

Personal Protective Equipment Utilization and Determinant Factors Among Workers in Phibela Edible Oil Factory, West Gojjam, Ethiopia

Environmental Health Insights
Volume 19: 1–10
© The Author(s) 2025
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/11786302251321230



Abraham Teym¹, Eniyew Tegegne¹, Getasew Yirdaw¹,
Lake Kumlachew¹, Temesgen Ayenew², Mahmud Ahmednur³,
Tirsit Ketsela Zeleke⁴ and Alehegn Aderaw Alamneh⁵

¹Department of Environmental Health, College of Health Sciences, Debre Markos University, Debre Markos, Ethiopia. ²Department of Nursing, College of Health Sciences, Debre Markos University, Debre Markos, Ethiopia. ³Department of Environmental Health Sciences and Technology, Jimma University, Jimma, Ethiopia. ⁴Department of Pharmacy, College of Health Sciences, Debre Markos University, Debre Markos, Ethiopia. ⁵Department of Human Nutrition, College of Health Sciences, Debre Markos University, Debre Markos, Ethiopia.

ABSTRACT

BACKGROUND: An edible oil factory is a labor-intensive and technologically complex industry, with workers potentially exposed to a variety of dangers associated with such industries. Personal protective equipment is a universal, legal requirement, and an important strategy for preventing occupational injuries and illnesses caused by workplace hazards. However, such industries receive little attention, especially in Ethiopia.

OBJECTIVE: To assess personal protective equipment utilization and its associated factors among workers in the PhiBela edible oil factory in Burie, Ethiopia, in 2022.

METHODS: A cross-sectional study was employed among the PhiBela edible oil factory workers in Burie. A simple random sampling technique was used to select 389 PhiBela edible oil factory workers. Face-to-face interviews and self-administered structured questionnaires were used to collect data on workers' protective equipment utilization practice, socio-demographic, work-related, environmental, and organizational factors. Data was analyzed using SPSS version 25. The logistic regression method was used to see factors associated with workers' protective equipment utilization. The strength of the association was calculated using an odds ratio at 95% confidence intervals.

RESULTS: Of the total workers, 216, 55.52% (48.33-57.78) workers utilize personal protective equipment in the factory. The study showed safety training [AOR (4.68, 95%CI (2.76-7.45))], availability of personal protective equipment [AOR = 4.86; 95%CI: 2.23-6.98], regular health and safety supervision [AOR = 2.751; 95%CI: 1.806-3.801], availability of safety guideline at workplace [AOR = 3.798; 95%CI: 1.248-6.173], having work experience 3 years and above [AOR = 1.64; 95%CI: 1.06-2.18], not using alcohol [AOR = 3.07; 95%CI: 2.11-4.76], and not smoking cigarette [AOR = 1.88; 95%CI: 1.55-3.11] were predictors of personal protective equipment utilization.

CONCLUSION: The level of personal protective equipment utilization among Phibela edible oil factory workers is 55.52%, which is moderate when compared to other studies done in developing countries. The presence of Safety training, availability of personal protective equipment, regular health and safety supervision, availability of guidelines at workplaces, having work experiences, not using alcohol, and cigarette smoking were factors found to be a significant predictors of personal protective equipment utilization. As a result, close workplace supervision, safety training, and availing guidelines are the recommendations to be in place.

KEYWORDS: Utilization, personal protective equipment, factory worker, Ethiopia

RECEIVED: November 4, 2023. **ACCEPTED:** January 30, 2025.

TYPE: Original Research

FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

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.

CORRESPONDING AUTHOR: Abraham Teym, Department of Environmental Health, College of Health Sciences, Debre Markos University, Debre Markos, Amhara 269, Ethiopia. Emails: abrishteym23@gmail.com; abraham_teym@dmu.edu.et

Introduction

Background

Employers, employees, governments, and the general public have long been concerned about how to protect workers against occupational diseases and injuries. This is because a safe workplace not only encourages the physical, mental, and social well-being of workers but also saves money on medical costs, work injuries, the loss of experienced personnel, and training costs of new workers, as well as costs related to workplace accidents.¹

Edible oil production facilities in Ethiopia are crucial for food security, economic growth, and sustainable development. They contribute to the well-being of the population and offer investment prospects for entrepreneurs and investors.² Several companies in Ethiopia are involved in the manufacturing of edible oil. Some of the major players in the industry include: Savola Edible Oils Ethiopia Private Limited Company(PLC), Mulugeta Metaferia Oil Factory, Kaleb Edible Oil Share Company, Abyssinia Integrated Steel PLC, Tsehay Industry S.C, Belayneh Kinde Import & Export, Kifiya Edible Oil



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

Factory, Hamaressa Edible Oil Share Company, Gutema Firisa Construction PLC, and Mega Food Complex PLC.² The number of employees across all edible oil production facilities in Ethiopia varies from facility to facility. For example, Addis Modjo Edible Oil Complex Share Company has about 280 employees, whereas PhiBela oil factory owned by Belayneh Kinde Import & Export have total of 3562 workers who work in different sections of the factory.³

