ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Assessment of Work-Related Injuries among Small and Medium-Scale Building Construction Workers in Addis Ababa, Ethiopia

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Acronyms and Abbreviations:

AAU: Addis Ababa University

BC: Building Contractors

BOLSA: Bureau of Labor and Social Affairs

CSA: Central Statistics Agency

ETB: Ethiopian Birr

GDP: Gross Domestic Product

ILO: International Labor Organization

MOH: Ministry of Health

MUI: Ministry of Urban and Infrastructure

OHS: Occupational Health Services

OSHA: Occupational Safety and Health Administration

PPE: Personal Protective Equipment

SMEs: Small and Medium-Sized Enterprises

SPSS: Statistical Package for Social Science

WHO: World Health Organization

Summary

Background: Among the most hazardous industries identified in several countries, the construction industry has been one of them due to the high rates of work-related injury and fatality. Globally, construction sites account for at least 55,000 fatalities annually.

Objectives: To assess the prevalence of occupational injury and the associated factors among construction workers in Addis Ababa, Ethiopia.

Methods: A cross-sectional study was conducted on small and medium-scale public construction projects in Kolfe Keraniyo, Akaki Kality, and Lemi Kura sub-cities, Addis Ababa city. Data was collected from August 2023 – September 2023. A simple random sampling method was used to collect data from 378 study subjects through a structured questionnaire and workplace observational checklist. Data were entered, cleaned, coded, and analyzed by SPSS (Statistical Package for Social Science) version 25. Descriptive analysis and binary followed by multiple logistic regression analysis were employed.

Results: Among the 378 participants, 132 (34.9%) had encountered occupational injury in the past year. Illiterate workers were 3.74 times more likely to report occupational injury (AOR= 3.74, 95% CI; 1.92-11.72). Participants with ≤ 2 years of work experience were 5.31 times more injured than those with > 2 years of experience (AOR= 5.31, 95% CI; 1.41-19.99). Moreover, workers who hadn't had safety training in connection with new employment, equipment, or work process experienced injury 11.47 times more than those who had it (AOR= 11.47, 95% CI; 1.35-27.74).

Conclusions: In comparison to studies conducted on large-scale building constructions, this study's report showed a relatively lower injury prevalence (34.9%). Factors such as educational status, work experience, and safety training were found to be significantly associated with occupational injury.

Keywords: Occupational injury, construction workers, building construction, small and medium scale construction, health and safety training

1. Introduction

1.1. Background

An occupational injury is defined as any personal harm, illness, or demise resulting from an occupational accident (1). An occupational accident is any unforeseen and unplanned event that occurs during or in connection with work and causes workers to incur injury, disease, incapacitation, or death. An occupational injury could be fatal, where death occurs immediately or at some time after the accident, or non-fatal, where there could be lost work time (1,2).

The International Labor Organization (ILO) estimates that there are 317 million occupational injuries and 2.34 million occupational fatalities globally each year (3); and out of 2.34 million occupational fatalities that occur every year, 321,000 are due to occupational accidents (4). Despite the proven long-term downward trend in occupational injuries globally, this hasn't been the case in rapidly developing countries, which are registering increased occupational injury fatalities due to the shifting of manufacturing, construction, mining, and agriculture (5).

Among the most hazardous industries identified in several countries, the construction industry has been one of them; due to the high rates of work-related injury and fatality (6,7). The construction industry accounts for at least 55,000 fatal occupational accidents globally per year, equating to a fatal accident every 10 minutes (5). With an average of 3,551 injuries per 100,000 workers in the European Union, the construction industry is responsible for the second-highest proportion of work-related injuries (8).

Construction is one of the most hazardous industries in Africa, contributing to high rates of work-related injuries and fatalities (9). In sub-Saharan Africa, the estimated work-related injury rate is around 21 per 100,000 workers, which is significantly higher than the global average (5).

Among the 180 million construction workers worldwide, about 75% are employed in developing countries (10). Of these, Ethiopia comprises 6.5 million construction workers working on about 252,000 construction sites on any day (11). According to a study conducted in Addis Ababa, the

incidence of work-related injuries among building construction workers was 50.5 per 1,000 construction workers annually (12).

According to a systematic review of studies from different countries, the direct medical costs linked to construction-related injuries can account for 15% to 30% of the overall economic burden (5). The annual economic cost of work-related illnesses and injuries, according to a study conducted in 27 European countries, is estimated to be €476 billion, which is 3.3% of the gross domestic product of the European Union (8).

According to a study conducted in Addis Ababa, Ethiopia, building construction workers' average medical cost for work-related injuries was 1,463 Ethiopian Birr, which was approximately $40 according to the currency during the time of the study. According to this study, 61.8% of injured workers were required to cover their own medical costs, which presented a substantial financial burden (12).

According to an article review published in Safety Science, small and medium-sized construction enterprises frequently have more difficulty implementing effective safety measures, which can lead to higher rates of injury and productivity losses (13). This article review concluded that small and medium-sized construction enterprises face higher injury rates and productivity losses than larger, more resourced construction companies due to factors such as limited resources, lack of dedicated safety expertise, organizational culture challenges, subcontracting and coordination issues, and regulatory compliance barriers (13). A report by the Center for Construction Research and Training showed that the annual cost of work-related injuries and illnesses in the construction industry in the United States is estimated to be over $13 billion (14).

Most of the construction industry employees are part of a very unorganized sector; the majority of them are temporary workers who lack any form of social or economic protection (10). Moreover, they lack education, skill, and training; and are inexperienced with the tools and unfamiliar with the hazards associated with construction, which can raise the risk of work-related injuries (11).

1.2. Statement of the Problem

Work-related injuries continue to be the leading cause of occupational health problems for construction workers (12). The risk of fatality is five times higher in the construction industry than in manufacturing, while the risk of a catastrophic injury is two and a half times higher (15). Moreover, construction workers in developing nations experience occupational health and safety risks that are 10 to 20 times more severe than those in industrialized nations (15).

A study conducted over 3 years in Iran depicted that occupational injuries occur more frequently in smaller construction firms; and the primary problems identified were a lack of awareness of the value of safety, hiring unqualified individuals, and a lack of safety personnel (16). It was noted that the hazard control program had shortcomings in such congested environments. It was presented that during these 3 years, the number of injuries increased by almost 5 folds (from 12% to 57%) (16). This rise in accident frequency is thought to have happened due to the increased number of workers at the same site, which can cause congestion, irregularity, and concurrent construction activity (16).

About 80% of workers are employed by small and medium-scale industries, which make up more than 90% of all industries in developing nations and contribute significantly to employment and share of Gross Domestic Product (GDP) (17). The majority of these businesses are informal, which means that they are, at most, only partially in conformity with the laws and regulations already in place regarding business registration, taxes, zoning, minimum wage and social security provisions, and environmental protection. Furthermore, they don't fulfill safety requirements; provide adequate training, and implement risk prevention programs (17,18). Due to poor literacy rates, lack of acquaintance with the work process and potential hazards, low compliance with occupational health and safety standards, and inadequate training, employees in these industries are more likely to suffer work-related injuries, chronic illnesses, stress, disability, or death (19).

Construction workers may experience severe consequences of work-related injuries, such as physical impairments, psychological trauma, and financial difficulties (13). Apart from the direct consequences on workers, work-related injuries can also have a major financial impact on the construction industry, the healthcare system, and society at large (5).

Studies from other low- and middle-income countries have demonstrated how work-related injuries disproportionately affect small and medium-sized construction enterprises (9).

According to a review, the informal construction sector in sub-Saharan Africa poses significant risks due to poor working conditions, scarcity of personal protective equipment, and restricted availability of occupational health services (20). These results highlight the significance of attending to the particular issues that Addis Ababa's small and medium-scale construction enterprises face.

Ethiopia is one of the developing nations where the construction industry is now seeing rapid growth. However, there may be regional and even company-specific differences in the frequency of injuries in certain industries (21), which is assumed to be higher in the small and medium-scale construction industry. Studies conducted on Bale Zone and North Gondor revealed that the overall annual prevalence rate of work-related injury in small and medium-scale industries is 30% and 33.5% respectively (19,22). A recent study conducted on building construction workers in Addis Ababa city showed that 40% of the participants had work-related injuries in the past 12 months. Industrial safety and health issues are becoming significant difficulties due to low awareness of occupational hazards, lack of workplace safety and health policies, and ineffective safety management systems (12,23).

1.3. Rationale of the Study

Data on occupational health and safety issues are quite limited in the medium, small, and microenterprise sectors, especially in low- and middle-income countries. The fact that the majority of these industries do not safeguard the well-being of workers continues to be a headache.

Despite the significance of this problem, there is a dearth of research on the particular obstacles and associated factors related to work-related injuries among small and medium-scale construction workers in Addis Ababa. The few studies that have been done so far have primarily focused on the entire construction industry, without a specific focus on the small and medium-scale construction enterprises that are part of the informal economy. Therefore, this study attempts to contribute to these gaps.

1.4. Significance of the Study

The findings of this study are of utmost importance to policymakers, local and national government, as well as non-governmental organizations, for evidence-based occupational hazard prevention and related health promotion programs. In addition to guiding the development of focused interventions to enhance workplace safety and lower the frequency of work-related injuries in Addis Ababa's small and medium-scale construction industry, the study's findings will offer insightful information about the unique occupational health and safety issues this vulnerable population faces. It could also be used by researchers as a baseline for further investigations. Additionally, these findings will provide employers with useful information to develop a plan to prevent work-related injuries, particularly in small and medium-scale building construction sites.

2. Literature Review

2.1. Prevalence of Occupational Injuries among Small and Medium-Scale Building Construction Workers

Construction, being one of the largest industries in the world, encompasses a wide range of jobs, including building, civil engineering, demolition, renovation, repair, and maintenance. Construction workers are subject to a wide range of hazards. About 108,000 workers worldwide die on construction sites each year, which accounts for nearly 30% of all fatal occupational injuries (24). Even though there has been a decline in construction accidents during the past ten years in the majority of industrialized regions due to the proper implementation of adequate safety measures, this in no way lessens the urgent need for workers to uphold and enhance safety procedures both on and off construction sites (24).

Small and medium-sized enterprises (SMEs) play a critical role in the global economy. In contrast to large enterprises, however, occupational health and safety is poorer in SMEs. This is explained by SMEs having a nearly eight-fold higher risk of fatal accidents, and a 50% higher risk of non-fatal injuries; coupled with decreased establishment of associations and safety committees, which is mostly attributed to their limited resources and low number of employees (25).

The Ministry of Manpower and Transmigration in Thailand noted that construction services had the highest (31.9%) rate of occupational accidents in 2010 (26). According to statistics of occupational accidents and/or diseases during 2003-2011 in Thailand, there is an overall increase in occupational accidents and diseases in microenterprises, while there is an overall decreasing trend in the rest of enterprises (26).

In Kampala City, Uganda, 32.4% of building construction workers were reported to have encountered occupational injuries (27).

In Ethiopia, there is no single study that addressed construction SMEs; however according to a systematic review, construction workers in the nation overall experienced occupational injuries at a rate of 46.78%, and the highest prevalence (55.9%) was observed in Addis Ababa city (11).

2.2. Common Occupational Injuries, Causes, and Parts of the Body Affected

SMEs typically participate in all sequences of the construction process (28), meaning workers are prone to nearly the same or even worse work-related injuries as those working in larger construction sectors. According to recent studies, the majority of construction accidents and fatalities involved small or medium-sized businesses, and fall-related hazards were major issues (29).

2.2.1. Common Occupational Injuries and Causes

According to reports from the US Bureau of Labor Statistics (BLS), the "Fatal Four" hazards, which account for more than 60% of workplace fatalities among construction workers, have been designated by OSHA as the primary causes of workplace fatalities (28). These four primary risks include falls (39.2%), struck-by-object (8.2%), electrocutions (7.3%), and caught-in-between (5.1%). The hazard scenarios that lead to falls include unprotected sides, wall openings, floor holes, improper scaffold construction, and misuse of portable ladders. Vehicles, falling/flying objects, and constructing masonry walls cause struck-by accidents. Electrocutions happen to occur due to contact with power lines, the missing or discontinuous path to ground, equipment not used in the manner prescribed, and improper use of extension and flexible cords. Caught-in-between accidents occur as a result of the absence of a protective system, unsafe placement, and unsafe access/egress (28).

