

# Factors associated with the level of Knowledge and self-reported Practice toward safety precautions among Factory Workers in East Gojjam Zone, Northwest Ethiopia

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## Abstract

**Background:** According to the International Labor Organization, occupational accidents and diseases kill millions of workers every year.

**Objective:** To assess factors associated with the level of knowledge and self-reported practice toward safety precautions among factory workers in the East Gojjam Zone, Northwest Ethiopia, 2021.

**Methods:** An institution-based, cross-sectional study was conducted on 420 randomly selected factory workers. Data were collected through face-to-face interviews using structured questionnaires and an observation checklist. The data were analyzed using the descriptive statistical method and using bivariate binary and multivariable logistic regression models. Variables with a  $p$ -value  $<0.05$  with a 95% confidence interval were considered to have statistical significance.

**Results:** The study had a response rate of 99.0%, with a total of 416 respondents. 53.4% of respondents were aware of safety precautions, and 56.0% of them rated the use of personal protective equipment as an indicator of the practice of safety precautions. Factory workers' educational status (adjusted odds ratio: 4.3, 95% confidence interval: 2.4, 7.8), job satisfaction (adjusted odds ratio: 4.7, 95% confidence interval: 2.1, 10.4), and having training on safety issues (adjusted odds ratio: 12.8, 95% confidence interval: 6.3, 26.1) were determinant factors of knowledge regarding safety precautions, while the type of factory (adjusted odds ratio: 16.0, 95% confidence interval: 5.8, 44.1), the presence of regular supervision (adjusted odds ratio: 3.8, 95% confidence interval: 2.1, 6.8), and overall knowledge about safety precautions (adjusted odds ratio: 7.2, 95% confidence interval: 3.9, 13.2) were the independent determinants of the practice of safety precautions.

**Conclusions:** Workers' knowledge and practice regarding safety precautions were low as compared to studies in developing countries. Interventions targeted at the provision of training, promotion, and enforcement of issues regarding safety precautions should be in place. Employers, the government, and employees should work together to address these workplace safety issues.

## Keywords

Knowledge, practice, safety, safety precaution, factory worker

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## Introduction

In the 21st century, the World Health Organization considers the workplace (schools, towns, hospitals, and enterprises) to be an important area for health promotion. The workplace can have a significant positive impact on the health and well-being of employees, their families, communities, and society at large.<sup>1</sup> The promotion and preservation of safe work and workplaces is one of the most essential acts in industrial development.<sup>2</sup> The International Labour Organization (ILO) estimates that each year, over 300 million non-fatal accidents and over 2 million fatalities are caused by work-related accidents and diseases.<sup>3</sup> Every day, more than 6000 are killed and over 800,000 peoples are injured.<sup>3</sup>

In sub-Saharan African countries, around 54,000 fatal occupational accidents occur each year, with approximately 42 million job-related incidents resulting in at least 3 days off work.<sup>4</sup> According to the ILO, the overall expenses of such accidents and illnesses amount to about 4% of global GDP (GDPs).<sup>5</sup> In Ethiopia, there are 5596 fatal occupational accidents per year, with a death rate of 21.5 per 100,000 employees and an accident rate of 16,426 per 100,000 workers. Because of this, the industry has been designated as a high-risk workplace for health and safety.<sup>6</sup>

Job risks can be avoided or decreased by closely adhering to safety measures, which can only be ensured by workers' knowledge of work-related threats and their understanding of the necessity of adopting proper behavior as well as the proper use of personal protective equipment (PPE). Furthermore, knowledge and understanding of occupational health contribute to the maintenance of a healthy workplace environment by allowing for the early detection of work-related health problems, assisting with possible protection, improving worker performance to reduce disabilities, and worker rehabilitation.<sup>7</sup> Various studies conducted among factory workers in Ethiopia reveal 54%, 87.2%, 82.4%, and 49.9% compliance with occupational safety practices.<sup>3,6,8,9</sup> Another study conducted in Ethiopia among workers in the FDRE Metal and Engineering Corporation (METEC), shows that 79.5% of the respondents have a high knowledge of safety precautions (in this case, PPE).<sup>10</sup> A study conducted in Hawassa among wood and metal workers shows that concerning practice on using PPE, out of the six PPE mentioned, only 37.3% reported that they use three or more of them sometimes or always.<sup>11</sup> This demonstrates that a significant proportion of factory workers continue to work in an unsafe manner. Occupational health and safety practices are neglected or given little attention by the employer, government, and employees, according to studies from Ethiopia on the difficulties of adhering to safety practices among industries. Besides, emphasis was not given to the correct use of appropriate measures.<sup>9</sup> As a result, the negative effects of various workplace hazards are most likely

to manifest at work. In recent years, the population's occupational health and safety have improved in industrialized countries, which is considered satisfactory. However, the same cannot be said for developing countries, where occupational health is often overlooked and ranked low on national priority lists.<sup>12</sup> For the same reasons, it is anticipated to be comparable in Ethiopia, where factories are expanding and information about worker safety is scarce.

The number of industries in Ethiopia is rapidly increasing as a result of the country's favorable policies, which encourage the growth of both small and large-scale industries.<sup>13</sup> Though there are numerous causes of work-related injuries, the majority (88%) of injuries are the result of unsafe working conditions.<sup>3</sup> Even though some studies are being conducted in Ethiopia, there is little knowledge on the level of occupational safety knowledge and practice and its determinant factors among factory workers. Despite the fact that there are numerous factories in the East Gojjam zone, no research has been conducted on occupational safety knowledge and practice among factory workers. Furthermore, this study tries to include 12 factories of diverse nature to increase the study's generalizability. The findings of this study will assist planners and policymakers in developing appropriate intervention and control mechanisms for work-related hazards. As a result, the present study was aimed at assessing the knowledge and practices of factory workers toward occupational safety and finding the factors responsible for it.

