

# Prevalence of occupational injuries and associated factors among workers of textile and garment factories during the era of COVID-19 pandemic in mekelle city, Northern Ethiopia: A cross-sectional study

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## Abstract

**Background and Aim:** Occupational injury is any personal injury that can lead to disease, disability, or death due to accidents sustained by workers while performing their work. The present study aimed to determine the prevalence of occupational injuries and associated factors among workers of textile and garment factories in Mekelle City, Northern Ethiopia during the era of COVID-19.

**Methods:** A cross-sectional study was conducted among 348 Textile and Garment factories in Mekelle City, Northern Ethiopia on September and October 2020. Data were collected using a semi-structured face-to-face interview questionnaire by trained data collectors and supervisors. Occupational injury was assessed by a yes/no question "Have you had any injury related to your occupation in the last 12 months?." Epi Data version 3.1 was used to enter data and Statistical Package for Social Sciences (SPSS) version 23 was used for data analysis. A multivariable logistic regression model was used to determine the independent determinants of occupational injury, and variables with  $p < 0.05$  were considered as statistically significant.

**Results:** The annual prevalence rate of occupational injury among textile and garment factories was 27.8% (95% confidence interval [CI] = 23.2–32.9%). Factors like being a male (AOR = 3.65; 95% CI = 1.92–6.92), job satisfaction (AOR = 0.22; 95% CI = 0.11–0.43), sleeping disorder (AOR = 3.47; 95% CI = 1.91–6.32), job stress (AOR = 2.62; 95% CI = 1.44–4.73), and safety and health training (AOR = 0.40; 95% CI = 0.22–0.74) were significantly associated with the occurrence of occupational injury.

**Conclusion:** Expectedly, lockdown during COVID-19 could lead to absenteeism and reduced prevalence of occupational injuries as the outcome of this study.

## KEYWORDS

COVID-19, Ethiopia, garment, occupational injury, magnitude, Mekelle, textile

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## 1 | INTRODUCTION

The working environment is a potentially hazardous place where a number of employees spend at least one-third of a day. This might affect the health and safety of workers and could result in different work-related injuries.<sup>1</sup> Occupational injury is any personal injury that can lead to disease, disability, or death due to accidents sustained by workers while performing their work.<sup>1,2</sup> These occupational injuries can occur due to a lack of effective training and education, poor occupational health services, and unsafety habits<sup>3</sup> and can pose serious health, social, and economic consequences to workers and their employers.<sup>1,4</sup>

Worldwide, each year, 160 million people live with work-related injuries, which result in 4 days and above absence from work.<sup>3,5</sup> As the ILO report of the 20th World Congress, the estimated average cost of occupational injuries and accidents is 4% of the global GDP.<sup>6</sup> Furthermore, about 19% of deaths attributed to work are due to occupational injuries and accidents.<sup>3</sup>

Due to the low attention given to occupational health and safety, occupational injuries are an important cause of morbidity and mortality in low-income countries, particularly in Sub-Saharan Africa and Asia in which 54,000 annual deaths and 42 million accidents were recorded in Africa.<sup>7-9</sup> Sociodemographic variables such as gender and age,<sup>10,11</sup> behavioral characteristics including alcohol consumption, job dissatisfaction, and sleep disturbance,<sup>12-14</sup> and environmental factors like lack of safety and health training and unsafe machines<sup>10,14,15</sup> were among the determinants of occupational injuries.

Reports showed that industries including the textile sector have various occupational hazards that are responsible for occurrences of different occupational injuries and diseases such as burn injury due to fire exposure, falling due to slips, fractures, and loss of body parts due to heavy and unsafe machinery, chemical poisoning due to exposure to different toxic substances, and suicidal ideation due to different psychosocial stressors.<sup>16-18</sup>

In Ethiopia, several studies have been conducted on the prevalence and associated factors of occupational injuries among workers of textile and garment factories before the occurrence of COVID-19 with a 1-year prevalence of 40.8% among workers of Ayka Addis textile factory,<sup>19</sup> 42.7% among Bahir Dar Textile factory,<sup>20</sup> 31.4% among Arba Minch textile factory,<sup>16</sup> and 36.9% among Kombolcha textile factory.<sup>12</sup>

