



Full Length Research Paper

Assessment of occupational injury and associated factors among municipal solid waste management workers in Gondar town and Bahir Dar City, northwest Ethiopia, 2012

Zemichael Gizaw^{*1}, Mulat Gebrehiwot¹, Zinabu Teka², Mesafint Molla¹

¹Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, Gondar University, Gondar City, Ethiopia

²Department of Statistics, Collage of Natural and Computational Science, Gondar University, Gondar City, Ethiopia

*Corresponding author's e-mail: zemichael12@gmail.com

Abstract

This cross sectional study design was conducted to assess occupational injury and associated factors among municipal solid waste management workers in Gondar town and Bahir Dar city, Northwest Ethiopia, 2012. Four hundred, eighty two workers were taken as study subjects and data were collected by face to face interview. The overall annual prevalence rate of work related injury was 63.9 %.The one month period incidence, on another hand, was 11.7%. The severity of injury was also assessed by days lost due to injury: 110(35.7%) workers had non-serious accident which requires 1- 3 days' absence from work and 77(25%) workers had serious accident which requires more than 3 days' absence from work. In the study areas, high prevalence of work related injury (63.9%) was reported. And old age, low educational status, engaged in two or more work categories, absence of health and safety training, Provision/utilization of personal protective equipments, sleeping disorder and alcohol consumption were identified as factors associated with work related injury.

Keywords: Work related injury, Municipal solid waste management workers, Prevalence, Severity

INTRODUCTION

Work-related injuries (WRIs) and illnesses are multifactorial and remain major problems of public health magnitude requiring the attention of all stakeholders (Olorunnishola and Byrd 2010; Zangirolani et al., 2007).

The International Labor Organization (ILO) estimates that 270 million occupational accidents and diseases occur each year. The annual cost for workers compensation in 2007 was \$85 billion (Lund and Marriott, 2011). The economic loss related to these accidents and diseases are estimated to 4% of world gross national product (Piedrahita, 2006; Du and Leigh, 2011; Jovanoviæ et al., 2004).

Work related accidents and injuries are a source of substantial human and economic cost. Available data reveal an alarming and extremely high rate of work related deaths and injuries in both the developed and

developing nations. Work related injuries cause an estimated number of 3,400,000 disabling injuries. Each week day, a fatal injury occurs every 2hrs and a disabling injury every 8hrs (Gyekye, 2006; Wilkins and Mackenzie, 2007).

ILO estimates that each year, around 2.3 million workers die as a result of occupational accidents and work-related diseases and fatal occupational accidents are about 0.35 million every year and fatal work-related diseases are around 1.95 million per year (Niu, 2010; Takala et al., 2009).

The number of occupational accidents and diseases are increasing in many developing countries. It has been estimated that over 120 million industrial accidents with over 200,000 fatalities occur each year in these nations. This is the area which has 80% of the world's labor force.

Sub-Saharan Africa appears to have the greatest rate per worker of occupational injuries followed by Asia (Lund and Marriott, 2011; Du and Leigh, 2011).

In Sub-Saharan Africa countries, slightly more than 54, 000 fatal occupational accidents happen annually. Approximately 42 million work-related accidents took place that causes at least 3 days absence from work. The fatality rate of the region is 21 per 100,000 workers and the accident rate per 100,000 workers is 160,000 (Ha'ma'la'inen et al., 2006).

In Ethiopia, over 5,596 fatal occupational accidents happen annually. Approximately 4,270,815 work-related accidents took place that causes at least 3 days absence from work. The accident rate per 100,000 workers is 16426 and the fatality rate is 21.5 per 100,000 workers (Ha'ma'la'inen et al., 2006).

The extent of work related injuries and diseases which are the major problems of the globe are varied from different types of occupation. For example, solid waste management is the sixth hazardous occupation next to Fishery, Loggers, Pilots and Flight Engineers, Iron and Steel Workers, Ranchers and Farmers with incident rate of 35.5 per 100,000 (Dan F. cited 2012 February 10). Therefore, the potential health effects of both waste itself and the consequences of managing it have been the subject of a vast body of research. This study is aimed to determine the prevalence of occupational injury among municipal solid waste management workers in Gondar town and Bahir Dar city.

METHODS AND MATERIALS

Study design

A cross sectional study was conducted to assess occupational injury and associated factors among municipal solid waste management workers in Gondar town and Bahir Dar city, April - 2012.

Study population and data collection

All municipal solid waste management workers (482) who had direct contact with wastes in Gondar town and Bahir Dar city were taken as study participants.

Data were collected by face to face interview using pre-tested standard questionnaire which was developed based on the related published studies with certain modification. The questionnaire composed of four parts: socio demographic, injury characteristics (occurrence of injury, season and time of injury occurrence, types of injury, body parts affected, working days lost due to injury), work environment and behavioral or personal variables.

Determination of prevalence and severity of injury

Prevalence of work related injury was determined by

interviewing the municipal solid waste management workers on the occurrence of injury and types of injury occurred in the last 12 months prior to data collection. Current prevalence among respondents was also determined by asking the occurrence of injury in the last one month.

