

Occupational Physical Injuries and Associated Factors Among Workers of Bishoftu Automotive Industry, Bishoftu, Ethiopia

Naol Hunduma Tolera^{1, *}, Dufera Rikitu Terefa²

¹Department of Public Health, Adama Hospital Medical College, Adama, Ethiopia

²Department of Public Health, Institute of Health Sciences, Wollega University, Nekemte, Ethiopia

Email address:

naolhunduma5254@gmail.com (N. H. Tolera), duferarikitu24@gmail.com (D. R. Terefa)

*Corresponding author

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Abstract: *Background:* Occupational injury is an unintentional personal physical injury resulting from occupational accidents. It is a major public health problem resulting in serious social and economic consequences that could potentially be prevented. However, evidence on occupational physical injury among automotive industry workers in the country; particularly in the study area was scanty. Hence, this study was aimed to assess the prevalence of occupational physical injuries and associated factors among workers of the Bishoftu automotive industry, Bishoftu, Ethiopia. *Methods:* Institutional-based cross-sectional study design was employed to assess the prevalence of occupational physical injury among workers of the Bishoftu automotive industry from December 15 to 30, 2019. Data was collected from 477 randomly selected participants and analyzed using Statistical Package for Social Sciences version 25. Multi-variable logistic regression analysis was performed to identify predictors of occupational injuries and all variables with P-value at <0.05 and an Adjusted Odds Ratio (AOR) with 95% CI were used to declare the predictors of the outcome variable. *Results:* The prevalence of occupational physical injury among Bishoftu automotive industry workers within the last 12 months was 29.4% (95% CI: 25.2, 33.9). Abrasion 50 (39%), cut 34 (26.6%) and puncture 19 (14.8%) were the most common types of injuries; and of which hands 54 (42.2%), head 22 (17.2%), legs 20 (15.6%) and eyes 19 (14.8%) were the most commonly affected body parts. Workers with low monthly income [AOR: 3.03, 95% CI (1.25, 7.36)], sleeping disorders during working time [AOR: 5.40, 95% CI (2.30 – 9.40)], without Personal Protective Equipment (PPE) during working time [AOR: 14, 95% CI (7.71, 25.63)] and working greater than forty-eight hours per week [AOR: 2.40, 95% CI (1.40, 7.14)] were factors significantly associated with occupational injury. *Conclusion:* Low monthly income, sleeping disorders, not using PPE and engaging in work for greater than forty-eight hours were major predictors of occupational injury. Hence, decision makers, policy designers, implementers, and managers of an industry should have to give due attention toward effective implementation of injury prevention policies, regulations and strategies; provision of adequate and quality PPEs and effective utilization of PPE is needed.

Keywords: Automotive Industry, Occupational Injury, Physical Injury, Ethiopia

1. Introduction

The automotive industry is currently the major industrial and economic forces across several economies in the world. It originated in Germany and France and recently, China has become a leader in the industry [1]. Also, currently industries are expanding in Ethiopia for the achievement of the Agenda of Sustainable Development Goals (SDGs), but it has its own

externalities (negative externalities) for the workers in the industry [2]. Of these, occupational injury is one of its externalities for the workers.

Occupational injury is an unintentional personal physical injury resulting from an occupational accident. It is also an unexpected and unplanned occurrence, including acts of different violence, which arise out of or in the course of work in which workers are injured while an occupational disease is

a disease contracted as a result of exposure over a period of time to risk factors arising from work activities [3, 4].

Ethiopia had favorable policy and regulatory frameworks regarding Occupational Safety and Health and had even ratified several, around 20, International Labor Organization (ILO) conventions in 1981 (No. 155). The ministry of Labor and Social Affairs of Ethiopian is the government body responsible for supervising the labor administration, working conditions, occupational safety and health according to Labor Proclamation No. 377/2003 [5]. However, it's monitoring systems and laboratory investigations were inadequate.