Worldwide, there are inconsistencies regarding the prevalence of occupational injuries during the COVID-19 pandemic. For instance, studies from Taiwan<sup>21</sup> and Korea<sup>22</sup> revealed that the prevalence of occupational injuries decreased among workers as a result of lockdowns, reductions in economic activities, and changes in work methods during the pandemic. In contradiction, a study from Japan found around a 4.4% increase in the prevalence of occupational injuries during the COVID-19 pandemic compared with the previous year's prevalence.<sup>22</sup> Furthermore, in Ethiopia, information regarding the prevalence of occupational injuries during the COVID-19 pandemic is lacking, particularly in the study area. Hence, the present

study aimed to determine the prevalence of occupational injuries and associated factors among workers of textile and garment factories in Mekelle City, Northern Ethiopia, during the COVID-19 pandemic.

## 2 | METHODS AND MATERIALS

### 2.1 | Study design, area, and period

A cross-sectional study was used to assess the prevalence of occupational injury and associated factors among textile and garment workers in Mekelle town in September and October of 2020. Mekelle is located in the Northern part of Ethiopia, 783 km from the capital city, Addis Ababa. The city has one textile and garment factory (MAA garment) and three garment factories named Dbl, Itaca, and Velocity.

### 2.2 | Population

All employees working in MAA garment, Dbl, Itaca, and Velocity textile and garment factories found in Mekelle city were the source population and the randomly selected workers of textile and garment factories who fulfill the eligibility criteria were the study population.

### 2.3 | Sample size and sampling procedure

The sample size was calculated using the sample size determination formula for a single population proportion. Using a confidence interval of 95%, the margin of error 5%, according to a study conducted among workers of Arba Minch textile factory proportion was 31.4%,<sup>16</sup> 10% for nonrespondents and the study population was less than 10,000. Therefore, the calculated sample size was 348. The required sample size for each factory was deployed using proportional allocation to their population size (Figure 1). First, a sampling frame comprising a list of workers from each factory was obtained. Then, a systematic random sampling technique was administered to select the study participants.

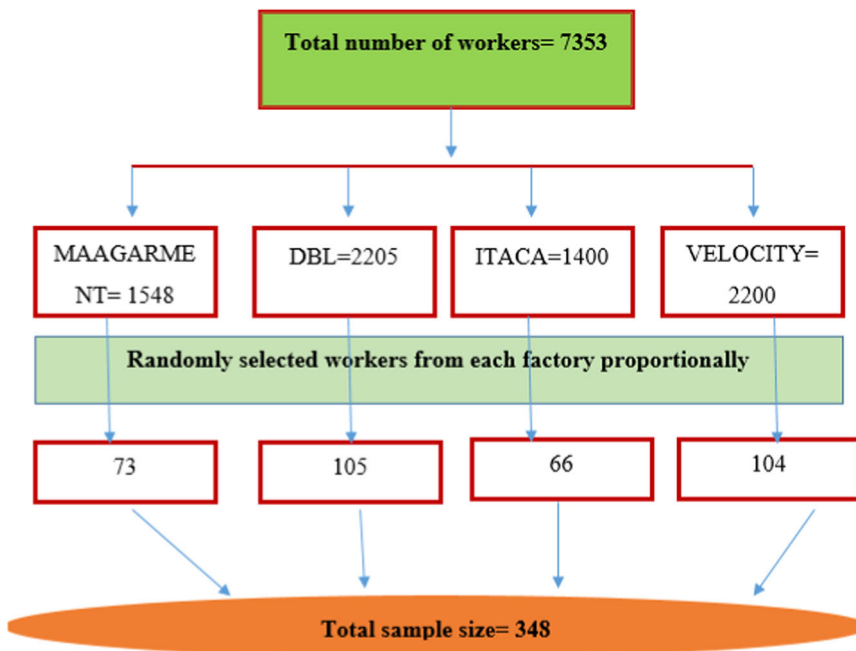
### 2.4 | Eligibility criteria

All employees who were directly engaged in the production process in the selected factories were included in the study while the administrative staff, those who had less than 1 year of work experience, and critically ill workers were excluded from this study.