However, similar to other industrial operations, the manufacturing of edible oil entails significant risks to public health, safety, and the environment.⁴ An accident that occurs in the industrial context, will pose a risk that harms people, property, and the environment. By an International Labor Organization (ILO) report, there are 317 million workplace accidents each year, and 6300 people die as a result of those accidents or illnesses. These incidents cost around 4% of the global GDP in economic terms.⁵ In the Edible Oil Factory the capital-intensive nature of the technology and infrastructure required for oil extraction, refining, and packaging generates high obstacles to entry, incentivizing larger, more centralized operations, which are the leading source of accidents.⁶ Wearing personal protection equipment (PPE) at work is one of the best strategies to prevent occupational injuries among workers. The utilization of PPE is a widely accepted regulatory necessity and an essential tactic for preventing occupational diseases and injuries.⁷

Personal Protective Equipment (PPE) is any tool, device, clothing, or piece of equipment that shields the user from health or safety concerns that could cause illness, injury, or even death to the user.⁸ Different PPEs such as safety helmets, hard hats, face masks, gloves, eye protection, boots, ear plugs, high-visibility apparel, and safety footwear are used in preventing exposure to or impact on different body parts by chemicals, hot particles (a microscopic piece of radioactive material), biological agents, and radiation.⁹

PPE should be worn by employees to safeguard against work-related diseases, injuries, and fatalities.¹⁰ Studies carried out all across the world indicate that workers use PPE in an inadequate, erroneous, incomplete, and inconsistent manner.^{11–13}

Globally, 34% of occupational accidents were caused by loss of adherence to the use of PPE. Furthermore, improper utilization of PPE is attributed to 13% of work-related injuries.¹⁴ In Ethiopia, workers' health and safety is governed by the Labour Proclamation No. 1156/2019. Some key provisions related to protecting workers' health in Ethiopian companies includes: Suitable Measures of Protection and Safety, Protective Equipment and Clothing, and Training and Instruction.¹⁵ However, according to earlier studies, only about 5% to 10% of Ethiopian employees have access to occupational health services in their specific employment. As a result, nearly half (44.66%) of the employees have reported having work-related injuries in the country. However, having safety measures in

place and wearing PPE appropriately and frequently can prevent more than 90% of these injuries.¹⁶

Different factors are identified as having correlation with non-utilization of PPEs in building construction work places in Ethiopia. These includes awareness and training, safety orientation, supervision, and availability of PPE materials.⁷ However, there is a paucity of evidence regarding the magnitude of PPE utilization among edible oil factory employees and factory-specific factors are not identified so far in Ethiopia.

An edible oil factory is a labor-intensive and technologically complex industry, with workers potentially exposed to several chemical, dust, and mechanical hazards emanating from such industries, which we may mitigate based on extraction and refining. However, such industries are not given a great deal of attention, particularly in Ethiopia. As a result, the objective of this study was to assess PPE utilization and the variables affecting its use among employees of the PhiBela edible oil factory in Burie, Northwest, Ethiopia.

Materials and Methods

Study area

The study was carried out at the PhiBela oil factory in Burie, West Gojjam, Amhara Region, Northwest Ethiopia. The area is located at a distance of 411 km from Addis Ababa, the capital of Ethiopia, and 164 km from Bahir Dar, the regional capital of the Amhara. The factory produces edible oil and is one of the largest privately held businesses in the town of Burie. It has a total of 3562 workers who work in different sections of the factory, excluding those who work as administrative workers other than production (Figure 1).

Study design and period

An institutional-based cross-sectional study was carried out between March and April 2022.

Study population

All workers who are directly involved in the process of production in PhiBela edible oil factory were included until the required sample size was achieved. The factory workers who were selected as a study subjects were considered as a study population.

Inclusion criteria

To be eligible to participate in the study, they had to be workers in the selected industry who draw salaries or wages and have been on the payroll for at least 6 months or more before the date of research. While those workers who were absent due to illness, and those who were on sick-leave during the study period were excluded from the study.