Occupational safety and health service at the workplace is to provide preventive measures and advisory roles for assisting employers, workers and their representatives in establishing and maintaining a safe and healthy working environment [6]. Although a lot of attempts have been made to reduce occupation-related morbidities and mortalities, still now it is one of the leading major public health problems in developed and developing countries globally [7], particularly in Sub Saharan African (SSA) countries of which Ethiopia is among them [8].

Working in the industry is associated with potential risks and hazards which are categorized under occupational, environmental and public health. Every day, thousands and hundreds of thousands of workers were died and suffered from permanently disabling injuries respectively due to work-related accidents around the globe [3].

According to international labor organization (ILO) and World Health organization (WHO), report, around 2.3 million, 317 million and 160 million work-related deaths, work-related accidents or injuries and non-fatal work-related diseases occurred each year. Of the deaths that occurred, over 2 million and 350,000 deaths were due to fatal work-related diseases and accidents respectively. This estimate also implies that every day nearly 860,000 and 6,400 people were injured at work and died respectively [9, 10]. The risk of having work-related injury was almost 20 times higher in developing countries including Ethiopia than that of developed countries [7, 8, 11].

Also, in the country, only about 5-10% of workforces had access to occupational health services and lack safe working conditions. Due to this, a majority of them faced work-related occupational injuries [12].

In Ethiopia, different studies have been conducted to assess the prevalence of occupational injury and associated factors on different industries work forces. Particularly; in Addis Ababa on large-scale metal manufacturing industries [13] and among construction workers [14]; in southern region on small scale industries [11] and Etab soap and detergent factory [12] and in the Northern parts of the country on textile share company [15] workers. In the studies; employment patterns, job satisfactions, alcohol consumption, smoking, sleep disorders, utilization of personal protective equipment, working hours per week, work safety trainings, work experiences, work schedules, daily supervisions, pollution and occupational safety were the most important factors being assessed for the existence of an injury [8].

However, as far as the knowledge of the researchers is concerned, there was no study conducted on occupational physical injury among automotive industry workers in the country, particularly in the study area, Bishoftu, Oromia region. So, the study aimed to assess the prevalence of occupational physical injury and associated factors among workers in the Bishoftu automotive industry.

Therefore, these findings will help policy makers and program planners of occupational health and safety in order to inform, plan, implement and evaluate health policies and strategies which are vital for preventing an occupational injury in the industrial areas of the countries.

2. Materials and Methods

2.1. Study Area and Period

The study was conducted in Bishoftu town, Oromia regional state, Ethiopia from December 15 to 31, 2019. The town was located 50 km in the west direction of the big zonal town, Adama, and 47 km in the south-east direction of the capital city of Ethiopia, Addis Ababa.

Bishoftu automotive industry is one of the manufacturing industries found in the town and which was established in 1999. It was incorporated in the metals and engineering corporation in 2010. The total number of employee in the industry at the time of the study was 2252, of which 1850 were directly engaged in the production process and 402 of them were not directly engaged in the productions process. The main productions of the industry were assembling city buses, tractors, dumb trucks, assembling pick-ups, cross-country buses, and Super Urban Vehicles (SUVS), and the main services given were overhauling of tanks and armored personnel carriers. The industry has six different factories: Vehicle system production factory, commercial bus production factory, light pickup production factory, engine and power production factory, vehicle body and frame production factory, light military vehicles and heavy duty truck production factory. The industry has one health center [16].

2.2. Study Design and Population

2.2.1. Study Design

The institutional-based cross-sectional study design was conducted among workers of the Bishoftu automotive industry, Bishoftu, Ethiopia, 2019.

2.2.2. Population

All workers of the Bishoftu automotive industry who were engaged in the production process were the source population and those randomly selected participants from those who were directly engaged in the production process were the study population for this study.

All workers who were directly engaged in the productions process in the industry in the last one year and more were included in the study. Administrative and supportive staffs or workers; workers who were from other industry for a short

period of time for training, practices, transferring technology and those who were on sick, annual, maternity, and family leaves during the data collection period were excluded from the study.