Number of working days lost due to injury in last one year was used to determine the severity of injury. Accordingly those workers who lost from 1 – 3 working days due to injury were categorized under non serious injury whereas workers who lost more than 3 working days were categorized under serious injury.

Data management, processing and analysis

Data were entered using EPI INFO version 3.5.3/2011 statistical software and then exported to SPSS version 20.0 for further analysis. Descriptive statistics of the collected data was done for most variables in the study using statistical parameters: percentages, means and standard deviations. Bivariate analysis was used primarily to check which variables were associated with the dependent variable individually. Variables found to have association with the dependent variables were then analyzed by multivariate logistic regression for controlling the possible effect of confounders and finally the variables which had significant association were identified on the basis of AOR, with 95%CI.

Ethical considerations

The study was carried out after getting permission from the ethical review committee of institute of public health, university of Gondar. Informed verbal consent was also obtained from each waste collection enterprise and study participants to conduct the study. Confidentiality was granted for information to be collected from each waste collection enterprises and study participants. Participants' involvement in the study was on voluntary basis; participants who were unwilling to participate in the study and those who wish to quit their participation at any stage were informed to do so without any restriction. Each respondent was informed about the objective of the study and privacy during interview was ensured.

RESULTS AND DISCUSSION

Results

482 respondents who had direct waste contact were interviewed to determine the prevalence and severity of occupational injury. Of which 293(61%) were from Bahir Dar city and 189 (39%) were from Gondar town. Data were collected on Socio demographic characteristics, Injury type, nature, cause, severity, work environment and behavioral characteristics of the respondents.

Table 1. Socio - demographic characteristics of municipal solid waste management workers in Gondar town and Bahirdar city, 2012

Variables	Number	Percent
Sex		
Female	379	78.6
Male	103	21.4
Total	482	100
Age group		
< 30	232	48.1
≥30	250	51.9
Religion		
Orthodox	443	91.9
Protestant	6	1.2
Muslim	33	6.8
Educational status		
Illiterate	285	59.1
Primary	159	33.0
Secondary	38	7.9
Marital status		
Married	165	34.2
Single	180	37.3
Divorced	91	18.9
Widowed	46	9.5
Monthly income in birr		
<200	21	4.4
200 – 600	441	91.5
>600	20	4.1

Socio demographic characteristics of respondents

From the total respondents, 379(78.6%) were female and 103(21.4%) were male with 1:3.7 male to female sex ratio. The mean age of the respondents was 30.56 years with standard deviation of 7.60 years (30.56 ± 7.60) and range 32 years(18 – 50 years).About 250(51.9%) of the workers were in the age group ≥ 30 years. The highest number of study participants, 443(91.9%) were Orthodox Christian. Two hundred eighty five (59.1%) of the respondents were illiterate and 180(37.3%) were not married. The mean monthly income of the respondents was 429 birr (Table 1).

Characteristics of work related injuries

Occurrence of injury in the last twelve months

Out of 482 municipal solid waste management workers who had direct waste contact, 308 of the respondents were injured in the last twelve months. Therefore, the overall prevalence of work related injury was 63.9 per 100 exposed workers per year. Of the 308 workers who were injured in the last one year, 216(70.1%) workers experienced work related injury more than once. Moreover, 36 (11.70%) workers had injury in the last one month prior to the data collection. Of the 36 cases,

5(13.9%) reported that they had been injured more than once in one month

Injury by type

The leading type of injury reported by the workers was cut / punctures 119(38.6%). However, because of the nature of the job, higher numbers of workers were affected by a combination of two or more injuries. Eighty four (27.3%) workers were affected by two or more injuries (Figure 1).

Body parts affected

The highest number of workers 70(22.7%) were injured on their hand followed by leg 67(21.8%) injury (Figure 2). From workers who had hand injury, 35(50%) workers reported injury on two or more hand parts (Table 2).

Cause or mechanism of injury

In this study, the causes for work related injury were highly variable, but the most common agent stated as causes were sharp or slender pointed objects by 73(23.7%), lifting/pushing/pulling of heavy waste storage containers by 37(12%), dust or particulate matters by 32(10.4%). Eighty five (27.6%) of injuries were caused by two or more causes (Figure 3).