## Methods and materials

### *Study design and setting*

An institutional-based cross-sectional study was conducted from 1 January to 30 March 2021. The East Gojjam zone is one of the 13 zones in the Amhara region. Debre Markos, its capital city, is located in Northwestern Ethiopia, about 300 km from Addis Ababa. In the zone, there are 12 large-scale factories of different types. Five of these factories were food processing, and the rest were manufacturing factories producing different products like cement (2), gypsum (1), nails (1), and others (3) (include edible oil, plastic, and fertilizer). The total number of workers in these factories was 1,200.<sup>14</sup> Samples were taken from factories in Debre Markos town, Awabel district, and Dejen district, including cement (1), gypsum (1), and food processing (4) factories.

### *Study population*

The study population consisted of all factory workers working in large-scale factories in the East Gojjam Zone who fulfilled the inclusion criteria.

### Source population

All factory workers of the selected district.

### Inclusion criteria

All factory workers who were active and who were present at work during the study period were considered in this study.

### Exclusion criteria

Factory workers working in the quality control department and workers employed within the past six months of the study period.

### Sample size estimation

The sample size was calculated using a single proportion approach assuming a 5% margin of error, 95% confidence interval (CI), adopting the 54% practice of workers on safety precautions,<sup>6</sup> by adding a 10% non-response rate, resulting in a total sample size of 420.

### Sampling procedure

From the total of 12 large-scale industries found in East Gojjam Zone, six industries were selected by simple random sampling. To select the right study subject, the total numbers of workers in the factory were first stratified into administrative and production workers. Further, the production workers were divided into different sections. The study subjects were drawn according to their proportions using a simple random sampling technique (Figure 1).

### Data collection tool and procedure

The sociodemographics, knowledge regarding safety precautions, practice toward adopting safety precautions, and observational data were collected through a pretested, structured questionnaire developed by reviewing the literature.<sup>3,6,8–11,15</sup> Prior to the start of the actual data collection process, the questionnaire was pretested on 21 Phibela edible oil factory (found in Burie town) workers (5% of the sample size), and any necessary changes were made (with an alpha Cronbach value of 0.82). An observational checklist was used to collect the required information. The questionnaire was first prepared in English and then translated into Amharic (the native language of the study participants) and again back to English to ensure its consistency. A trained environmental health expert collected the data. To ensure data quality, training was provided to both data collectors and supervisors for 2 days before data collection. Finally, data were collected by trained professionals using an interviewer-administered questionnaire and observation checklist in

accordance with WHO preventative techniques for the COVID-19 global pandemic, such as wearing masks, social distancing, and the use of personal protective methods.<sup>16</sup>

### Study variable

**Dependent variable.** Knowledge and practice toward safety precautions were the dependent variables of the study.

**Independent variable.** Socio-demographic characteristics: age, sex, marital status, educational status, job category, and work experience.

Personal behaviors include drinking alcohol, chewing chat, and cigarette smoking.

Work environment-related factors: Workplace health and safety training, employee rights and responsibilities, safety advice, PPE availability, work regulations, supervision, job satisfaction, working hours, and work burden.

### Statistical analysis method

Epi-data was used to enter the data, and SPSS version 21.0 was used to analyze it. Continuous variables were reported as means and standard deviations, and categorical data were represented as counts and percents. The goodness of the model fit test was checked by the Hosmer–Lemeshow test ( $p$  value = 0.621), and the value suggested that the model is a good fit ( $p$  value > 0.05). A multi-collinearity check was also conducted using a variance inflation factor, and there is no correlation detected between variables. However, candidate variables were identified using binary logistic regression analysis, and variables with a  $p$ -value of 0.25 in the bivariate analysis were entered into the multivariable logistic analysis, and independent predictors of knowledge and practice were estimated considering a  $p$ -value of 0.05 and a 95% CI.

