Occupational Injury and Factors Associated among Employees in Heineken Brewery Share Company, Harar Brewery Share Company, and Awash Wine Share Company, Ethiopia

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Abstract

Occupational injury is a serious global public health issue that causes morbidity, disability, and fatality at work. The food and beverage processing business has the most significant rate of occupational injuries, making it the most dangerous occupation among industrial industries. Various labor hazards have been reported to beverage workers. Against this background, the objective of the research was to assess the magnitude and predictors of occupational injury among employees in the beverage industry in Harar and Addis Ababa, Ethiopia. A cross-sectional descriptive study was conducted at a beverage factory, with 675 respondents chosen randomly. Qualitative data was collected through interviews with key informants. The data was analyzed using Epi-Data statistical software and SPSS. Multiple logistic analysis, descriptive analysis, binary logistic, and crude logistic regression analysis were used. A p-value of less than 0.05 was considered statistically significant. The occupational injury rate is 20.9%, with fingers and hands being the most common type of trauma. Sleeping difficulties, contract employment status, and technical field work are associated with injuries. 28-34-year-olds are 55% less likely, and one year of experience is 85% less likely. Challenges include inconsistent safety measures and a lack of organizational commitment, especially for contract workers. The prevalence of occupational injuries among beverage industry employees was high. Technical departments, contract employment, and the prevalence of sleeping problems were revealed to be risk factors for occupational injuries. At the same time, one year of experience and the age range of 28–34 were found to be protective. Among the study participants, difficulties such as poor use of personal protective equipment and a lack of a consistent supply of personal protective equipment were noticed. As a result, firms must increase occupational safety measures, such as providing and replenishing personal protective equipment, focusing on contract employees.

Keywords: *Beverage Industry, Employees, Occupational Injury, PPE, Working Hour*

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Introduction

Background of the Study

Occupational injury is a problem associated with the engagement of citizens in any working environment. There is no area of work devoid of occupational injury and health problems. According to the Journal of Occupational & Environmental Health of 2014, there was a 2.9 billion economically active population and a report of four or more days of absence because of occupational injury by 6.03 million people. According to the International Labor Organization (ILO), there are 317 million occupational injuries and 320,580 fatal injuries. Fatal work-related disease was reported as 2.02 million, and total work-related mortality was 2.3 million. Its magnitude is higher in the developing than in the developed world (Takala *et al*., 2014).

Occupational injury and safety are crucial concerns in both worlds to control factors related to occupational hazards. The aim of occupational health and safety is to eliminate or control the effects of hazards in the workplace. An industry that pays attention to occupational health and safety measures can dramatically reduce injury occurrence (Takala *et al*., 2014). Currently, most occupational injuries are not adequately documented and reported, as awareness among employees is low, and companies neglect some of the incidents reported (Hse, 2008).

The hazard of occupational injury varies from sector to sector; agricultural, fishing, and forestry are the leading sectors in the developing world, while it is highest in the construction sector in the developed world. The manufacturing industry is associated with spine, hand, and wrist injuries (J.M Stellman, 1998).

The beverage manufacturing industry has two categories: alcohol and non-alcohol. The subgroups of the latter category encompass soft drinks, water bottling, fruit, juice bottling, caning, boxing, the coffee industry, and the tea industry. In contrast, the former subgroups are distilled spirit, wine, and brewing (J.M Stellman, 1998).

Though the ingredients and product types of the various beverage industries may differ, they share many characteristics. The work process involves using raw materials as input by an industry that employs both unskilled and semi-skilled laborers whose understanding of safety issues is limited, resulting in increased occurrences of occupational-related illness (Jeanne Mager Stellman, 1998).

The most commonly encountered injuries in beverage manufacturing are related to car accidents while transporting raw materials and products. Another common type of injury is associated with the use of chemicals for sanitizing bottles and treating wastewater plants. Chemical poisoning of employees and the environment is also another hazard during production. Moreover, slippery floors and working from high areas are among the factors causing occupational injury as they expose the sector's employees to the risk of falls and accidents (Dagnan, 2014).

This study has attempted to disclose the magnitude of occupational injury and its predictors among the employees in some beverage industries, ultimately informing concerned bodies to take prompt and sound public health measures to avert the problems.

Statement of the Problem

The emphasis on industrialization by the government of Ethiopia in its new transformation plan has resulted in many domestic and external industries flourishing, creating a massive demand for a workforce and new employment areas. Many work-related injuries have emerged as major public health problems. Employees spend a substantial amount of their time in the workplace, and if the workplace is not conducive and employees do not have the appropriate level of awareness about their work and its related potential for injury, the risk has the highest probability of increasing. As the occurrence of occupational injury is not controlled, it causes fatality and disability and reduces productivity as well. It also increases compensation-related costs (ILO, 2014).

The 2014/2015 national labor statistics reported 5135 cases of work-related accidents and 43 fatal accidents from 12 regions and the federal reporting industry in Ethiopia. Though there are reporting problems, the figure mentioned is significant and shows a public health concern. From the distribution point of view, companies in Oromia take a more significant number, 2742, which is 53.4%, followed by Amhara with 987 (19.22%), and Addis Ababa has a share of 433(8.43%) (International Labour Office & Somalia; Federal Democratic Republic of Ethiopia, 2013). The highest magnitude of fatality is reported in the manufacturing industry. The brewing industry has a lot of production workers and problems related to the working area that have yet to be explored independently in Ethiopia, and there is only one study in Africa and Zimbabwe at two plants in Harare.

The research examines occupational health-related injuries among employees in a Rwandan brewery factory. It highlights the importance of occupational health, the types of injuries, the safety measures used, and the factors influencing their use. The study emphasizes addressing occupational health risks to prevent injuries and improve working conditions. The research suggests that improving safety measures, increasing awareness of occupational health risks, and addressing factors like alcohol consumption and job satisfaction can reduce employee injury prevalence (Mbonigaba, 2015).

Though much is said about the magnitude of occupational injuries in various sectors like construction, agro-industry, small and medium-scale manufacturing, and textile industries in Ethiopia, to the researcher's knowledge, no single study has been carried out in the beverage industry.

This study aims to determine the extent of occupational injury and the factors contributing to its occurrence in a subset of the beverage industry (Heineken Breweries SC, Harar Brewery SC, & Awash Wine SC) in Addis Ababa and Harar. It also aims to pinpoint the key issues that impact industry workers' general welfare and safety and provide employers with guidance on prioritizing factors that lower the risk of injury with local evidence.