### 2.5 | Data collection and data quality control

Data were collected using semi-structured face-to-face interview questionnaires adopted from previous literature.<sup>16,20</sup> The questionnaire was first prepared in English, and then translated to a local

**FIGURE 1** Sample size and sampling procedure of workers of textile and garment factories in Mekelle City, Northern Ethiopia, 2020.



language (Tigrigna), and retranslated back to English to maintain its consistency. The questionnaire composes four parts including socio-demographic (gender, age, religion, marital status, educational level, employment type, work experience, and monthly salary), environmental factors (job category, hours worked per week, working shift, access of personal protective equipment (PPE), workplace supervision, health and safety training and manual handling activities), behavioral factors (alcohol consumption, khat chewing, cigarette smoking, sleeping disturbance, job satisfaction, and PPE utilization), and injury characteristics (occurrence of injury, type of injury, body part injured, number of injuries, causes of injury, and number of days lost due to the injury). Job satisfaction was determined by 10 statements with five Likert scale points with values of strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5) and individuals who scored 32–50 points were categorized as satisfied. Furthermore, job stress was also measured by eight questions with Likert scale points and individuals who scored 26 or more were grouped as stressed.<sup>14</sup>

Two nurses and two environmental health professionals were recruited to collect the data. The data collectors were trained by the principal investigator for 2 days on the data collection tools and procedures, including the aim of the study, the content of the questionnaire, and how to approach study subjects. To ensure quality data, a pretest was conducted before the actual data collection on 18 (5% of the respondents) working in a small-scale industry to check understandability and metric characteristics. The results of the pre-test were used to ensure clarity of language and verify skip patterns of the questions and some modifications were made. According to the pretest, the internal reliability of the questionnaire was checked by calculating the Cronbach alpha which was 0.732.

Moreover, the Supervisor oversaw interviewers daily during the whole period of data collection and checked questionnaires for completeness. Overall, the data were collected by a face-to-face interview among 348 workers.

## 2.6 | Measure the outcome variable

The outcome variable (the 1-year occupational injury) was assessed by a yes/no question “Have you had any injury related to your occupation in the last 12 months?”

## 2.7 | Operational operations

### 2.7.1 | Alcohol consumption

defined as respondents who admitted to having used alcoholic drinks in the 12 months before the date of data collection.<sup>23</sup>

### 2.7.2 | Cigarette smoking

refers to individuals who smoke cigarettes during the 12 months before the date of data collection.<sup>24</sup>

### 2.7.3 | Khat chewing

an individual who had used khat the 12 months before the date of data collection.<sup>25</sup>

**TABLE 1** Sociodemographic characteristics of workers of textile and garment factories in Mekelle City, Northern Ethiopia, 2020.

Variables		Frequency (n = 345)	Percent
Sex	Male	152	44.1
	Female	193	55.9
Educational status	Primary	9	2.6
	Secondary	108	31.3
	College and above	228	66.1
Religion	Orthodox	318	92.1
	Muslim	23	6.7
	Others	4	1.2
Marital Status	Single	285	82.6
	Married	54	15.7
	Divorced	6	1.7
Employment type	Permanent	307	89.0
	Temporary	38	11.0
Age in years	<23 years	211	61.2
	≥23 years	134	38.8
	Mean ± SD	23.12 ± 3.39	
Work experience in years	<2.1 years	243	70.4
	≥2.1 years	102	29.6
	Mean ± SD	2.1 ± 1.52	
Monthly income	<1977 ETB	196	56.8
	≥1977 ETB	149	43.2
	Mean ± SD	1976.68 ± 695.74 ETB	

Abbreviations: ETB, Ethiopian birr; n, sample size.

### 2.7.4 | Workplace stress

is a result with a total score of 26 or more for work stress presence and less than 26 for no work stress.<sup>14</sup>

### 2.7.5 | Job satisfaction

is a result with a total score of 32–50 as satisfied with the job and less than 32 as no job satisfaction.<sup>14</sup>

### 2.7.6 | PPE

is defined as any worker-specialized clothing or equipment to be worn by workers for protection against health and safety hazards in the workplace.<sup>26</sup>

### 2.7.7 | Occupational injury

Occupational injury refers to any personal injury, disease, or death which has a connection with the performance of workers of different occupations. It can include minor injuries like bruise, scrape, or cut, to more severe injuries such as shock, concussion, loss of a limb or an eye, fractured bones, suffocation, and poisoning.<sup>16</sup>

## 3 | DATA PROCESSING AND ANALYSIS

Epi Data version 3.1 was used to enter data and Statistical Package for Social Sciences (SPSS) version 23 was used for analysis. Descriptive analysis was done for most variables in the study using standard statistical parameters: percentages, means, and standard deviation. Binary logistic regression was used to test the association between the dependent and independent variables using a crude odds ratio with a 95% confidence interval. A multivariable logistic regression model was used to determine the independent factors associated with occupational injury and variables with  $p < 0.05$  were considered as statistically significant. The Hosmer–Lemeshow goodness-of-fit test was checked and gave a  $p$  Value of 0.814 which was greater than 0.05. Tables and statements were used to present the findings of this study.