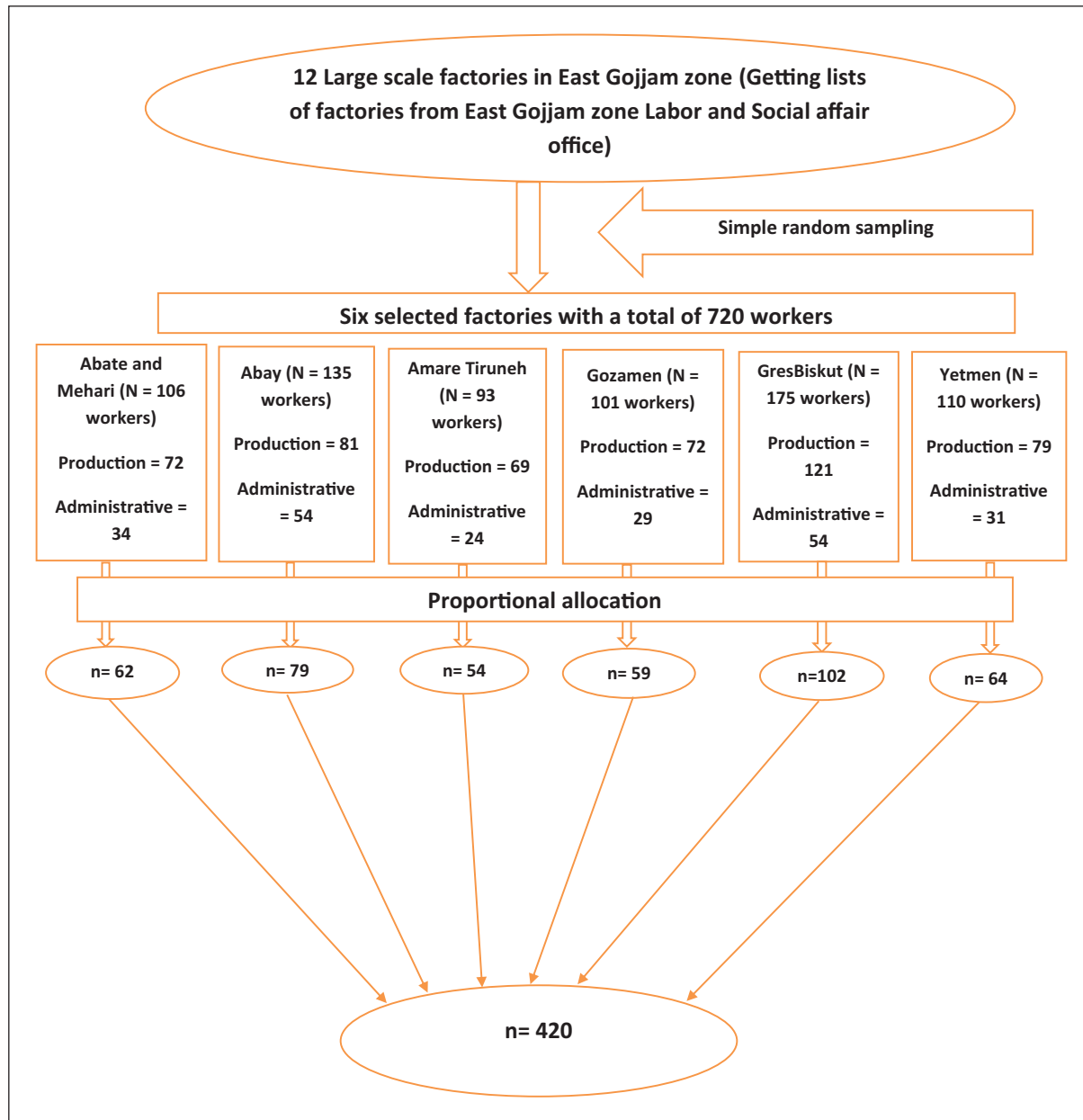
### Operational definition

**Knowledge toward safety precautions:** Participants were asked to answer 11 knowledge questions about safety and health. Graded as being “knowledgeable” if they had answered correctly ( $\geq 60\%$ ) 7–11 questions, and ( $< 59\%$ ) 0–6 as being “not knowledgeable.”<sup>3</sup>

**Safety Practice:** Those workers who scored a practice score of 60% and above on practice assessment items (16 questions) were considered as having “good safety practice,” while those who scored less than 60% were considered as having “poor safety practice.”<sup>17</sup>

**Job satisfaction:** Whether the worker was happy or not with the job that he or she was engaged with currently. A score measured using the generic satisfaction scale as yes (27–45) and no (26 or less).<sup>18</sup>

**Incidents:** means all hazard-related events that have been referred to as accidents, mishaps, near misses, occupational illnesses, environmental spills, losses, fires, explosions.<sup>19–21</sup>



**Figure 1.** Schematic presentation of the sampling procedure of the study to assess factors associated with the level of knowledge and self-reported practice toward safety precautions among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

**Emergency escape or first-aid sign:** a sign that informs people about emergency exits, first-aid, or rescue facilities.<sup>19–21</sup>

**Information sign:** is a sign that instructs anyone in the work area on how to safely do any activity or movement.<sup>19–21</sup>

**Safety and/or health sign:** A sign that uses a signboard, a color, an illuminated sign, an auditory signal, verbal communication, or a hand signal to transmit information or instructions about workplace safety or health.<sup>19–21</sup>

**Cigarette smoker:** is a person who smokes cigarettes daily whatever the number of cigarettes.<sup>22</sup>

## Results

### Socio-demographic characteristics of factory workers

A total of 416 factory workers responded for this study, with an overall response rate of 99.0%. Almost half of the participants (50.5%) were female. The mean age of the study participants was normally distributed with a 26.76 years  $\pm$  SD, (SD=4.36). The majority of 359 (86.3%) of the workers were Orthodox Christians, and the

**Table 1.** Socio-demographic characteristics of the study participants in East Gojjam Zone, Northwest Ethiopia, 2021.

Variables(n=416)	Frequency (%)
Sex	
Male	206 (49.5)
Female	210 (50.5)
Age	
14–29	318 (76.44)
≥30	98 (23.56)
Religion	
Orthodox	359 (86.3)
Muslim	50 (12.0)
Protestant	7 (1.7)
Marital status	
Married	177 (42.5)
Single	206 (49.5)
Divorced	11 (2.6)
Widowed	14 (3.4)
Separated	8 (1.9)
Educational status	
Secondary (9–12) and lower level	230 (55.3)
Diploma and above	186 (44.7)

rest 50 (12.0%) and 7 (1.7%) were Muslim and protestant, respectively. Regarding marital status, 177 (42.5%) of the workers were married, while the rest (239, or 57.5%) were not married (never married, divorced, or widowed) during the study period (Table 1).

### *Personality and behavior of the factory workers*

When personality traits were analyzed, from 416 respondents, 255 (61.3%), 10 (2.4%), and 4 (1.0%) drink alcohol, chew chat, and smoke cigarettes, respectively.

### *Work environment-related characteristics of the factory workers*

In the majority, 405 (97.4%) of the study participants were permanently employed workers. More than half, 226 (54.3%) of the study participants worked for three or more years in the factory where they are currently working. Two hundred seventy-eight (66.8%) of the study participants said they received safety training as a result of a new job, new equipment, or other changes. One hundred sixty (40.6%) of the respondents ascertained the presence of occupational safety and health recommendations in their organization (Table 2), while 260 (62.5%) of respondents reported that regular supervision was carried out in the organization. The most common safety recommendations that the workers faced on their work sites were: it is harmful 110 (67.5%), use PPE 65 (39.9%) and confined space 55 (33.7%) (Table 4).