Research Objectives

The general objective of the research was to assess the magnitude of occupational injury and its predictors among employees in beverage industries in Addis Ababa and Harar, Ethiopia, from September 1- October 15, 2017, GC. In line with the general objectives, the specific objectives were: i) to determine the magnitude of occupational injury in the lifetime after employment and 12 months before the study; and ii) to identify factors associated with occupational injury among beverage industries.

Significance of the Study

The findings of this study may be used by the Ministry of Labor and Social Affairs (MOLSA) in order to get insight into endorsing pressing regulations that may force the beverage industry to comply with the safety and health of employees, beverage manufacturing industry owners, and beverage industry employees to design and implement appropriate safety and health program in the working environment. It will also raise awareness among both employees and employers. Companies will save time and resources lost due to occupational injury on their premises. In

addition, this study makes an important addition to the existing literature and shows unexplored parts for future researchers.

Review of Literature

Occupational Injury Status

A case study on the effect of human factors on the occurrence of occupational injury events in construction projects shows an annual incidence of 1.5%. The same study showed that the highest injury is reported from 10 AM to 12 noon (Hamed Yeganeh, Z. Naserzadeh, 2016).

According to an interdepartmental comparative study in Nigeria's South Geo political zone, the mechanical engineering department has statistically lower work-related traumatic injuries than logging department workers (Owigho Peter Opreh, 2014). The study on factors associated with occupational injury at a beverage manufacturing company in Zimbabwe, Harare, indicated that 53.3% of respondents sustained workplace injury. Of those who encountered injury, 26% did not report the injury (Chimamise *et al*., 2013). From two cross-sectional studies done in Ethiopia, the occupational injury among waste collectors in four zones of the Amhara region was 34.3%, and a similar study in Addis Ababa identified the prevalence of occupational injury as 43.7%. As per the study in four zones of the Amhara region, 50.7% of injured have visited a health facility to receive health care. Shorter years of service, low monthly salary, job-related stress, being illiterate, and sleep disturbance were the factors associated with injury among solid waste collectors in the Amhara region (Eskezia *et al*., 2016).

Factors Associated with Occupational Injury

Determining the factors associated with occupational injury is very important to designing protective mechanisms and helping to understand the factors associated with the study thoroughly. Most of the studies reviewed are associated with socio-demographic and work-environmental factors.

Socio-Demographic Factors

Socio-demographic factors included in most of the reviewed literature are age, sex, education level, family size, and salary. A study done in south Ethiopia at Arbaminch Textile found an occupational injury prevalence of 31.4%. Among socio-demographic factors, low salary was associated with higher odds of injury. Similarly, another study showed that the occurrence is

related to socio-demographic factors - age and education are significantly associated with injury. An increase in educational level and age reduces the risk of injury (Chercos & Berhanu, 2017).

Work Environmental Factors

Physical Work Environment

Physical agents include chemicals, physical, biological, ergonomics, mechanical, energy, and driving. A study carried out in Zimbabwe on beverage industries showed that working in the packaging department, sleeping disorders, and working seven days a week without rest had a risk associated with it. The hazards identified in the study were noise, broken bottles, unguarded machines, and coal dust. The high-risk area was automated. The most common injury was cut/laceration, the most affected body parts were finger and hand, and the majority of injuries happened in the packaging department because of the breaking of bottles (Chimamise *et al*., 2013).

Pertinent factors statistically associated with occupational injury in the study carried out in Addis Ababa are Personal Protective Equipment (PPE) utilization and household size. The odds of occupational injury among PPE non-users were lower than among PPE users, and injury was lower among respondents with a family size of five or more than a small family size (Bogale *et al*., 2014).

Based on a report from ergonomics and safety evaluation at Colorado Brewery, employees were exposed to a combination of risk factors for developing work-related musculoskeletal disorders (WMSDs), including awkward posture, forceful extraction, and repetitive motion. From an interview and OSHA log of work-related injuries, the most common body parts affected were the upper extremities (shoulder and wrist). Failures to report accidents were also identified, and the reasons for not reporting vary according to their perception of effect (Ramsey *et al*., 2011).

Psychosocial Environment

Psychosocial environment factors include poor work organization, organizational culture, command and control management style, inconstant application and protection of basic rights, shift work issues, lack of support for work-life balance, lack of awareness and competence in dealing with mental health, illness, and fear of job loss related to mergers and acquisitions in recognition or the labor market/economy. As per the study done in the Zimbabwe Beverage industry, sleeping disorders and working for seven days a week without rest were independent

factors for occupational injury (Chimamise *et al*., 2013). According to a twelve-month descriptive longitudinal survey at Nigeria paper producing company, a comparison of the engineering department and logging department carried out and indicated the difference in occupational trauma among departments - the prevalence was high among the logging department compared with the engineering department, and the departments were independent predictors of occupational injury (Owigho Peter Opreh, 2014).

Personal Resources in the Workplace

These include the availability of a supportive environment, health services, information, resources, opportunities, and flexibility that an enterprise provides to workers to support or motivate their efforts to improve or maintain healthy personal lifestyle practices and monitor and support their ongoing physical and mental health.

According to a study in Arbaminch, work environment-related factors like extra hour duty, health and safety training, and workplace supervision had significant associations after adjusting all factors. Among the behavioral factors, Personal Protective Equipment use and job stress are significantly associated with injury (Gebremichael & Kumie, 2015). Another institute-based cross-sectional study conducted to identify significant determinants of occupational injury in the Kombolcha Textile factory in northeast Ethiopia showed that working >48 hours, handling objects>20 Kg, visual concentration, timely maintenance of the machine, and sleep disorder were found to be significant factors (Yessuf Serkalem *et al*., 2014).

Enterprise Community Involvement:

Enterprises exist in communities and are affected by those communities. Since workers live in the communities, the community's physical and social environment affects their health. Activities, expertise, and resources are provided not only to the immediate local environment but also to the broader global environment (WHO, 2010).

Based on the above explanations, the factors contributing to occupational injury were reviewed from different literature as follows. According to a study conducted in Iran among construction workers, 79% of accidents occurred in far capitals, which shows the impact of distance from facilities. In the same study, 84% of participants with occupational injuries had a low education level, and 24.13% of accidents were due to non-election or absence of supervision (Hamed,2016).

A study done in Mexico to identify the factors associated with fatal occupational injuries among workers affiliated with the Mexican Social Security Institute indicated that sex, age, work experience, and workplace condition have associations with occupational injury (Gonzalez-Delgado *et al*., 2015). This is similar to the national survey done in Germany, which indicated that factors like age, sex, work characteristics, and length of working hours have an association with occupational injury (Rommel *et al*., 2016).

