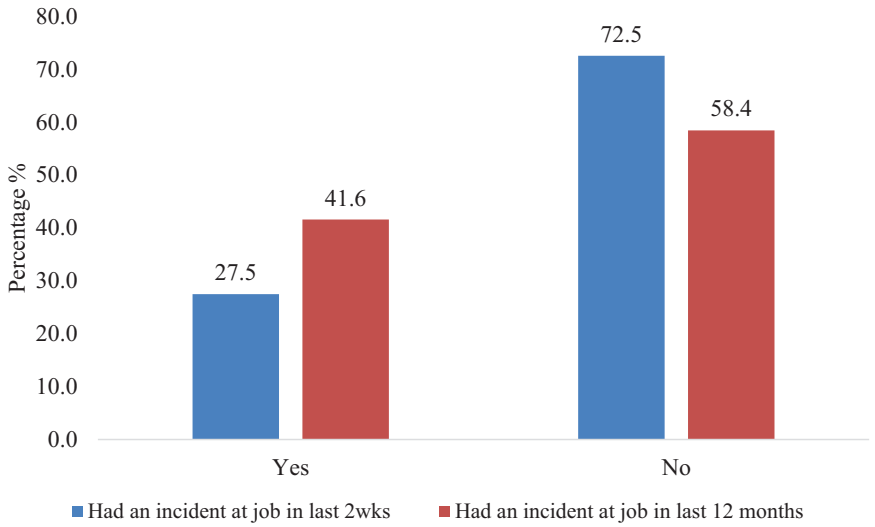


Figure 2. The prevalence of occupational injuries of the respondents in the small-scale woodworking industry of Hawassa city, South Ethiopia, 2020.

Prevalence of work-related injuries

In this study, the prevalence of at least one occupational injury in the previous 12 months among the small-scale woodworking industry in Hawassa city was 168 (41.6%) [95% CI: 36.9-46.4]. Furthermore, 111 (27.5%) of respondents had suffered occupational injuries in the 2 weeks preceding data collection (Figure 2).

Factors associated with work-related injury

Table 4 shows the results of a multivariate logistic regression analysis used to identify risk factors for occupational injuries among woodworking industry workers. After controlling for potential con-founders such as gender, educational status, work experience, employment pattern, occupational safety and health

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Table 4. Bivariate and multivariate logistic regression analysis for work-related injuries among workers in the small-scale woodworking industry.

	WORK RELATED INJURY		COR 95% CL	AOR⁺ 95% CL	*P*-VALUE
	YES	NO			
	NO. (%)	NO. (%)			
Gender					
Female	25 (32.9)	51 (67.1)	1.00	1.00	
Male	143 (43.6)	185 (56.4)	1.6 (0.93, 2.66)	1.4 (0.76, 2.45)	.29
Educational status					
Elementary school	76 (44.4)	95 (55.6)	1.7(0.99, 3.03)	1.4 (0.72, 2.55)	.34
High school	67 (43.5)	87 (56.5)	1.7(0.94, 2.94)	1.4 (0.74, 2.66)	.30
College and above	25 (31.6)	54 (68.4)	1.00	1.00	
Employment pattern					
Permanent	61 (35.9)	109 (64.1)	1.00	1.00	
Temporary	107 (45.7)	127 (54.3)	1.5 (1.00, 2.26)	1.5 (0.99, 2.39)	.056
Work experience (y)					
1-2 y	49 (60.5)	32 (39.5)	3.4 (1.93, 6.19)	2.8 (1.49, 5.22)	.001*
3-5 y	80 (40.8)	116 (59.2)	1.6 (0.97, 2.49)	1.4 (0.85, 2.36)	.184
>5 y	39 (30.7)	88 (69.3)	1.00	1.00	
Number of hours worked/wk					
⩽48 h	75 (33.6)	148 (66.4)	1.00	1.00	
>48 h	93 (51.4)	88 (48.6)	2.1 (1.39, 3.12)	2.2 (1.41, 3.49)	.001*
Occupational safety and health training					
Yes	23 (41.1)	33 (58.9)	1.00	1.00	
No	213 (61.2)	135 (38.8)	2.3 (1.27, 4.02)	2.5 (1.35, 4.75)	.004*
Workplace supervision					
Yes	51 (36.4)	89 (63.6)	1.00	1.00	
No	117 (44.3)	147 (55.7)	1.4 (0.91, 2.12)	1.5 (0.94, 2.45)	.090
PPE use					
Yes	33 (41.8)	46 (58.2)	1.00	1.00	
No	203 (62.5)	122 (37.5)	2.3 (1.40, 3.82)	3.3 (1.85, 5.83)	.001*
Alcohol use					
No	103 (37.7)	170 (62.3)	1.00	1.00	
Yes	65 (49.6)	66 (50.4)	1.6 (1.07, 2.48)	1.5 (0.96, 2.46)	.076

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.
**P*-value <.05.
⁺Adjusted for workers gender, educational status, work experience, employment pattern, occupational safety and health training, workplace supervision, number of hours worked/week, PPE use and alcohol use.

training, workplace supervision, number of hours worked/week, PPE use, and alcohol use, we found that work experience of 1 to 2 years, working more than 48 hours per week, lack of OSH training, and non-use of PPE were factors significantly associated with occupational injury.