**Table 2.** Work environment-related characteristics of the study participants to assess knowledge and practice on safety information and its associated factors among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

Variables(n=416)	Frequency (%)
Pattern of Employment	
Permanent	405 (97.4)
Temporary/contract	11 (2.6)
Job title or responsibilities	
Production	225 (54.1)
Maintenance	70 (16.8)
Packing	99 (23.8)
Other	22 (5.3)
Work experience	
Less than 3 years	190 (45.7)
3 and above years	226 (54.3)
Work burden	
Low	29 (7.0)
Fair	281 (67.5)
High	106 (25.5)
Job satisfaction	
Dissatisfied	294 (70.67)
Satisfied	122 (29.33)
Getting any kind of safety instruction as a result of a new job, new equipment, or other changes	
Yes	278 (66.8)
No	138 (33.2)
Presence of safety recommendations	
Yes	169 (40.6)
No	247 (59.4)
Belief that occupational health and safety should be existing in work places	
Yes	403 (96.9)
No	13 (3.1)
Availability of protective equipment	
Yes	115 (27.6)
No	301 (72.4)
Presence of regular supervision undertaken in the organization	
Yes	260 (62.5)
No	156 (37.5)

### *Working conditions of factories*

More than half, 214 (51.4%) of the factory workers were from food processing factories, and the rest were from manufacturing factories (48.6%). The address of all the food processing factory workers was the Debre Markos town administration.

### *Workers' knowledge with regard to safety precautions*

Detailed results on workers' knowledge with regard to safety precautions have been presented in Table 3. The majority of 251 (60.3%) of factory workers had knowledge of at least

**Table 3.** Knowledge with regard to safety information among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

Variables	Frequency (%)
Knowledge of any occupational health and safety information that can be described using graphics, signs, labels, or other means ( <i>n</i> = 416 people)	
Yes	251 (60.3)
No	165 (39.7)
Ways of occupational health and safety information described ( <i>n</i> = 251)*	
Symbol	218 (86.9)
Safety color	163 (64.9)
Labeling	175 (69.7)
Guidelines	30 (12.0)
Acoustic signal	18 (7.2)
How information mentioned gained ( <i>n</i> = 251)*	
Training in the organization	88 (35.6)
Training in higher education	43 (17.4)
Work experience	221 (89.5)
Knowledge of workers to report unsafe condition, emergencies, or accidents ( <i>n</i> = 416)	
Yes	412 (99.0)
No	4 (1.0)
Workers' knowledge of the presence of a regulation affecting their rights and responsibilities ( <i>n</i> = 416)	
Yes	306 (73.6)
No	110 (26.4)
Workers are aware that they have the right and responsibility to regulate their working conditions ( <i>n</i> = 416)	
Yes	320 (76.9)
No	96 (23.1)
Knowledge toward safety information ( <i>n</i> = 416)	
Yes	222 (53.4)
No	194 (46.6)

\*Because of the possibility of multiple responses the percentages do not sum up to 100%.

one piece of information on occupational health and safety that can be described through graphics, signs, labels, or other means (Table 3).

The knowledge of factory workers who know at least one occupational health and safety precaution that may be described in photos, signs, labels, or other language. That is, their knowledge was different when asked to describe the signs they knew and when checked using the symbols available at the hand of the data collector (Figure 2).

The majority, 220 (87.6%) of the factory workers, had knowledge of occupational safety and health signs and symbols in their organization. The other 163 (64.9%) and 153 (61.0%) of them responded to occupational safety and health signs found in the form of safety colors and labeling at their organization, respectively. In general, 222 (53.4%) of the factory workers had a knowledge score of  $\geq 60\%$  out of 11 questions and were considered knowledgeable about safety precautions.

### Practice of safety precautions

Among those factory workers who had training on safety precautions, the majority, 276 (99.3%) of the factory workers, responded as they put what they had learned into practice. All of the factory workers use at least one PPE and coveralls (called "Tuta"), which is the most frequently used PPE by 407 (98.3%) of the factory workers. The majority of 390 (93.8%) of the factory workers wore PPE because they were aware of the benefits. Generally, 233 (56.0%) of the factory workers scored a practice score of 60% or above out of 16 questions and were considered to have good safety practices. In the previous 12 months, 191 factory workers (45.9%) suffered work-related injuries or accidents. Piercing, abrasions, and cuts were the most frequent work-related injuries or accidents faced by 45 (23.6%), 40 (20.9%), and 37 (19.4%) factory workers, respectively. Falling objects, hand tools, and machines were the commonest causes of injuries or accidents faced by 63 (33.3%), 42 (22.2%), and 40 (21.2%) of the factory workers, respectively.