According to a study done in a brewery in Zimbabwe, Harare, working in packaging is associated with working seven days without rest, having sleeping disorders, and being a contract worker. In addition, the majority of injuries happened during the day. In this study, smoking habits were not significantly associated (Chimamise *et al*., 2013).

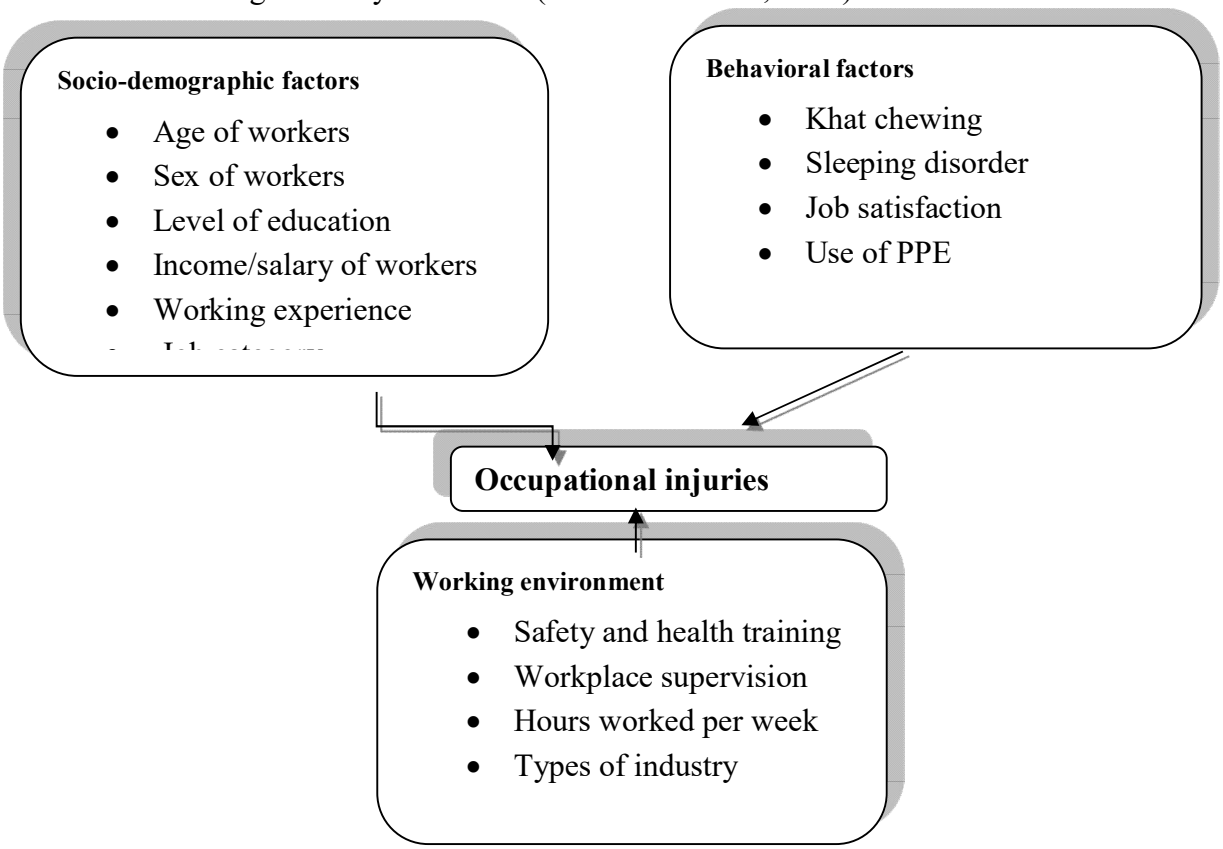

Figure 1: Conceptual framework for occupational injury among beverage industry beverage industry in Awash wine, HBSC, and Harar BSC September 2017

Research Methods

Study area and period

In Ethiopia, eleven brewery plants are owned by seven firms. Currently, following a privatization policy, all eleven plants are privately owned.

This study was conducted among Heineken Brewery SC and Awash Winery in Addis Ababa and Harar Brewery SC in Harar, which have workforces of 794, 456, and 315, respectively. It was conducted from September 1 to October 15, 2017.

Study Design

A descriptive cross-sectional study design has been employed comprising mixed methods, *i.e.*, quantitative and qualitative methods.

Population

Source Population

The source population for this study was employees of a selected beverage manufacturer in Addis Ababa and Harar.

Study Population

The study populations for this study were all employees who get chance of randomly selected from HBSC, Harar Brewery SC, and Awash Wine SC employees involved directly in the production and distribution activities.

Inclusion and Exclusion Criteria

All permanent, temporary, and contract employees involved in the production and distribution processes of the selected beverage manufacturing companies were included. Moreover, cleaners and all drivers transporting raw materials and products were included. All employees who are not directly exposed to production and distribution are excluded, besides self-collector drivers.

Sampling

Sample Size Determination

A single population proportional formula was used to determine the sample size for this study. The following assumptions were used: a confidence interval of 95% with a precision of 5%, and the prevalence of occupational injury was considered to be 53.3% based on research done in the Zimbabwe beverage industry (Chimamise *et al*., 2013).

$$N = \frac{z^2 p(1-p)}{d^2}$$

n=the minimum sample size required

p= prevalence of occupational injury in the beverage industry in Zimbabwe, 2008

z= the standard value of confidence level of α=95%

d = the level of precision between the sample and the population

Z=1.96 P=53.3%, d= 0.05

$$n = \frac{1.96^2 0.533(1-0.533)}{0.05^2} \approx 383$$

Multiplied by 1.5, considering the design effect, equals 575, and 15% added by considering the non-response rate gives a sample size of 675.

For the qualitative department heads, a safety focal person and a labor union representative were selected.

All the documents, guidelines, rules, procedures, and safety signs posted beside the environmental setup were included.

Lastly, the sample size of 675/1,565 was decided for this study based on the largest figure from objective one. The intentional sample correction formula is not used to get a large sample size.

Sampling Procedure

Six hundred seventy-five samples were planned and drawn from all beverage-manufacturing companies in Addis Ababa and Harar. Based on the proportion of productive workforce size per institution, an institutional sample size was allocated. Based on the staffing proportion of departments (warehouse, brewing/cellar, packaging, technique, distribution, and support), sample sizes from each department were allocated for each beverage manufacturing company. For sampling, the list of employees in the breweries and departments was used as a sample frame.