2.3. Sample Size and Sampling Techniques

2.3.1. Sample Size

The sample size was determined by using a single population proportion formula with prevalence of 68.3% [17]; by considering 95% degree of confidence level ($Z_{\alpha/2}=1.96$), 4% margin of error (d), 10% non-response rate and since the source population (N=1850) were less than ten thousand, finite correction formula was used. Finally, the calculated sample size yielded 447 respondents. The calculated sample size was proportionally allocated to each production factory based on the number of workers engaged in each production factory in the industry.

2.3.2. Sampling Techniques

From the beginning, lists of workers who were engaged in the production process in each of the production factories (departments) were obtained from human resource personnel of the industry. Then, the sample size was proportionally allocated to each production factory based on the number of workers engaged in each production factory in the industry.

Following these procedures, number of respondents and sample size allocated for each production factory were indicated as follows: PF1 (N=323, n=78), PF2 (N=315, n=76), PF3 (N=336, n=81), PF4 (N=379, n=92), PF5 (N=289, n=70), PF6 (N=208, n=50). Where PF, N and n were referred to production factories, source population and sample size, respectively.

Finally, study subjects were selected by a simple random sampling technique based on the allocated sample size from each factory. Every selected respondent was approached and interviewed after obtaining consents. When the recruited participants were not available, the next participants from the list were selected.

2.4. Measurement and Variables

Occupational injury among workers of Bishoftu automotive industry was the dependent variable, whereas various variables described in three main sections such as; socio-demographic and economic factors (age, sex, religion, marital status, educational status, working experiences, employment condition and monthly salary), working environmental factors (availability of PPE, health and safety trainings, hours worked per week, health and safety supervision) and behavioral factors (smoking, alcohol, use of PPE, job satisfaction) were the independent variables.

2.5. Operational Definition

Occupational Injury: Any physical injury condition experienced by the workers in connection with the performance of his/ her work in the last one-year period but does not include work-related diseases that need exposure

assessment or laboratory tests and doctoral examination. It was measured by the close-ended question as “Have you been physically injured in the last one year at least once?” (Yes/No). Those participants who have encountered an injury answered as “Yes” and those who have not encountered an injury answered as “No” to the question [4].

Personal Protective Equipment’s (PPEs): Utilization of the worker-specialized clothing or equipment worn by employees for protection against health and safety hazards at the time of interview and were checked by observation. Personal protective equipment was designed to protect many parts of the body, that include eyes, head, face, hands, feet, and ears [15].

Work Place Supervision: Regular supervision made on occupational health and safety by responsible bodies from external or internal in the factory.

Job Satisfaction: It is any combination of psychological, physiological, and environmental circumstances that cause a person to truthfully say “I am satisfied with my job”. It is a subjectively perceived response of the study participant to their job [15].

Khat Chewing: An employee chewing khat (a mild psychoactive substance) three times a week for at least one year.

Cigarette Smoking: An employee who has smoked at least one cigarette per a day for at least six months.

Sleeping Disorders: The presence of sleeping problems (due to difficulty in initiating sleeping at night, sleeping poorly at night, sleep insufficiency, and insomnia symptoms) which disturb them when workers were at their work place in the industry [15].

2.6. Data Collection and Procedures

A semi-structured interviewer administered a pre-tested questionnaire by face-to-face interviewing of the respondents and was employed from December 15 to 30, 2019. The questionnaire was adapted by a review of different literature [12, 14, 18]. Prior to the actual data collection, the questionnaire was pre-tested in the Dejen aviation industry on 5% (23) of the total sample, then after the results were discussed, and some modification and correction have been made accordingly. Data was collected by two experienced health professionals who had a college diploma and were proficient in both languages (Afan Oromo and Amharic). Both data collectors and supervisor were trained for two days on the data collection questionnaires, study procedures, and research ethics.

The data collection processes were implemented in such a way that data collectors approached every respondent after obtaining consent. The overall data collection processes were monitored and supervised by one health professional who had a qualification of Bachelor of Science degree in occupational health and who was proficient in both languages.