About 37.3% of the injured participants in a study conducted in Ghana, had an open wound, 15.3% had superficial injuries, 15.3% had concussions and internal injuries, 10.5% had sprains and dislocations, 8.5% had traumatic amputation and deformities, 6.8% had fractures, and 6.5% had other types of injuries (30). Cuts and lacerations (30.9%), contusions (28.6%), sprains/strains/musculoskeletal discomfort, and multiple injuries (14.3% for each) were the most frequent injuries reported among workers in Egypt (31).

A study in Kampala, Uganda showed that more than a quarter of construction workers who suffered injuries were cut by sharp objects, while the remaining were pierced by construction equipment, were struck by falling objects, fell from heights, got electric shocks, fell at the same level, were held between objects, or were struck by coworkers (27). The two major causes of

injuries among workers in Egypt were falls (476%) and injuries from using manual tools (23.8%) (31).

Regarding the causes of injuries stated in a study done in Ethiopia, construction workers' working behaviors accounted for 35.2% and failure to use personal protective equipment accounted for 34.1%

2.2.2. Parts of the Body Affected

The majority of the respondents of a study in Kampala, Uganda got injuries on their hands, feet, legs, head/neck, shoulder, chest, eye, back, or abdomen (27). According to a study conducted in Egypt, the upper and lower limbs were the most often damaged body parts (31.0% and 26.2%, respectively) (31). According to a study done in Addis Ababa, Ethiopia, hands (23.9%) and toes (19.3%) were the most reported injured body parts (23).

2.3. Factors Determining Occupational Injuries among Small and Medium-Scale Building Construction Workers

2.3.1. Socio-demographic Factors

In Ghana, workers aged 25 to 34 were less likely to be exposed to the risk of injury compared to older workers, whereas in Uganda age of ≤24 years (APR: 2.09 CI: 1.20–3.65, $P = 0.009$) was significantly associated with occupational injuries (27,30).

When compared to female workers, male workers had a higher risk of injury (30). In Ethiopia, male workers had 2.44 times the likelihood of suffering a work-related injury compared to female workers (11).

A study depicted that the highest rates of injuries occurred in people with primary literacy and diplomas, 46.3% and 33.8% respectively (16).

According to a study in Gondar, the likelihood of an occupational injury among single construction workers was 50% lower than that of married workers (32).

In Uganda, occupational injuries were strongly correlated with daily incomes in or above the second quartile (USD ≥3.2) (27).

A study in Gondar, Ethiopia showed that the likelihood of injury occurrence among workers who worked for more than 5 years was 2.79 times higher compared with workers who worked for five and below years (32).

In Kampala, Uganda, injuries were most prevalent among casual laborers (porters), who accounted for the majority (41.2%) of the workers (27).

2.3.2. Working Environment Factors

The majority of businesses in Africa, Asia, and the Middle East tend to pay less attention to the safety and health of their workers. Poor working conditions were a major cause of worker injuries and fatalities in these regions, which is also noted as a sign of lax implementation of safety regulations (33).

Working for a small enterprise can be detrimental to employees' health and safety because of unfavorable working circumstances, authoritarian management, and problems handling risk. Moreover, smaller enterprises offer lower salaries and fewer benefits than larger companies do. Pyramid contracting, implementation costs, challenges with capability and knowledge, and a fear of change are factors identified to prevent small construction enterprises from improving their OHS (34).

Workers in the construction sector frequently endure substandard working conditions, making them exposed to numerous hazards while not having the appropriate health and safety training. They participate in a variety of tasks that could expose them to unsafe machinery, being struck by heavy objects, electrocution, working at heights, falling from rooftops, etc., which could cause fatal injuries and serious physical impairment (10).

Occupational safety hazards in the construction industry occur due to poorly built ladders, inappropriate or poorly maintained lifting equipment, improper walking surfaces on high platforms, improperly shored ditches, poorly maintained tools, and inadequate illumination (35).

The likelihood of occupational injuries is influenced by daily production targets, job location, work structure, trade specialization, off-work days, hours worked per week, workplace supervision, vocational training, and PPE availability (15,30). Managerial responsibilities are

frequently streamlined for SMEs, and the majority of the regulatory legislation for building safety concentrates on large businesses (28).

According to a study in Uganda, workers who worked between 4-6 and 7-9 hours per day had a 95% reduction in risk compared to those who worked more than 10 hours. Around 70% of injuries occurred among night shift workers. Working 48 hours or fewer per week reduced occupational injury by 58.1% as compared to working more than 48 hours a week according to a study conducted in Addis Ababa, Ethiopia. Compared to individuals who work every day throughout the month in Ghana, workers who enjoy off days in a month are 96% protected against accident incidence (15,27,30).

In a study conducted in Gondar, the nature of the work was the most frequently cited cause of injury, accounting for 52.03% (32).

In the Ghanaian construction industry, compared to those who work from heights and on rooftops, workers operating from any location in the workplace reduced their risk of harm by 71% (30).

In a study in Uganda, over half (52.2%) of respondents never had any health and safety training, and those lacking safety training suffered the most injuries (27). According to a meta-analysis done in Ethiopia, workers who did not obtain occupational safety training had odds of sustaining a work-related injury that was 2.43 times higher than those who did (11). Vocational training was found to decrease the odds of injury by 85.5% in a study done in Addis Ababa (15).

In a study conducted in Addis Ababa, injury and workplace supervision were inversely associated [AOR= 0.353, 95%CI (0.164-0.757)]

A study in Uganda stated that poor safety environment (APR: 1.51, CI: 1.10–2.05, $P = 0.009$) and PPE provision (AOR: 1.47, CI: 1.05–2.05, $P = 0.02$) were significantly associated with occupational injuries (27). In Addis Ababa, workers provided with PPE were 0.145 times less likely to have occupational injury than their counterparts (15).

A study in Ethiopia showed that hazard prevention is currently only practiced on a personal level. Source control and hazard path modification techniques are rarely seen. Moreover,

compared to businesses that continue to rely on outdated technologies, modern businesses appear to protect employees better (36).

2.3.3. Behavioral Factors

Accidents do not simply occur; they are caused when either what shouldn't have been done is done, or vice versa. One-third of accidents are caused by negligence, carelessness, and indifference (24).

According to a study conducted in Malaysia, the human elements, failure to employ PPE and unsafe equipment use are the main causes of construction accidents in Malaysia (37). Many unqualified operators sustain injuries as a result of incorrect equipment handling (6). Based on a study conducted in Kampala, Uganda, job dissatisfaction, job stress, and routine use of PPE were significantly associated with occupational injuries. Employees who were dissatisfied with their jobs had a 1.63 times higher rate of occupational injuries. While workers with job stress were nearly twice as likely to experience occupational injuries. Workers who did not routinely use PPE had 0.57 times more risk of getting injured (27). According to a study in Ethiopia, workers who wear personal protective equipment (PPE) are 2.32 times less likely to sustain a work-related injury than workers who do not (11). Not utilizing PPEs was the second most commonly reported cause of injury (16.74%) in a study conducted in Gondar town (32). Additionally, injury prevalence was 1.5 times greater among workers who perceived their workplace was unsafe (27).

Personal habits including alcohol use, risk-taking behavior, and the worker's physical and mental state all raise the chance of accidents (35). The occurrence of injury was 3.16 times higher among construction workers who consume alcohol in Gondar, Ethiopia (32). Similarly, among construction workers in Ethiopia, behavioral traits including alcohol drinking and smoking were highly significant injury predictors (36).

In Gondar town, construction workers who were not paying attention to their work were 2.65 times more likely to be injured when compared to their counterparts. Moreover, workers who were unaware of workplace hazards were 4.66 times more likely to have an injury (32). The major cause of injuries among building construction workers in Addis Ababa city was a lack of safety awareness, 46.7% (12).

Workers in the construction SMEs do not consistently adhere to safety regulations which is stated to be due to a general lack of safety awareness, the idea that accidents are an "act of God," a lack of knowledge of workplace risks, and national culture. As a result, problems like disregarding safety regulations and misinterpreting them are frequent, which leads to accidents (28,38).

Construction workers are skilled in certain forms and types of tasks. Even though each project has a different nature, employees frequently use the same skills and knowledge, causing an increased injury occurrence, as they are not conversant with other tools and techniques (6).

2.4. Small and Medium-Scale Building Construction Industry in Ethiopia

The review of different literatures revealed that there is no universal definition for what a construction small and medium-sized enterprise (SMEs) constitutes. Rather, SME definitions are typically based on criteria such as the number of full-time employees and annual sales or turnover. For instance, an SME in the European Union (EU), is a business with fewer than 250 people, (where small enterprises are those with between 1 and 49 employees and medium-sized enterprises are those with 50–249 employees) and that have annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million, whereas SME in the United States (USA) has fewer than 500 employees. According to the Australian Bureau of Statistics, small businesses are those with fewer than 20 employees, whereas medium-sized businesses have between 199 and more employees, and according to the Australian Taxation Office, they have an annual revenue of less than AU$10 million (25,28,34).

In Ethiopia, enterprises are categorized by the Federal Democratic Republic of Ethiopia's Central Statistical Agency (CSA) as small, medium, and large scale. Organizations are categorized using a variety of factors, including level of employment, turnover, capital investment, production capacity, technological sophistication, and sub-sector. Accordingly, small, medium, and large-scale businesses must have fewer than 10, 50, and more employees, respectively. Additionally, according to the CSA, small and medium-sized enterprises have paid-up capital between Birr 20,000 and Birr 500,000 and large-scale enterprises have more than Birr 500,000. In Ethiopia, there are over 570,000 SMEs, 99.4% of which are micro-enterprises which account for 88.2% of

employment in the private sector. There are about 10,061 small enterprises and 8593 micro-enterprises in Addis Ababa (39).

The construction industry is described by the Ethiopian Ministry of Urban and Infrastructure (MUI) as a sector of the economy that transforms various resources into built-in social, economic, and physical infrastructure for socio-economic development. The processes that are planned, designed, procured, built, produced, altered, repaired, maintained, and demolished about the physical infrastructure are included. These include buildings, transportation facilities such as airports, harbors, highways, subways, bridges, railroads, transit systems, pipelines and transmission and power lines and structures for fluid containment, control, and distribution such as water treatment and distribution, sewage collection and treatment distribution systems, sedimentation lagoons, dams, and irrigation and canal systems; underground structures, such as tunnels and mines (40).

According to the information presented in 2020/21 by the Ethiopian Ministry of Urban and Infrastructure (MUI) on construction, contractors, advisors, and machinery, there are 5,189 (45%) Building Contractors (BC), 5,189 (45%) General Contractors (GC) and few Specialized Contractors (SC) and Road Contractors (RC) registered in Addis Ababa city ranging from grade 1 to 9 (41).

A limited number of studies on Ethiopian construction SMEs show that there are health risks associated with ergonomics, including back pain, and eye and body injuries. Repetitive body movement is one feature of the construction workplace. Workplaces like these also often include working outside and have a lot of noise and dust (36).

2.5. Conceptual Framework

In general, in the construction literature, the constrain-response accident model has been extensively used. The theory suggests that in the course of executing their roles at the workplace, every individual is constrained by certain factors; and their response to these constraints further adds another set of constraints for other participants who depend on the formal's actions to act. Management, organizational, and operational factors interact to cause occupational injury. Proximal and distal factors are the two key constructs used to explain this theory. The proximal factors include socio-demographic profile and immediate individual lifestyle and behavioral

traits such as alcohol consumption, smoking, adherence to safety regulations, type of work, and exposure to hazards. The distal factors describe the organizational and work-related characteristics, such as daily production targets, job location, work structure, trade specialization, off-working days, and temporality of work among others (30).