## 4 | RESULTS

### 4.1 | Sociodemographic characteristics

From the 348 invited participants, 345 workers participated in this study giving a 99% response rate. More than half of the participants were females (55.9%) with an arithmetic mean age of 23.12 (SD = 3.39) years. The majority (66.1%) of the study participants had college and above educational level, 92.2% were Orthodox Christian religion followers, and 82.6% were single regarding their marital status. Furthermore, three hundred seven (89%) were permanently employed with an average service year of 2.1(SD = 1.52) years. Moreover, the mean monthly income of the workers was 1976.68 (SD = 695.74) ETB (Table 1).

### 4.2 | Behavioral characteristics of workers

Regarding the behavioral characteristics of the workers, 302 (87.5%), 339 (98.3%), and 341 (98.8%) consumed alcohol, smoke cigarette, and chewed chat respectively. Around half (52.5%) had sleeping disturbances at their workplace and 125 (36.2%) complained that they were stressed due to their work. Furthermore, nearly half (44.6%) of the participants were satisfied with their current job.

**TABLE 2** Behavioral characteristics of workers of textile and garment factories in Mekelle City, Northern Ethiopia, 2020.

Variables	Categories	Frequency (n = 345)	(%)
Alcohol consumption	Yes	43	12.5
	No	302	87.5
Cigarette smoking	Yes	6	1.7
	No	339	98.3
Khat chewing	Yes	4	1.2
	No	341	98.8
Sleeping disturbance	Yes	181	52.5
	No	164	47.5
Job SatisfactionSatisfied	Yes	154	44.6
	No	191	55.4
Job stress	Yes	125	36.2
	No	220	63.8
PPE utilization during work	Yes	192	55.7
	No	153	44.3
How often use of PPE	Regular	127	65.1
	Often	45	23.1
	Sometimes	23	11.8

Abbreviations: n, sample size; PPE, personal protective equipment.

Moreover, more than half (55.7%) of workers utilized PPE during their working time (Table 2).

### 4.3 | Working environment conditions

The majority (88.1%) of the respondents worked  $\leq 48$  h per week, during the day shift (69.3%). Two hundred one (58.3%) had access to PPE and 340 (98.6%) reported that their workplaces were being supervised regularly. More than half of the participants, 204 (59.1%) reported that they did not get health and safety training, and about 199 (57.7%) workers involved in manual handling activities (Table 3).

### 4.4 | Prevalence and characteristics of occupational injury

The 1-year prevalence of occupational injury was 96 (27.8%), 95% CI (23.2–32.9%), which means 278 per 1000 exposed workers per year. The most commonly injured body part was hand 37(38.6%), followed by fingers (18.7%) and eyes (17.8%) and the most commonly reported causes of injury were splinters 29 (30.2%) and machinery 28(29.2%). Among those who reported an injury, 43 (44.8%) experienced a work-related injury once a year, and 38 (39.6%) injured respondents were absent due to injury from work for 1 day (Table 4).

**TABLE 3** Working environment conditions among workers of textile and garment factories in Mekelle City, Northern Ethiopia, 2020.

Variables	Categories	Frequency (n = 345)	(%)
Availability of PPE	Yes	201	58.3
	No	144	41.7
Working hours	$\leq 48$ h	304	88.1
	$>48$ h	41	11.9
Workplace is supervised	Yes	340	98.6
	No	5	1.4
Health and safety training	Yes	141	40.9
	No	204	59.1
Manual handling of machines	Yes	199	57.7
	No	146	42.3
Working shift	Day work	239	69.3
	Morning, evening and night	106	30.7
Working department	Engineering	13	3.8
	Processing	205	59.4
	Weaving	25	7.2
	Spinning	45	13.0
	Machine operator	28	8.1
	Others	29	8.4

Abbreviations: n, sample size; PPE, personal protective equipment.