After identifying the study population sample, they were stratified in two steps. The first step determined the weight of the sample among each beverage company, and the second step determined the sample among the departments of each beverage company based on the proportion of the population size. Considering the two-strata design effect of 1.5 in the calculation for objective one, A stratified simple random sampling method was deployed to get 675 sample units from all departments of each company.

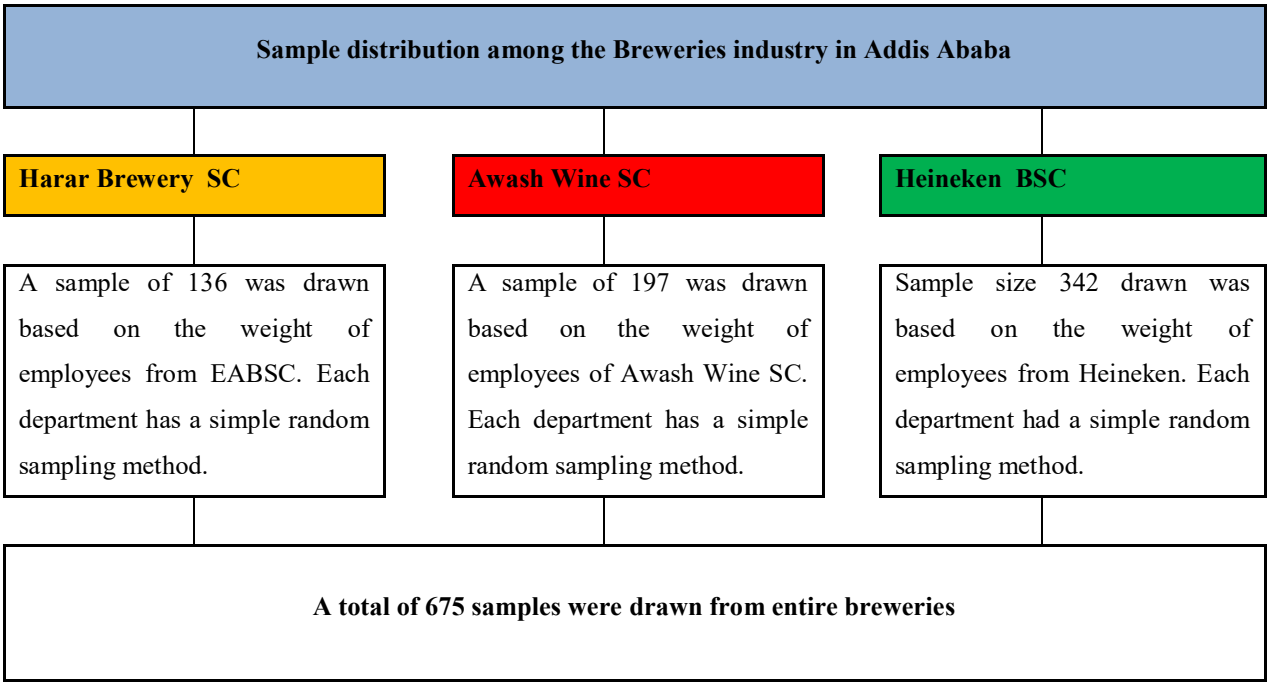

Figure 2: Distribution of Sample across the beverage industry in Awash wine, HBSC, and Harar BSC September 2017

The key informants were selected based on their responsibility and role. All team leaders of each department and labor union representatives are the respondents for the qualitative type.

Operational Definitions

Absence from work-related injury	This includes all absences due to the consequence of on-the-job injury, regardless of official sick leave. It captures unreported injury-related absences from work.
Agents	The contract holder who collects vast amounts of products from the factory to be dispatched to the end user
Department	The working area is segregated according to the activity they run, and it comprises a warehouse, brewing, cellar, packaging, technique, distribution, and support.
Distributor	This term is used for people who are involved in carrying products from factory to Agent store or outlet.
Lifetime occupational injury	Work-related injuries occur on the job and are a direct result of the tasks allotted to the specific job.
Occupational injury in 12 months	Work-related injuries occur on the job and as a direct result of the tasks allotted to the specific job 12 months prior to the study, and it excludes chronic exposure.

Occupational injury in 1 month	Work-related injuries occur on the job and are a direct result of the tasks allotted to the specific job in the one month prior to the study; it excludes chronic exposure.
Production General	It consists of engendering, maintenance, quality, and utility staff

Study variables

Dependent variable - Occupational injury

Independent variables

Socio-demographic factors
- Age
- Sex
- Marital status
- Monthly income
- Educational status
- Employment status
- Experience

Working environment factors
- Weekly working hours
- Supervision at the workplace
- Safety training
- Fulfillment of PPE
- Department
- Job category
- Sleeping problem
- Satisfaction in job

Behavioral factors
- Khat chewing habit
- Smoking habit
- Drug use habit
- PPE utilization

Data collection tools

This study used face-to-face interview questionnaires with close-ended questions, classified into socio-demographic, environmental, and behavioral factors, to assess occupational injury occurrences and their factors among beverage companies. The tool was adopted from a study done by Takele Tadesse (29%). The questionnaire was prepared in English and translated into Amharic by qualified professionals. For triangulation purposes, key informants' interview guides and institutional observation checklists were used as instruments.

Data Collection

Data Collectors

After a one-day training session, six data collectors and three supervisors were put into action for eighteen days. Three data collectors were involved for every chosen company in the study. Supervisors with prior experience conducting public health research were hired for the same duration to plan the study. The data collection tools and data collectors were assigned to the Gulele Soap Manufacturing Industry to conduct a pre-test on 5% (35) individuals for study and standardization of tools; thereafter, data collection commenced.

Data Collection Procedure

Data was collected using an interview questionnaire from each sample unit. Data collectors who had taken the training and participated in the pre-test collected the data. The data from HBSC and Awash was collected in two weeks, and the data from Harar was collected over four days.

Data related to occupational health and safety were gathered by reviewing available documents in the manufacturing company using an observation checklist. In addition, key informants were interviewed using a key informant interview checklist and a voice recorder to capture their responses for further use. Key informants were team leaders in each department, the safety focal persons, and the labor union representatives of each company.

Employee compliance with PPE was observed on the spot during data collection using an observation checklist produced prior to data gathering.