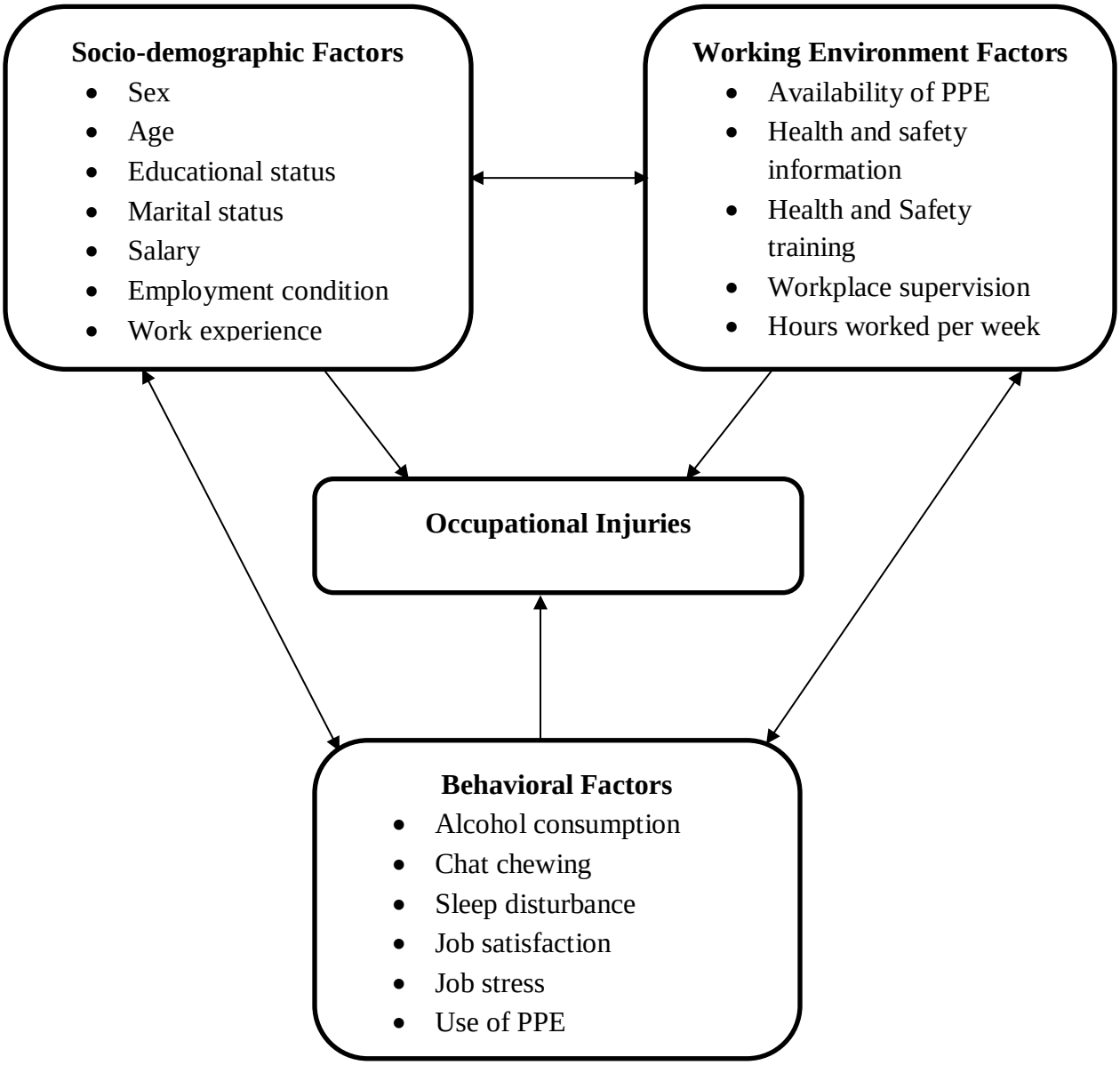

Figure 1: Conceptual framework on occupational injuries and associated factors as adopted from different literature

3. Objectives

3.1. General Objective

- ✓ To assess the prevalence of occupational injury and the associated factors among small and medium-scale building construction workers in Addis Ababa, Ethiopia.

3.2. Specific Objectives

- ✓ To assess the magnitude of occupational injuries among small and medium-scale building construction workers in Addis Ababa, Ethiopia.
- ✓ To assess factors contributing to occupational injuries among small and medium-scale building construction workers in Addis Ababa, Ethiopia.

4. Materials and Methods

4.1. Study Area

The study was conducted in Addis Ababa city administration, which comprises 11 sub-cities and occupies a total of 540 square kilometers of land area. Its average altitude is 2,400 meters above sea level and is geographically located at the heart of the country, 9°1′48″N latitude, and 38°44′24″E longitude. Ethiopia's capital and largest city, Addis Ababa, serves as a center for the country's construction and economic activity.

The study was conducted on three sub-cities, namely Kolfe Keraniyo Sub-city Administration, Akaki Kality Sub-city Administration, and Lemi Kura Sub-city Administration, where small and medium-scale building constructions take place at a high rate. Due to their diverse locations within the city, these three sub-cities are anticipated to represent the diversity of small and medium-scale construction enterprises and workers, making the data more representative of Addis Ababa's small and medium-scale building construction industry as a whole. As defined by the government, building constructions running with 6–30 members and/or with a paid-up capital of total assets not exceeding Birr 60 million are classified as small and medium-scale building constructions. Due to the enhanced access and readily available data and information on public projects in addition to feasibility and manageability issues, public construction projects that fulfill the prior mentioned criteria were included in the study. Thus, there are 19 active public building construction projects in the current budget year: 9 projects running in the Kolfe Keraniyo sub-city, 4 projects in the Akaki Kality sub-city, and 6 projects in the Lemi Kura sub-city.

4.2. Study Design and Period

A cross-sectional study was conducted to assess the prevalence of occupational injury and the associated factors among small and medium-scale building construction workers. Data was collected from August 2023 – September 2023.

4.3. Source Population

All building construction employees working on small and medium-scale building construction sites in Addis Ababa city are the source population.

4.4. Study Population

All selected building construction employees working on small and medium-scale building construction sites in Kolfe Keraniyo, Akaki Kality, and Lemi Kura sub-cities in Addis Ababa city are the study population.

4.5. Study Subjects

All selected workers who are directly involved in the building construction work process.

4.6. Eligibility Criteria

4.6.1. Inclusion Criteria

Workers who have been directly involved in the construction work process/industry for at least twelve months are included. Masons, carpenters, roofers, plumbers, electricians and welders, workers carrying out finishing works and painters, plasterers, daily laborers, and other helpers, operators, and drivers are the working departments that were included in the study.

4.6.2. Exclusion Criteria

- ✓ Administrative and other supportive staff such as site supervisors, contractors, accountants, health and safety officers, and the like.
- ✓ Workers who are absent from work during the time of data collection.
- ✓ Workers who are not willing to participate.

4.7. Sample Size Determination

The sample size for both objectives is calculated using Open Epi version 3.01, an online open-source calculator. The sample size for the first objective was calculated using a single population proportion formula using the prevalence of occupational injury within one year in Addis Ababa which was 40% (23), with a confidence interval of 95%, and a 5% margin of error. The total population (small and medium-scale building construction workers in Addis Ababa city) is

assumed to be more than 10,000; thus, the population correction formula is not used. Considering a 10% non-response rate, the final sample size is 406.

n = $\frac{(Z\alpha/2)^2 P(1-P)}{d^2}$ = 369, after adding a 10% non-response rate, n = 406.

Where: n= Sample size

Z α/2= Critical value at 95% confidence level = 1.96, using the level of significance of α=0.05.

P= Prevalence of occupational injury (40%)

d= Margin of error to be tolerated = 5%

Z= Value of a standard normal distribution score= 1.96

The sample size for the second objective was calculated using the double population proportion formula.

$$n = \frac{\left[Z\alpha/2\sqrt{\left(1+\frac{1}{r}\right)P(1-P)} + Z\beta\sqrt{P1\left(1-P1+\frac{P2(1-P2)}{r}\right)}\right]2}{(P1-P2)2}$$

n= Sample size

P1= Proportion of occupational injury among non-exposed

P2= Proportion of occupational injury among exposed

P= Pooled proportion

Zα/2= 95% degree of confidence interval; α = 0.05

β= 80% power of the study

r = Ratio of control to cases = 1.5 (23).

Table 1: Sample size calculation for assessment of factors associated with occupational injury among small and medium scale construction workers in Addis Ababa city, Ethiopia, 2023.

Variable	% of controls exposed	CI	AOR	Power	Ratio of controls to cases	Final sample size (with a 10% non-response rate
Educational status	39.3%	95%	2.052	80%	3:2	308
Employment condition	56.2%	95%	2.694	80%	3:2	196

Work experience	46.7%	95%	2.892	80%	3:2	156
Work hours per week	50.4%	95%	2.952	80%	3:2	156

Since the single population proportion formula has yielded the largest sample size, the final sample size is 406.

4.8. Sampling Procedure

Three sub-cities, i.e., Kolfe Keraniyo, Akaki Kality, and Lemi Kura, where small and medium-scale building constructions take place more often were selected. Based on the operational definition, small and medium-scale building construction sites in these sub-cities were selected. The study focused on the public building construction projects, which are 19 in total; 9 in Kolfe Keraniyo, 4 in Akaki Kality, and 6 in Lemi Kura. Then the number of study units sampled from each sub-city was determined using the proportion to size allocation formula: ni×nf/N, where: ni = number of workers in each sub-city, nf = final sample size of the study, and N = total number of workers in selected sub-cites. Study subjects were selected from each construction site by simple random sampling technique.

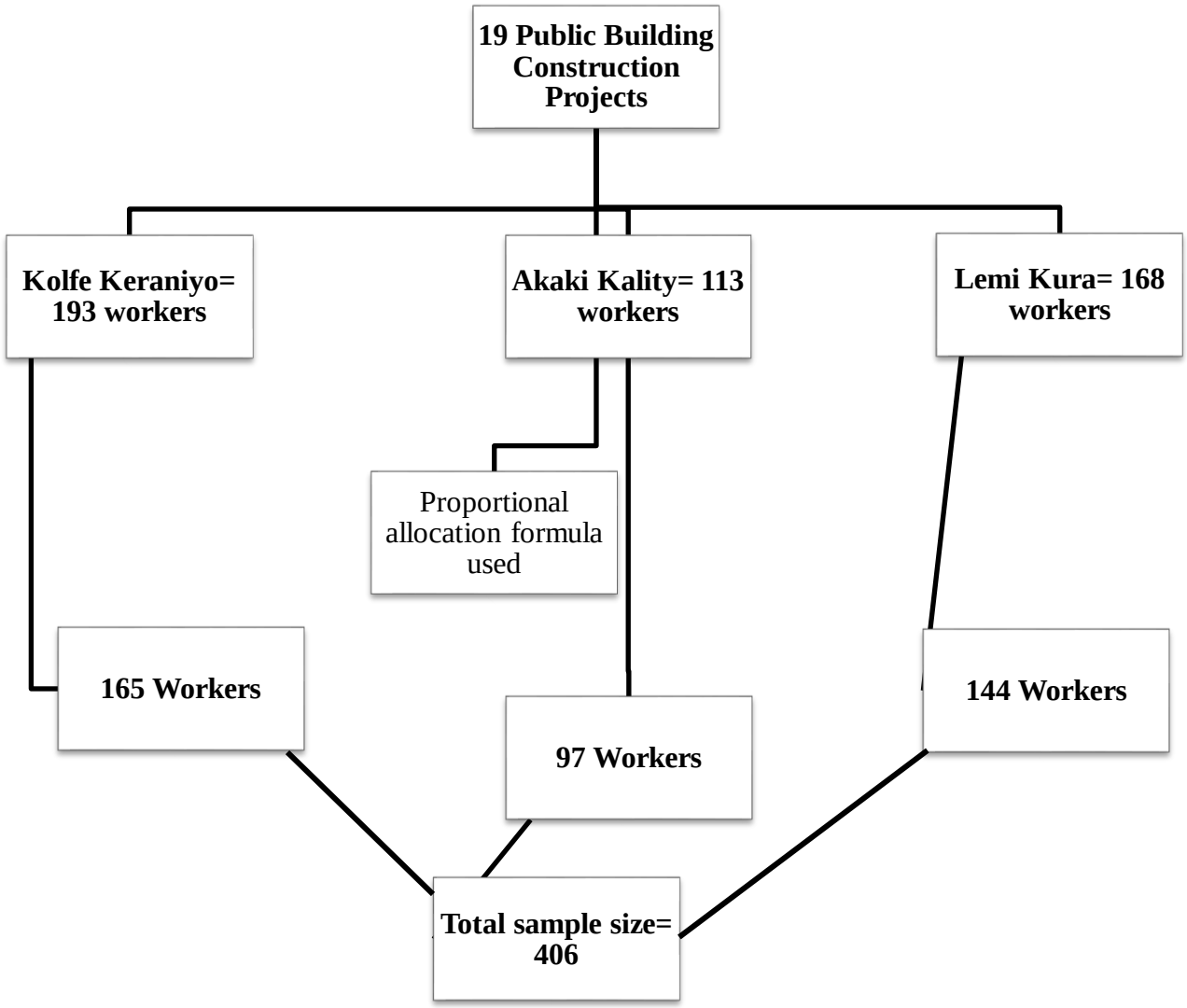

Figure 2: Schematic presentation of the sampling procedure for the assessment of work-related injuries among small and medium-scale building construction workers in Addis Ababa, Ethiopia.