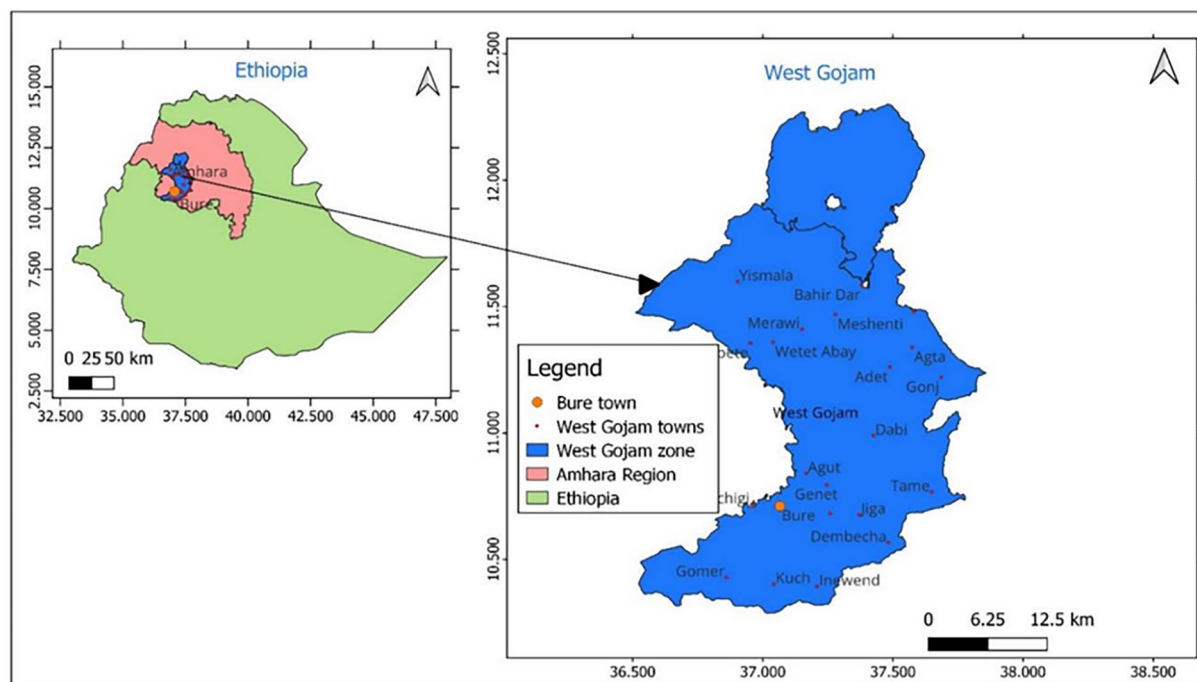


Figure 1. Study area map.

Sample size determination

The required sample size for the study is determined using single population proportion formula according to the available literature taking the prevalence of PPE actual use as 41%.¹⁷

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

$$(n) = \frac{(1.96)^2 0.41(1 - 0.41)}{(0.05)^2} = 372$$

Where, n = calculated sample size, z = standard normal deviate at 95%, Confidence Interval (CI) = 1.96, P = percentage of utilization of PPE (41%),¹⁷ $1 - P$ = the complementary probability of P which is .59, and d is margin of error .05.

After a 10% non-respondent rate was considered (Ejeso et al, 2024=Prevalence and Associated Factors of Work-Related Injury Among Municipal Solid Waste Collectors in Hawassa City, Southern Ethiopia: A Cross-Sectional Study) not to miss representative number of study subject, the final sample size was found to be 409 the factory workers.

Sampling technique

Stratified sampling followed by simple random sampling techniques were used to select the study participants. The manufacturing units were stratified into 6 departments: operator, welder, loader, plumber, mechanic, and painter. Then, the total of 409

samples was proportionally allocated to each department. Finally, the participants were drawn from the factory's list of workers using simple random sampling.

Study variables

Utilization of PPE was considered as a response or outcome variable in this study. Socio-demographic characteristics [Age, sex, religion, educational status, marital status, employment pattern, monthly income, work experience], Behavioral related factors [Drinking alcohol, smoking cigarette, satisfaction with job, chewing chat], Individual factors [Knowledge about work hazards, knowledge about PPE], Work related factors [Work experience, work status, types of occupation, duration of work, availability of PPE, attend safety training, orientation given, safety supervision, work shift, and work rotation, good light, well ventilation] were considered as the independent variables in this study.

Data collection tool and procedure

The socio-demographic, behavioral related, and work-related variables were collected through a pretested structured questionnaire developed by reviewing the literature^{7,17-21} and following the COVID-19 global pandemic prevention guideline.²² The questionnaire contains 4 main parts. Part I contains the sociodemographic condition of the respondents; and comprises a list of 8 items. Part II also contains the behavioral characteristics of the respondents; and it comprises 4 items, whereas Part III contains

individual characteristics of the respondents; and comprises 2 items. Then Part-IV also contains work-related conditions; which comprises 12 items. To maintain uniformity, the questionnaires were written in English and then translated into Amharic and returned to English by independent language specialists. To ensure the dependability and validity of the tool, a pre-test was conducted among 16 respondents from the nearby Grace Biscuit factory, found in Debre Markos town. The Cronbach's alpha value for the questionnaire was .73, which indicates that it is acceptable because it is greater than 0.60.²³ As a result, the reliability of the questionnaire in this study was determined to be acceptable. The data were collected by 4 Environmental Health professionals pre-trained for the purpose.

Data management and statistical analysis

Data cleaning was done to make sure the data was accurate, comprehensive, consistent, and free of missing values and variables. It was coded manually, entered into Epi Data version 4.2.0.0, and exported to SPSS version 25 for analysis. Descriptive statistics were performed on numerical values (mean, standard deviation, frequencies, and proportion) to describe the study population with dependent and independent variables. Model fitness was also tested using the Hosmer-Lemeshow test (P -value = .61), and the value indicated that the model is a good fit (P -value > .05). A multi-collinearity among variables was checked by considering a variance inflation factor (VIF) and found no predictor variable with VIF greater than 10. Then, bi-variables and multi-variables logistic regression were computed to identify significantly associated determinant factors. Variables that appear to be associated with $P < .25$ in the bivariate binary logistic regression analysis were considered in the multivariable analysis. Adjusted odds ratio (AOR) and 95% confidence interval (CI) are estimated. Variables with $P < .05$ were considered statistically significant predictor variables.