Data quality control

Due attention was given to preparing and translating the questionnaire, training data collectors and supervisors, and a pilot survey to standardize the tool and data collector. The data gathered from respondents was checked daily and run frequently to check for outliers and missing values for its quality, *i.e.*, completeness and consistency.

Data Analysis

Data entry was conducted using Epi data statistical software version 3.1, and after entry, data was transferred to SPSS version 21 packages where data cleaning and frequency analysis were done, and using frequency descriptive statistics, workers with injury and without injury were identified. The missing value was checked at this stage.

After checking collinearity, binary logistic regression analysis was done for the independent variable. The variable that yielded a p-value <0.2 in the bivariate logistic analysis was taken to multiple logistic analysis to determine a predictor of occupational injury rate. Assuming a confidence interval of 95% and a strength of p-value less than or equal to 0.05 of the result taken for the significance conclusion. The findings are presented using frequency tables, graphs, and charts.

The qualitative data analysis was done using the conversation analysis method and key informant interview checklists. Responses were categorized and narrated using respondents' response concepts. The categorized concepts are listed and presented in the table and chart.

Ethical Consideration

Ethical clearance was obtained from the Rift Valley University (RVU) Research Ethical Review Committee. The official letter obtained from RVU was submitted to three beverage companies (HBSC, Harar Brewery SC, and Awash Wine SC) where the study took place.

At the commencement of the study, the study title, purpose, possible risks, and benefits were clearly communicated to the study participants using the languages they commanded (English or Amharic). After gaining a clear understanding of the study's merits and demerits, each study participant was asked for informed consent on the questionnaire's first page. The researcher has kept the participant's responses confidential by omitting their name from the data-gathering tool. In addition, any records or responses will remain confidential. The study participants were informed they could refuse to give information even during data collection.

Result and Discussion

Quantitative Data Analysis

A total of 657 study participants were involved in the quantitative study out of the 675 workers selected, yielding a 97.3% response rate. The distribution of study participants across the

beverage industry was 197 (30%), 339 (51.6%), and 121 (18.4%) from Awash Wine SC, Heineken B SC, and Harar BSC, respectively. Concerning the distribution of respondents across departments, 198 (30.13%) of them were warehouses, 125 (19%) were packaging, 120 (18.3%) were distribution, 91 (13.9%) were support, 71 (10.8%) were techniques, and 52 (7.9%) were brewing or cellars.

Socio-Demographic Characteristics

Regarding the socio-demographic characteristics of respondents, 501 (76.3%) were males; the median age was 28 years, with an interquartile range of 18–65 years. Participants who did not have formal education were 19 (2.9%), while those who completed 9–12th grade were 223 (33.9%). Close to half, or 313 (47.6%), were married; about employment status, 400 (60.9%) were permanent employees of their respective companies, while 262 (39%) were contract employees. The monthly median income was 3600 Birr, while the range is 700–60,802 Birr (Table 1).

Table 1: Socio-demographic characteristics among Respondents of the beverage industry in Awash wine, HBSC, and Harar BSC September 2017(n=657)

Socio-Demographic Variables		**Frequency**	**Percent**
Sex	Male	501	76.3
	Female	156	23.7
Age category	<24 years (first quartile)	167	25.4
	24-27 years (second quartile)	140	21.3
	28-34 years (third quartile)	191	29.1
	>34 years (fourth quartile)	159	24.2
	Total	657	100
Education	Illiterate	19	2.1
	Read & Write	5	0.8
	Grade 1-8	160	24.4
	Grade 9-12	223	33.9
	Diploma	109	16.6
	Degree and Above	146	22.2

Marital status	Married	313	47.6
	Single	326	49.6
	Divorced	13	2
	Widowed	5	0.8
Employment	Permanent	400	60.9
	Contract	257	39.1
Monthly income	<2000 (first quartile)	187	28.5
	2000-3599 (second quartile)	141	21.5
	3600-8000 (third quartile)	168	25.6
	>8000 (fourth quartile)	161	24.5
	Total	657	100.0

Characteristics of Occupational Injury

In this study, 137 (20.9%) with a 95% CI of 18–23.7% have sustained a lifelong occupational injury (since employment). Seventy-three (11.1%) with a 95% CI of (8.9–13.3) sustained an occupational injury within 12 months prior to the study period, and injuries one month prior to the study accounted for 16 (2.4%) with a 95% CI of (1.4–3.8). The distribution of occupational injuries across the company: Awash Wine had 22.8% (45/197) for life, 9.6% (19/197) for annual, and 2.5% (5/197) in one month prior to the study. HBSC had 19.2% (65/339) for life, 12.5% (43/339) as annual, and 2.1% (7/339) in one month prior to the study. It was also disclosed that Harar BSC was 22.3% (27/121) for life, 9.1% (11/121) annual, and 3.3% (4/121) in one month prior to the study (Table 2). Regarding occurrences of injury among departments: warehouse 23.7% (47/198), brewing/cellar 17.3% (9/52), packaging 24.8% (31/125), technique 25.4% (18/71), distribution 17.5% (21/120), and support 12.1% (11/91).

Regarding types of occupational injury in lifetime, 43 (31.4%) had trauma on the finger, followed by skin laceration 41(29.9%). Similarly, among respondents who sustained an occupational injury in the 12 months, 24(32.9%) had an injury figure, followed by lacerations on various body parts, 21(28.8%). Finger injury was also common among respondents who had occupational injury in one month prior to study 9 (45%), followed by laceration on the body (40%), as presented in Table 2).

Table 2: Type of occupational injury among Respondents of the beverage industry in Awash wine, HBSC, and Harar BSC September 2017(n=657)

Type of Injury	lifetime occupational injury after employment		Occupational injury within 12 months		Occupational injury within 1 month	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Head Face	9	7	6	8		
Eye	3	2	2	3		
Fracture	6	4	4	5	2	13
Poison	1	1	1	1		
MSK problem	27	20	13	18		
Skin laceration, cut	41	30	21	29	4	27
Trauma to finger.	43	32	24	33	9	60
More than one type	6	4	2	3		

Regarding the causes of injury, broken glass contributes for 41(29.9%), car accident 32(23.4%), hand tools 19(13.9%), machine 17 (12.4%), chemical 13(9.5%) slippery floor 12(8.8%) and burn 1(0.7%) illustrated in (table 3).