Occupational Classification of Study Participants

The following categories of construction workers were used for this study: masons, carpenters, roofers, plumbers, electricians and welders, workers carrying out finishing works and painters, plasterers, daily laborers, and other helpers, operators, and drivers.

Masons, carpenters, roofers, plumbers, and electricians/welders are typically regarded as the core skilled workers engaged in constructing a building's structural and mechanical work. Painters and plasterers who complete the last aesthetic and functional aspects of a construction fall under the finishing works category (12). While operators and drivers are in charge of operating construction equipment and vehicles, daily laborers and other helpers provide general support. This worker categorization is consistent with the occupational classifications that are frequently utilized in studies of the construction sector, both in the Ethiopian context and more broadly (12,23,42). Organizing the workers in this manner allows for a detailed assessment of the work-related injury patterns and associated factors specific to each job role within the small and medium-scale building construction sector in Addis Ababa.

4.9. Study Variables

4.9.1. Dependent Variable

Self-reported occupational injury status

4.9.2. Independent Variables

- Socio-demographic variables (sex, age, educational status, marital status, income, employment condition, and working experience).
- Work environment variables (job category, working hours, workplace supervision, health and safety training, and personal protective equipment availability).
- Behavioral variables (alcohol consumption, smoking, khat chewing, job satisfaction, sleep disturbance, and use of personal protective equipment).

4.10. Operational Definitions and Terms

Occupational injury: covers any injuries resulting from accidents arising in the course of construction work in the past year before this study (43).

Occupational accident: an unanticipated and unplanned event that occurs at or in connection with work and results in one or more workers suffering from a personal injury, illness, or death (2).

Medium-scale industry: any industry that employs 10-30 workers and uses power-driven machines (19).

Small-scale industry: any industry that employs less than 10 workers and uses power-driven machines (19).

Health and safety training: is a training on health and safety given to construction workers (15).

Workplace supervision: is regular supervision performed by trained health and safety professionals and supervisors (44).

Job satisfaction: is a pleasurable emotional state reported by workers as a result of their job. It is the study participants' subjective assessment of how their job makes them feel (45).

Personal protective equipment: These include items such as gloves, goggles, overalls, boots, earmuffs, helmets, masks, vests, and face shields worn during a particular activity at the workplace to minimize exposure to workplace injuries and illnesses resulting from different workplace risks (15).

Sleeping disturbance problem: it refers to the presence of sleeping problems at work (44).

4.11. Data Collection

Data were collected using a structured and interviewer-administered questionnaire which was adopted from previous literature and modified accordingly (15,23,32,46). The questionnaire was pretested on 20 respondents (5%) who did not participate in the actual data collection. Socio-demographic, behavioral, and environmental factors related to occupational injuries as well as injury episodes from the previous year were inquired. Moreover, a workplace observational checklist was used to identify different workplace hazards and the availability, use, and, type of PPE and other facilities. Data was collected by five BSc graduates in health fields and one 2nd year MPH student was recruited as a supervisor. They were trained by the principal investigator concerning the research tools and data collection procedures for one day. The supervisor together with the principal investigator gathered and checked for completeness of data regularly.

4.12. Data Processing and Management

Data were entered into SPSS version 25 computer software after being checked for completeness manually. Incomplete data were excluded from entry. The data were given unique questionnaire

ID numbers both on hardcopy questionnaires and datasets entered into the computer. The data were checked for computer consistency by running frequencies, sorting the data in ascending order, and identifying the missing or mistyped variables. The syntax list and find were used to identify the inconsistent unique questionnaire IDs and the variables entered were compared with the hardcopy ones and corrected for any inconsistency.

4.13. Data Analysis

Descriptive statistics such as frequency distribution, percentage, ratio, proportion, mean, and standard deviation were used to describe the data on occupational injury and the factors related. The result is presented by cross tabs, simple frequency tables, and figures. Binary logistic regression analysis was employed to show the association of each factor with occupational injury using OR with 95% CI. Variables that have a P-value <0.2 in binary logistic regression analysis were included in the multiple logistic regression analysis. In the multiple logistic regression analysis, the independent effect of each variable was seen after controlling for covariates. P-value < 0.05 was used to determine the level of statistical significance. Crude Odds Ratio (COR) and Adjusted Odds Ratio (AOR) are used to express the result.

4.14. Data Quality Assurance

The questionnaire was translated into an Amharic version for common understanding and was translated back to English to check the consistency of the translation. Pretesting was conducted on 5% of the workers who were not selected in the actual data collection process, and modifications have been made accordingly. The supervisor and data collectors were trained on the objective of the study, ethical issues, interviews, and overall activities. Supervision was made throughout the data collection period by one supervisor (2^{nd} year MPH student) and the principal investigator. Data was checked for consistency and completeness.

4.15. Ethical Considerations

The proposal was submitted to the AAU School of Public Health Ethical Review Committee. Permission letter of support was obtained from the AAU School of Public Health. Verbal consent was obtained from each participant after explaining the objective of the study, the risks and benefits, issues of confidentiality, and, the right to participation. Questionnaires were coded to remove personal identifiers and information was kept confidential.

4.16. Dissemination of Findings

The final report of the study will be presented and submitted to Addis Ababa University School of Public Health. The finding will also be submitted to the Addis Ababa Bureau of Labor and Social Affairs (BOLSA), Ethiopian Ministry of Urban and Infrastructure (MUI), Kolfe Keraniyo, Akaki Kality, and Lemi Kura Sub-cities Design and Construction Works Offices and other responsible authorities. Finally, an attempt will also be made for publication in a reputable peer-reviewed journal.

5. Results

5.1. Socio-demographic Characteristics

From a total of 406 sample sizes calculated, 378 respondents participated in this study; yielding a response rate of 93.1%.

The study involved 154 (40.7%), 134 (35.4%), and 90 (23.8%) participants from the three sub-cities: Kolfe Keraniyo, Lemi Kura, and Akaki Kality respectively. Most of the respondents were males (78%) and ≤ 30 years old (69.6%) with a mean age of 28.22 (SD ±4.896). More than half of the respondents (52.4%) were married while 39.4% had a primary-level education. Among the participants, 357 (94.4%) were temporarily employed and 170 (45.0%) had 2-5 years of work experience. The workers' mean daily income in ETB was 371.22 (SD ±106.267) (Table 1).

Table 2: Socio-demographic determinants of work-related injuries among small and medium-scale building construction workers in Addis Ababa city, Ethiopia, 2023.

Variables	Categories	Frequency	Percentage (%)
Sub-city	Kolfe Keraniyo	154	40.7
	Akaki Kality	90	23.8
	Lemi Kura	134	35.4
Sex	Male	295	78
	Female	83	22
Age	≤ 30	263	69.6
	> 30	115	30.4
Marital Status	Married	198	52.4
	Single	158	41.8
	Divorced	15	4
	Widowed	7	1.9
Educational Status	Illiterate	63	16.7
	Read and write	51	13.5

	Primary (1-8)	149	39.4
	Secondary (9-12)	85	22.5
	College and above	30	7.9
Employment Condition	Temporary	357	94.4
	Permanent	21	5.6
Daily Income in ETB	≤ 200	17	4.5
	201-400	227	60.1
	> 400	134	35.4
Department	Mason	51	13.5
	Carpenter and roofer	53	14
	Plumber and electrician /welder	45	11.9
	Worker carrying out finishing work /painter	33	8.7
	Plasterer	40	10.6
	Daily laborer and other helper	148	39.2
	Operator /driver	8	2.1
Work Experience	≤ 2 years	57	15.1
	> 2 years	321	84.9

5.2. Availability and Utilization of Personal Protective Equipment

Of the respondents, 192 (50.8%) utilize PPE on duty. Among these, 141 (73.4%) use overalls. Of the individuals who used PPE, 110 (57.3%) did not use it all the time. Carelessness/ negligence (69.1%) and discomfort (34.5%) were the most reported reasons not to use PPE all the time. Sources of PPE that were mentioned by the participants were supplied by the institution (74.5%) and bought by themselves (52.6%) (Table 2).

Table 3: Availability and utilization of PPE and safety training among small and medium-scale building construction workers in Addis Ababa city, Ethiopia 2023.

Variables	Categories	Frequency	Percentage (%)

PPE on duty (n=378)	Yes	192	50.8
	No	186	49.2
PPE all the time (n=192)	Yes	82	42.7
	No	110	57.3
Reasons not to use PPE all the time	Discomfort	38	34.5
	To save time	1	0.9
	Carelessness /negligence	76	69.1
	No access	11	10
Source of PPE (n=192)	Supplied by institution	143	74.5
	Bought it themselves	101	52.6
Gloves (n=192)	Yes	59	30.7
	No	133	69.3
Respirators (n=192)	Yes	35	18.2
	No	157	81.8
Helmet (n=192)	Yes	53	27.6
	No	139	72.4
Overalls (n=192)	Yes	141	73.4
	No	51	26.6
Goggles (n=192)	Yes	22	11.5
	No	170	88.5
Face shield (n=192)	Yes	4	2.1
	No	188	97.9
Boots /shoes (n=192)	Yes	40	20.8
	No	152	79.2
First training (n=378)	Yes	42	11.1
	No	336	88.9
On job training (n=378)	Yes	19	5
	No	359	95

Gloves:

Durable, cut-resistant gloves are necessary for construction work to shield workers' hands from cuts, abrasions, and other injuries. The recommended qualities are being made of materials resistant to sharp things and heavy-duty tasks, such as leather, metal mesh, or reinforced fabric. These kinds of gloves are appropriate for Masons, carpenters, roofers, plumbers, electricians, welders, and workers carrying out finishing works (47).

Respirators:

To prevent construction workers from breathing in dangerous dust, fumes, or vapors, respirators are needed. Qualities that are recommended as rated for the particular hazards that are present include N95 or P100 filters for particulate matter. Respirators are appropriate for masons, workers carrying out finishing works; such as painters and plasterers, and any workers who come into contact with potentially hazardous airborne substances (48).

Helmets:

Hard hats and helmets shield workers' heads against collisions, falling objects, and other injuries. A rigid shell, suspension system, and chin strap to secure the helmet are the recommended qualities. Wearing helmets is appropriate for all construction workers, including masons, carpenters, roofers, plumbers, electricians, welders, and those carrying out finishing works (49).

Overalls:

Overalls, also known as coveralls, offer complete protection for the body against dirt, debris, and potentially hazardous substances. Durability, resistance to flames, and ease of moving in are the recommended attributes. Overalls are appropriate for masons, carpenters, roofers, plumbers, electricians, welders, and workers carrying out finishing works (50).

Goggles:

Goggles protect workers' eyes from dust, splashes, and other eye hazards. A good seal around the eyes, adjustable fit, and shatter-resistant lenses are the recommended features for goggles. Eye

goggles are appropriate for Masons, workers carrying out finishing works (such as painters and plasterers), and any workers who might come into contact with potential eye hazards (51).

Face shields:

Face shields provide extra protection for the face, covering the entire face and neck area. Being clear, impact-resistant, and compatible with additional personal protective equipment (PPE), such as respirators, are recommended features. They are appropriate for welders, workers carrying out finishing works (painters, plasterers, etc.); and other workers who may be exposed to chemicals or high-impact hazards (51).

Footwear:

Robust and non-slippery footwear protects workers' feet from punctures, falling objects, and other potential injuries. A steel or composite toe, a sole that resists punctures, and ankle support are recommended features. All construction workers need to wear the appropriate footwear (52).

5.3. Occupational Injury Characteristics

Among the 378 participants, 132 (34.9%) [95% CI:] of them had encountered occupational injury in the past year; of which 87 (65.9%) got injured one time. Of the total injured workers, 23 (17.4%) respondents got injured in the past two weeks. Regarding the day of injury, 49 (37.1%) respondents don’t remember it; and among those who remember it, Friday 21 (15.9%) and Saturday 17 (12.9%) were the most reported days of injury. Most (63.6%) of the respondents got injured during the afternoon. The most injured body parts were hand 49 (37.1%) and lower leg 24 (18.2%). Hurt by sharp object 41 (31.1%), struck by object 25 (18.9%), and falling from height 20 (15.2%) are among the type of accidents reported; whereas, work behavior 46 (34.8%), not using PPE 27 (20.5%) and accidents being beyond control 24 (18.2%) are among the reported reasons for injury. Of the injured respondents, 103 (78%) of them work both on the ground and at height; and 22 (16.7%) were hospitalized due to injury, where 18 (81.8%) of them were hospitalized for not more than two days (Table 3 and Figure 3).