Operational definitions

Utilization of PPE. Workers should wear all essential worker-specific clothing or equipment to protect themselves from health and safety concerns at work.²⁴ Workers were classified as those who used PPE when they were observed wearing all the PPE that was necessary to be worn during work in a particular working section. The nature of the dependent variable workers use PPE all the time while working with yes/no questions, with ratings for yes = 1 and no = 0. The necessarily worn PPE were: (1) a respirator, gloves, eye protector, boot shoes, overall, ear plugs, and mask at the operator section, (2) a respirator, gloves, eye protector, boot shoes, ear plugs and overall at welder section, (3) respirator, gloves, mask, ear plugs, boot shoes and overall at loader section, (4) respirator, gloves, boot

shoes, eye protector, overall, reflector, mask and helmet at plumber section, (5) gloves, boot shoes, mask and overall at mechanic section, and (6) respirator, gloves, masks, ear plugs, boot shoes and overall at painter section were provided in self-administered form.

Results

Socio-demographic characteristics of the respondents

This study included 409 factory workers, and the response rate was 95.1% (389). The participants were found to be mostly male, with 261 (67.09%). The majority of respondents were between the ages of 25 and 31 which account for 214 (55.01%). The respondents mean age was 28.60 years (SD = 5.90 years). The minimum and maximum age of the respondents were 18 and 55 years, respectively. Three hundred six (92.80%) study participants were identified as followers of the Orthodox Christian religion. In terms of marital status, 199 respondents (51.08%) were single. At least 1 out of 4 respondents 102 (26.22%), had completed secondary education. Only quarter of the respondents (24.01%) have more than 3 years of work experience. The respondents mean monthly income was 6377.51 Ethiopian Birr (ETB; SD = 1943.03). The minimum and maximum monthly income of the respondents were 1500 and 9500 ETB, respectively (Table 1).

Utilization of PPE

Two hundred sixteen (55.52%) of the participants were using all the job-demand PPE during working time. On the other hand, 173 (44.48%) of the workers did not use all the necessary PPE during work. The top 4 reasons for not using PPE were non-availability, not being comfortable to use, wanting to save time, and personal negligence (Figure 2).

All workers have 100% adherence to safety shoe utilization unlike for the other type of PPEs. The study revealed that only 40 (10.28%) of the 166 workers who needed to use earplugs did so. The level of worker utilization for each PPEs depicted (Table 2).

Behavioral characteristics of respondents

Of the total participants, 13 (3.35%), 11 (2.82%), and 170 (43.70%) are addicted to smoking, chewing khat, and drinking alcohol, respectively. Additionally, 369 (94.86%) of the respondents said they were happy with their work (Table 3).

Environmental and organizational conditions

Almost all of the respondents (98%) responded that the factory provides PPEs. The majority of the respondents, 356 (91.52%), perceived their work to be risky. Almost 85% of the respondents took safety training in connection with new employment,

Table 1. Socio-demography characteristics of the respondent among PhiBella oil factory workers, Burie, West Gojjam, Ethiopia, 2022 (n=389).

VARIABLE	CATEGORY	FREQUENCY	PERCENT (%)
Gender	Male	261	67.09
	Female	128	32.91
Age (y)	18-24	86	22.10
	25-31	214	55.01
	32-38	65	16.70
	39-45	19	4.88
	>45	5	1.28
Religion	Orthodox	361	92.80
	Muslim	18	4.62
	Protestant	10	2.57
Marital status	Married	174	44.73
	Single	199	51.08
	Divorced	8	2.05
	Widowed	3	0.77
	Separated	5	1.28
Educational status	Unable to read and write	3	0.77
	Read and write	20	5.14
	Primary school (1-8)	86	22.20
	Secondary school (9-12)	102	26.22
	Technical and vocational	96	24.67
Employment pattern	Permanent	375	96.40
	Temporary	14	3.59
Monthly income (ETB)	1500-3400	17	4.37
	3500-5400	125	32.13
	5500-7400	121	31.10
	7500-9400	90	23.13
	≥9500	36	9.25

(Continued)

Table 1. (Continued)

VARIABLE	CATEGORY	FREQUENCY	PERCENT (%)
Type of work	Mechanic	93	23.90
	Welder	67	17.22
	Electrician	24	6.16
	Painter	16	4.11
	Plumber	10	2.57
	Carpenter	24	6.16
	Machinist	29	7.45
	Operator	56	14.39
	Loader/Off loader	52	13.36
Work experience (y)	Cleaner	18	4.62
	<1	136	36.13
	1-3	158	40.21
	>3	95	24.01

equipment, or work process. The detail on environmental and organizational conditions is depicted below (Table 4).