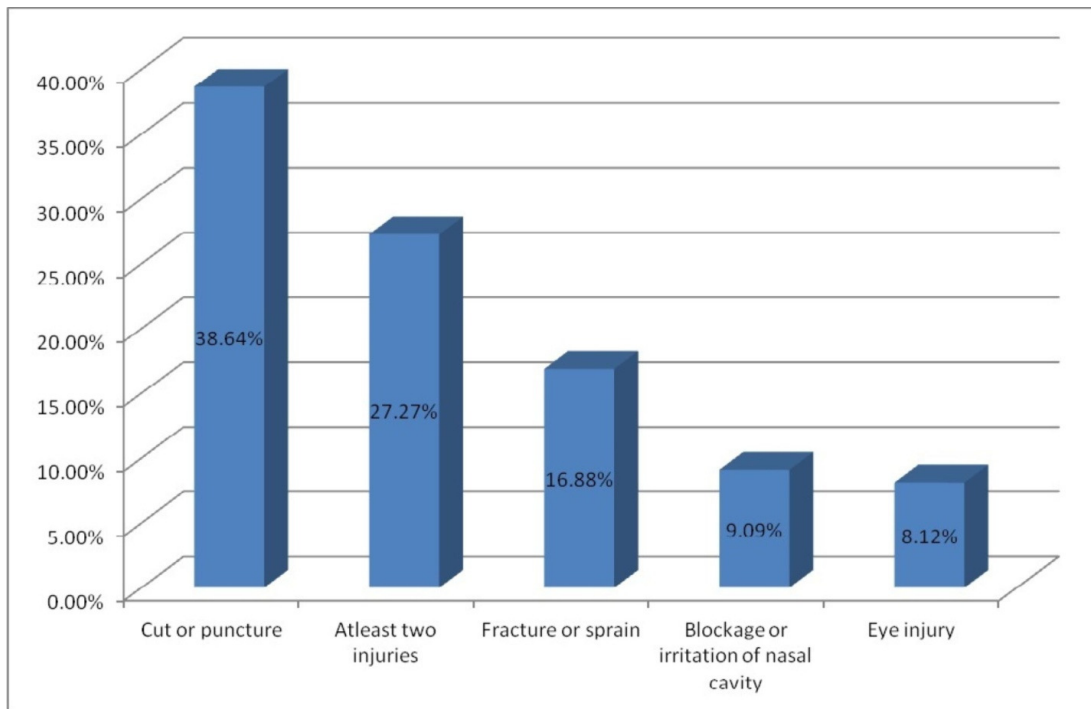


Figure 1. Types of work related injuries reported by municipal solid waste management workers in Gondar town and Bahir Dar city, 2012

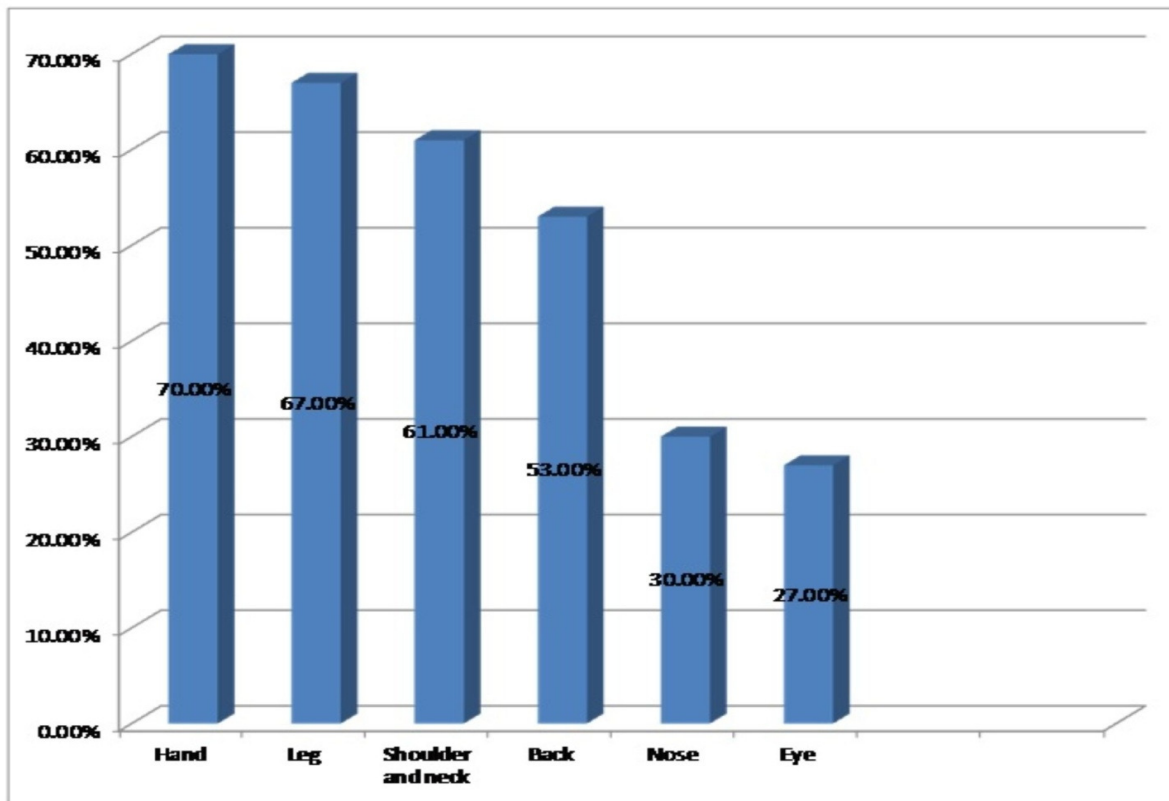


Figure 2. Body parts affected by different work related injuries among the municipal solid waste management workers in Gondar town and Bahir Dar city, 2012

Table 2. Distribution of work related injury on different body parts among municipal solid waste management workers in Gondar town and Bahir Dar city, 2012.