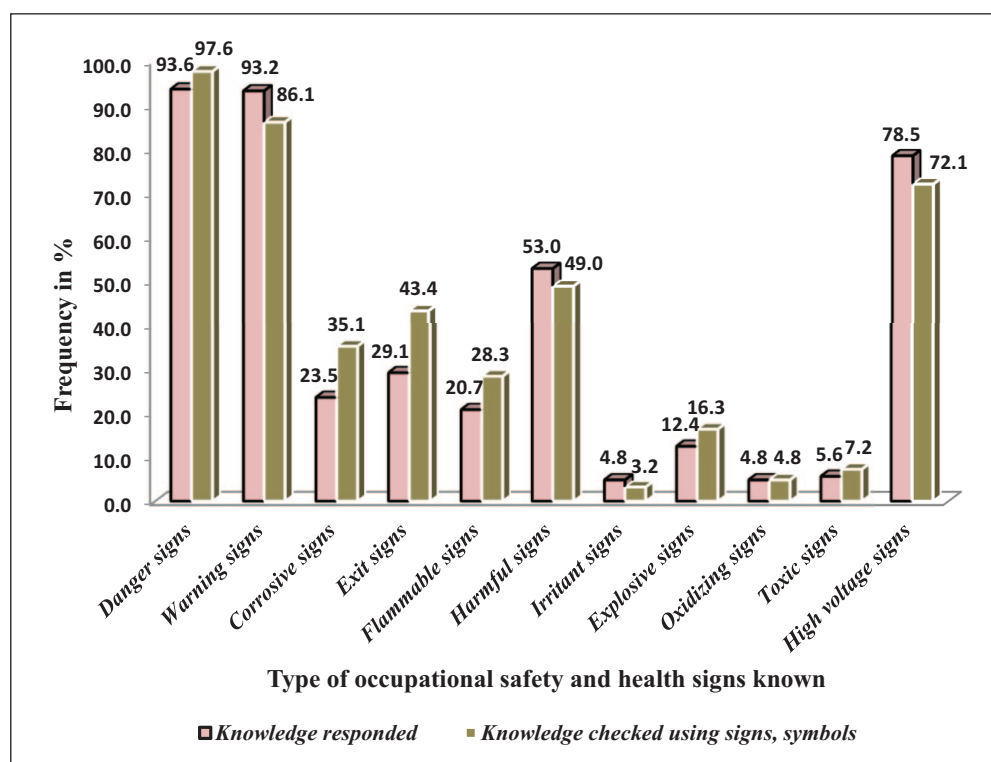
The observational findings revealed that the notice of danger was the most regularly posted safety sign at 151 (73.7%) workers' workplaces. Sign of a confined area and wearing PPE were the next common signs posted at 53 (25.9%) and 45 (22.0%) workers' work sites, respectively. The work spaces were free of electrical risks for 329 (98.2%) of the workers (no exposed wiring, broken electrical cords, or unsafe usage of extension cords/power strips). In addition, 399 (92.2%) of the worker corridors and stairwells were kept clear of obstructions and were not used for storage (Table 4).

### Factors associated with workers' knowledge about safety precautions

Variables such as sex, age, educational status, alcohol drinking habits, safety training, job satisfaction, and the presence of regular supervision had significant associations with the respondent's knowledge. On safety precautions, male workers were more than twice as knowledgeable as females (adjusted odds ratio (AOR): 2.5, 95% CI: 1.4, 4.6; Table 5).

### Factors associated with practice of the workers on safety precautions

Variables such as sex, type of factory, presence of regular supervision, knowledge of the regulations in place that concern the workers and their responsibilities, knowledge of safety precautions, and knowledge of workers' rights and obligations had significant associations with the respondent's practice. Workers who work in food processing facilities practice safety precautions more than two times as often as workers who work in manufacturing factories (AOR: 2.4, 95% CI: 1.1, 5.0; Table 6).



**Figure 2.** Type of occupational safety and health signs known through interview and using signs and symbols among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

Because of the possibility of multiple responses the percentages do not sum up to 100%.

**Table 4.** Observed safety signs posted and availability of general safety conditions at the work site of the workers among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

Variables	Frequency (%)
Safety signs posted at the work site	
Wear personal protective equipment	45 (22.0)
Confined area	53 (25.9)
Toxic	9 (4.4)
Flammable	41 (20.0)
Irritant	14 (6.8)
Wash with water	26 (12.7)
Harmful	151 (73.7)
Explosive	10 (4.9)
Oxidizing	22 (10.7)
Availability of general safety conditions	
Make a proper emergency exit sign list.	28 (8.4)
Fire extinguishers and fire alarms are conspicuous and easily accessible.	167 (49.9)
Corridors and stairwells are maintained clear of debris and are not utilized for storage.	309 (92.2)
Electrical dangers are avoided in the workplace (no exposed wiring, faulty electrical cords, or the improper usage of extension cords/power strips).	329 (98.2)
Floors are dry and free of slip hazards; bench tops (including hoods) are clean and well-organized.	305 (91.0)
Various hazard indicators are correctly posted in the right locations.	217 (64.8)
Different warning signals are easily recognizable and understandable.	213 (63.6)

**Table 5.** Factors associated with knowledge of safety information among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

Variables	Knowledgeable	Not Knowledgeable	COR (95% CI)	AOR (95% CI)	p-Value
	Frequency (%)	Frequency (%)			
Sex					
Male	145 (70.4)	61 (29.6)	4.1 (2.7–6.2)**	2.5 (1.4–4.6)*	0.003
Female	77 (36.7)	133 (63.3)			
Age of workers(year)					
14–29	207 (65.0)	111 (35.0)	1.51 (1.1–3.3)*	2.9 (1.4–6.2)*	0.006
≥30	54 (55.1)	44 (44.9)			
Educational status					
Secondary (9–12) and lower level	91 (39.6)	139 (60.4)			
Diploma and above	131 (70.4)	55 (29.6)	3.4 (2.3–5.2)**	4.3 (2.4–7.8)**	<0.001
Job satisfaction					
Dissatisfied	152 (51.7)	142 (48.3)			
Satisfied	56 (45.9)	66 (54.1)	1.26 (1.2–6.8)*	4.7 (2.1–10.4)**	<0.001
Drinking alcohol					
Yes	121 (47.5)	134 (52.5)			
No	101 (62.7)	60 (37.3)	1.9 (1.2–2.8)*	2.1 (1.1–4.0)*	0.027
Having training on safety information					
Yes	191 (68.7)	87 (31.3)	7.6 (4.7–12.2)**	12.8 (6.3–26.1)**	<0.001
No	31 (22.5)	107 (77.5)			
Presence of regular supervision					
Yes	157 (60.4)	103 (39.6)	2.1 (1.4–3.2)**	0.5 (0.3–0.9)*	0.046
No	65 (41.7)	91 (58.3)			

\*p-value less than 0.05 level. \*\*p-value less than 0.001 levels.