Factors that affect the utilization of PPE

The result of the multivariable logistic regression analysis showed that the utilization of PPE among workers who have taken safety training is 4.68 times higher than workers who have not taken the training [AOR = 4.68; 95%CI: 2.76-7.45]. Similarly, the utilization among workers who have access to and availability of PPE is 4.86 times higher than their counterparts [AOR = 4.86; 95%CI: 2.23-6.98]. The presence of health and safety supervision [AOR = 2.75; 95%CI: 1.81-3.80] and safety guidelines for the workers [AOR = 3.80; 95%CI: 1.25-6.17] were also among the factors significantly associated with PPE utilization. The odds of PPE utilization among workers having work experience of more than 3 years was approximately 2 times higher as compared to those workers who had work experience of less than 1 year [AOR = 1.64; 95%CI: 1.06-2.18]. Furthermore, the odds of PPE utilization among alcohol non user workers was 3 times higher as compared to those who used alcohol [AOR = 3.07; 95%CI: 2.11-4.76]. Likewise, the odds of PPE utilization among cigarette non-smoker workers was approximately 2 times higher as compared to those who smoked cigarette [AOR = 1.88; 95%CI: 1.55-3.11] (Table 5).

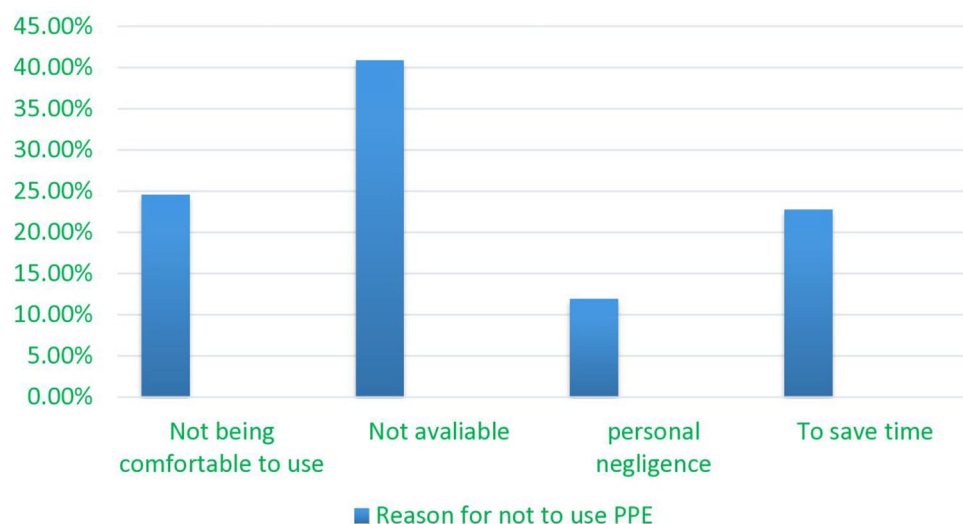


Figure 2. Reasons of the respondents for not to utilize the necessary PPE during work among PhiBella oil factory workers, Burie, West Gojjam, Ethiopia, 2022.

Table 2. Type and level of PPE utilization by PhiBella oil factory workers, Burie, West Gojjam, Ethiopia, 2022 (n=389).

TYPE OF PPE	USE	FREQUENCY	PERCENT (%)
Glove	Yes	371	95.37
	No	18	4.63
Ear plug	Yes	40	10.28
	No	349	89.71
Mask	Yes	315	80.97
	No	74	19.03
Helmet	Yes	281	72.23
	No	108	27.76
Overall	Yes	349	89.71
	No	40	10.28
Goggles	Yes	44	19.73
	No	179	80.26
	Subtotal	223	100.00
Boots/shoes	Yes	297	100.00
	No	0	0.00
Face shield/ Safety glass	Yes	21	20.19
	No	83	79.91
	Subtotal	104	100.00
Reflective vest	Yes	32	20.64
	No	123	79.36
	Subtotal	155	100.00

Table 3. Behavioral characteristics of PhiBella oil factory workers, Burie, West Gojjam, Ethiopia, 2022 (n=389).

CATEGORY	RESPONSE	FREQUENCY	PERCENT (%)
Smoke cigarette	No	376	96.65
	Yes	13	3.35
Alcohol use	No	219	56.30
	Yes	170	43.70
Chew khat?	No	378	97.17
	Yes	11	2.82
Job satisfaction	No	20	5.14
	Yes	369	94.86

Discussion

In this study, the magnitude of PPE utilization among Phibella edible oil factory workers was 55.52%. This finding is almost comparable with studies finding from the Kombolcha textile factory, Ethiopia, Adwa textile factory, Ethiopia, and Kampala, Uganda which indicated that 58.2%, 54.0%, and 50.4% of the workers had good PPE utilization, respectively.^{17,25,26} This finding is much lower than a study done in Addis Ababa (78.2%), Hawassa Town (82.4%), Zambia (77.33%), and Thailand (70.1%).^{21,27,28} While the result is higher than a study done in Addis Ababa (43.6%), industrial workers in Iran (41.7%), Debre Berhan town (41.7%), Debre Berhan (35.4%), and small-scale garment enterprises in Botswana (9.3%).^{18,24,29,30} This disparity could be attributed to the differences in study populations, workplace conditions, and employees' level of awareness about hazard control and disease prevention. This finding implies that those workers who are

Table 4. Working environment and organization conditions in Phibela edible oil Factory, Burie, West Gojjam, Ethiopia, 2022 (n=389).