2.7. Data Processing and Analysis

Collected data were checked for completeness and

consistency. Data were entered into Epi-Data version 3.1 and exported to SPSS version 25. Data cleaning was also conducted after data entry by running frequencies. Duplicated records were removed from SPSS. Coding and recoding of variables were performed in the preparation for analysis.

Descriptive statistics such as frequencies and percentages were utilized. Then, data were presented using tables and graph. Multivariate logistic regression was performed to identify the potential predictors of occupational physical injury. All variables with P-value less than 0.25 in the bi-variable logistic regression analysis were entered into a multi-variable model and run by the backward stepwise variable selection method with probability of removal of 0.10 and a p-value of less than or equals to 0.05 and an Adjusted Odds Ratio (AOR) with 95% CI were used to declare the predictors of the outcome variable. Finally, fitness of the model was checked by using Hosmer and Lemeshow's goodness-of-fit test.

2.8. Ethical Consideration

The study was conducted after appropriate research ethical clearance was obtained from the ethical review Board of Adama Hospital Medical College. Study permission or support letters were also obtained from the Bishoftu automotive industry, which were written to each department in the industry. This study was conducted in accordance with the Declaration of Helsinki. All study participants were well-informed about the aim of the study, benefits and risks. Following this, informed written consent was secured from study participants. Study participants' confidentiality was maintained. No personal identifiers were used in the data collection tools and codes were used in place of it. Data were kept in protected and safe locations.

Paper-based data were kept in a locked cabinet and computer-based data were password-secured. The recorded data were not accessed by a third person, except the research team. Data sharing was enacted based on the consent and permission of research participants and the ethical and legal rules of data sharing.

3. Results

Out of the total study participants (n=447), 436 participated in the study with a response rate of 97.5%.

3.1. Socio-demographic and Economic Characteristics of the Participants

Of the study participants, three hundred three (69.5%) were males. The mean age of the respondents was 26 years (SD=5.8 years) and with the majority of the respondents age, three hundred five (70%) ranging from 21 to 30 years old. Majority of the respondents were Orthodox Christian religion followers (49.5%), single in their marital status (60.8%) and graduated from vocational and technical school (47.2%). Concerning their working

experience, 228 (52.3%) of the respondents had an experience of one to three years. Regarding their employment patterns, 317 (72.7%) of the respondents were permanently employed and 119 (27.3%) were temporarily employed. Regarding their monthly salary, almost half, 210 (48.2%) of the respondents were earned between 2501-4500 ETB (Table 1).

3.2. Work Environment Related Factors and Utilization of PPE

Concerning work environment-related factors; 345 (79.1%) of the respondents were working less than or equal to 48 hours per week while 91 (20.9%) were working greater than 48 hours per week. The majority, (73.6%) of the respondents were not regularly supervised at their work place and 186 (42.7%) of the respondents had no training on occupational safety. Regarding personal protective equipment, 327 (75%) of participants used personal protective equipment all the time. Concerning the reason not to use personal protective equipment, 42 (38.6%) of the participants replied that PPE was not comfortable to use (Table 2).

3.3. Behavioral Factors

Regarding the behavior of the respondents, 20 (4.6%), 31 (7.1%) and 96 (22.0%) of them were used to drink alcohol, smoke cigarette and chew khat respectively. Thirty-nine (8.9%) of the respondents were challenged with sleeping during the working time and 258 (59.2%) of them were dissatisfied with their work (Table 3).

3.4. Prevalence of Occupational Injuries

Of the study participants, 128 (29.4%) were experienced occupational injuries in the last 12 months. From injured participants; the most commonly affected body parts were: hand 54 (42.2%), head 22 (17.2%), leg 20 (15.6%) and eye 19 (14.8%). Of the study participants, 128 (29.4%) were experienced occupational injuries in the last 12 months. From injured participants; the most commonly affected body parts were hand 54 (42.2%), head 22 (17.2%), leg 20 (15.6%) and eye 19 (14.8%). With regard to specific days of injuries; majority of the respondents were injured on Monday 50 (39%) followed by Tuesday 34 (26.6%) and most of them were injured in the afternoon 76 (59.4%). In this study, the injury was caused by varied objects. Of these, 78 (60.9%), 15 (11.7%) and 13 (10.2%) of them were majorly caused by machineries and hand tools, hit by falling objects and acid and hot substances respectively (Table 4).

