



## RESEARCH ARTICLE

# Days away from work injury and associated factors among waste collectors in Mekelle city, Northern Ethiopia

MESELE BAHRE ABRHA<sup>1</sup>, YISAK ARBISE<sup>2</sup>, AKEZA AWEALOM ASGEDOM<sup>1</sup>, BEYENE MERESSA<sup>1</sup><sup>1</sup> Department of Environmental Health, College of Health Sciences, Mekelle University, Mekelle, Ethiopia;<sup>2</sup> Department of Radiology, College of Health Sciences, Mekelle University, Mekelle, Ethiopia

## Keywords

Days away from work injury • Waste collectors • Mekelle

## Summary

**Introduction.** In most cities of low-income countries, waste management is a labour intensive task, which exposes workers to numerous occupational hazards. This study was aimed to investigate the magnitude of days away from work-related injury and associated factors among organized waste collectors in Mekelle city, Northern Ethiopia.

**Method.** A pre-tested questionnaire and observation checklist based cross-sectional study design was employed from June 1 to 30, 2017. Data was analysed using SPSS for windows 20.0. Descriptive statistics and logistic regression methods were used to describe the study population and assess the association between dependent and independent variables, respectively.

**Result.** From the total of 279 waste collectors involved as a study participant, 10% of them reported at least one day away from

work injury during the last twelve months. Being married is 87% less likely to be injured as compared to be a single. The odds of injury were 4.5 times higher among personal protective equipment users as compared to their counterparts. Waste collectors, who had less than 1000 Birr per month income, were 3 times more likely to be injured than those with income greater than 1,001 Birr. **Conclusions.** Days away from work injury among waste collectors is a public health problem and has an impact on the economic and social well-being of workers. Therefore, strengthening the provision of personal protective devices and ensuring its utilization is highly recommended.

## Acronyms and abbreviations

DAFWI: Days Away from Work Injury  
ECSA: Ethiopian Central Statistical Agency  
ILO: International Labor Organization  
ICC: Intra-class Correlation Coefficient  
GNP: Gross National Product  
PPE: Personal Protective Equipment  
SPSS: Statistical Package for Social Science  
SME: Small Scale Enterprises  
WHO: World Health Organization

## Introduction

Occupational injury is a major problem in many economic sectors and affects large numbers of workers [1, 2]. About 30-50% of the worker's working place is unsafe and the majority proportion of the global workforce has no access to occupational health services which is a contributing factor for work related injury [3, 4]. International labor organization (ILO) estimated that globally, 320,580 fatal injuries taken place due to occupational exposure [5].

In addition to its public health impact, occupational injury has a socio-economic importance due to loss of workdays, long term disabilities, reduced work ability and capacity due to partial disabilities, premature

retirement from work and deaths [2, 5]. More than six million workers are absent four or more days from their workplace due to occupational injury [6]. In sub-Saharan Africa, about 42 million work-related accidents take place that cause at least three days' absence from work [7]. Study conducted in Zambia reported from 4,998 (8.1%) injured study participants, 60.5% of them reported having stayed away from work as a result [8]. The economic costs of work related illness, injuries and death is massive at individual, enterprise, national and global levels. Roughly more than 4% of global GNP every year losses is estimated due to compensation, lost working time, interruption of production, training and retraining, medical expenses, and so on [7, 9]. This is more economical burden for developing countries as 70% of the world working population live in [9].

Studies revealed that the cause and the magnitude of occupational injuries depend on factors such as: sex, age, work experience and working hours, job satisfaction, educational status, type of work and working condition [2]. Though occupational injury has profound health and economy impact, it remains neglected in developing countries, where only 5-10% of the workers have access to occupational health services because of social, economic, and political challenges [9]. Occupational health research in developing countries is unable to recognize the social and political context of work

relations and lack political commitment to translate scientific findings into effective policies [1].