CATEGORY	RESPONSE	FREQUENCY	PERCENT (%)
Training on any type of PPE issues when you were first engaged in this job?	Yes	69	17.73
	No	321	82.26
On-job training on any type of PPE issues?	No	62	15.93
	Yes	323	84.07
The perceived workplace is a risk	No	33	8.49
	Yes	356	91.52
May be exposed to injuries or harmful substances at work	No	130	33.41
	Yes	259	66.59
Fellow workers use PPEs when they are working	No	9	2.31
	Yes	380	97.69
Co-workers encourage you to use PPEs	No	87	22.36
	Yes	302	77.63
Work-related injury	No	366	94.08
	Yes	22	5.92
Regular health and safety supervision	Yes	241	36.24
	No	148	19.28
Safety training in connection with new employment, equipment, or work Process	No	61	15.68
	Yes	328	84.32
Safety orientation before the start of the job?	No	146	37.53
	Yes	243	62.47
Safety guidelines in the workplace	No	205	52.69
	Yes	184	47.30
Work shift	No	41	10.53
	Yes	348	89.47
Work rotation?	No	346	88.94
	Yes	43	11.06

not using PPE are prone to work related injuries. Workers health and safety should be protected and guaranteed.¹⁵

In this study, the major reasons for not using PPE at work were unavailability of PPE in place, discomfort to use, time taking, and being negligent. This is supported by the study done in Addis Ababa and Debre Berhan, which showed a lack of PPE as the reason for not using PPE in 74.5% and 86.9% of cases, respectively.^{7,20} It is also in line with the study conducted in Nigeria,³¹ in which feeling discomfort to use PPE was the major reason.

This study pointed out as taking safety training, availability of PPE, regular health and safety supervision, and availability of safety guidelines were significantly associated predictors

factors with the level of PPE utilization. In this regard, workers who have taken safety training were 4.68 times more likely to utilize PPE. This was supported by previous studies.^{7,17,32-34} Similarly, those who had not been trained on PPE utilization were less likely to utilize PPE in line with the previous studies.^{34,35} This might be due to the reason training the workers ensures workers remain enforced and motivated to follow the safety instructions by creating better cooperation between workers, managers, and the safety committee of the factory. Furthermore, training workers on safety and proper PPE use promotes and has significant benefits in the proper utilization of PPE, which is intended to reduce the risk of worksite injuries.

Table 5. Factors associated with the utilization of PPE among Workers in Phibella Edible Oil factory, Burie, West Gojjam, Ethiopia, 2022 (n=389).

VARIABLE	CATEGORY	PPE UTILIZATION		COR (95%CI)	AOR (95%CI)
		YES	NO		
Term of employment	Permanent	209	166	1	1
	Temporary	7	7	0.79 (0.65-0.96)	0.81 (0.71-0.95)
Safety training	Yes	99	32	5.42 (3.12-8.21)	4.68 (2.76-7.45)
	No	117	121	1	1
Work experience	<1 y	69	67	1	
	1-3 y	86	72	1.15 (1.02-1.22)	1.07 (1.01-2.56)
	>3y	61	34	1.74 (1.45-2.43)	1.64 (1.06-2.18)
PPE available	Yes	166	64	5.65 (2.33-8.79)	4.86 (2.23-6.98)
	No	50	109	1	1
Alcohol use	Yes	96	123	1	1
	No	120	50	3.07 (2.11-4.76)	3.01 (2.06-4.32)
Smoke cigarette	Yes	5	8	1	
	No	211	166	2.03 (1.67-3.88)	1.88 (1.55-3.11)
Health and safety supervision	Yes	141	100	1.37 (1.12-3.67)	2.75 (1.81-3.80)
	No	75	73	1	1
Safety Guidelines in the workplace	Yes	136	48	4.42 (2.88-6.97)	3.80 (1.25-6.17)
	No	80	125	1	1

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio. Significant at a *P*-value less than .05.

In this study, workers in PPE-equipped workplaces within the factory were 4.86 times more likely to utilize PPE than those in non-equipped or limited-access working sites. This is similar to that of previous studies done in small-scale garment enterprises in Gaborone, Botswana, and among textile mill workers in Dera Ismail Khan.^{24,36} Cognizant of this fact, safety administration programs should consider availing of all the necessary PPE on regular bases to promote health and safety in the workplace.

Regarding health and safety supervision, the odds of PPE utilization among workers who have close workplace supervision were about 2.75 times higher as compared to their counterparts. This finding is in line with studies conducted in Addis Ababa and Debre Berhan, Ethiopia on building construction and Large Scale Factory Workers' PPE utilization respectively.^{7,20} This implies that close supervision of workplaces condition assists workplace hazard identification and compliance monitors processes.