With respect to the types of injuries; abrasions 50 (39%), cuts 34 (26.6%), punctures 19 (14.8%) and eye injuries 16 (12.5%) were the most common types of injuries reported by participants (Figure 1).

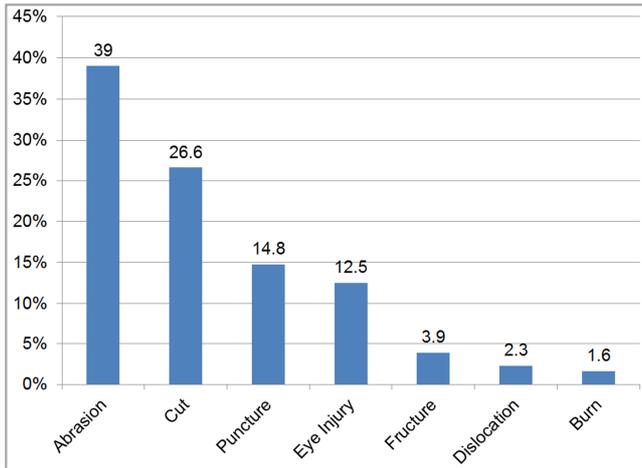


Figure 1. The commonest type of injuries among workers of the Bishoftu automotive industry, Bishoftu Town, Ethiopia, December 2019 (n=128).

3.5. Factors Associated with Occupational Injuries

In order to identify factors associated with occupational injury, bi-variable and multivariable logistic regression analysis were conducted. From socio-demographic and economic variables; educational status and monthly salary;

work environment and utilization of PPEs; use of PPEs and working hours per week and from behavioral factors sleeping disorder were the candidate variables on binary logistic regression analysis for multivariable logistic regression. When adjusted, the variables such as monthly salary, use of PPEs, working hours per week and sleeping disorders were statistically associated with occupational injuries in multiple logistic regression analysis after controlling possible confounders (Table 5).

According to this study finding, respondents whose their monthly salary ranged from 2501-4500 were three times more likely to encounter an injury when compared to those whose their monthly salary were greater than 4500 birr [AOR: 3.03; 95% CI (1.25, 7.36)]. Likewise, respondents who had sleeping disorders during working time were five times more likely to encounter an injury than those without sleeping disorder [AOR: 5.40; 95% CI (2.30, 9.40)]. Workers without PPE during their working time were fourteen times more likely to encounter an injury than workers who used PPEs [AOR=14; 95% CI (7.71, 25.63)]. Participants who were engaged to work greater than 48 hours per week were 2.4 times more likely to encounter injury compared to those who were engaged to work for less than or equals to 48 hours per week [AOR: 2.40; 95% CI: (1.40, 7.14)] (Table 5).

Table 1. Socio-demographic and economic characteristic of the study participants among workers of Bishoftu automotive industry, Bishoftu Town, Ethiopia, December 2019 (N=436).

Variables	Frequency	Percent	
Sex	Male	303	69.5
	Female	133	30.5
Age in years	≤ 20	56	12.8
	21-30	305	70
	31-40	63	14.4
	>41	12	2.8
Religion	Orthodox	216	49.5
	Muslim	80	18.3
	Protestant	126	29
	Wakefata	11	2.5
	Catholic	3	0.7
Education status	Can read and write	33	7.6
	Primary school (1-8)	52	11.9
	Secondary school (9-12)	104	23.9
	Technical and vocational school graduated	206	47.2
	Degree and above	41	9.4
Work experience	1-3 years	228	52.3
	4-5 years	68	15.6
	>6 years	140	32.1
Employment pattern	Permanent	317	72.7
	Temporary	119	27.3
Monthly salary in birr	<1400	4	0.9
	1401-2500	127	29.1
	2501-4500	210	48.2
	>4500	95	21.8

Table 2. Work environment-related factors and utilization of PPE of the study participants among workers of Bishoftu automotive industry, Bishoftu Town, Ethiopia, December 2019 (n=436).