In Ethiopia, workplace related illnesses and injury represent a major public health concern due to rapid expansion of industrialization. Ethiopia will have a major shift towards industrialization in the coming decades [6]. Occupational diseases and injuries globally are known to affect the GDP due to economic losses for compensations and medical expenses, although this contribution in the Ethiopian context is not yet known. Information on occupation-related diseases and injury or accident is not well organized or systematically recorded, evaluated, or monitored in the Ethiopian work setting.

In developing countries including Ethiopia, waste management procedures are characterized by a dominance of manual labor tasks, which therefore exposes waste professionals to a number of occupational hazards of variable nature, occurring at every stage of the waste management process [6, 10-13]. Several studies noted that working as a waste collector is associated with a high risk of occupational injuries [13-18].

A study done in Addis Ababa shows an overall occupational injury prevalence rate among waste collectors in the last 12 months was 383 (43.7%). Utilization of personal protective devices and family size in the household were statistically associated with injury [6]. However, prevalence of occupational alone injuries does not clearly indicate its severity which can be indicated by the loss of workdays due to occupational injury.

Moreover, there is no comprehensive study on occupational health hazards among small scale organized micro enterprise in Mekelle city where there are a number of workers engaged in the collection of solid waste. Thus, the study was aimed to investigate the magnitude of injury that involves lost workdays and associated factors.

## Methods

**Study Area and Design** Cross-sectional study design was used to determine prevalence day away from work injuries and associated factors in Mekelle City. Mekelle is located in northern Ethiopia (783 km away from Addis Ababa). The city is located between latitude of 13°32' north and longitude of 39°28' with a total population of 215,546 and an annual growth rate of 5.4% is among the fastest growing cities in Ethiopia [19]. The daily solid waste generation rate is 0.22 kg/c/d. The municipality was able to collect only 33.4% of the total waste generated [20]. Currently, the solid waste collection system in the city is based on door to door collection of micro and small-scale enterprises. In general, there are eight micro and small enterprises engaged in solid waste management. The waste collectors were involved in house-to-house waste collection, street sweeping, and sorting at the dumping site. The majority of the waste is decomposable which directly transported and disposed to a fenced dumping site.

## POPULATION

The source and study population for this study were all waste collectors engaged in solid waste collection of the city. Individual workers who have a minimum of 12 months' work experience were included.

## SAMPLE SIZE DETERMINATION

There were 315 workers and of those, 279 were eligible for the study, i.e. they work for more than 12 months in the enterprises. All the eligible 279 waste collectors were volunteer and recruited to participate in the study.

## DATA COLLECTION PROCEDURES AND QUALITY CONTROL

Structured questionnaire and observational checklist were used to collect data related to socio-demographic characteristics, occupational injury, previous occupational history and illness, smoking history, type and use of personal protective devices, training about occupational health and safety of the waste collectors.

The questionnaire was first prepared in English and translated into the local language (Tigrigna). The consistency of language translation was checked by translating back from Tigrigna into English. To evaluate and confirm the content of the data collection tool, pre-test was done on 5% of the questionnaire out of the study site before the main data collection and, some questions were modified before the actual data collection. On top of this, half day training was given for the data collectors and supervisors on the purpose of the study, content of questionnaires, and data collection process and techniques. The whole data collection process was supervised and monitored the principal investigator.

Face and content validity of the tool was determined based on the viewpoints of the experts to evaluate the validity and reliability of the questionnaire. Test-retest reliability of the tool was examined by pre-testing the tool on 5% of the sample size in a similar context. Therefore, the questionnaire was reviewed and analyzed for repeatability and internal consistency aspects. Cronbach's alpha coefficient was used to assess internal consistency and said to be internally consistent if a score of 0.8 and above. Repeatability was estimated using the intra-class correlation coefficient (ICC). Based on ICC reliability ranges of less than 0.4 (poor), 0.4-0.7 (fair to good), 0.6-0.8 (good), and 0.8-1 (excellent), the reliability of the questionnaire was considered excellent.