The level of PPE utilization was also significantly associated with the presence of health and safety guidelines in which the odds of PPE utilization among workers who work in working areas where health and safety guidelines are in place were

3.80 times higher as compared with those without such guidelines. This evidence is in line with a study done in Debre Berhan, Ethiopia on PPE utilization and associated factors among Large Scale Factory Workers.²⁰ The presence of health and safety guidelines might promote and dictates the workers to use PPE appropriately following the guidelines' processes.

Work experience is another factor significantly associated with the utilization of PPE among factory workers. The possible reason for this might be taking training and experience sharing as the workers get more experience.

Furthermore, the odds of PPE utilization among alcohol non-users, and cigarette nonsmokers was higher as compared to their counterparts. This might be due to the effect of these substance use on users' perception and make them to be negligence at risk of work related injuries.

Limitations of the Study

A causal relationship between the predictor and outcome variables could not be determined because of the cross-sectional nature of the study. In self-reported studies, workers may express socially acceptable responses rather than their real day-to-day practices.

Conclusion

The level of utilization of PPE among Phibela edible oil factory workers is 55.52%, which is moderate as compared with other studies done in developing countries. However, this does not mean that there will be no need for further strengthening of the safety programs, as a significant proportion (almost half) of the workers still do not use all the necessary PPE during work. The PPE utilization of workers in the Phibela edible oil factory was significantly associated with the safety training, availability of PPE, presence of regular health and safety supervision, presence of safety guidelines, having work experience, not using alcohol, and not smoking cigarettes. So factory management and workers should intervene to increase the availability of PPE and safety guidelines in place, strengthening supervision, providing training for workers, and advise them not to use alcohol and smoke cigarette.

Acknowledgement

First, the authors would like to thank Debre Markos University's College of Health Sciences for providing us with an ethical clearance letter and writing a letter of support for the study area. Second, the administrator of the Burie PhiBela oil factory deserves our gratitude for giving us all the data we needed for this study. Last but not least, the authors express gratitude to all of the factory workers who responded to the survey for their willingness to participate.

Author Contributions

AT: developed the study design literature review, quality assessment, data extraction, statistical analysis, and interpretation of the data. AT, ET, GY, LK, TA, MA, TKZ, and AAA developed drafts of the manuscript. All authors approved the final manuscript.

Availability of Data and Material

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Consent for Publication

Not applicable

Ethical Consideration

The College of Medicine and Health Sciences at Debre Markos University's Research and Ethics committee provided its ethical approval and clearance. To obtain permission, a formal letter of support was provided to the PhiBela edible oil factory. After obtaining clearance from the Phibela edible oil factory Managerial office, data collection began by contacting study participants. Participants' involvement in the study shall be voluntary, and those who are unwilling to participate in the study or who wish to discontinue their participation at any stage would be informed to do so without any restrictions. Study participants were informed of the purpose of the study; confidentiality will also be maintained at all levels of the study.

In addition, an informed verbal consent was taken from each participant.