Variables	Number	Percent
Parts of hand injured		
Elbow	8	11.4
Finger	21	30.0
Upper arm	5	7.1
Lower arm	1	1.4
At least two hand parts	35	50.0
Total	70	100.0
Parts of leg injured		
Knee	12	18.0
Toe/feet	19	28.0
Upper leg	6	9.0
Lower leg	1	2.0
At least two leg parts	29	43.0
Total	67	100.0
Parts upper neck injured		
Eye	14	24.6
Nose	23	40.4
Eye and nose	20	35.0
Total	57	100.0

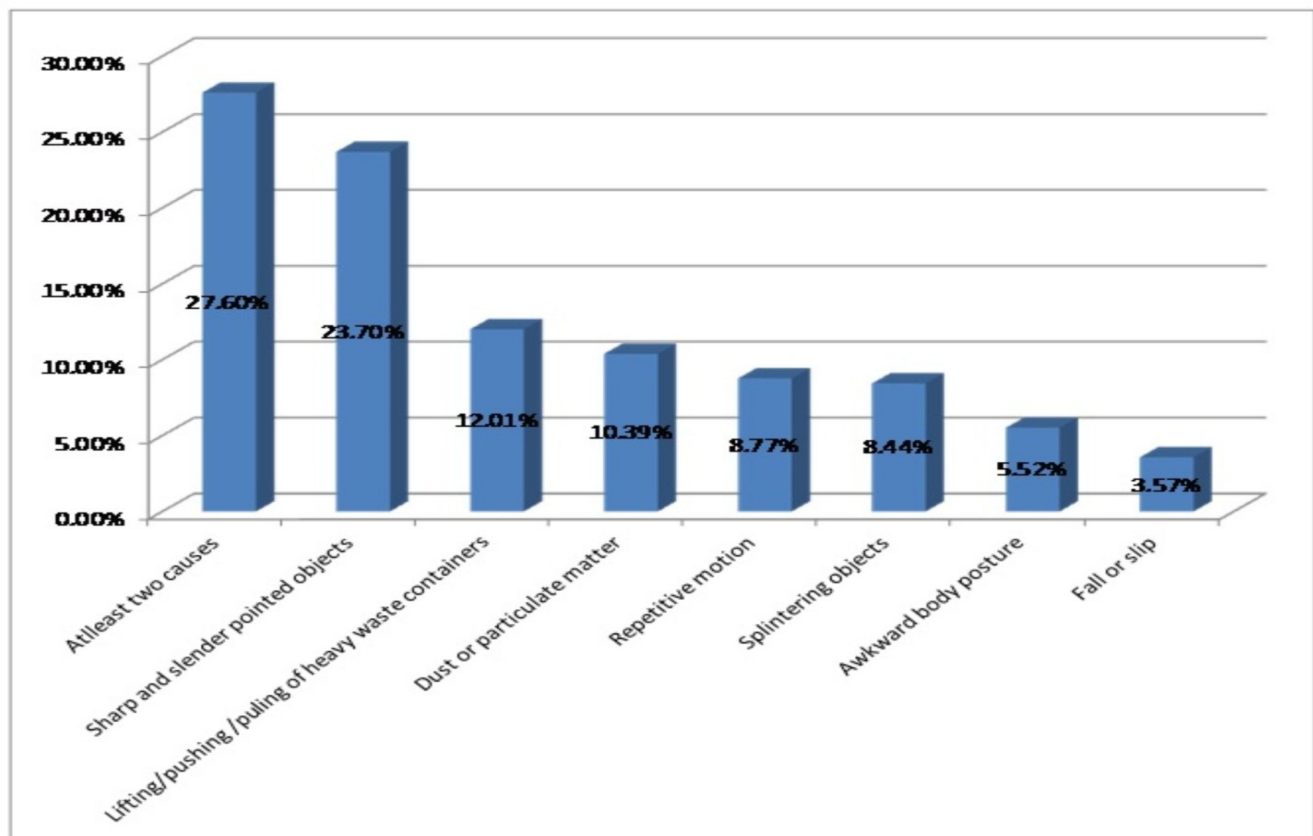


Figure 3. Common causes of work related injuries among the municipal solid waste management workers in Gondar town and Bahir Dar city, 2012

Table 3. Work environment and behavioral characteristics of municipal solid waste management workers in Gondar town and Bahir Dar city, 2012.