Table 3: Causes of occupational injury among Respondents of the beverage industry in Awash wine, HBSC, and Harar BSC September 2017(n=137)

Causes of injury	Frequency	Percent
Machine	17	12.4
Chemical	13	9.5
slippery floor	12	8.8
Hand tools	19	13.9
Burn	1	0.7
Broken glass	41	29.9
Car Accident	32	23.4
More than one causes	2	1.5
Total	137	100

Of the respondents who had an injury in the 12 months' time, 11 (15%) of them were admitted to hospital, 34 (46.5%) of them were absent from work in the range of 1-30 days, and a total of 293 working days were lost in the year.

Working Environment Characteristics

The mean working hour for all respondents was 54.11 hours with std. deviation of 9.5. Of all, 383 (58.3%) work ≤ 48 hours a week, while 274 (41.7%) work >48 hours. Of all, 541 (82.3%) had supervision in their workplace, 439 (66.8%) had taken safety training, and 543 (82.6%) had necessary PPE for their job.

Of all respondents, 150 (22.8%) had a sleeping problem. Of those with sleeping problems, 116 (77%) were caused by workload, 13 (9%) shift work, 10 (7%) stress, and 7 (5%) fatigue. Of all respondents, 529 (80.5%) of respondents were satisfied with their job. In comparison, 128 (19.5%) reported dissatisfaction due to low salaries 75 (59%), employing agency mistreatment 12 (9%), workload 10 (8%), dissatisfaction with management style 14 (11%), job stress for 8 (6%) and 5 (4%) due to long working hours.

Behavioral factors

Of all respondents, 544 (82.8%) used the PPE required for their job, and the remaining 113 (17.2%) did not acquire proper utilization behaviors. Of the commonly used PPE, 509 (77.3%) of the workers were wearing safety shoes, 432 (65.8%) were wearing gloves, and 315 (47.9%) used a visibility jacket.

The reasons given for not using PPE were access to the devices 72 (63.7%), absence of awareness and lack of training 20 (17.7%), and the remaining due to improper supply of PPE 28(24.8%).

Regarding exposure to a drug substance, 19(27.2%) have tried Khat chewing in their lives, and 52 (7.9%) are using Khat at present. Of these, 31 (59.6%) chew occasionally, 19 (36.5%) chew every week, and only 2 (3.8%) use it daily.

Regarding exposure to smoking cigarettes, 55(8.4%) have tried smoking in their life, and of these, 12 (21.8) smoked in one-year time, and only 6 (50%) of those who smoked in the 12 months are reported as a current smokers. Four of the smokers smoked five cigarettes per day, while 2 smoked up to 10 cigarettes per day. Only 8 (1.2%) had exposure to drugs like Hashish and Shisha, and there is no one using the latter substances at present.

Factors associated with occupational injury

Bivariate analysis was done to see the association between the dependent and independent variables like Department, Age, Education, Employment, Experience, Job Category, Weekly

Working Hours, Safety Supervision, Training, PPE fulfilled, PPE utilization, Presence of sleeping disorder, Job satisfaction, Frequency of Khat chewing, and Smoking at present was found to have a p-value of< 0.2. These variables were tested for collinearity diagnosis and model fitness prior to multiple logistic regressions.

After the test, department, age, education, employment, experience, job category, weekly working hours, safety supervision, training, PPE utilization, presence of sleeping disorder, and job satisfaction were found to be fit to the model and further analyzed in multiple logistic regressions.

Factors associated with lifetime occupational injury

Respondents working in the Technique Department were four times more likely to sustain an occupational injury than supporting workers with [AOR: 4.08, 95% CI=1.18-14.11]. Respondents in the age group of 28-34 years were 55% less likely to sustain an occupational injury compared to the age group more than 34 years[AOR:0.45, 95% CI= .24-.87]. Being a Contract Employee was 2.4 times more likely to have occupational injuries compared to a permanent employee [AOR:2.44, 95% CI=1.20-4.94].

Employees with work experience of less than or equal to one year were 85% less likely to sustain an injury compared to those who had more than five years of experience [AOR: 0.15, 95% CI: 0.06-0.36]. Respondents who had sleeping disorders were 1.8 times more likely to develop occupational injury compared with those who did not have sleeping disorders [AOR: 1.81, 95% CI: 1.10–2.98]. The remaining departments, including weekly working hours, safety supervision, safety training, use of PPE, and job satisfaction, did not have a statistically significant association with occupational injury (Table 4).

Table 4: Factors associated with lifetime occupational injury among Respondents of the beverage industry in Awash wine, HBSC, and Harar BSC September 2017(n=657)

Variables		**Lifetime OI**		**COR**	**AOR**
		Yes	**No**		
Department	Warehouse	47	151	2.26(1.11-4.60)	.85(.24-2.96)
	Brewing/ Cellar	9	43	1.52(.58-3.95)	1.02(.28-3.67)
	Packaging	31	94	2.39(1.13-5.07)	1.96(.68-5.66)
	Technique	18	53	2.46(1.08-5.64)	4.08(1.18-14.11)
	Distribution	21	99	1.54(.70-3.38)	.83(.25-2.70)
	Support	11	80	1	

Age category	<24 yrs.(1st quartile)	41	126	.78(.53-1.44)	1.19(.52-2.72)
	24-27 yrs. (2nd quartile)	24	116	.55(.31-.97)	.63(.29-1.38)
	28-34 yrs. (3rd quartile)	29	162	.48(.28-.81)	.45(.24-.87)
	>34 yrs. (4th quartile)	43	116	1	
Employment	Contract	62	195	1.37(.94-2.01)	2.44(1.20-4.94)
	Permanent	75	325	1	
Experience	<=1 yr. (1st quartile)	24	188	.32(.18-.55)	.15(.06-.36)
	2-3 yrs. (2nd quartile)	50	172	.73(.45-1.17)	.53(.25-1.09)
	4-5 yrs. (3rd quartile)	20	52	.96(.51-1.80)	1.08(.49-2.38)
	>5 yrs. (4th Quartile)	43	108	1	
Weekly working hrs.	>48 HR	72	202	1.74(1.19-2.54)	1.51(.94-2.44)
	<= 48 HR	65	318	1	
Supervision	No Safety supervision	99	442	2.17(1.39-3.39)	1.67(.87-3.20)
	Safety supervision	38	78	1	
Training	No Safety training	62	156	1.92(1.31-2.83)	1.50(.89-2.54)
	Safety training	75	364	1	
PPE Utilized	PPE not utilization	32	81	1.65(1.04-2.62)	1.37(.73-2.58)
	PPE utilization	105	439	1	
Sleeping problem	Presence	42	108	1.68(1.10-2.56)	1.81(1.10-2.98)
	No sleeping problem	95	412	1	
Job satisfaction	Not satisfied with Job	32	105	.74(.47-1.16)	.75(.40-1.39)
	Satisfied in Job	96	424	1	

Factors associated with occupational injury among respondents 12 months preceding the survey

Of all the variables tested for association of injury in the twelve months, only the presence of sleeping problems has a significant association in multiple regression analysis for occurrences of occupational injury in 12 months. Respondents who had sleeping problems were twice as likely to develop work-related injuries as those who did not have sleeping problems [AOR: 1.98, 95% CI= 1.10-3.53], assuming other factors are constant. The remaining variables, including job type, safety supervision, safety training, PPE fulfillment, PPE utilization, and weekly working hours, were not statistically associated with Occupational injury (Table 5).