Table 4: Occupational injury during the past 12 months among small and medium-scale building construction workers in Addis Ababa city, Ethiopia 2023.

Variables	Categories	Frequency	Percentage (%)
Occupational injury in the past year (n=378)	Yes	132	34.9
	No	246	65.1
Number of occurrences (n=132)	One time	87	65.9
	Two times	35	26.5
	≥ 3 times	10	7.6
Occupational injury in the past 2 weeks (n=132)	Yes	23	17.4
	No	109	82.6
Affected body parts (n=132)	Hand	49	37.1
	Lower leg	24	18.2
	Lower arm	16	12.1
	Head	15	11.4
	Knee	14	10.6
	Back	13	9.8
	Finger	12	9.1
	Toe	7	5.3
	Upper arm	6	4.5
	Eye	2	1.5
	Tooth	2	1.5
	Chest	2	1.5
	Upper leg	1	0.8
	Other	5	3.8
Type of the accident (n=132)	Hurt by a sharp object	41	31.1
	Struck by object	25	18.9
	Falling from height	20	15.2
	Hit by a falling object	17	12.9
	Falling at ground level	13	9.8

	Stuck against an object	11	8.3
	Other	5	3.8

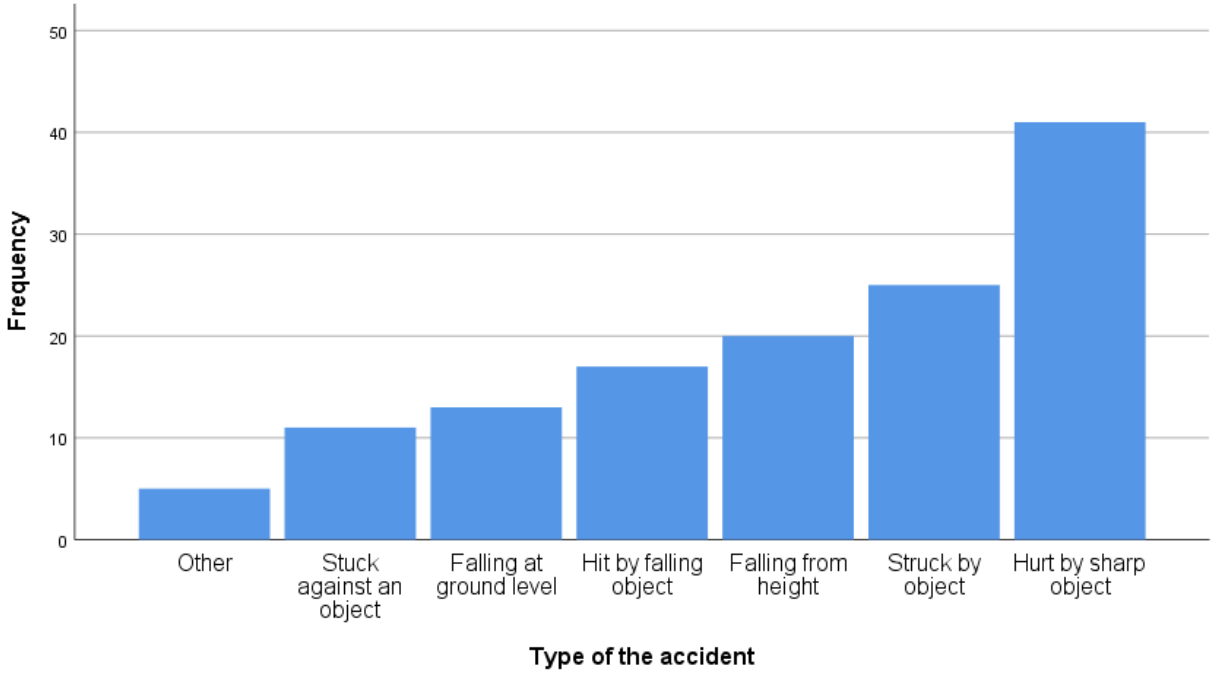

Figure 3: Types of accidents occurring among small and medium-scale building construction workers in Addis Ababa city, Ethiopia 2023.

5.4. Working Environment-Related Factors

Among the 378 respondents, 356 (94.2%) work for ≤ 48 hours per week. All of the respondents reported that there was no regular health and safety supervision at their workplace. Only 33 (8.7%) had had safety training in connection with new employment, equipment, or work processes. Participants whose work involved manual handling activities such as pulling, pushing, carrying, and lifting were 339 (89.7%). Of those, 264 (77.9%) handle very heavy (> 50kg) weight per day; and 303 (89.4%) spend more than 4 hours on this work per day. Workers who reported that their work needed visual concentration are 374 (98.9%), 91 (24.1%) workers used vibrating tools at their workplace, and most (80.2%) of these workers used vibrating tools for more than 4 hours per day. Among all respondents, 307 (81.2%) reported that the machines they

work with are always guarded or installed with safety devices; and 295 (78%) reported that the machines they work with get maintained immediately when old or unsafe.

5.5. Behavioral Factors

Among the total participants, 42 (11.1%) smoke cigarettes, 219 (57.9%) drink alcohol, and 85 (22.5%) chew khat. Among those who smoke, almost half (47.6%) of them smoke every day; and 148 (67.6%) of the alcohol consumers drink alcohol occasionally; and among those who chew khat, more than half (57.6%) do so daily. Sleeping disorders were reported to be present by 48 (12.7%) of the respondents, and the most reported reasons for this were working for more than 8 hours without shifting 19 (39.6%) and stress 13 (27.1%). Of the study participants, 95 (25.1%) are not satisfied with their current job.

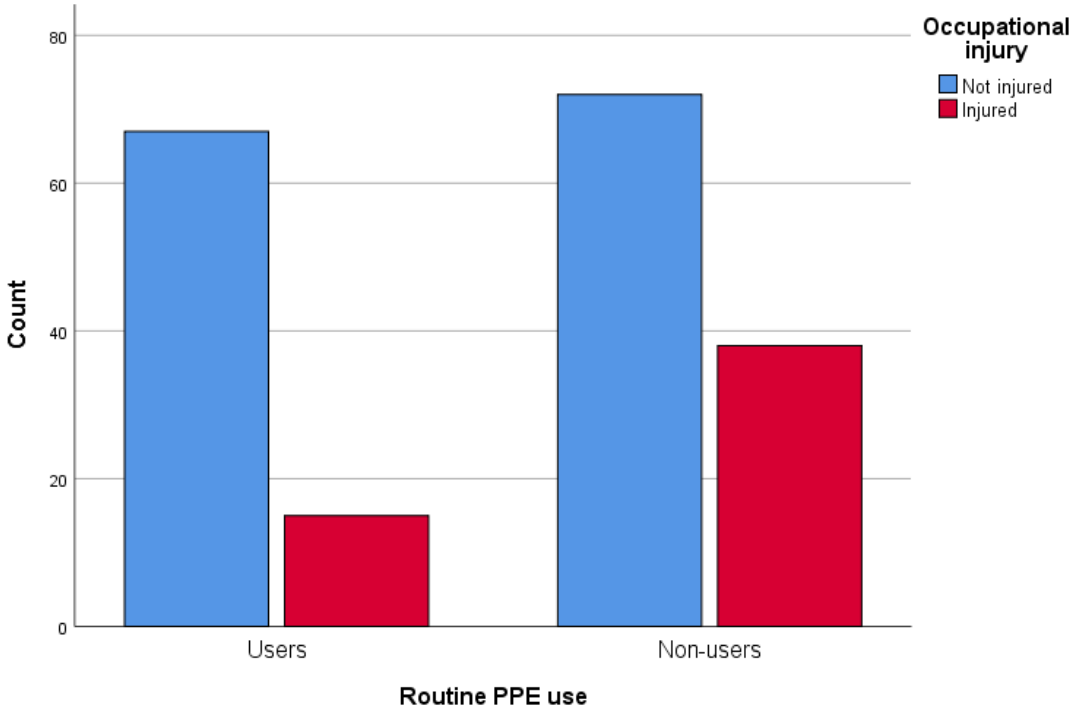

Figure 4: The distribution of routine PPE use with occupational injury among small and medium-scale building construction workers in Addis Ababa city, Ethiopia 2023.

5.6. Work Environment Observational Findings

The overall observational findings show that most workplace health and safety factors were not fulfilled. Equipment was not put in a correct place and orderly (63.2%); there were no warning signs or safety rules in the workplace (78.9%); employees did not use the necessary PPE (78.9%); there was no first aid equipment (73.7%); electrical panel knockouts were not in place (47.4%); ladders were not safe and inspected as appropriate (36.8%); hammers were not kept free of splinters /mushrooms (63.2%); unsafe handling of tools was not prohibited by the supervisors (84.2%); wall openings and floor holes were not covered or guarded (78.9) and portable circular saws were not equipped with protective guards (89.5%).

5.7. Binary Logistic Regression Analysis

In binary logistic regression analysis, among the socio-demographic characteristics of respondents, sex, age, marital status, educational status, daily income, and work experience showed significant statistical association with occupational injury. Male workers were 2.27 times more likely to be injured than female workers (COR= 2.27, 95% CI; 1.28-4.03). Workers with the age of ≤ 30 years were 3.81 times more likely to be injured than those with the age of >30 years (COR= 3.81, 95% CI; 2.20-6.59). Single workers had 1.54 times increased injury likelihood than married workers (COR= 1.54, 95% CI; 0.99-2.38). Illiterate respondents were 3.84 times more likely to get injured than those who had completed secondary education and above (COR= 3.84, 95% CI; 1.95-7.57); whereas, respondents whose daily income is ≤ 200 ETB had 2.64 times increased likelihood to get injured than those who earn > 400 ETB per day (COR= 2.64, 95% CI; 0.95-7.34). Workers with ≤ 2 years of work experience had a 7.19 times increased chance of occupational injury when compared to those who have > 2 years of experience (COR= 7.19, 95% CI; 3.80-13.60).

Among The working environment factors that showed significant association were hours worked per week, safety training, machines being guarded with safety devices, and machines being maintained when old or unsafe. Respondents who worked for > 48 hours had a 3.53 times higher chance of injury (COR= 3.53, 95% CI; 1.44-8.65). Those who didn’t have safety training in connection with new employment, equipment, or work processes were 2.59 times more likely to get injured than their counterparts (COR= 2.59, 95% CI; 1.04-6.44). Workers operating with

unguarded machines were 1.70 times more likely to get injured (COR= 1.70, 95% CI; 1.01-2.87); and workers operating with machines that aren't maintained when old or unsafe were 1.49 times more likely to get injured (COR= 1.49, 95% CI; 0.90-2.45).

Behavioral factors that were significantly associated include PPE use all the time and khat chewing. Workers who don't use PPE all the time at work had a 2.36 times increased chance of injury (COR= 2.36, 95% CI; 1.19-4.67). Khat chewers had 1.51 times increased injury likelihood (COR= 1.51, 95% CI; 0.92-2.47).

5.8. Multiple Logistic Regression Analysis

Variables with a p-value less, than 0.2 on binary logistic regression analysis were entered into multiple logistic regression analysis to see the relative effect of confounding variables.

Among socio-demographic factors, educational status, and work experience showed significant association with occupational injury. Illiterate workers were 3.74 times more likely to report occupational injury than those who had completed secondary education and above (AOR= 3.74, 95% CI; 1.19-11.72). Participants with ≤ 2 years of work experience were 5.31 times more injured than those with > 5 years of experience (AOR= 5.31, 95% CI; 1.41-19.99).

Regarding work environment factors, workers who hadn't had safety training in connection with new employment, equipment, or work process experienced injury 11.47 times more than those who had it (AOR= 11.47, 95% CI; 1.35-27.74).

Table 5: Summary of binary and multiple logistic regression analysis of factors associated with occupational injury among small and medium-scale construction workers in Addis Ababa city, Ethiopia, 2023.