Variables	Frequency	Percent
Working hours per week		
<48 hours	345	79.1
>48 hours	91	20.9
Work place supervision		
Yes	115	26.4
No	321	73.6
Safety training in the working area		
Yes	250	57.3
No	186	42.7
Use of PPE all the time		
Yes	327	75
No	109	25
Reason for not using PPE all the time (n=109)		
Lack of PPE	32	29.4
Lack of awareness	35	32.1
Not comfortable to use	42	38.5

Table 3. Behavioral factors of the study participants among workers of the Bishoftu automotive industry, Ethiopia, 2019 (n=436).

Variables	Frequency	Percent
Drinking alcohol		
Yes	20	4.6
No	416	95.4
Smoking cigarette		
Yes	31	7.1
No	405	92.9
Chewing khat		
Yes	96	22
No	340	78
Sleeping disorder		
Yes	39	8.9
No	397	91.1
Job satisfaction		
Yes	178	40.8
No	258	59.2

Table 4. Most commonly affected body parts of the study participants among workers of the Bishoftu automotive industry, Bishoftu Town, Ethiopia, December 2019 (n=128).

Variables	Frequency	Percent
Occupational injuries in the last 12 months		
Yes	128	29.4
No	308	70.6
Affected body parts		
Hand	54	42.2
Head	22	17.2
Eye	19	14.8
Leg	20	15.6
Other body parts*	13	10.2
Days of injuries		
Monday	50	39
Tuesday	34	26.6
Wednesday	12	9.4
Thursday	21	16.4
Friday	6	4.7
Saturday	3	2.3
Sunday	2	1.6
Time of injuries		
Morning	24	18.7
Afternoon	76	59.4
Evening	23	18
Mid night	5	3.9
Causes of injuries		
Machinery and hand tool	78	60.9
Hit by falling objects	15	11.7

Variables	Frequency	Percent
Acid and hot substance	13	10.2
Collusion with objects	10	7.8
Other ** 12		9.4

*Back, chest, hip, ear and poly trauma; **electricity, vehicles

Table 5. Multi-variable analysis results of occupational injuries of the study participants among workers of Bishoftu automotive industry, Bishoftu Town, Ethiopia, December 2019 (n=436).

Variables	Occupational injury		OR [95% CI]	
	Yes (%)	Yes (%)	COR	AOR
Educational status				
Can read and write	5 (15.2)	28 (84.8)	0.89 (0.54, 1.47)	0.90 (0.47, 1.72)
Primary school (1-8)	16 (30.8)	36 (69.2)	0.35 (0.12, 0.99)	0.85 (0.23, 2.89)
Secondary school	35 (33.7)	69 (66.3)	0.48 (0.2, 1.14)	0.55 (0.17, 1.81)
Technikinacl and vocational	64 (31)	142 (69)	0.88 (0.43, 1.79)	0.66 (0.26, 1.70)
Degree and above	8 (19.5)	33 (80.5)	1	1
Monthly Salary				
<1400	1 (25)	3 (75)	1.87 (1.04, 3.39)	2.05 (0.92, 4.60)
1400-2500	45 (35.4)	82 (64.6)	1.43 (0.14, 14.52)	0.75 (0.41, 13.89)
2501-4500	64 (30.5)	146 (69.5)	2.35 (1.25, 4.40)	3.03 (1.25, 7.36)**
>4500	18 (18.9)	77 (81.1)	1	1
Sleeping disorder				
Yes	17 (43.6)	22 (56.4)	2.50 (1.26, 5.98)	5.40 (2.30 – 9.40)**
No	111 (28)	286 (72)	1	1
Use of PPE				
Yes	55 (16.8)	272 (83.2)	1	1
No	73 (67)	36 (33)	10.03 (6.13, 16.42)	14 (7.71, 25.63)**
Working hours /week				
<48 hours	70 (20.3)	275 (79.5)	1	1
>48 hours	58 (63.7)	33 (36.3)	6.91 (4.18, 11.40)	2.40 (1.40, 7.14)**