Table 5 Factors associated with work-related injury in 12 months among respondents in Awash, HBSC, and Harar September 2017 (n=657)

Variables		12 month injury		COR	AOR
		Yes	No		
Employment	Contract	40	217	2.05(1.25-3.34)	1.29(.62-2.65)
	Permanent	33	367	1	
Job	Operator & Assistant	13	103	1.91(.73-4.98)	1.92(.65-5.49)
	Packaging	2	34	.89(.17-4.49)	.92(.16-5.15)
	Technique	6	54	1.68(.53-5.25)	2.05(.63-6.68)
	Loading unloading	34	182	2.82(1.21-6.60)	1.84(.63-5.34)
	Driver	1	45	.33(.04-2.81)	.26(.02-2.45)
	Cleaner	10	60	2.52(.91-6.97)	2.22(.64-7.61)
	Support	7	106	1	
Safety Supervision	not supervised	20	96	1.91(1.09-3.35)	1.12(.52-2.37)
	Supervised	53	488	1	
Safety Training	not Trained	35	183	2.01(1.23-3.29)	1.53(.83-2.80)
	Trained	38	401	1	
PPE Fulfilment	Not fulfilled	21	93	2.13(1.22-3.70)	
	Fulfilled	52	491	1	
PPE Utilization	Not utilized	18	95	1.68(.94-2.99)	1.11(.54-2.30)
	Utilized	55	489	1	
Weekly working Hours	>48 hrs.	40	234	1.81(1.11-2.95)	1,49(.83-)2.67
	<= 48 hrs.	33	350	1	
Sleeping Problem	Present	26	124	2.05(1.22-3.44)	1.98(1.10-3.53)
	Not Present	47	460	1	

Qualitative Data Analysis

Key Informants Response

Twenty-five key informants were interviewed using an interview checklist that consists of questions on the roles of interviewees in safety intervention, the frequency of safety supervision, knowledge about the presence of policy, challenges in executing safety procedures, the cause of frequent workplace accidents, the existence of injury reports, the presence of dedicated safety personnel, and the role of the labor union in the company.

With regards to the respondent's role in the execution of safe working procedures, the team leaders from three beverage industries have given a response on the role they play in realizing a safe working atmosphere. 11 respondents described this as their role in controlling employee safety compliance and making routine vigilance for conformity to protocol. They responded that the task of educating and reinforcing safety materials is used and safe procedures are followed. 6 respondents have been involved in emergency response by giving first aid to the injured and facilitating the safe transfer of the victim. 3 of the respondents have mentioned that they use PPE. 2 of them declared that their department does not have a role in safety-related actions.

Regarding the presence of workplace safety supervision, 22 respondents confirmed the existence of workplace supervision. At the same time, 2 of them mentioned that there is no supervision, and one does not know about the issue. The majority (19) of those who confirmed the presence of supervision had reported daily follow-up as a routine task; 4 of them confirmed that the follow-up was twice a week, 1 attested that it was every week, and another respondent reported that it was every month.

In response to the existence of the safety policy, 19 (76%) confirmed the presence of the policy, 5 (20%) declared they did not own it, and 1 (4%) did not know about it.

Twenty-five respondents have responded regarding safety-related challenges in their respective departments. Six (24%) of these respondents stated that there was inconsistent provision of required safety material and inadequate facilities at work; eight (32%) confirmed that there were inconsistent behaviors of employees in compliance with safe behavior; and six (24%) reported on the issue of management retaining trained staff, as well as the challenge of turnover and socialization of new staff members. Four (16%) people were concerned about a nationwide lack of standardized occupational policy. The absence of appropriate workplace regulations for the nation's circumstances has presented difficulties for the business and its employees. Twenty percent, or five of them, said their team has no challenges.

Respondents have mentioned that the causes of frequent accidents among their team encompass accidents caused by sharp materials like fragments of broken bottles, chemicals, cut wounds, falling accidents, clashes, road traffic accidents, allergies, machines, and electric shock.

Twenty (80%) of respondents knew about the presence of reports on accidents, and five (20%) did not have information about the reporting.

All the respondents agree that their respective organizations have dedicated safety personnel, while the contract employees had reservations about proper support from dedicated safety personnel.

The respondents' responses regarding the role of labor unions were different: 7 (28%) reported that they were involved in safety audits; 4 (16%) stated that their function was not visible to them; 2 (8%) reported that they were involved in the creation of rules and regulations, and 2 (8%) did not know the roles of labor unions.

Record Review and walkway observation

Observation of institutional setup shows that HBSC and Harar have safety induction sites with audiovisual demonstrations, and any person entering the compound is obliged to get safety induction and acquire a certificate of safety orientation. This facility does not exist in Awash Wine premises. The walkway is clearly delineated in Harar and HBSC throughout the compound, and there is no consistency in Awash Wine SC.

The packaging processes in Harar and HBSC have been automated, and the risks in the working areas have been reduced by using robotic machines that manage the entire task. Palletized materials are transferred using a forklift to the warehouse, whereas, in Awash, the labor force carries out the processes.

The clinics of HBSC and Harar are well equipped to meet the appropriate standards of the medium clinic, while Awash is a primary clinic with the capacity to give first aid for common minor trauma. Basic lifesaving training was given to HBSC and Harar employees, while this is not done in Awash. There is a fully equipped stand-by Ambulance on HBSC premises, but it is unavailable in Harar and Awash.

Protocol for emergency intervention is located in all the hazards found in all the sites in HBSC and Harar, which is not available in Awash. The trend of reporting incidents, accidents, near misses and unsafe actions is well accustomed in Harar and HBSC.