Work environment and behavioral characteristics	Number	Percent
Job category		
Only one job	147	30.5
Two or more jobs	335	69.5
Total	482	100.0
Days worked per week		
≤ 5 days/40 hours/	82	17.0
>5 days/48 hours/	400	83.0
Total	482	100.0
Service year		
≤3 years	277	57.5
>3 years	205	42.5
Total	482	100.0
Health and safety training		
Yes	132	27.4
No	350	72.6
Total	482	100.0
Use of PPEs		
No	180	37.3
Yes	302	62.7
Total	482	100.0
Sleeping pattern		
Normal or sleepy	179	37.1
Non sleepy with nonrestorative sleep	195	40.5
Insomnia	108	22.4
Total	482	100.0
Level of drink		
No drink	418	86.7
heavy drink	64	13.3
Total	482	100.0

Season and time of injury occurrence

Regarding the occurrence of injury, 155(50.3%) of the total reported injuries occurred during summer, where as 71(23%) and 82(26.7%) were during winter and both summer and winter respectively. Also 155(50.3%), 98(31.8%) and 55(17.9%) injuries were reported during morning or early morning, noon and both morning and noon respectively.

Severity of injury

Of the 308 municipal solid waste management workers who had injury in the last twelve months, 110(35.7%) workers were lost from 1 – 3 working days due to injury. Similarly, 77(25%) workers lost more than three working days.

Work environment and behavioral characteristics of respondents

The work environment and behavioral characteristics of respondents are summarized in Table 3.

Multivariate analysis of work related determinants

In bivariate binary logistic regression analysis work related injury was associated significantly with age, educational status, marital status (widowed), job category, service year, health and safety training, utilization of PPEs, sleeping pattern and alcohol consumption (Table 4).

However, in the multivariate binary logistic regression analysis, injury was associated significantly with age; educational status, job category, service year, health and safety training, utilization of PPEs, sleeping pattern and alcohol consumption (Table 5).

Significant variables by the model

Socio demographic determinants

Age and educational status were the significant socio-demographic determinants of work related injury. The older workers were more injured than younger ones. Workers aged ≥ 30 years were 1.834 times more likely to be injured than workers aged < 30 years (AOR = 1.834, 95% C.I = 1.003 – 3.355).

Table 4. Bi-variate logistic regression of work related injury with predictor variables among municipal solid waste management workers in Gondar town and Bahirdar city, 2012.

Predictor variables	Injury in the last 12 months		Crude odds ratio	95% C.I of the crude odds ratio	
	Yes	No		Lower	Upper
Sex					
Female	237	142	1		
male	71	32	1.329	0.834	2.119
Age					
<30	122	110	1		
≥30	186	64	2.620	1.786	3.845 *
Educational status					
Illiterate	225	60	1		
Primary	74	85	0.232	0.152	0.354 *
Secondary	9	29	0.083	0.037	0.184 *
Marital status					
Married	104	61	1		
Single	100	80	0.733	0.476	1.129
Divorced	66	25	1.548	0.886	2.706
Widowed	38	8	2.786	1.221	6.360 *
Job category					
One job only	81	66	1		
At least two jobs	227	108	1.713	1.151	2.549 *
Service year					
≤ 3 years	134	143	1		
>3 years	174	31	5.990	3.823	9.384 *
Monthly income in birr					
<200	15	6	1		
200 – 600	277	164	0.676	0.257	1.776
>600	16	4	1.600	0.376	6.808
Days /Hours worked per week					
≤ 5 days/40 hours	48	34	1		
>5 days/40 hours	260	140	1.315	0.810	2.137
Health and safety training					
Yes	57	75	1		
No	251	99	0.300	0.198	0.454 *
Utilization of PPEs					
No	154	26	1		
Yes	154	148	0.176	0.109	0.282 *
Sleeping pattern					
Normal	58	121	1		
Non sleepy with nonrestorative sleep	147	48	6.389	4.066	10.038 *
Insomnia	103	5	42.976	16.611	111.186 *
Alcohol consumption					
No drink	249	169	1		
Heavy drink	59	5	8.009	3.149	20.371 *

* Significance variables (95% C.I does not include 1)

The prevalence of work related injury was decreased as level of education increased. Work related injury decreased by 75.1% among workers who completed grade 8 (AOR = 0.249, 95% C.I = 0.135 – 0.460). Injury

also decreased by 91.4% among workers who completed grade 9 – 12 compared to the illiterate one [AOR = 0.086, 95% C.I = 0.029 – 0.252]

Table 5. Multi-variate logistic regression of work related injury with predictor variables among municipal solid waste management workers in Gondar town and Bahirdar city, 2012.