ORCID iDs

Abraham Teym  <https://orcid.org/0000-0001-5954-0923>

Temesgen Ayenew  <https://orcid.org/0000-0001-5411-6947>

Tirsit Ketsela Zeleke  <https://orcid.org/0000-0003-3528-0703>

REFERENCES

- Benjamin O. Fundamental principles of occupational health and safety. *ILO*. 2001;13:1-159.
- Alemaw G, Gurmu F. Towards edible oil self-sufficiency in Ethiopia: lessons and prospects. *Cogent Food Agric*. 2023;9:2198742.
- Mengesha Y, Dagnew Z, Aderaw Z, et al. Factors associated with the level of knowledge and self-reported practice toward safety precautions among factory workers in East Gojjam Zone, Northwest Ethiopia. *Sage Open Med*. 2023;11:20503121221150957.
- Stringfellow MV. *Accident Analysis and Hazard Analysis for Human and Organizational Factors*. Massachusetts Institute of Technology; 2010.
- Kim Y, Park J, Park M. Creating a culture of prevention in occupational safety and health practice. *Saf Health Work*. 2016;7:89-96.
- Kolahdouzi M, Halvani GH, Nazarpour Abdehghah E, et al. Investigation of the effect of control measures on reduction of risk events in an edible oil factory in Tehran, Iran. *Arch Hyg Sci*. 2017;6:250-258.
- Alemu AA, Yitayew M, Azazeh A, Kebede S. Utilization of personal protective equipment and associated factors among building construction workers in Addis Ababa, Ethiopia, 2019. *BMC Public Health*. 2020;20:794-797.
- James MK, Ogle-Mustafa CA, Chichester MA. Determinants of the use of personal protective equipment: a literature review. *Br J Educ Soc Behav Sci*. 2023;36:1-14.
- Acharya SR. Utilization pattern of personal protective equipment among industrial workers of Nawalparasi, Nepal. *Health Prospect*. 2014;13:24-27.
- Lombardi DA, Verma SK, Brennan MJ, Perry MJ. Factors influencing worker use of personal protective eyewear. *Accid Anal Prev*. 2009;41:755-762.
- Jafaralilou H, Zareban I, Hajaghadzadeh M, Matin H, Didarloo A. The impact of theory-based educational intervention on improving helmet use behavior among workers of cement factory, Iran. *J Egypt Public Health Assoc*. 2019;94:1-7.
- Okello TR, Kansime K, Odora J, Apio JA, Pecorella I. Barriers and factors affecting personal protective equipment usage in St. Mary's Hospital Lacor in Northern Uganda. *East Central Afr J Surg*. 2017;22:59-65.
- McCann-Pineo M, Li T, Barbara P, Levinsky B, Berkowitz J. Factors influencing use of personal protective equipment among emergency medical services responders during the COVID-19 pandemic: a retrospective chart review. *West J Emerg Med*. 2022;23:396-407.
- Chepkener AC. *Knowledge, Attitude and Practice of Eye Safety Among Jua Kali Industry Workers in Nairobi, Kenya*. University of Nairobi; 2013.
- Teshome Z. Review of National Employment Policy of Ethiopia: Reference to Labor Proclamation 1156/2019. *Public Policy Adm Res*. 2020;10.
- Seblework D. *Occupational Safety and Health Profile for Ethiopia*. Ministry of Labour and Social Affairs; 200.
- 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. *J Public Health*. 2020;7:100025P16KZ2020.
- Tessema M, Sema W. Utilization of personal protective equipment and associated factors among large-scale factory workers in Debre-Berhan Town, Amhara Region, Ethiopia, 2021. *J Environ Public Health*. 2022;2022:8439076.
- Kyalo AM. *Level of Utilization of Personal Protective Equipment Among Workers in Grain and Oil Seed Milling Industries in Nairobi City County, Kenya*. Kenyatta University; 2016.
- Baye BF, Baye MF, Teym A, Dershe BT. Utilization of personal protective equipment and its associated factors among large scale factory workers in Debre Berhan Town, Ethiopia. *Environ Health Insights*. 2022;16:1178630221102324.
- Tadesse S, Kelaye T, Assefa Y. Utilization of personal protective equipment and associated factors among textile factory workers at Hawassa Town, Southern Ethiopia. *J Occup Med Toxicol*. 2016;11:6-6.
- Al-Tawfiq JA, Memish ZA. COVID-19 in the Eastern Mediterranean region and Saudi Arabia: prevention and therapeutic strategies. *Int J Antimicrob Agents*. 2020;55:105968.
- Sorra J, Nieva V. *Hospital Survey on Patient Safety Culture*. (Prepared by Westat, Under Contract No. 290-96-0004). AHRQ Publication No. 04-0041. Agency for Healthcare Research and Quality; 2004.

24. Zungu LI, Gabe S. A survey of work, health and safety conditions in small-scale garment enterprises in Gaborone, Botswana. 2011;17:13-19.
25. Tetemke D, Alemu K, Tefera Y, Sharma HR, Worku W. Knowledge and practices regarding safety information among textile workers in Adwa town. Ethiopia. *Sci Postprint*. 2014;1:5.
26. Mulyowa A. *Factors Associated With Use of Personal Protective Equipment Among Temporary Construction Workers in Makindye Division*. Makerere University Undergraduate Dissertations Repository (Mak UD), 2019.
27. Panakobkit W, Sakunkoo P, Chamroen P. Health belief model and behavioural usage of respiratory protective equipment among sugarcane workers in northeast of Thailand: a cross-sectional analytical study. *J Clin Diagn Res*. 2019;13:LC06-LC09.
28. Zgambo J. *Occupational Hazards and Use of Personal Protective Equipment Among Small Scale Welders in Lusaka*. the University of Bergen; 2015.
29. Bogale D, kumie A, Tefera W. Assessment of occupational injuries among Addis Ababa city municipal solid waste collectors: a cross-sectional study. *BMC Public Health*. 2014;14:169-178.
30. Mehrparvar AH, Fazlalizadeh M, Mostaghaci M. A survey of the usage of personal protective devices in industrial workers in Yazd, Iran, in 2011. *Iran J Heal Sci*. 2015;3:14-20.
31. Tanko BL, Anigbogu N. The use of personal protective equipment (PPE) on construction sites in Nigeria. Proceedings of the 4th West Africa Built Environment Research (WABER) Conference. 2012.
32. Ayikoru M, Ddamulira C, Mutekanga DR. Determinants of employee use of personal protective equipment, the case of spedag interfreight Uganda limited, Kampala. *J Environ Res Public Health*. 2019;03:419-434.
33. Beyene Gebrezgabher B, Tetemke D, 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.
34. Ngwu FA, Alabere ID, Douglas KE. Prevalence of falls and associated factors among construction workers in Port Harcourt, Nigeria. *Asian J. Med Health*. 2019;14:1-16.
35. Macfarlane E, Chapman A, Benke G, et al. Training and other predictors of personal protective equipment use in Australian grain farmers using pesticides. *Occup Environ Med*. 2008;65:141-146.
36. Ahmad I, Qadir S, Marwat M, et al. Knowledge, attitude and practice related to occupational health and safety among textile mills workers in Dera Ismail khan. *Gomal J Med Sci*. 2012;10:222-226.