Incident and accident reports are maintained in all beverage industries. The records from HBSC and Harar include identification, injury type, outcome of injury, date, time, and department of rescue. However, the document in Awash Wine is not complete.

The annual prevalence of the three beverages industry was 14%, according to the records reviewed. The prevalence in the three beverage industries varies from 11% to 20%.

Discussion

This particular study has tried to assess the magnitude of occupational injury and the factors associated with it among beverage industry employees. Based on this, the prevalence of lifetime occupational injury was more than one in five individuals [20.9 %, CI=18.0-23.7]. This is lower than the magnitude of one of the studies conducted in Zimbabwe and Rwanda, which were 53.3% and 72.7%, respectively (Chimamise *et al*., 2013; Mbonigaba, 2015). Also, the magnitude is less than that of Arbaminch Textile Factory, which was 31.5 (Gebremichael & Kumie, 2015). The variation of magnitude may be related to the implementation of safety action, reporting of unsafe action, and full automation of HBSC and Harar, where most respondents were drawn. The prevalence of occupational injury in the 12 months of this study was [11.1%, CI=8.9-13.3], more than the annual prevalence of occupational injury reviewed by Eurostat through a self-reported injury and illness survey in all EU Member States of 3.2% (Takala *et al*., 2014), incidence of case study in construction project 1.5% (Hamed Yeganeh, Z. Naserzadeh, 2016) and [2.8% CI=2.4-3.2] in Germany population survey (Rommel *et al*., 2016) which is unlike the prevalence in survey conducted in Rwanda brewery (Mbonigaba, 2015). This shows that the burden is high in this study.

The common injury type for the lifetime was finger trauma, at 32%, and skin laceration, at 30%. This was the same for 12 months of finger trauma, at 33%, followed by skin lacerations on various parts of the body, at 29%. This finding is higher than the finding in Zimbabwe (Chimamise *et al*., 2013).

Regarding factors associated with occupational injury, the age group 28-34 was less likely to sustain occupational injury than those above 34 years, while other socio-demographic factors like sex, marital status, education, and monthly income do not have a significant association in this study and hold in a similar study done in Zimbabwe (Chimamise *et al*., 2013). However, the survey in Germany shows that the male gender is 3.16 times more prone to sustain injury (Rommel *et al*., 2016). In a study done in the Kombolcha textile factory, being single was 2.21 times more likely to get an occupational injury (Yessuf Serkalem *et al*., 2014).

Contract employees are 2.4 times more likely to have occupational injury compared to permanent employees in their lifetime [AOR: 2.44,95% CI=1.20-4.94]. This is not significant

after adjustment in another study on the Zimbabwe beverage industry (Chimamise *et al*., 2013). This might be due to the small sample size in the study done in Zimbabwe.

The presence of sleeping disorder was found to be an independent factor associated with occupational injury both in a lifetime and 12 months with AOR of 1.81 and 1.98, respectively, in multivariate regressions. This finding is similar to a study in Zimbabwe, where employees with sleeping problems were 2.26 times more likely to get injured (Chimamise *et al*., 2013). The significance of both studies confirms that it is a determinant for occurrences of injury.

In this study, the technique department is significantly associated with occupational injury, and a similar finding was reported from a population survey in Germany (Rommel *et al*., 2016). However, the study done in Zimbabwe showed that the risk department was packaging (Chimamise *et al*., 2013). This difference may be explained by the presence of automation in two breweries (HBSC and Harar), which reduces human involvement.

The presence of a supervisor, safety training, and fulfillment of PPE has a risk of association in bivariate analysis and was not significant in the adjusted model in this study as well as other studies carried out in brewery industries of Rwanda and Zimbabwe (Chimamise *et al*., 2013; Mbonigaba, 2015).

The responses of the qualitative study of this survey show the involvement of team leaders in routine supervision of safety behavior compliance, educating the employee on working procedures, and the existence of policy and pertinent safety signs, which indicates commitment and the embedding of safety culture.

Key informants presented challenges that may contribute to injury occurrences: inconsistent employee compliance with safe behavior, inconsistent provision of required safety materials, improper facility at work, failure of management to retain trained staff, turnover challenge, and socialization of new staff members.

As per key informants' responses, injuries were caused by sharp materials like fragments of broken bottles, chemicals, cut wounds, falling accidents, clashes, road traffic accidents, allergies, machines, and electric shock, which is consistent with the findings of this study and the literature on beverage industry risk.

Strengths and Limitations of the study

The strength of this study is the use of qualitative and quantitative data with facility observation that gives insight into the findings.

The limitation of this study is that the sample size is not sufficient to explore annual prevalence and predictors like drug and substance use.

Conclusions and Recommendations

Conclusions

This study revealed that more than one-fifth of the study respondents experienced injury in their lifetime. In the last year, the prevalence is half of the lifetime, and the prevalence rate based on a review of beverage company clinic records is greater than the annual prevalence finding. The most commonly affected part of the body is the finger, which is attributable to the inconsistent use of protective gloves. Therefore, the provision of durable standard gloves and the replacement of damaged ones reduce injury occurrence.

Contract-based employment increases the risk of occupational injury due to concerns about job security and the perception that employees' jobs could be taken by other employees at any time.

Recommendations

Stringent safety precaution measures, such as training focused on awareness creation, induction on safety rules, surveillance camera use, experience sharing, substitute modern technology, consistent use of safety equipment, embedding safety culture, proper implementation of safety policy, management commitment to safety, budget, and reporting culture, are reliable means of preventing occupational injury.

Factories are advised to work on eliminating or reducing workplace injuries, as this is useful in preventing employee morbidity, disability, and mortality. This can be attained by emphasizing proactive safety action. Therefore, it is advisable to revisit the work processes of departments that are exposed to potential risks, such as technical departments and risky jobs, including loading and unloading.

The common injury type identified brought the need for a proper supply of durable personal protective devices like gloves to avert finger and hand injury. Hence, it is recommended that beverage companies implement the following:

- The provision of durable gloves to prevent commonly occurring finger and hand injuries can easily prevent injuries that occur due to the unavailability or the use of torn gloves.
- The management of the sub-contracting agencies must also be vigilant to avoid work-related dissatisfaction.

- Attention has to be given to manage outsourced activities in order to diminish risks associated with contract workers.
- Sleep disruption due to long working hours is significantly associated with injury. Therefore, companies must consider avoiding or minimizing long working hours and adjusting the shift pattern accordingly.
- To explore more findings, a similar study needs to be carried out on a larger sample scale to identify factors associated with annual prevalence and drug and substance effects as well.

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