Variable	Categories	Occupational injury		COR (95% CI)	AOR (95% CI)
		No	Yes		

Sex	Male	181(61.4%)	114(38.6%)	2.27(1.28-4.03) **	1.15(0.37-3.54)
	Female	65(78.3%)	18(21.7%)	1	1
Age	≤ 30	150(57%)	113(43%)	3.81(2.20-6.59) ***	1.5(0.57-3.92)
	> 30	96(83.5%)	19(16.5%)	1	1
Marital status	Married	134(67.7%)	64(32.3%)	1	1
	Single	91(57.6%)	67(42.4%)	1.54(0.99-2.38)	0.84(0.36-1.95)
Educational status	Illiterate	33(52.4%)	30(47.6%)	3.84(1.95-7.57) ***	3.74(1.19-11.72) *
	Primary	91(61.1%)	58(38.9%)	2.69(1.52-4.76) ***	2.45(1.02-5.91) *
	Secondary and above	93(80.9%)	22(19.1%)	1	1
Daily income in ETB	≤ 200	8(47.1%)	9(52.9%)	2.64(0.95-7.34)	1.36(0.13-13.82)
	201-400	144(63.4%)	83(36.6%)	1.36(0.86-2.14)	1.58(0.65-3.85)
	> 400	94(70.1%)	40(29.9%)	1	1
Work experience	≤ 2 years	15(26.3%)	42(73.7%)	7.19(3.80-13.60) ***	5.31(1.41-19.99) *
	>2 years	231(72%)	90(28%)	1	1
PPE is used all the time	No	72(65.5%)	38(34.5%)	2.36(1.19-4.67) *	2.18(0.95-5.05)
	Yes	67(81.7%)	15(18.3%)	1	1
Work hours per week	≤ 48 hours	238(66.9%)	118(33.1%)	1	1
	> 48 hours	8(36.4%)	14(63.6%)	3.53(1.44-8.65) **	4.16(0.76-22.70)
Safety training	No	219(63.5%)	126(36.5%)	2.59(1.04-6.44) *	11.47(1.35-27.74) *
	Yes	27(81.8%)	6(18.2%)	1	1
Machines guarded	No	39(54.9%)	32(45.1%)	1.69(1.01-2.87) *	4.56(0.40-51.81)
	Yes	207(67.4%)	100(32.6%)	1	1
Machines maintained	No	48(57.8%)	35(42.2%)	1.49(0.90-2.45)	0.25(0.03-2.50)
	Yes	198(67.1%)	97(32.9%)	1	1

Khat	No	197(67.2%)	96(32.8%)	1	1
	Yes	49(57.6%)	36(42.4%)	1.51(0.92-2.47)	2.43(0.96-6.12)

Where *Significant at P<0.05, **Significant at P<0.01 and ***Significant at P<0.001

1: Reference

6. Discussion

This study aimed to assess the annual occupational injury prevalence and its associated factors among small and medium-scale building construction workers in Addis Ababa, Ethiopia.

The overall prevalence of occupational injury in the preceding year was 34.9%. This result is slightly higher than the 31% prevalence reported among building construction workers in Iran (53) and the 32.4% prevalence in Uganda (27), which might be attributed to decreased regular health and safety supervision and enforcement. Whereas, studies conducted on building construction workers in Mit-Ghamr City, Egypt (31) and Ghana (30) yielded a higher annual occupational prevalence: 46.2% and 57.9% respectively, likely due to variations in study area, sample population difference, and worksite conditions.

Compared to different studies conducted on building construction workers in Ethiopia, the injury prevalence is slightly higher than the 32.6% prevalence reported in Dessie (46); while it is lower than the 40% prevalence in Addis Ababa (23) and 41.4% in Jimma (21). The higher prevalence in the latter two studies may be linked to the longer weekly working hours reported in those populations.

Among the injured workers, 65.9% got injured one time in a year. This finding is in line with that of studies conducted on building construction workers in Addis Ababa 67.8% and small-scale industry workers in the Bale zone, Southeast Ethiopia 58.9% (22,23). Two weeks injury prevalence in this study was 17.4%, which is relatively higher than the 10.3% reported in a study conducted in Bale Zone, which might be because the later study was done on a small-scale industry comprising sectors other than construction (22).

The most reported injured body parts were the hand (37.1%) and lower leg (18.2%), consistent with findings from several studies conducted on building construction workers (12,15,16,22,23,31). The predominant accident types were being hurt by sharp objects (31.1%) and struck by objects 18.9%, aligning with the study on building construction injuries in Kampala, Uganda, Nigeria, Addis Ababa and Gondar, Ethiopia (12,15,24,27,31,32).

In this study, the nature of work 34.8% and not using PPE 20.5% are the leading reasons for injury. This finding is similar to the ones yielded from studies conducted on building

construction workers in Addis Ababa (23) and Gondar town (32). Of the injured respondents in this study, 16.7% were hospitalized due to injury; of which 81.8% were hospitalized for not more than two days. This result is more or less in line with previous studies conducted in Addis Ababa (15,23).

Factors associated with occupational injuries in this study included low educational status, short work experience, and lack of health and safety training. Illiterate workers were 3.74 times more likely to report occupational injury than those who had completed college and above. This result is supported by several prior studies conducted on building construction workers in Addis Ababa, Dessie, and Iran (16,23,46,53). This may be because construction workers with low literacy rates may be more susceptible to occupational injuries because they are less aware of unsafe behaviors, are frequently assigned challenging and dangerous tasks, and are not as likely to work in safe environments as educated workers.

According to this study, participants with ≤ 2 years of work experience were 5.31 times more injured than those with > 2 years of experience. This could be because shorter work tenure is linked to less experience and knowledge of potential hazards at work, both of which promote risk-taking. And this is supported by numerous studies including those conducted on building construction workers in Iran, Egypt, and Addis Ababa (16,23,31,53).

Regarding work environment factors, workers who hadn't had health and safety training in connection with new employment, equipment, or work process experienced injury 11.47 times more than those who had it. This may be the case because training helps employees protect themselves by educating them about the various safety hazards that may exist in the construction industry. Furthermore, training might influence employees' behavior to adhere to safety procedures. This finding goes in line with several studies conducted on construction, manufacturing, and mining industry workers in different parts of the world including Ethiopia (11,15,21,27,46,53,54).

The walkthrough observation did not yield statistically significant associations; however, most of the necessary safety parameters/ standards were not implemented, and most workers did not adhere to safety practices such as wearing the appropriate PPE. This highlights the need for

improved safety training and regular workplace supervision by health and safety professionals, and it necessitates immediate action to rectify the situation and enhance safety measures.

7. Strengths and Limitations of the Study

7.1. Strengths of the Study

- Since there were no prior studies conducted on occupational injury prevalence and associated factors among small and medium-scale building construction workers, this study's findings will serve as baseline information for further research and policy/strategy design in the process of prevention and control of occupational injuries in the sector.
- The use of simple random sampling makes the sample more representative and reduces selection bias.
- The data being collected through face-to-face interviews gave a chance to clarify questions based on the respondents' understanding level; in addition to reducing the non-response rate.
- The use of a workplace walk-through observational checklist complemented the self-reported data, providing an objective assessment of the work environment factors that contribute to occupational injuries.

7.2. Limitations of the Study

- The lack of similar studies, particularly on small and medium-scale building construction, made it difficult to compare results.
- Since this study was a one-year study, recall bias resulting in under or over-reporting and misreporting of events could occur.
- The study was conducted in three sub-cities of Addis Ababa, which may limit the generalizability of the findings to the entire construction industry in Addis Ababa.
- The exclusion of administrative and supportive staff, such as site supervisors, contractors, and health and safety officers, may limit the understanding of occupational injuries from a broader organizational perspective.
- This study did not assess fatality; as severely injured participants might have not been present at the workplaces.

- This study did not include workers who missed work due to illness. Thus, the healthy worker's effect may have an impact on the study's findings.
- Since the study included workers who have been directly involved in the construction work process/industry for at least one year, and as they might have been working on large-scale building constructions, the findings of this study might as well reflect the large-scale building construction sector; making it less generalizable.

8. Conclusions and Recommendations

8.1. Conclusions

- In comparison to other studies conducted on large-scale building constructions, this study's report showed a relatively lower injury prevalence (34.9%); yet greater when compared to some.
- Factors such as educational status, work experience, and safety training were found to be significantly associated with occupational injury.
- The most reported types of accidents were being hurt by sharp objects and struck by objects; moreover, the leading reasons for injury were the nature (behavior) of the work and not using PPE.
- The study's findings emphasize the need for targeted interventions to enhance worker experience, education, and safety training as effective approaches to lower occupational injuries in this sector. The safety of this construction work environment could be further improved by highlighting the use of appropriate personal protective equipment and engineering controls to mitigate workplace hazards.

8.2. Recommendations

- The Ministry of Health should create and implement national-level construction safety regulations.
- Ministry of Labor and Social Affairs should work on improving regular health and safety supervision and enforcement of safety practices at construction sites.
- Construction companies and vocational training institutes need to provide comprehensive health and safety training to construction workers, especially those with less work experience.
- Construction companies should ensure the availability and proper utilization of PPE at construction sites.
- Addis Ababa Bureau of Labor and Social Affairs should work with construction companies to implement comprehensive occupational health and safety measures, such as

providing PPE, safety training, workplace safety committees, regular inspections, and on-site health facilities.

- MOLSA and construction companies should enhance safety awareness and promote a safety-conscious culture among construction workers.
- The Ministry of Finance should encourage construction companies to invest in safety-related infrastructure, equipment, and resources.
- More thorough research on the small and medium-scale construction industry is required, in addition to workers' monitoring and medical checkups to obtain more pertinent and fact-based information.

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Annex 1: English Version Questionnaire

Participant's Information Sheet

Title of the Research Project: Assessment of Work-Related Injuries among Small and Medium-Scale Building Construction Workers in Addis Ababa, Ethiopia.

Name of Principal Investigator: Mahlet Beyene

Name of the Organization: Addis Ababa University, College of Health Sciences, School of Public Health

Introduction: Among the most hazardous industries identified in several countries, the construction industry has been one of them; due to the high rates of work-related injury and fatality. This study will provide the existing literature with undeniably relevant information regarding work-related injuries among small and medium-scale building construction workers.

Aim of the Study: This study aims to assess the magnitude and associated factors of occupational injuries in small and medium-scale building construction workers in Addis Ababa city.

Risk and/or Discomfort: The study will not impose any risks on the participants.

Benefits: Though the research will not have a direct benefit for the participants, it indirectly benefits as an instigator for prevention efforts to strengthen and help policymakers improve OSH policies.

Confidentiality: The information collected from this study will be kept confidential and the information reviewed will be stored being coded. The information gathered will not be accessible.

Consent Form

Addis Ababa University, School of Public Health, a Study on Work-Related Injuries among Small and Medium-Scale Building Construction Workers in Addis Ababa.

Good morning/Good afternoon, my name is _____. I am from the research team of Addis Ababa University, College of Health Science, School of Public Health. We are conducting a study "Assessment of Work-Related Injuries among Small and Medium-Scale Building Construction Workers in Addis Ababa, Ethiopia.' The study aims to fill the information gap and provide evidence for program planners, implementers, and decision-makers at different levels. There are no risks or direct benefits you get from participating in the study, but your participation will contribute to boosting prevention efforts. Please be assured that the information is confidential and you may choose to stop your participation at any time or refrain from answering any questions. This will not have any impact on the service you are getting now and in the future. Your name will not be used or made public. This questionnaire will take about 20-30 minutes.

Do you agree to participate?

1. Yes 2. No

Consent Form

I have read/listened to the information sheet above and I have clearly understood the purpose and anticipated benefit of the research. I hereby need to assure that I have decided to voluntarily participate in the study, to contribute my part in the effort being made.