## OPERATIONAL DEFINITION

### *Injury*

Work related physical damage to body tissues as the result of exposure to occupational hazards.

### *Days-away-from-work injuries*

The self-reported injuries that cause workers absent from work at least one day beyond the day of the event in the last twelve months prior the data collection.

### *Micro and small enterprise*

Small scale unions that are organized by the government and involved in waste management activities.

## STATISTICAL ANALYSIS

The collected data were entered to SPSS version 20.0 for analysis. Descriptive statistics like frequency distribution, mean, graphs were computed to explain the study population in relation to relevant variables. An association between dependent and independent variables was presented using odds ratios and 95% confidence intervals. Both Bivariate and multiple logistic regressions were used to test the association between the outcome and independent variables. Variables which had association at  $P < 0.2$  during the bivariate analysis were a candidate to multiple logistic regressions.

## Results

### SOCIO-DEMOGRAPHIC CHARACTERISTICS

A total of 279 waste collectors were participated in this study. Female waste collectors account 69% of the respondents. The mean age of the respondents was 33.70 ( $\pm 12.245$ ) years. Almost 63% of the respondents completed primary school. Almost, 93% of respondents were not permanently employed. The majority (68.8%) of the respondents were street sweepers. Regarding income, 63% of the respondents have a monthly income ranged from 500 to 1,000 Ethiopian Birr (Tab. I).

Tab. I. Socio-demographic characteristics of waste collectors in Mekelle city, June, 2017.

Variable	Category	Frequency	Percent
Sex	Female	194	69.5
	Male	85	30.5
Age	18-25	90	32.3
	26-35	79	28.3
	36-45	71	25.4
	> 45	39	14
Religion	Orthodox	265	95
	Muslim	10	3.6
	Catholic	2	0.7
	Protestant	2	0.7
Educational status	Primary school (1-8)	178	63.8
	Secondary school (9-12)	80	28.7
	Certificate and above	2	0.7
	Can read and write	19	6.8
Marital status	Single	101	36.2
	Married	92	33
	Divorced	65	23.3
	Widowed	21	7.5
Employment pattern	Permanent	21	7.5
	Temporary	258	92.5
Job category	Street sweeper	192	68.8
	Waste collectors	87	31.2
Income	< 500	74	26.5
	500-1,000	176	63.1
	1,001-1,500	29	10.4

Tab. II. Occupational behavior and work environment of waste collectors in Mekelle city, June, 2017.

Variable	Category	Frequency	Percent
Working experience	5 and less than 5years	231	82.8
	Greater than 5 years	48	17.2
Working hours	8 and less than 8 hours	230	82.4
	Greater than 8 hours	49	17.6
Regular supervision of workplace	Yes	18	6.5
	No	261	93.5
Presence of hazard	Yes	231	82.8
	No	48	17.2
Had safety training	Yes	89	31.9
	No	190	68.1
PPE utilization	Yes	182	65.2
	No	97	34.8
Job satisfaction	Yes	171	61.3
	No	108	38.7
Type of PPE used	Glove	179	64.2
	Face mask	51	18.3
	Boot	93	33.7
	Other	92	33
Reason for not using PPE	I do not have	9	3.2
	No provision	72	25.8
	It doesn't need always	9	3.2

### WORK ENVIRONMENT AND WORKER'S OCCUPATIONAL BEHAVIOUR

The majority (82%) of the respondents had five and less than five years' experience and worked eight and less than eight hours per day. Out of the 279 respondents, 93.5% of them reported their workplace was not regularly supervised. Presence of hazard was observed in 82.8% of the study participant's work place. About 31% of the respondents reported that no safety training was given during their employment time. Among the respondents, 65% of them were used at least one type of personal protective equipment (PPE). Glove (64.2%), face mask (18.3%) and boot (33.7%) were the commonly used type of personal equipment by the respondents. Lack of availability of PPE (25.8%) was the main reason reported for not using personal protective equipment (Tab. II).