Predictor variables	Injury in the last 12 months		Crude odds ratio	95% C.I of the crude odds ratio		Adjusted odds ratio	95% C.I of the adjusted AOR	
	Yes	No		Lower	Upper		Lower	Upper
Age in years								
<30	122	110	1					
≥30	186	64	2.620	1.786	3.845	1.834	1.003	3.355*
Educational status								
Illiterate	225	60	1					
Primary	74	85	0.232	0.152	0.354	0.249	0.135	0.460*
Secondary	9	29	0.083	0.037	0.184	0.086	0.029	0.252*
Job category								
One job only	81	66	1					
At least two jobs	227	108	1.713	1.151	2.549	3.538	1.861	6.725*
Service year								
≤ 3 years	134	143	1					
>3 years	174	31	5.990	3.823	9.384	5.758	2.824	11.739*
Health and safety training								
Yes	57	75	1					
No	251	99	0.300	0.198	0.454	2.569	1.284	5.137*
Utilization of PPEs								
No	154	26	1					
Yes	154	148	0.176	0.109	0.282	0.164	0.082	0.326*
Sleeping pattern								
Normal		58	1					
		121						
Non sleepy with nonrestorative sleep	147	48	6.389	4.066	10.038	3.987	2.192	7.249*
Insomnia	103	5	42.976	16.611	111.186	27.376	9.108	82.288*
Alcohol consumption								
No drink	249	169	1					
Heavy drink	59	5	8.009	3.149	20.371	3.632	1.162	11.356*

* Significance variables (95% C.I does not include 1)

Work environment determinants

Job category, service year, health and safety training and utilization of PPEs were the major work environment determinants of injury.

Service year had significant association with prevalence of work-related injury. Workers who reported higher working year (above 3 years) were more likely to report work related injury than their counterparts (AOR=5.758, 95% C.I=2.824 – 11.739).

Job category was also statistically associated with work related injury. Workers who had at least two job categories were 3.538 times more likely to be injured than workers who had one category (AOR = 3.538, 95% C.I = 1.861 – 6.725).

Those workers who had not health and safety training were more likely to report work related injury than trained one [AOR = 2.569, 95% C.I = 1.284 – 5.137].

Utilization of PPEs had preventive role on work related injury. The probability of injury occurrence was decreased by 83.6% among users than non users [AOR = 0.164, 95% C.I = 0.082 – 0.326].

Behavioural determinants

This study revealed that sleeping pattern and alcohol consumption were statistically associated with work related injury. The odds of having work related injury among non sleepy with nonrestorative sleep individuals was 3.987 times higher than sleepy individuals [AOR = 3.987, 95% C.I = 2.192 – 7.249]. Insomnia individuals were also 27.376 times more likely to be injured than sleepy individuals (AOR = 27.376, 95% C.I = 9.108 – 82.288). But the confidence interval is wide. It may be due to small number of participants in the category and accuracy of the measurement in a survey.

Heavy drinkers were 3.632 times more likely to be injured than non drinkers (AOR = 3.632, 95% C.I = 1.162 – 11.356).

DISCUSSION

This study was done to assess the prevalence of work related injury and associated factors in the last twelve months among municipal solid waste management workers in Gondar town and Bahir Dar city. The severity and types of injury were also assessed.

In this study, the overall annual prevalence rate of work related injury was 63.9 %.The one month commutative incidence, on another hand, was 11.7%. This figure is markedly greater than rate reported by other studies. A study conducted in Zimbabwe during 2006 and Brazil during 2008 reported that 41% and 38% prevalence rate of one or more work related injuries respectively (Kuijer and Frings-Dresen; 2010). The highest prevalence rate in the study area may be justified as: no suitable and complete protective equipments given; their protective equipment could not serve to the intended purpose because they were not of good quality and most workers were not using them at work always; it was rare to find workers in their complete outfit at work contrary to the ideal situation; the type of waste and management systems.

This study has depicted that hands 22.7%, legs 21.8%, shoulder /neck 19.8% and back 17.2% as the most commonly injured area of the body. Similar study conducted in Australia among refuse collectors had depicted that hands 9%, legs 20%, back 25%, shoulder/ neck 21% (Olorunnishola and Byrd, 2010; Lund, 2011).The discrepancy between hand, shoulder and back injury is due to the capacity of bins. In Australia, they used litter bins located in parks and gardens which are more difficult to work with and required higher forces to push or pull a full wheel bin across soft or wet lawn, pine bark, mud or soil and the workers adopted awkward posture. But in the study area workers used bags which were not puncture proofed.

In this study, the most frequent causes of work related injury were sharp and slender pointed objects (23.7%), lifting/pushing/pulling of heavy waste storage containers (12%), dust or particulate matters (10.4%), repetitive motion (8.77%), awkward body posture (5.52 %) and fall (3.57%). A study conducted in America during 2010 in solid waste industry showed that lifting/pushing/pulling (22.5%) was the most common cause of injury followed by fall (10.5%), repetitive motion (6.2%) and awkward body posture (6.2%) (Olorunnishola and Byrd, 2010). A study conducted in Brazil also identified similar causes with different figures (50). The possible reasons in which sharps and slender pointed objects were the common cause of injury for this study population are: No suitable and complete (Gloves, Toetector, reinforced cloth)

protective equipments used; Sharps and slender pointed objects were disposed together with the general waste (mixed waste); Even, workers that used hand gloves at the time of data collection were of poor quality; No continuous and frequent use of the PPEs; The community used bag which is not puncture proved to store wastes so that the collectors became easily injured during handling.