COR: Crude Odd Ratio, AOR: Adjusted Odd Ratio, **P-value<0.05, and 1=reference

4. Discussion

Globally, occupational injuries are not only public health challenges. It is also both public health burden and economic burden in both developed and developing countries [8, 13, 18]. A variety of studies has been conducted among workers of different industries on occupational injury which verified the intensity was high in developing countries in which Ethiopia is one among them [8]. However, nothing has been conducted on occupational injuries among workers of the automotive industries in our setup. Hence, this industry-based cross-sectional study aimed to determine the prevalence of occupational injuries and identified associated factors as it is essential in the development of injury prevention strategy in the industrial areas, automotive industry of Ethiopia.

Accordingly, the finding revealed that the overall prevalence of occupational physical injuries in the last 12 months was 128 (29.4%) (95 CI: 25.2, 33.9). This finding was almost similar with a study done on occupational injuries, illness and fatalities to automotive service technicians in Chicago, (34.9%) [19], and workers of the Federal Democratic Republic of Ethiopia (FDRE) metal and engineering corporation (METEC), 27% [20]. However, it was lower than the study conducted on that of the workers in an Indian automobile repair workers, 63% [21]; Egyptian construction building workers, 46.2% [17]; Ghana automotive company workers, 64% [22] and also lower than

different studies conducted in some regions of the country, Ethiopia, like which was conducted on; large scale metal manufacturing industries, 48.9% [13], large-scale metal manufacturing factories, 49.9% [18] and construction workers, 84.7% [14] of Addis Ababa city; Bahir Dar Textile Share Company, 42.7% [15] of Amhara Region; Etap soap and detergent factory, 38.1% [12] in Hawassa of South nation nationality and people's Region; Ethiopian hotel industry, 37.9% [23] and systematic review and meta-analysis conducted on occupational injury and its associated factors in Ethiopia, with the pooled prevalence of 44.66% [8]. The discrepancies might be due to the difference in nature of industries, health and safety regulations, utilization of occupational safety procedures and effective injury prevention systems, working environment and worker's behavior.

With respect to the types of injuries; abrasions 50 (39%), cuts 34 (26.6%), punctures 19 (14.8%) and eye injuries 16 (12.5%) were the most common types of injuries reported by participants, which was supported by study done in Egypt and some of the studies conducted in Ethiopia [12, 15]. From injured participants; the most commonly affected body parts were hands 54 (42.2%), head 22 (17.2%), legs 20 (15.6%) and eyes 19 (14.8%). This finding was in line with different studies conducted in developing countries [14, 15, 17, 18]. This might be due to the fact that, in most of the cases, they might have used manually operating tools.

According to this finding, workers with low monthly

income, sleeping disorders, those who did not use PPEs during working times and worked more than 48 hours per week were factors significantly associated with occupational injury. These findings revealed that employees with low monthly income were more likely to be injured compared to workers earning a high monthly salary per month. This finding was in line with the study conducted in America [24]. The reason might be explained as higher payment is related to high experience and higher educational status, which might have an impact on effective utilization of different injury prevention strategies or mechanisms among skilled or experienced workers unlike to that of unskilled individuals in the industries. Also, similar to the study conducted in Ethiopia, among construction workers in Addis Ababa [14]. This might be due to similarity in socio-economic status.

Regarding sleep disturbances, the study showed that workers who have sleep disturbances such as difficulty in initiating sleeping at night, sleeping poorly at night, sleep insufficiency, and insomnia symptoms were five times more likely to encounter an injury than workers without sleeping disorders. This result has shown similarity with a study done by different scholars among textile factory workers in Amhara regional state, Ethiopia [6], Kombolcha Textile Factory, and Ethiopian hotel industry [23]. This might be due to the fact that sleeping disorder might affect healthy life, healthy thinking and mental problems which in turn could affect the ability to maintain wakefulness, concentration, ability to focus in focusing in the work environment and working conditions and performing activities safely. Whereas, the current study finding was in contrast to the study done among construction building workers in Egypt [17]. This might be due to the difference in behavior of the study participants.