#### Substance use

In the last twelve months, 89 (31.9%) and 185 (66.3%) of the respondents had a history of alcohol and coffee consumption respectively. However, around 98% of the respondents never had a history of smoking and "Khat" consumption (Fig. 1).

### WORK RELATED INJURY

Of the 279 respondents, 29 (10.4%) respondents were reported at least one day away from work injury in the last twelve months. Leg and hand were the most reported injured body part of the waste collectors. Regarding the type of injuries, out of the respondents who had an occupational injury in the last twelve

Fig. 1. Substance use of waste collectors in Mekelle City, 2017.

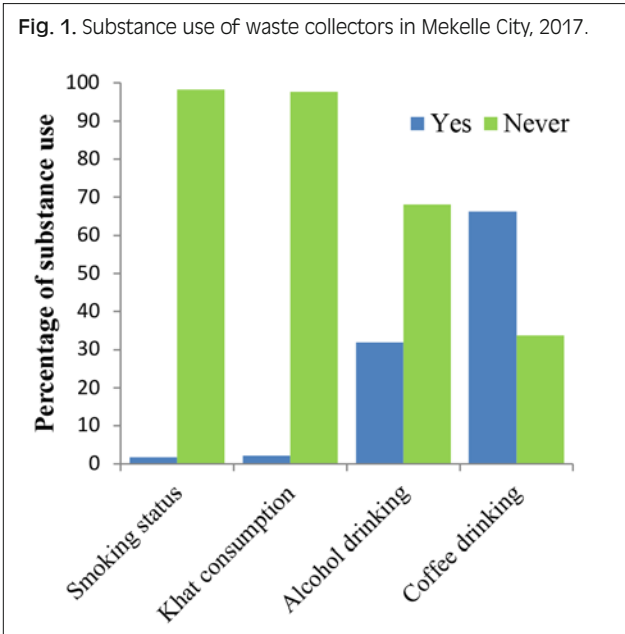
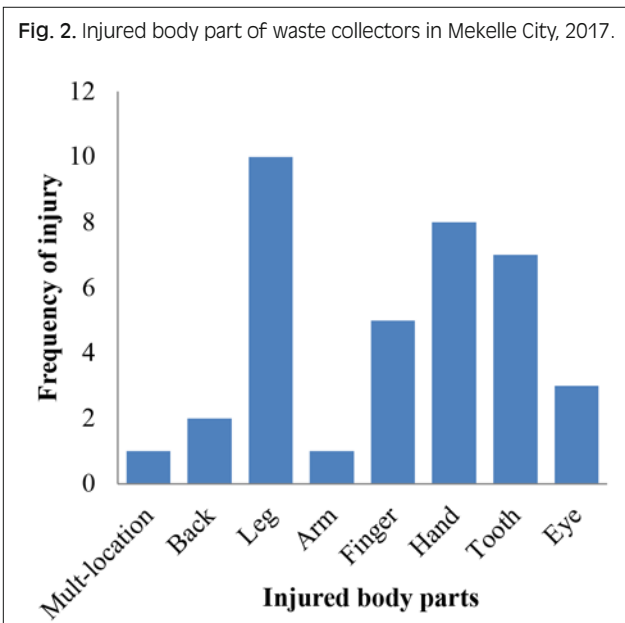


Fig. 2. Injured body part of waste collectors in Mekelle City, 2017.



months, eighteen respondents reported abrasion type of injury, two respondents reported fracture type of injury, one respondent reported cut type of injury and one respondent reported puncture type of injury. Waste collection (11 respondents) and Loading and unloading (10 respondents) were the major activities performed during injury time of solid waste collectors (Fig. 2).