Larger number of work related injury occurred during summer [155(50.3%)] than winter [71(23%)] and morning or early morning [155(50.3%)] than the afternoon [98(31.8%)]. This may be due to: the waste during summer may become bulky because of wet and rain (wet weight); Clothing suitable to each weather condition was not given to the workers so that accidents like fall, slip are very common; The weather condition also made the workers inactive; Flood out of the sewer line put the waste on the street so that create work burden; Poor illumination for street sweepers and garbage collectors at early morning; The highest number of workers had sleeping disorder so that the next day activity was highly affected and workers became depressed at the morning.

In this study , participants were categorized into two groups according to accident rates: 266 (55.19%) in to the low accident group (0–1 accident per year) and 216 (44.81%) in the high accident group (more than one accidents per year (SAG., 2006).The severity of injury was also assessed by days lost due to injury: 110(35.7%) workers had Non- serious accident which requires 1- 3 days' absence from work and 77(25%) workers had serious accident which requires more than 3 days' absence from work (SAG., 2006). In addition 36(11.7%) workers were current injured (who had injury in the last one month).Of these 31(86.1%) and 5(13.9%) were in the low and high accident group respectively.

This study showed that the prevalence of work related injury increased with old age (≥ 30 yrs). A higher risk was found in study subjects aged ≥ 30 years (AOR = 1.834, 95% C.I = 1.003 – 3.355).Similar study conducted in Kentucky USA during 2011 to assess injury among solid waste collectors in public sectors reported that 35 – 44 years old group in the public Sectors had the highest frequency of work related injury (Kisner and Pratt, 2005; Terry et al., 2011; Yiha and Kumie, 2006; Safe Work Australia., 2012).Other study conducted in Amsterdam, Netherland reported that older age workers are subjected to fall injury than the younger (Vianda et al., 2004). This may be due to: the older workers worked equal time with the younger ones; there was no chance to do work that is well suited to their ability; the older workers are subjected to some accidents like fall and chronic health effects.

This study also analyzed that increasing educational levels have been associated with decreased work related injuries (AOR = 0.249, 95% C.I = 0.135 – 0.460) and [AOR = 0.086, 95% C.I = 0.029 – 0.252] for primary and secondary education respectively. Most occupational

health and safety studies conducted in developing countries revealed that increasing educational levels have been associated with decreasing work related injuries. This may be explained that education is likely to enhance workers health and safety practice, education can increase aware of the potential hazards and the health impacts related to wastes collecting methods and educated workers used the personal protective equipment frequently at work that prevent them from work related injuries (Liv, 2004; Milhem, 2004).

Workers having two or more Job categories had higher frequency of work related injury than having one job category with AOR = 3.538, 95% C.I = 1.861 – 6.725. This finding was supported by other similar studies (Gauchard et al., 2003). This may be due to workers had exposed with different mixed waste items, were subjected to work burden and restless work and workers did not use suitable and complete (Gloves, Toetector, reinforced cloth and respirator) protective equipments for each job category.

The present study showed that Workers who reported higher working year (>3 years) were more likely to report work related injury than their counterparts (AOR=5.758, 95% C.I=2.824 – 11.739). Findings of similar studies strengthen this finding (Yiha and Kumie, 2006, ILO, JaO, et al., 2004). This may be explained that Fatal accidents usually occur to workers who could still have had a long working career ahead of them; the routine type of daily work may not require special experience or expertise and those engaged in such routine activities for long period of time with poor working environment may sustain job dissatisfaction ; the work is insecure so that workers stayed for long period of time in this insecure job had increased vulnerability of different injuries; once the employer provided personal protective equipments ,they did not provide extra for a year and the past injury might be the cause for the next year injury/chronic effect/.

The occurrence of work related injury was also associated with health and safety training. Those workers who had not health and safety training were more likely to report work related injury than trained one [AOR = 2.569, 95% C.I =1.284 – 5.137]. Because of lack of health and safety training towards danger of their occupation, 30 % of workers did not use the personal protective equipment frequently at work. This may be due to: Un-trained workers were not aware of the cause of injuries and their reduction and prevention methods, Un-trained workers did not use the personal protective equipment frequently and correctly at work.

Utilization of PPEs had preventive role on work related injury. The probability of injury occurrence was decreased by 83.6% among users than non users [AOR = 0.164, 95% C.I =0.082 – 0.326].

The result of the study has revealed that the occurrence of work-related injury is significantly related to sleeping disorder. Non sleepy with nonrestorative sleep individuals had 3.987 times higher injury than sleepy

individuals. Insomnia individuals were also 27.376 times more likely to be injured than sleepy individuals (AOR = 3.987, 95% C.I = 2.192 – 7.249) and (AOR = 27.376, 95% C.I = 9.108 – 82.288) respectively. This could explain that sleeping disorders affect the ability to maintain wakefulness, concentration, ability in assessing or watching the work environment and working conditions. Most occupational health and safety studies conducted in developing and developed countries strongly agree with this report (Nakata et al., 2005; Melamed and Oksenberg, 2002). For insomnia individuals the confidence interval is wide. It may be due to small number of participants in the category and accuracy of the measurement in a survey.