Respondents who did not use Personal Protective Equipment (PPE) were more likely to encounter an injury than workers who used PPE during working time. This finding was different from a study done on construction building workers in Egypt [17] and occupational health risks and hazards among the Fisherfolk in Kenya [22]. This might be explained by the fact that there is a difference in the characteristics of the study participants and nature of the industries on which the study has been conducted with regard to utilization of PPEs.

However, the study finding was consistent with different studies conducted by different scholars on different industries at different time in Ethiopia's different regions, such as the study conducted on: large-scale metal manufacturing industries [13], construction workers in Addis Ababa [14], large-scale metal manufacturing factories in Addis Ababa [18], Etab soap and detergent factory Hawassa [12] and also supported by a systematic review and meta-analysis conducted on occupational injury and its associated factors in Ethiopia [8]. This might be explained by the fact that the proper utilization of PPEs reduces the occurrence of unexpected occupational injuries in different factories, and this could be the same for workers in automotive industries even if there were no similar studies to make comparisons boldly in our set up. Due to these reasons, utilization of

personal protective equipment's a very important factor for the prevention of occupational injuries in the automotive industries of Ethiopia, the Bishoftu automotive industry in particular. Concerning the reason not to use personal protective equipment, almost four out of ten workers replied that PPEs were not comfortable to use. This could be due to the lack of adequate induction, orientation and on-job trainings regarding its advantage and mental readiness during recruitment and selection of workers.

Regarding working environment-related factors, workers who were engaged to work 48 hours or more per week were two times more likely to be injured than workers who spend their time at the work place for 48 hours and less. This finding was consistent with a study conducted on occupational health and safety among vehicle repair workers in Ghana [22] and construction building workers in Addis Ababa [17]. Also, this finding was supported by different studies conducted on various industries in Ethiopia [8, 13, 14]. This might be due to excessive tiredness connected to such a relatively long work hours as a result of working for additional payments after they have finished their daily quotas.

This study had its own limitations. Firstly, we have used a cross-sectional study design using questionnaire-based interview to assess the prevalence of injury in the last year period, which could prevent identification of causal factors for work-related injury or illness and the ability to determine whether reported health conditions existed before or resulted from work-related injury or illness. Secondly, as responses were self-reported, the findings might also be subject to recall and social desirability biases, which could result in differential recall of more severe or recent events. Thirdly, those on leave due to injury were excluded from the sample. Thirdly, people might be hesitant to disclose truth for some responses in face-to-face interviews (like non availability of PPE from the management) even though confidentiality was assured and excluding people not completed one year service from the sample could be a source of bias in estimating injury prevalence if newly recruited are more likely to be injured due to less-trainings. These might have underestimated or overestimated the findings.

5. Conclusion

The study finding showed that the overall annual prevalence of occupational physical injury in the last 12 months among workers of the Bishoftu automotive industry was high. Abrasions, cuts and punctures were the most common types of injuries; and of which hands, head and legs were the most commonly affected body parts. Machinery and hand tools were the two major causes of these injuries. Workers with low monthly income, sleeping disorders, those who did not use PPEs during working times and worked more than 48 hours per week were significantly associated with occupational injuries.

Therefore, our finding calls up decision makers, policy designers, implementers, and managers of an industry to pay due attention toward effective implementation of injury

prevention policies, regulations and strategies; provision of adequate and quality PPEs and promotion of utilization of PPEs are needed.

Also, inductions, orientations, on and off-job trainings on occupational health and safety as well as practicing work shifts or rotations in order to reduce consecutively prolonged duration of working hours and minimization of sleeping disturbances are recommended.

Beside this, further studies needed to be conducted to determine the economic burden of occupational injury.

Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Disclosure

All the authors do not have any possible conflicts of interest.

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