Table III shows the distribution of occupational injuries in season and days. More injuries were occurring during winter (70%). Tuesday and Monday were the days that more injuries are occurring as it is reported by 9 and 8 respondents, respectively. Fifteen and ten respondents reported the injury were happening in the morning and at noon, respectively (Tab. III).

Tab. III. Season, day and time of Injury among waste collectors in Mekelle city, June 2017.

Variable	Category	Frequency
Day of injury	Monday	8
	Tuesday	9
	Wednesday	1
	Thursday	2
	Friday	1
	Saturday	1
	Sunday	1
	Don't remember	4
	<b>Total</b>	<b>27</b>
Time of injury	Morning	15
	Noon	10
	Afternoon	1
	Evening	1
	<b>Total</b>	<b>27</b>

**FACTORS ASSOCIATED WITH OCCUPATIONAL INJURY**

From all variables entered in the final multivariable model fitted for occupational injuries, sex, marital status, PPE utilization and income were remained significant after adjusting for other independent factors. Female were 96% less likely to be injured as compared to male (AOR = 0.04, 95% CI: 0.008-0.204). Being married is 87% less likely to be injured as compared to being a single (AOR = 0.130 95% CI: 0.027-0.621). The odds of DAFW injury were 4.5 times higher among those who do not use PPE as compared to their counterparts (AOR = 4.514 95% CI: 1.684-12.095). Waste collectors, who had less than 1000 Birr income, were 3 times more likely to be injured than waste collectors who had greater than 1001 Birr per month income (AOR = 3.008 95% CI: 1.081-8.371 (Tab. IV).

**Discussion**

This study revealed that the magnitude of days away from work injury was found to be 10.4%, which is relatively low compared to other previous studies [6, 15, 21, 22]. Besides the exclusion of injuries without lost workdays, the discrepancy could be due to difference in waste collection and segregation practices plus the utilization of PPE by waste collectors. Moreover, the majority of the participants of this study are street sweepers which are relatively less exposed to occupational injury.

Almost all the waste pickers involved in this study had experienced an injury that made them at least one day away from their work. This is probably due to the nature of the work and manually picking important materials from unsegregated wastes without personal protective equipment, which is common practice in most of low income countries [13, 23, 24].

In this study, abrasion was commonly reported type of injuries. Likewise, abrasion was reported as common type of injury in Addis Ababa waste collectors [6]. This is probably due to the effect of collecting, picking and transporting of unsegregated wastes that contain sharp



**Tab. IV.** Factors associated with occupational injuries among municipal solid waste collectors in Mekelle City, June, 2017.

Variable	Category	Occupational injury		COR (95% CI)	AOR (95% CI)
		Yes	No		
Sex	Male	24	61	1	1
	Female	5	189	14.872 (5.439-40.662)	0.04 (0.008-0.204)**
Age	18-30 years	24	112	7.500 (1.719-32.720)	0.774 (0.052-11.563)
	31-40 years	3	68	1.544 (0.250-9.531)	2.070 (0.205-20.945)
	Above 41 years	2	78	1	1
Marital status	Single	23	78	1	1
	Married	3	89	0.114 (0.033-0.395)	0.130 (0.027-0.621)**
	Divorced	2	63	0.108 (0.024- 0.474)	0.666 (0.082-5.405)
	Widowed	1	20	0.170 (0.022-1.332)	1.201 (0.092-15.611)
Job category	Street sweepers	6	186	1	1
	Waste collectors	23	64	11.141 (4.342-28.586)	1.289 (0.145-11.469)
Job satisfaction	Satisfied	12	159	1	1
	Not satisfied	17	91	2.475 (1.132-5.414)	1.288 (0.451-3.682)
PPE Utilization	Yes	13	173	1	1
	No	16	77	2.765 (1.268-6.030)	4.514 (1.684-12.095)**
Income	Less than 1,000	19	110	2.418 (1.081-5.411)	3.008 (1.081-8.371)**
	1,001 and above	10	140	1	1
Working Hours	≤ 8 hours	20	210	1	1
	> 8 hours	9	40	2.362 (1.003-5.562)*	1.279 (0.456-3.590)
Alcohol drinking	Yes	12	77	1.586 (0.722-3.481)	1.724 (0.607-4.892)
	No	17	174	1	1
Coffee drinking	Yes	12	173	0.314 (0.143-0.690)*	2.790 (0.870-8.946)
	No	17	77	1	1