In this study, workers who had 1-2 years of work experience [AOR = 2.8, 95% CI: 1.49-5.22] were 2.8 times likely to be injured than those who had more work experience. Workers who worked more than 48 hours per week were 2.2 times [AOR = 2.2, 95%CI: 1.41-3.49] more likely than those who

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worked less than 48 hours per week to suffer an occupational injury. In this study workers who did not receive OSH training [AOR = 2.5, 95% CI: 1.35-4.75] were more likely to sustain work-related injuries than workers who received OSH training. The study participants who did not use PPE [AOR = 3.3, 95% CI: 1.85-5.83] were approximately 3 times more likely to sustain a work-related injury than those who did use PPE.

Discussions

Employees in the small-scale wood processing industries of developing countries are frequently subjected to occupational accidents and are at risk of occupational injuries. In this study, 41.6% of small-scale woodwork industry workers experienced at least one occupational injury in the previous year. The findings of this study were higher than those of a study conducted among small or medium industry workers in Bahir Dar, North West Ethiopia (34.2%)[4] and study conducted in Bale Zone, southeast Ethiopia, among small-scale industry workers (30%).[20] But, lower than the study conducted in Arba Minch Town, Southern Ethiopia among small-scale industries workers (80.8%)[11] and in Mekelle City, Northern Ethiopia (58.2%).[21] Differences in industry setup, machine type, sample size, and worker practices for occupational safety and health could be the cause of inconsistency.

In this study, 51.8% of the injured workers (51.8%) suffered a hand injury. The findings of this study were lower than those of a study conducted among small-scale industry workers in Arba Minch Town, Southern Ethiopia (59.5%)[11] and higher than in a study of small and medium-sized industry workers conducted in Bahir Dar Town, northwestern Ethiopia (22.9%).[4] The variation could be due to differences in industry type, sample size, working environment, and inappropriate and improper use of personal protective equipment.

According to the International Labor Organization (ILO), working more than 48 hours a week is considered excessively long and has a negative impact on workers. Workers who worked more than 48 hours per week were 2.2 times more likely to suffer an occupational injury than workers who worked 48 or fewer hours per week, according to this study [AOR = 2.2, 95 % CI: 1.41-3.49]. The findings of this study were evidenced by findings from other similar studies.[21-25] Long working hours can also reduce workers' capacity, efficiency, and energy, which may increase the risk of occupational injuries, as one possible explanation. Long work hours may also result in injuries as a result of poor decision making and lack of concentration on the job as a result of tiredness or fatigue, as well as a high level of job stress.

Due to a lack of work experience and understanding of workplace hazards, inexperienced workers were more vulnerable to serious non-fatal accidents. Workers with 1-2 years of work experience were 2.8 times more likely to be exposed to work-related injury in this study than those with more work experience [AOR = 2.8, 95% CI: 1.49-5.22]. The findings of this study are consistent with previous research.[26,27] A lack of experience with how to handle and manage various machines, as well as hazards in the workplace, could be one explanation for the increased occurrence of work-related injuries among small-scale woodwork industry workers.

Workers who did not receive occupational safety and health (OSH) training were 2.5 times more likely to develop work-related injuries than those who received OSH training [AOR = 2.5, 95% CI: 1.35-4.75]. The findings of this study were supported by studies conducted in Arba Minch Town, Southern Ethiopia[11] and Towns of Bale Zone, Southeast Ethiopia[20] which found that workers who did not receive health and safety training were more likely to develop occupational injuries. The possible reason could be training teach workers in the small-scale woodworking industry how to recognize and manage different types of hazards in the workplace, as well as how to protect themselves from accidents and injuries. Occupational Safety and Health (OSH) training may also have an impact on changing workers behaviors to ensure that workers follow occupational safety precautions.

PPE used as a physical barrier to prevent occupational accidents and injuries and accidents. In this study, workers who did not use PPE were 3.3 times more likely to be injured on the job than those who did [AOR = 3.3, 95% CI: 1.85-5.83]. The findings of this are consistent with those of other studies conducted in Arba Minch Town, Southern Ethiopia,[11] and Bahir Dar City, Northwest Ethiopia.[4,28] One possible explanation is that workers did not use PPE correctly or consistently to protect themselves from workplace hazards.

Conclusions

The overall prevalence of occupational injuries among workers in the small-scale woodworking industry was high in Hawassa, Southern Ethiopia. Occupational injury was found to be more common among workers with 1 to 2 years of experience, who were not OSH trained, who worked long hours (>48 hours per week), and who did not use PPE. As a result, workers in the small-scale woodworking industry should receive ongoing OSH training, PPE should be provided and monitored, and special consideration should be given to inexperienced workers and workers who work long hours (>48 hours per week).

Author Contributions

This study's authors all made significant contributions. BG, AE, ZA, and MBA designed the study, collected, analyzed, and interpreted the data, and wrote the manuscript. ZA, MB, and AE wrote the manuscript and provided pertinent comments and suggestions on the manuscript. The final manuscript was read and approved by all of the authors.

Availability of Data

Data will be made available by request.

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Ethical Consideration

Both verbal and written consent were considered and supportive letters from Hawassa University and different stakeholders has been secured and also Approval from IRB of the university was secured before the implementation of the research.

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Supplemental Material

Supplemental material for this article is available online.

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