**Table 6.** Factors associated with the practice of safety information among factory workers in East Gojjam Zone, Northwest Ethiopia, 2021.

Variable	Poor practice	Good practice	COR (95% CI)	AOR (95% CI)	p-Value
	Frequency (%)	Frequency (%)			
Sex					
Male	140 (68.0)	66 (32.0)	2.7 (1.8–4.0)**	1.9 (1.03–3.4)*	0.039
Female	93 (44.3)	117 (55.7)			
Type of factory					
Biscuit	93 (91.2)	9 (8.8)	21.0 (9.5–46.1)**	16.0 (5.8–44.1)**	<0.001
Gypsum	52 (47.7)	57 (52.3)	1.9 (1.07–3.2)*	1.2 (0.6–2.4)	
Nail and iron sheet	51 (54.8)	42 (45.2)	2.5 (1.4–4.3)*	–	
Cement	37 (33.0)	75 (67.0)			
Presence of regular supervision					
Yes	174 (66.9)	86 (33.1)	3.3 (2.2–5.0)**	3.8 (2.01–6.8)**	<0.001
No	59 (37.8)	97 (62.2)			
Knowing whether or not there is a regulation in place that pertains to workers and their obligations					
Yes	192 (62.7)	114 (37.3)	2.8 (1.8–4.5)**	2.3 (1.07–4.9)*	0.033
No	41 (37.3)	69 (62.7)			
Knowing that workers have a right to and an obligation to follow work regulations					
Yes	204 (63.7)	116 (36.3)	4.1 (2.5–6.6)**	2.9 (1.4–6.3)*	0.006
No	29 (30.2)	67 (69.8)			
Knowledge about safety information					
Knowledgeable	186 (83.8)	36 (16.2)	16.2 (9.9–26.3)**	7.2 (3.9–13.2)**	<0.001
Not knowledgeable	47 (24.2)	147 (75.8)			

\*p-value less than 0.05 level. \*\*p-value less than 0.001 levels.



## Discussion

According to the current study's findings, the overall knowledge level for safety precautions was 53.4%. The results of this study are lower than those of studies done in Adwa and Addis Ababa, Ethiopia, where 68.7% and 69.5% of respondents have knowledge about safety precautions, respectively.<sup>6,20</sup> Differences in awareness creation activities of the organizations, size, and type of factories might be one of the possible explanations for the differences in the findings of the current study and the previous studies.

This study showed that the socio-demographic characteristics of the factory worker's age, sex, and educational status were the independent determinant factors for knowledge of safety precautions. The odds of being knowledgeable about safety precautions were higher among male factory workers. Male factory workers were two times more likely to be knowledgeable compared to female factory workers. This finding was supported by a study done in Addis Ababa, Ethiopia,<sup>20</sup> and Adwa, Ethiopia.<sup>6</sup> This variation of knowledge level by sex might be due to differences in social structure or access to such information.<sup>23</sup> Also, the odds of being knowledgeable about safety precautions were higher among younger workers compared to older ones. This finding was in line with a study conducted in Aksum Town, Ethiopia.<sup>24</sup> However, this variation of knowledge by age was not reported by most of the studies conducted in Ethiopia; for instance, studies done in Hawassa, Ethiopia,<sup>8</sup> Addis Ababa, Ethiopia,<sup>25</sup> Kombolcha, Ethiopia,<sup>26</sup> and Addis Ababa, Ethiopia.<sup>20</sup> The discrepancies between the findings of the current and previous studies could be due to methodological differences like study population, definitions of knowledge on safety precautions, and methods of data collection.

The factory workers' level of knowledge of safety precautions was dependent on their increased level of educational attainment. The odds of being knowledgeable about safety precautions among factory workers who completed at least a secondary level education were 4.3 times higher as compared to the odds of workers who completed a primary level education or below. This finding is supported by studies conducted in Nigeria,<sup>27</sup> Nepal,<sup>28</sup> Aksum Town, Ethiopia,<sup>24</sup> and Addis Ababa, Ethiopia.<sup>25</sup> Moreover, it was shown that higher-educated workers showed up the best perception on safety and lowest accident involvement rate.<sup>29</sup> This could be because workers with a higher level of education have a greater tendency to critically analyze existing information, thereby increasing their knowledge level. Having courses on such safety precautions during their educational career might be the other possible explanation for the variation of knowledge by educational status. Similarly, workers' level of satisfaction had a significant association (AOR: 4.7, 95% CI: 2.1, 10.4). This finding was consistent with a study in Nepal,<sup>28</sup> and Addis Ababa, Ethiopia.<sup>30</sup> Previous research has

identified job satisfaction as a ubiquitous and influential factor in preventing workplace hazards. This could be linked to the fact that when employees are happy with their jobs, they feel more fulfilled, have more responsibility, and are able to put their knowledge and abilities to better use. Increased job satisfaction may result in increased focus on safety motivation, knowledge, and compliance.<sup>28</sup> Drinking alcohol (AOR: 2.1, 95% CI: 1.1, 4), and the presence of regular supervision (AOR: 0.5, 95% CI: 0.3, 0.9) had a significant association with workers' knowledge levels.