Participant unique ID No._____ Signature _____ Date_____

Interviewer's name_____ Signature_____ Date_____

Date of interview_____ Time started_____ Time finished_____

Supervisor's Name_____ Signature_____ Date_____

For any information, you can contact:

Mahlet Beyene Tel: +2519-42-54-6319 Email: mayabeyu65@gmail.com

Advisor: Teferi Abegaz (PhD.) Tel: +2519-11-36-1607 Email: teferiabegaz@gmail.com

Questionnaire ID: _____

Part 1: Socio-demographic Queries

S.N.	Questions	Responses	Code	Remark
101	Sex	1. Male 2. Female		
102	Age	_____		
103	Marital Status	1) Married 2) Single 3) Divorced 4) Widowed		
104	Educational Status	1) Illiterate 2) Read and write 3) Primary (1-8th Grades) 4) Secondary (9-12th Grades) 5) College and above		
105	Employment pattern	1) Temporary 2) Permanent		
106	Monthly income	_____ ETB/month		
107	Working department	1. Mason 2. Carpenter & roofer 3. Plumber & electrician /welder 4. Worker carrying out finishing works /painter 5. Plasterer 6. Daily laborer and other helper 7. Operator /driver		
108	Work experience	_____ in years		

Part 2: Availability and utilization of personal protective measures

S.N.	Questions	Responses	Code	Remark
201	Do you use any PPE while you are working?	1) Yes 2) No →		Skip to Q206

202	If yes to Q201, what type? (More than one answer is possible)	1) Glove 2) Ear plugs 3) Respirators 4) Helmet 5) Overalls 6) Goggles 7) Face shield 8) Boots/shoes 9) Others, specify _____		
203	If yes to Q201, do you use PPE all the time while working?	1) Yes 2) No		Skip to Q205
204	If no to Q203, what are the reasons not to use PPE all the time? (More than one answer is possible)	1) Not to feel discomfort 2) To save time 3) Not aware of risks 4) Carelessness/negligence 5) No access		
205	Where do you get PPE from? (More than one answer is possible)	1) It is supplied by institution 2) I buy it by myself 3) Others, specify _____		
206	Have you had training on any type of occupational safety issues when you were first engaged in this job?	1) Yes 2) No		
207	Have you ever had on job training on any type of occupational safety issues?	1) Yes 2) No		
208	If yes to Q207, where did you get it from? (More than one answer is possible)	1) From institution 2) From NGOs		

Part 3: Occupational (work-related) injury characteristics

S.N.	Questions	Responses	Code	Remark
301	Have you had an incident at work that resulted in injury to you in the last 12 months?	1) Yes 2) No		If no, skip to Part 4

302	Have you had an incident at work that resulted in injury to you in the last 2 weeks?	1) Yes 2) No		
303	If yes for Q301 or 302, how many times?	1) _____ in 12 months 2) _____ in 2 weeks		
304	Day of injury	1) Monday 2) Tuesday 3) Wednesday 4) Thursday 5) Friday 6) Saturday 7) Sunday 8) I don't remember		
305	Time of injury	1) Morning 2) Afternoon 3) Evening 4) Midnight 5) I don't remember		
306	Parts of the body affected	1) Eye 2) Tooth 3) Hand 4) Ear 5) Knee 6) Toe 7) Fingers 8) Head 9) Upper arm 10) Lower arm 11) Upper leg 12) Lower leg 13) Back 14) Chest 15) Other, specify _____		
307	Type of the accident	1) Falling from height 2) Struck by an object 3) Stuck against an object 4) Hit by a falling object 5) Falling at ground level 6) Hurt by a sharp object 7) Other, specify _____		

308	What was the reason(s) at the time of the injury?	1) I was new to the work process 2) I was thinking about private affairs 3) Due to other medical problems 4) I think accident is beyond control 5) It is the work behavior 6) It is due to not using PPE 7) I don't remember 8) Others, specify _____		
309	Working condition	1) At height 2) On ground 3) Both 4) Underground		
310	Have you been hospitalized due to injury?	1) Yes 2) No		
311	If yes for Q310, how long in hours?	_____ hours		
312	If yes for Q310, how long in days?	_____ days		

Part 4: Working environment-related variables

S.N.	Questions	Responses	Code	Remark
401	Hours worked per week	_____ hours		
402	Is there regular health and safety supervision at your workplace?	1) Yes 2) No		
403	Have you had safety training in connection with new employment, equipment, or Work Process?	1) Yes 2) No		
404	Does your work involve manual handling activity (pulling, pushing, carrying, and lifting)?	1) Yes 2) No		

405	If yes for Q404, how much weight on average do you handle per day?	1) Light (not greater than 5kg) 2) Medium (6-25kg) 3) Heavy (25-50kg) 4) Very heavy (greater than 50kg)		
406	How much time on average do you spend on this work per day?	1) Not more than 2 hours 2) 2-4 hours 3) Greater than 4 hours		
407	Does your work need visual concentration?	1) Yes 2) No		
408	Do you use vibrating tools at your workplace?	1) Yes 2) No		
409	If your answer for Q408 is yes, for how long per day do you use?	1) Not greater than 1 hour 2) 2-4 hours 3) Greater than 4 hours		
410	Are the machines you work with always guarded or installed with safety devices?	1) Yes 2) No		
411	Do the machines you work with always get maintained immediately when old or unsafe?	1) Yes 2) No		

Part 5: Workers' behavior and characteristics

S.N.	**Questions**	**Responses**	**Code**	**Remark**
501	Do you smoke?	1) Yes 2) No		If no, skip to Q503
502	If yes for Q501, how often?	1) Every day 2) 1-3 days/week 3) Occasionally		

503	Do you drink alcohol?	1) Yes 2) No		If no, skip to Q505
504	If yes for Q503, how often?	1) Every day 2) 1-3 days/week 3) Occasionally		
505	Do you chew khat?	1) Yes 2) No		If no, skip to Q507
506	If yes to Q505, how often?	1) Every day 2) 1-3 days/week 3) Occasionally		
507	Do you have any sleeping disorders?	1) Yes 2) No		If no, skip to Q509
508	If yes to Q507, what is the reason?	1) Working greater than 8 hours without shifting 2) Working in the evening 3) Trying to work more than one task at a time 4) Excessive heat 5) Others, specify _____		
509	Are you satisfied with the job or task you are currently required to do?	1) Yes 2) No		

Thank you!!!

Annex 2: Amharic Version Questionnaire

የተሳታፊው የመረጃ ወረቀት

የምርምር ፕሮጀክቱ ርዕስ፡- በአዲስ አበባ፣ ኢትዮጵያ በአነስተኛ እና መካከለኛ ደረጃ የግንባታ ሰራተኞች መካከል ያለውን ከስራ ጋር የተያያዙ ጉዳቶችን መገምገም፣ 2015

የዋና መርማሪ ስም፡- ማህሌት በየነ

የድርጅቱ ስም፡- አዲስ አበባ ዩኒቨርሲቲ፣ የጤና ሳይንስ ኮሌጅ፣ የህብረተስብ ጤና ትምህርት ቤት

መግቢያ፡- በበርካታ አገሮች ውስጥ ተለይተው ከሚታወቁት በጣም አደገኛ ኢንዱስትሪዎች መካከል የኮንስትራክሽን ኢንዱስትሪ አንዱ ነው። ከሥራ ጋር በተያያዙ ጉዳቶች እና የሞት አደጋዎች ምክንያት ይህ ጥናት በጥቃቅንና በመካከለኛ ደረጃ የግንባታ ሠራተኞች መካከል ከሥራ ጋር የተያያዙ ጉዳቶችን በተመለከተ ለነባር ጽሑፎች የማይካድ ጠቃሚ መረጃ ይሰጣል።

የጥናቱ ዓላማ፡- የዚህ ጥናት ዓላማ በአዲስ አበባ ከተማ በጥቃቅንና አነስተኛ የግንባታ ሠራተኞች ላይ የሚደርሰውን የሥራ ጉዳት መጠንና ተያያዥ ጉዳዮችን ለመገምገም ነው።

ስጋት እና/ወይም ምቾት ማጣት፡- ጥናቱ በተሳታፊዎች ላይ ምንም አይነት አደጋ አይፈጥርም።

ጥቅማ ጥቅሞች፡ ምንም እንኳን ጥናቱ ለተሳታፊዎች ቀጥተኛ ጥቅም ባይኖረውም በተዘዋዋሪ መንገድ እንደ ተነሳሽነት ማበረታቻ እና የስራ ላይ ደህንነት እና ጤና ፖሊሲዎችን ለማሻሻል ለፖሊሲ አውጪዎች ይጠቅማል።

ሚስጥራዊነት፡- ከዚህ ጥናት የሚሰበሰበው መረጃ በሚስጥር ይጠበቃል እና የተገመገመ መረጃ በኮድ ተቀምጦ ይቀመጣል። የተሰበሰበው መረጃ ተደራሽ አይሆንም።

የስምምነት ቅጽ

አዲስ አበባ ዩኒቨርሲቲ፣ የህብረተሰብ ጤና ትምህርት ቤት፣ በአዲስ አበባ በአነስተኛ እና መካከለኛ ደረጃ ህንጻ ግንባታ ሠራተኞች ላይ ስለ ጉዳቶች ስርጭት እና ተያያዥ ጉዳዮች ላይ የተደረገ ጥናት።

ጤና ይስጥልኝ፡ እኔ _____ እባላለሁ። የመጣሁት ከአዲስ አበባ ዩኒቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ፣ የህብረተሰብ ጤና ትምህርት ቤት የምርምር ቡድን ነው። በአዲስ አበባ፣ ኢትዮጵያ በአነስተኛ እና መካከለኛ ደረጃ የግንባታ ሰራተኞች መካከል ያለውን የጉዳት ስርጭት እና ተያያዥ ምክንያቶችን በመገምገም ጥናት እያካሄድን ነው። ጥናቱ የመረጃ ክፍተቱን ለመሙላት እና ለፕሮግራም ፕላነሮች፣ ፈጻሚዎች እና ውሳኔ ሰጪዎች በተለያዩ ደረጃዎች ማስረጃዎችን ለማቅረብ ያለመ ነው። በጥናቱ ላይ ከመሳተፍ የሚያገኟቸው አደጋዎች ወይም ቀጥተኛ ጥቅሞች የሉም፣ ነገር ግን የእርስዎ ተሳትፎ የመከላከል ጥረቶችን ለማሳደግ አስተዋፅዖ ያደርጋል። መረጃው ሚስጥራዊ ነው እና በማንኛውም ጊዜ ተሳትፎዎን ለማቆም ወይም ማንኛውንም ጥያቄዎችን ከመመለስ መቆጠብ ይችላሉ። ይህ አሁን እና ወደፊት በሚያገኙት አገልግሎት ላይ ምንም ተጽእኖ አይኖረውም። ስምህ/ሽ አይጠቀስም ወይም ይፋዊ አይሆንም። እና ይህ መጠይቅ ከ20-30 ደቂቃዎች ይወስዳል።

ለመሳተፍ ተስማምተሃል/ተስማምተሻል?

1. አዎ 2. አይ

ከላይ ያለውን የመረጃ ወረቀት አንብቤአለሁ/አዳምጫለሁ እና አላማውን እና ከጥናቱ የሚጠበቀውን ጥቅም በግልፅ ተረድቻለሁ። በጥናቱ ላይ በፈቃደኝነት ለመሳተፍ፣ እየተደረገ ባለው ጥረት የበኩሌን ለማበርከት መወሰኔን ላረጋግጥላችሁ እወዳለሁ።

የተሳታፊ ልዩ መታወቂያ ቁጥር፡- _____ **ፊርማ** _____ **ቀን** _____

የጠያቂው ስም፡- _____ **ፊርማ** _____ **ቀን** _____

የቃለ መጠይቁ ቀን፡- _____ **የተጀመረበት ጊዜ** _____ **ያበቃበት ጊዜ** _____

የተቆጣጣሪው ስም፡- _____ **ፊርማ** _____ **ቀን** _____

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የመጠይቁ መታወቂያ፡ _____

ክፍል 1፡ ማህበራዊና ስነ-ህዝባዊ ገፅታዎችን የተመለከቱ ጥያቄዎች

ተ.ቁ.	ጥያቄ	የመልስ አማራጮች	መለያ	ዝለል
101	ፆታ	1. ወንድ 2. ሴት		
102	እድሜ	_____		
103	የጋብቻ ሁኔታ	1. ያገባ/ች 2. ያላገባ/ች 3. የፈታ/ች 4. የሞተችበት/ባት		
104	የትምህርት ደረጃ	1. ማንበብና መፃፍ የማይችል/ትችል 2. ማንበብና መፃፍ 3. የመጀመሪያ ደረጃ ትምህርት(1-8) 4. የሁለተኛ ደረጃ ትምህርት(9-12) 5. ኮሌጅ እና ከዚያ በላይ		
105	የቅጥር ሁኔታ	1. በጊዜያዊነት 2. በቋሚነት		
106	የወር ገቢ	_____ ብር		
107	የስራ ክፍል	1. ግንበኛ 2. አናፂ እና ጣራ ሰራተኛ 3. የቱቦ ሰራተኛ እና መብራት ገጣሚ /በያጅ 4. የመጨረሻ ስራዎችን የሚሰራ /ቀለም ቀቢ/ 5. ለሳኝ 6. የቀን ሰራተኛ እና ሌሎች የረዳት ስራ የሚሰራ 7. ሹፌር/ኦፕሬተር/		
108	የስራ ልምድ	_____ ዓመት		