### 4.5 | Factors associated with occupational injury

Binary logistic regression was done and variables with  $p < 0.25$  (gender, age group, job satisfaction, sleeping disturbance, job stress, working department, working hours, safety and health training, and manual handling activities) were taken to a multivariable logistic regression for further analysis. In the multivariable analysis, results showed gender, job satisfaction, sleeping disturbance, job stress, and health and safety training were significantly associated with the occurrence of occupational injury. The odds of occupational injury among male participants was 3.65 times higher compared with their female counterparts (AOR = 3.65; 95% CI = 1.92–6.92). Most injuries occurred among workers less satisfied with their job (AOR = 0.22; 95% CI = 0.11–0.43). the workers with sleeping disturbance were 3.47 times more likely to have occupational injury compared with their counterparts (AOR = 3.47; 95% CI = 1.91–6.32). Our study participants who showed job stress were 2.62 times more likely to be injured compared with workers who were not stressed (AOR = 2.62; 95% CI = 1.44–4.73). Moreover, workers who took safety and health training were less likely to be injured compared with those who didn't take the training (AOR = 0.40; 95% CI = 0.22–0.74) (Table 5).

**TABLE 4** Distribution of work-related injuries by most common body part affected and causes in the last 12 months among 96 injured workers of textile and garment factories in Mekelle City, Northern Ethiopia, 2020.

Variables		Frequency (n = 96)	%
Most commonly injured body	Hands	37	38.6
	Fingers	18	18.7
	Legs	13	13.6
	Knee	3	3.1
	Toe	2	2.0
	Head	6	6.2
	Eye	17	17.8
Main cause of injury	Machinery	28	29.2
	Splinter objects	29	30.2
	Hand tools	12	12.5
	Lifting objects	10	10.4
	Falling accident	12	12.5
	Electricity	5	5.2
Annual number of injuries	Once	43	44.8
	Twice	25	26.0
	Three times and above	28	29.2
Number of days lost due to injury	1 day	38	39.6
	2 days	21	21.9
	Three and above	15	15.6
	Never	22	22.9
The overall prevalence of occupational injury	Yes	96	27.8
	No	249	72.2

Abbreviation: n, sample size.

## 5 | DISCUSSION

The 1-year prevalence of occupational injuries in textile and garment factories of Mekelle town was 27.8%, 95% CI (23.2–32.9%), which is relatively lower than previous studies such as a study among textile workers in Amhara region (33.3%),<sup>10</sup> Kombolcha (36.9%),<sup>12</sup> Ayka Addis (40.8%)<sup>19</sup> and Bahir Dar (42.7%)<sup>20</sup> in Ethiopia. These discrepancies could be due to the different study period and working conditions. For example, the present study was conducted during the COVID-19 crisis, which could reduce workloads and time spent at working places due to the lockdowns. This may have an influence on the occurrences of occupational injuries.<sup>21,22</sup>

This study showed that hands were the most frequently injured body parts with 53 (54.6%) which agreed with different studies done

in Ethiopia.<sup>12,16,20</sup> This could be due to the fact that these body parts are the most active and come in contact with various tools most frequently.<sup>14</sup> Therefore, these injuries may be due to the improper use of hand tools, unsafe machineries, and lack of safety training and working conditions.<sup>27</sup>

This study found that that the most common causes of occupational injury were splinters and machines. This result is consistent with the studies in Arba Minch<sup>16</sup> and Ayka Addis.<sup>19</sup> The similarity could be due to the same factory definition, the similarity of machines and tools, and the work processes in the factories.

In the present study, gender, job satisfaction, sleep disturbance, work stress, and health and safety training were determinant factors for occupational injury. Male employee had a higher risk of occupational injuries than female employees (AOR = 3.65, 95% CI = 1.92–6.92). This result is consistent with similar studies conducted in Ethiopia.<sup>10,20</sup> It is suggested that women's caution and females' low-risk behaviors had led to this variation. In addition, behaviors such as alcohol consumption are more common in males than females which can lead to the occurrence of occupational injuries.<sup>17,20</sup>