Workers getting training on safety precaution (AOR: 12.8, 95% CI: 6.3, 26.1) had a significant level of knowledge. This result is supported by studies done in Addis Ababa, Ethiopia<sup>30</sup> and Adwa, Ethiopia.<sup>6</sup> Reports on occupational health and safety training show the value of training in enhancing workers' awareness of job hazards and enacting better work practices in a variety of settings.<sup>31</sup> However, in contrast to the above studies,<sup>6,30</sup> the presence of regular supervision was negatively associated with a factory worker's knowledge of safety precaution. This might be due to the focus and nature of supervision; it might be focused on only increasing workers' production and product rather than their safety.

The results of this study show that the overall level of practice of adopting safety precautions among factory workers is 56%. This finding is almost in line with a previous study conducted in Adwa town, Ethiopia.<sup>6</sup>

In this study, sex had a significant effect on practice of safety precautions as males tend to use almost two times more PPE than female workers (AOR: 1.9, 95% CI: 1.03, 3.4). This variation of practice level by sex might be due to differences in job categories. The result of this study is in agreement with the findings of a study done in Addis Ababa, Ethiopia.<sup>20</sup> The findings of this study also show that the practice of safety precautions varied by the type of factory in which the workers were working (AOR: 16.0, 95% CI: 5.8, 44.1). The odds of practicing safety precautions were 16 times higher for those workers working in food processing factories than for those factory workers working in manufacturing factories. This might be due to the difference in the factory settings, like procedures, chemicals, power, and other safety requirements.

In this study, the presence of regular supervision (AOR: 3.8, 95% CI: 2.01, 6.8) was significantly associated with practice of safety precautions. This finding was supported by various studies.<sup>3,4,30</sup> There was a reported positive association between the presence of regular supervision and safety practice. The key factors contributing to safe practice were being aware of safety measures via health and safety training and being supplied with safety precautions by the supervisor. This might be due to the fact that the use of training and supervision during hazardous chores has enhanced safety awareness, which in turn increases safety practices. In this study, the factory workers' knowledge of the existence of a

regulation governing workers' rights and obligations (AOR: 2.3, 95% CI: 2.1, 6.8), knowledge of the workers' rights and obligations concerning work regulations (AOR: 2.9, 95%CI: 1.07, 4.9), and knowledge of safety precautions (AOR: 7.2, 95% CI: 3.9, 13.2) had significant associations with safety practice level. These findings were also supported by studies conducted in Ethiopia.<sup>3,4,20,30</sup> It is a fact that, knowing rights and regulations as well as health and safety issues might lead the factory workers to practice safety precautions and measures.

### Limitation of the study

The safety precaution knowledge and practice and their determinants were studied, but the attitude components of workers were not. Workers may report more socially acceptable responses than their actual day-to-day practice due to social desirability bias.

### Conclusion

In this study, the magnitude of knowledge and practice of safety precautions were low as compared to studies done in developing countries. Factors such as age, sex, and educational status; alcohol drinking behavior, having training on safety issues; and the presence of regular supervision were significant predictors of knowledge of safety precautions. Factors such as sex, type of factory, knowledge of regulations and responsibilities, knowledge that workers have the right and obligation to follow work regulations, and overall knowledge of safety precautions were significant predictors of workers' occupational safety practices.

In addition to training provided during their first job and when new machines or chemicals are purchased, factory administrators should arrange and facilitate various health and safety training for workers. The factory administrators should display safety symbols at visible and appropriate working places and label them accordingly so as to improve the knowledge and practice of safety precautions. Immediate supervisors or front line managers have to follow up and supervise workers to ensure they are appropriately practicing safety precautions. Employers, the government, and employees should work together to address these workplace safety issues.

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### Authors' contributions

The study was developed and initiated by YM, ZD, and ZA, who also made the data available. The study design and statistical analysis were greatly aided by GY, YM, ATT, and TT. ET, AT, TT, and GY all contributed to the writing of the manuscript and approved the final version.

### Availability of data and material

The data underlying the results presented in the study are available from the corresponding author upon a reasonable request.

### Declaration of conflicting interests

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

### Ethical approval

Ethical consent was obtained from the Research and Ethical Review Committee of the College of Health Sciences, Debre Markos University. All essential explanations about the purposes, method, and confidentiality issues were given to study participants. The respondents' privacy was ensured by removing names and identifiers from the questionnaire, and they were informed that they might withdraw their consent at any moment. The ethical approval number of the study was HSC/R/C/Ser/No/489/14.

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### Informed consent

For this study, we only obtained informed verbal consent from the study subjects because the study did not involve advanced data collection procedures such as specimen collection and so on. The data was gathered solely through interviews and observation. For those whose age was <18 years, we obtained assent from the study subjects, and we obtained informed verbal consent through a phone call from their parents. The research and ethical review committee confirmed the ethical procedure followed for this study.

### Trial registration

Not applicable

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### Supplemental material

Supplemental material for this article is available online.

### References

1. Burton J; World Health Organization. *WHO Healthy workplace framework and model: Background and supporting literature and practices*. Geneva: World Health Organization, 2010.