\* Significant at  $P < 0.05$  for COR; \*\* Significant at  $P < 0.05$  for AOR; PPE: Personal protective Equipment; COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; CI: Confidence Interval; 1: reference.

objects such as tin, broken glass, bones, metal and other building materials [13, 25-27].

With respect to the injured body part, legs and hands are commonly injured body parts. Our result is comparable with other studies [6, 21]. Manually; loading, uploading and picking of wastes without wearing appropriate glove and shoes can increase the probability of a cut, bruises and ruptures [28].

This study found injury is less likely to occur in female as compared to male. This is attributed to the job category of respondents as more women were involved in street sweeping. With respect to the marital status, being married is less likely to be injured as compared to be a single. The reason is that married individuals have extra family responsibility and then they can take care of themselves. The occurrence of occupational injuries is significantly associated with monthly salary of the workers. This finding is in agreement with a study conducted in Ethiopia [6, 22]. This finding is not surprise, as individuals with higher salary have a better chance to buy and properly use personal protective equipment.

This study revealed that occupational injury is significantly related to utilization of personal protective equipment. This was in agreement with the finding of other studies [6, 14, 22]. Proper utilization of PPE such as heavy-duty glove and boots will prevent a work related injury.

Female waste collectors were higher than male waste collectors (street sweeping) in our study. This finding is supported by other studies in other part of Ethiopia [6, 15]. The reason for this might be improving the livelihood

of women is the priority issue in developing countries and subsequently, this work sector is an emerging and categorized as one of small scale enterprises in which females can involve easily and actively due the nature of the work and the societal role expectations assigned to the different sexes [29, 30].

Self-reported data unsupported by clinical investigation were collected, which is considered as a limitation of this study. Hence, a further study on occupational injury supported by clinical investigation is necessary. Yet, despite this limitation, this study puts its significance on the magnitude of days away from work injury which indirectly indicate the severity of the injury and economical implication of the waste collectors.

## Conclusions

In conclusion, this study confirms that day away from work injury among waste collectors is a public health problem and might have an economic and social well-being impact on the workers. Thus, priority has to be given to take an immediate measure. PPE utilization and monthly salary are the main determinant factors for days away from work injuries in small scale organized waste collectors.

Therefore, strengthening the existing occupational health and safety services in general, and the provision of PPE and ensuring its utilization in particular, is highly recommended.

## Ethical statement

Ethical clearance was obtained from Mekelle University Ethical approval committee. Letter of permission was secured from Mekelle city municipality office and a written consent was obtained from each respondent by informing the purpose and significance of the survey.

## Availability of data and material

The dataset contains confidential injury related data which should not be shared publicly, according to the journal ethical policy. Therefore, the data sets used and/or analysed during the current study are available from the corresponding author and can be shared on reasonable request.

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## Conflicts of interest statement

The authors declare no conflict of interest.

## Authors' contributions

MB conceived and designed the study, performed analysis and interpretation of data. MB and BM participated in data collection and drafted the first manuscript; YA and AA did the data entry and critical review of the subsequent draft of the manuscript. All authors read and approved the final version of the manuscript for publication submitted to *Journal of Preventive Medicine and Hygiene*.

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**Correspondence:** Mesele Bahre Abrha, Department of Environmental Health, College of Health Sciences, Mekelle University, Mekelle, Ethiopia P.O. Box 1871 - Tel.: +251 984064837- Fax: +251344416675 - E-mail: mesele.bahre@mu.edu.et

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