ክፍል 2: የመከላከያ መሳርያዎች አቅርቦትና አጠቃቀምን በተመለከተ

ተ.ቁ.	ጥያቄ	የመልስ አማራጮች	መለያ	ዝለል
201	ስራ በሚስሩበት ግዜ የአደጋ መከላከያ ይጠቀማሉ?	1. አዎ 2. የለም		ወደ ቁ.206 ዝለል

202	ለጥያቄ ቁ.201፡ መልስዎ አዎ ከሆነ፣ ምን አይነት? (ከአንድ በላይ መልስ መስጠት ይቻላል)	1. ጓንት 2. የጆሮ መከላከያ 3. የአፍና የአፍንጫ መከላከያ 4. የጭንቅላት መከላከያ 5. ሁለንም የሰውነት ክፍል የሚሸፍን 6. የአይን መከላከያ መነጽር 7. የፊት መሸፈኛ 8. ቦት ጫማዎች/ጫማዎች 9. ሌሎች፣ ይግለጹ_____		
203	ለጥያቄ ቁ.201 መልስዎ አዎ ከሆነ፣ መከላከያዎቹን ሁል ግዜ ይጠቀማሉ?	1. አዎ 2. የለም		ወደ ቁ.205 ዝለል
204	ለጥያቄ ቁ.203 መልስዎ የለም ከሆነ፣ ምክንያትዎ ምንድን ነው? (ከአንድ በላይ መልስ መስጠት ይቻላል)	1. ስለማይመች 2. ጊዜን ለመቆጠብ 3. አደጋዎችን አለማወቅ 4. ግድየለሽነት/ቸልተኝነት 5. ስለሌለኝ		
205	መከላከያ መሳርያውን ከየት ነው የሚያገኙት? (ከአንድ በላይ መልስ መስጠት ይቻላል)	1. ከተቋሙ 2. እራሴ እገዛዋለሁ 3. ሌሎች፣ ይግለጹ _____		
206	በዚህ ስራ ሲሰማሩ የጥንቃቄ ስልጠና ወስደው ነበር?	1. አዎ 2. የለም		
207	በስራ ላይ እያሉ በማንኛውም አይነት የሙያ ደህንነት ጉዳዮች ላይ የስራ ስልጠና ወስደው ያውቃሉ?	1. አዎ 2. የለም		
208	ለጥያቄ 207 መልስዎ አዎ ከሆነ፣ ስልጠናውን ከየት ነው ያገኙት? (ከአንድ በላይ መልስ መስጠት ይቻላል)	1. ከተቋሙ 2. መንግስታዊ ካልሆነ ግብረስናይ ድርጅት 3. ሌሎች፣ ይግለጹ_____		

ክፍል 3፡ የስራ ላይ ጉዳትን በተመለከተ

ተ.ቁ.	ጥያቄ	የመልስ አማራጮች	መለያ	ዝለል

301	ባለፉት 12 ወራት ውስጥ ከስራዎ ጋር በተያያዘ የደረሰብዎ አደጋ አለ?	1. አዎ 2. የለም →		ወደ ክፍል 4 ይሸጋገሩ
302	ባለፉት 2 ሳምንታት ውስጥ ከስራዎ ጋር በተያያዘ የደረሰብዎ አደጋ አለ?	1. አዎ 2. የለም		
303	ለጥያቄ ቁጥር 301 እና 302 መልስዎ አዎ ከሆነ፣ ስንት ጊዜ?	1. ባለፉት 12 ወራት _____ ጊዜ 2. ባለፈት 2 ሳምንታት _____ ጊዜ		
304	አደጋው የደረሰብዎ ዕለት መቼ ነው?	1. ሰኞ 2. ማክሰኞ 3. ረቡዕ 4. ሐሙስ 5. ዓርብ 6. ቅዳሜ 7. እሁድ 8. አላስታውስም		
305	ምን ጊዜ ነው አደጋው የደረሰብዎ?	1. ጠዋት 2. ከሰዓት 3. ማታ 4. ሌሊት 5. አላስታውስም		
306	ጉዳት የደረሰበት የሰውነትዎ ክፍል	1. አይን 2. ጥርስ 3. እጅ 4. ጆሮ 5. ጉልበት 6. የእግር ጣት 7. የእጅ ጣት 8. ራስ 9. የላይኛው ክንድ 10. የታችኛው ክንድ 11. ከጉልበት በላይ ያለው እግር 12. ከጉልበት በታች ያለው እግር 13. ጀርባ 14. ደረት 15. ሌሎች፣ ይግለጹ _____		

307	የአደጋው አይነት	1. ከከፍታ ላይ መውደቅ 2. በእቃ መመታት 3. በእቃ ላይ ተጣብቆ መቆየት 4. በሚወድቅ እቃ መመታት 5. መሬት ላይ መውድቅ 6. በስለት መጎዳት 7. ሌሎች፣ ይግለጹ _____		
308	አደጋው ለምን የደረሰብዎ ይመስለዎታል?	1. ለስራው ሂደት አዲስ ነበርኩ 2. ስለ ግል ህይወቴ እያሰብኩ ነበር 3. ሌላ የጤና ችግር ስለነበረብኝ 4. አደጋን መከላከል ስለማይቻል ነው ጉዳቱ የደረሰብኝ 5. የስራው ባህሪ ስለሆነ ነው 6. የአደጋ መከላከያ ባለማደረጌ ነው 7. አላስታውስም 8. ሌሎች፣ ይግለጹ _____		
309	የሚስሩበት ቦታ የት ነው?	1. ከፍታ ቦታ/ፎቅ ላይ 2. መሬት/ምድር 3. ሁለቱም ቦታ 4. ከመሬት በታች		
310	በአደጋው ምክንያት በጤና ተቋም አልጋ ይዘው ነበር?	1. አዎ 2. የለም		
311	ለጥያቄ ቁ.310 መልሰዎ አዎ ከሆነ፣ ለምን ያህል ጊዜ? (በሰአት)	_____ ሰአት		
312	ለጥያቄ ቁ.310 መልሰዎ አዎ ከሆነ፣ ለምን ያህል ጊዜ? (በቀናት)	_____ ቀናት		

ክፍል 4፡ የስራቦታን በተመለከተ

ተ.ቁ.	**ጥያቄ**	**የመልስ አማራጮች**	**መለያ**	**ዝለል**
401	በሳምንት በአማካይ ምን ያህል ሰአትይሰራሉ?	_____ ሰአት		
402	በሥራ ቦታዎ መደበኛ የጤና እና የደህንነት ክትትል አለ?	1. አዎ 2. የለም		

403	ከአዲስ ሥራ፣ መሣሪያ ወይም የሥራ ሂደት ጋር በተያያዘ የሙያ ደህንነትና ጤንነት ሥልጠና ወስደው ያውቃሉ?	1. አዎ 2. የለም		
404	ስራዎ ከፍተኛ ዕቃዎችን መጎተት፣ መግፋት፣ መሸከም እና ማንሳት የመሳሰሉትን ያካትታል?	1. አዎ 2. የለም →		ወደ ቁ.407 ዝለል
405	ለጥያቄ ቁ.404 መልሰዎ አዎ ከሆነ፣ በቀን በአማካይ ምን ያህል ክብደት ያነሳሉ?	1. ቀላል (ከ5 ኪግ የማይበልጥ) 2. መካከለኛ (6-25 ኪግ) 3. ከባድ (25-50 ኪግ) 4. በጣም ከባድ (ከ 50 ኪግ የሚበልጥ)		
406	በአማካይ በዚህ ስራ ላይ ለምን ያህል ጊዜ ይቆያሉ?	1. ከ2 ሰአት ያነሰ 2. ከ2-4ሰአታት 3. ከ 4 ሰአታት በላይ		
407	ስራዎ የእይታ ትኩረትን የሚሻ ነው?	1. አዎ 2. የለም		
408	በስራ ቦታዎ ላይ ንዝረት ያለባቸውን መሳሪያዎች ይጠቀማሉ?	1. አዎ 2. የለም →		ወደ ቁ.410 ዝለል
409	ለጥያቄ ቁ.408 መልሰዎ አዎ ከሆነ፣ በቀን ለምን ያህል ጊዜ?	1. ከ1 ሰአት አይበልጥም 2. ከ2-4 ሰአት 3. ከ 4 ሰአት በላይ		
410	የሚሰሩባቸው ማሽኖች ሁልጊዜ በደኅንነት መሣሪያዎች የተጠበቁ ናቸው?	1. አዎ 2. የለም		
411	የሚሰሩባቸው ማሽኖች ሲያረጁ ወይም ሲበላሹ ሁልጊዜ በወቅቱ ጥገና ይደረግላቸዋል?	1. አዎ 2. የለም		

ክፍል 5፡ የሰራተኞችን ባህሪ በተመለከተ

ተ.ቁ.	ጥያቄ	የመልስ አማራጮች	መለያ	ዝለል

501	ያጨሳሉ?	1. አዎ 2. የለም →		ወደ ቁ.503 ዝለል
502	ለጥያቄ ቁ.501 መልስዎ አዎ ከሆነ፣ በየስንት ጊዜው?	1. በየቀኑ 2. በሳምንት ከ 1-3 ቀን 3. አልፎ አልፎ		
503	አልኮል ይጠጣሉ?	1. አዎ 2. የለም →		ወደ ቁ.505 ዝለል
504	ለጥያቄ ቁ.503 መልስዎ አዎ ከሆነ፣ በየስንት ጊዜው?	1. በየቀኑ 2. በሳምንት ከ 1-3 ቀን 3. አልፎ አልፎ		
505	ጫት ይቅማሉ?	1. አዎ 2. የለም →		ወደ ቁ.507 ዝለል
506	ለጥያቄ ቁ.505 መልስዎ አዎ ከሆነ፣ በየስንት ጊዜው?	1. በየቀኑ 2. በሳምንት ከ 1-3 ቀን 3. አልፎ አልፎ		
507	የእንቅልፍ መዛባት አለብዎ?	1. አዎ 2. የለም →		ወደ ቁ.509 ዝለል
508	ለጥያቄ ቁ.507 መልስዎ አዎ ከሆነ፣ ምክንያቱ ምንድን ነው?	1. ያለ ዕረፍት/ቅያሬ ከ8 ሰአት በላይ መስራት 2. በምሽት መስራት 3. በእንድ ጊዜ ከእንድ በላይ ስራ ለመስራት መሞከር 4. ከመጠን በላይ ሙቀት 5. ሌሎች፣ ይግለጹ _____		
509	በአሁኑ ጊዜ በስራዎ ይረካሉ?	1. አዎ 2. የለም		

እናመሰግናለን።።

Annex 3: Work Environment Observational Checklist

S.N.	Safety factors	Responses	Remark
1	Equipment put in correct place and orderly	1. Yes 2. No	"Yes" requires all materials and wood placed in the correct place.
2	Are there warning signs or safety rules in the workplace?	1. Yes 2. No	"Yes" requires no lack of such signs.
3	Do the employees use the necessary personal protective devices?	1. Yes 2. No	"Yes" requires no lack of such equipment and use by each worker.
4	Does the working section have first aid equipment?	1. Yes 2. No	"Yes" requires the presence of first-aid equipment.
5	Are electrical panel knockouts in place?	1. Yes 2. No	"Yes" requires the presence of electrical panel knockouts.
6	Are ladders safe and inspected as appropriate?	1. Yes 2. No	"Yes" requires the two legs of the ladder to properly stand and without moisture on it.
7	Are hammers kept free of splinters/mushrooms?	1. Yes 2. No	"Yes" requires the hammer not to be on the splinter area.
8	Are unsafe handling of tool prohibited by the supervisors?	1. Yes 2. No	"Yes" requires supervisors to prohibit workers from unsafe tools handling.
9	Are employers operating on lifts trained on the equipment?	1. Yes 2. No	"Yes" requires the employee to operate on lifts without any faire.
10	Are wall openings and floor holes covered or guarded?	1. Yes 2. No	"Yes" requires wall openings and floor holes to be covered.
11	Are portable circular saws equipped with protective guards?	1. Yes 2. No	"Yes" requires portable saws to have covers.

LETTER FOR DECLARATION

By signing below, I proclaim that this research is my original work, it was not done by others and claimed by others work in any institution or work. This research used materials that are accredited.

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