2. Mandrioli D, Schlünssen V, Adam B, et al. WHO/ILO work-related burden of disease and injury: protocol for systematic reviews of occupational exposure to dusts and/or fibres and of the effect of occupational exposure to dusts and/or fibres on pneumoconiosis. *Environ Int* 2018; 119: 174–185.
3. Tezera ST, Chercos DH and Dessie A. Self-reported safety practices and associated factors among employees of Dashen brewery share company, Gondar, Ethiopia: a cross-sectional study. *J Occup Med Toxicol* 2017; 12(1): 1–7.
4. Tafere GA, Beyera GK and Wami SD. The effect of organizational and individual factors on health and safety practices: results from a cross-sectional study among manufacturing industrial workers. *J Public Health* 2019;8(1): 173–179.
5. Benjamin O. Fundamental principles of occupational health and safety. *ILO* 2001; 13(2): 1–59.
6. Tetemke D, Alemu K, Tefera Y, et al. Knowledge and practices regarding safety information among textile workers in Adwa town, Ethiopia. *Science Postprint* 2014; 1(1): e00015.
7. Hassan SM, Nasir U, Anwar K, et al. An assessment of the level of awareness and reported complaints regarding occupational health hazards and the utilization of personal protective equipments among the welders of Lahore, Pakistan. *Int J Occup Environ Health* 2017; 23(2): 98–109.
8. Tadesse S, Kelaye T and Assefa Y. Utilization of personal protective equipment and associated factors among textile factory workers at Hawassa Town, Southern Ethiopia. *J Occup Med Toxicol* 2016; 11(1): 1–6.
9. Shiferaw M, Beyene H, Gitore WA, et al. Occupational safety practices and associated factors among employees in Jinmao and Philip Van Heusen Textile Ethiopia, Hawassa Industrial Park, south Ethiopia. *Int J Occup Safety Ergon* 2021; 28(3): 1874–1881.
10. Kebede M. *Assessment of knowledge, attitude & practice towards safety measures among workers in FDRE Metal & Engineering Corporation/METEC*. Ethiopia: Addis Ababa University, 2014.
11. Esaiyas A, Sanbata H and Mekonnen Y. Occupational health and safety related knowledge, attitude and practice among wood and metal workers in Hawassa, Ethiopia. *Annu Res Rev Biol* 2018; 1–9.
12. Phoon W. Occupational health in developing countries: a simple case of neglect. In: *Paper presented at World Health Forum*, 1983.
13. Tadesse T and Kumie A. Prevalence and factors affecting work-related injury among workers engaged in Small and Medium-scale industries in Gondar wereda, North Gondor zone, Amhara Regional State, Ethiopia. *Ethiopian J Health Dev* 2007; 21(1): 25–34.
14. East Gojjam Zone Investment Office annual report. 2019/20.
15. Motbainor A. *Assessment of knowledge and practice on safety information among factory workers*. Ethiopia: Addis Ababa University, 2007.
16. Cucinotta D and Vanelli M. WHO declares COVID-19 a pandemic. *Acta Bio Medica: Atenei Parmensis* 2020; 91(1): 157.
17. Truong CD. Knowledge, attitude, and practice on using personal protective equipment of rattan craftsmen in trade village at Kienxuong district, Tháibinh province, Vietnam [Abstract], 2008; 19: 168–181.
18. Serkalem SY, Haimanot GM and Ansha NA. Determinants of occupational injury in Kombolcha textile factory, North-East Ethiopia. *Int J Occup Environ Med* 2014; 5(2): 84.
19. Health and Safety. *Health & Safety: Safety Signs & Signals Policy September 2009*. Policy, 2009.
20. Motbainor A, Kumie A and Melkamu Y. *Assessment of knowledge and practice on safety information among factory workers*. Ethiopia: Addis Ababa University, 2007.
21. Alara S, Inuwa I and Gambo N. Application of semiotics for health and safety signs comprehension on construction sites in Yola metropolis, Nigeria. In: Paper presented at IOP conference series Materials Science and Engineering, 2019.
22. Yosef T, Belachew A and Tefera Y. Magnitude and contributing factors of low back pain among long distance truck drivers at Modjo dry port, Ethiopia: a cross-sectional study. *J Environ Public Health* 2019; 2019: 11–12.
23. Melesse MMF, Bitew YYB, Dessie KKN, et al. Impact of cultural practices during labor and delivery on maternal and child health service utilization and associated factors in Awi, East and West Gojjam Zones, Amhara Region, North West Ethiopia: community based cross sectional study. Research Square, 2021.
24. Beyene Gebrezgiabher B, Tetemke D and Yetum T. Awareness of occupational hazards and utilization of safety measures among welders in Aksum and Adwa towns, Tigray region, Ethiopia, 2013. *J Environ Public Health* 2019; 2019: 4174085.
25. Tadesse S, Bezabih K, Destaw B, et al. Awareness of occupational hazards and associated factors among welders in Lideta Sub-City, Addis Ababa, Ethiopia. *J Occup Med Toxicol* 2016; 11(1): 1–6.
26. Zegeorgous KG, Gebru HT, Demssie AF, et al. Utilization of personal protective equipment and associated factors among Kombolcha Textile Factory workers, Kombolcha, Ethiopia: a cross-sectional study. *Edorium J Public Health* 2020; 7: 16.
27. Onowhakpor AO, Abusu GO, Adebayo B, et al. Determinants of occupational health and safety: Knowledge, attitude, and safety practices toward occupational hazards of sawmill workers in Egor Local Government Area, Edo State. *Afr J Med Health Sci* 2017; 16(1): 58.
28. Budhathoki SS, Singh SB, Sagtani RA, et al. Awareness of occupational hazards and use of safety measures among welders: a cross-sectional study from eastern Nepal. *BMJ Open* 2014; 4(4): e004646.
29. Dahl Ø. Safety compliance in a highly regulated environment: a case study of workers' knowledge of rules and procedures within the petroleum industry. *Safety Sci* 2013; 60: 185–195.
30. Alemu AA, Yitayew M, Azazeh A, et al. Utilization of personal protective equipment and associated factors among building construction workers in Addis Ababa, Ethiopia, 2019. *BMC Public Health* 2020; 20: 1–7.
31. Sapbamrer R and Thammachai A. Factors affecting use of personal protective equipment and pesticide safety practices: a systematic review. *Environ Res* 2020; 185: 109444.