Workers who were satisfied with their works were less likely to be injured than dissatisfied workers (AOR: 0.22, 95% CI = 0.11–0.43), which is consistent with previous studies.<sup>28,29</sup> Dissatisfied individuals were unable to perform their job properly, which could have led to various injuries.<sup>14</sup> According to the results of this study, workers who complained of sleep disturbances during work were about three times more likely to report an occupational injury than workers who did not complain (AOR = 3.47, 95% CI = 1.91–6.32). This finding is also consistent with the results of a study conducted in the Amhara region and Kombolcha textile factories in Ethiopia, where workers who suffered from sleep disturbances had a higher injury rate.<sup>10,12</sup> This could be due to the fact that the sleep disorder affects the ability to maintain alertness and concentration as well as the ability to assess or monitor the working conditions.<sup>10</sup> In addition, our results indicated that stressed workers were more twice as likely to report higher occupational injury than their counterparts (AOR = 2.62, 95% CI = 1.44–4.73). This finding has been confirmed result was supported by previous studies.<sup>10,16,27,30</sup> Workers under occupational stress may experience various problems, such as loss of mental and physical activities and inattentive behavior to hazards which may increase the incidence of injuries.<sup>31</sup>

In addition, this study showed that workers who participated in safety and health training were less likely to have occupational injury (AOR = 0.40, 95% CI = 0.22–0.74). The result is consistent with a study in Addis Ababa, and other parts of Ethiopia.<sup>10,28,32</sup> This could be due to safety and health training that improves knowledge about the characteristics of hazards as well as their consequences and safety practices which in turn can prevent the occurrences of injuries.<sup>16</sup>

**TABLE 5** Factors associated with occupational injury among workers of textile and garment factories in Mekelle City, Northern Ethiopia, 2020.

Variables		AOR (95% CI)	p Value
Gender	Male	3.65 (1.92–6.92)	<0.001
	Female	Ref	
Age group	<23 years	1.35 (0.73–2.51)	0.333
	≥23 years	Ref	
Sleeping disturbance	Yes	3.47 (1.91–6.32)	<0.001
	No	Ref	
Job satisfaction	Yes	0.22 (0.11–0.43)	<0.001
	No	Ref	
Job stress	Yes	2.62 (1.44–4.73)	0.001
	No	Ref	
Working hours	≤48 h	Ref	
	>48 h	0.82 (0.34–1.99)	0.674
Safety and health training	Yes	0.40 (0.22–0.74)	0.004
	No	Ref	
Manual handling of tools and machines	Yes	Ref	
	No	1.60 (0.86–2.97)	0.134
Working department	Engineering	Ref	
	Processing	1.25 (0.31–5.01)	0.750
	Weaving	1.95 (0.31–9.18)	0.474
	Spinning	0.64 (0.14–2.96)	0.571
	Machine Operator	0.71 (0.14–3.63)	0.687
	Others	0.70 (0.12–3.81)	0.680

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; Ref, reference.

## 6 | CONCLUSION

The annual prevalence rate was 27 people per 100 employees. The hand was the most frequently injured body part, and the main cause of reported injuries was splinters. It is expected that the lockdown during COVID-19 could lead to absenteeism and a lower prevalence of occupational injuries as a result of this study. To prevent workplace injuries in factories, capacity building in occupational health and safety is recommended.

### 6.1 | Limitations of the study

Due to the cross-sectional design of study, it may be difficult to establish causal relationship between the independent and dependent variables. Annual leave, injured workers at home, and low production periods in the industry could be responsible for the underestimation of the overall prevalence of occupational injuries.

### AUTHOR CONTRIBUTIONS

**Efoita Weldearegay:** Conceptualization; formal analysis; investigation; methodology; project administration; resources; supervision; writing—original draft; writing—review and editing. **Gebbru Hailu Redae:** Conceptualization; data curation; formal analysis; investigation; methodology; software; validation; visualization; writing—original draft; writing—review and editing. **Akeza Awealom Asgedom:** Conceptualization; data curation; formal analysis; investigation; methodology; software; validation; visualization; writing—original draft; writing—review and editing.

### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

### DATA AVAILABILITY STATEMENT

All necessary data and materials are available on the hand of the correspondent author for any reasonable request.

## ETHICS STATEMENT

Ethical clearance was obtained from Mekelle University, College of Health Sciences Institutional Review Board. Additional support letter from the Tigray Health Bureau and the Tigray Bureau of Labor and Social Affairs was obtained to facilitate the study. Written informed consent from the study participants was obtained before the actual data collection. The respondents' confidentiality was maintained and their names were not included in the data.

## TRANSPARENCY STATEMENT

The lead author Gebru Hailu Redae affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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