Alcohol consumption was also another statistically associated variable with work related injury. Consistent with other study (Wang et al., 2010), this study stated that heavy drinkers were more likely to be injured than non drinkers (AOR = 3.632, 95% C.I = 1.162 – 11.356). This may be explained as: alcohol can impaired judgmental and psychomotor skills, alcohol took before work begins cause spillover effects, such as fatigue and hangovers, alcohol may be more likely to be engaged in other behaviors that increase the risk of injury.

Strengths and limitations of the study

A. Strength

1. Data were collected from the whole municipal solid waste management workers in Gondar town and Bahir Dar city to increase the power of the study (population based study).
2. Internationally accepted or validated measurement tools were used to assess sleeping pattern, job satisfaction and alcohol consumption of the workers.

B. Limitations

1. The study was a one -year cross sectional study. So that it did not identify the cause and effect relation sheep between the dependent variable and determinants.
2. There could be possibility of recall bias and social desirability bias resulting in under or over reporting and misreporting of events.

What it adds?

- In developing countries including Ethiopia, the prevalence and associated factors of work related injury among solid waste management workers is not well known and the risk factors still need to be addressed.
- Therefore this study will play its own role to know the prevalence and associated factors of work related injury among solid waste management workers.
- It may also used to adopt of controlling and prevention strategies of occupational injuries associated with solid waste management among waste collectors. Furthermore it may also act as a guide line data for future studies.

CONCLUSION

Compared to other similar studies conducted in developed and developing countries, higher prevalence rate of work related injury (63.9%) was reported in the study areas. Significant number, 77(25%) of serious injuries were also reported in the study areas. The commonest causes of injury were sharp and slender pointed objects, lifting/pushing/pulling of heavy waste storage containers, dust or particulate matters, awkward body posture, repetitive motion and fall.

Factors related to injury were age of the waste collector, job types, service year, the educational level, provision of health and safety training, utilization of PPEs, sleeping pattern and alcohol consumption. However, some factors proved to be more significant and more influential than others. Consistent with other studies, workers who were old, had long service year, had at least two job category, and sleeping disorder had significantly higher risks of Work-related injury.

ACKNOWLEDGMENT

First of all, our deepest gratitude goes to the Father, the Son and the Holy Spirit. Without God nothing happens.

REFERENCES

- Askenazy P (2006). Some determinants of reporting workplace accidents in France. The role of labour contract, February.
- Bahir Dar City (2010). Solid Waste Characterization and Quantification of Bahir Dar City. Bello SR, Mijinyawa Y (2010). Assessment of injuries in small scale sawmill industry of south western Nigeria Agric Eng Int: CIGR Journal;VOL.12, No.1 151. March
- Bogan RK, Turner JA (2007). New assessment tools that measure sleep vital signs. the SleepMed Insomnia Index and the Sleep Matrix, Neuropsychiatric Disease and Treatment.;vol.3(4) 501–10.
- JaO C, Linda K, Luisa CM, Neboj aN, Heikki S (2004). Self-reported injuries among seafarers Questionnaire validity and results from an international study Accident Analysis and Prevention 36 (2004) 405413.
- Chan AH, Leung PC (2011). Occupational Safety and Health Problems of Workers in Hong Kong Recycling Industries. A Preliminary Ergonomic Study. Proceeding of international multi conference of engineers and computer scientists; vol II.
- Cointreau S. World Bank (2006). Occupational and Environmental Health Issues of Solid Waste Management Special Emphasis on Middle- and Lower-Income Countries: The International Bank for Reconstruction and Development.
- Dan F. Top Ten Dangerous Jobs in the U.S. [cited 2012 February 10 at 0520 pm,226]; available at www.ehow.com .Job Search & Employment].
- Du J, Leigh JP (2011). Incidence of Workers Compensation Indemnity Claims Across Socio Demographic and Job Characteristics. American journal of industrial medicine 54:758–70.
- Gauchard GC, Chau N, Touron C, Benamghar L, Dehaene D, Perrin P, et al. (2003). Individual characteristics in occupational accidents due to imbalance: a case-control study of the employees of a railway company Occup Environ Med;60:330–335.
- Gyekye S (2006). Workers' Perceptions of Workplace Safety:An African Perspective. Department of Social Psychology. University of Helsinki. Finland International J. Occupational Safety and Ergon. (JOSE) 12 No 1:31–42.
- Ha'ma"la"inen Pi, Takala J, Saarela KL (2006). Global estimates of occupational accidents. Safety Science 44:137–56.
- Henry RK, Yongsheng Z, Jun D (2006). Municipal solid waste management challenges in developing countries. Kenyan case study waste management vol.26:92–100.International Labour Organization ;Safety in numbers Pointers for global safety culture at work.
- Inyang MP (2007). Health and safety risks amongst the municipal solid waste collectors in port harcourt metropolis of the niger delta region of nigeria: International Conference "Waste Management, Environmental Geotechnology and Global Sustainable Development. August 28 - 30
- Jovanoviæ J, Aranđeloviæ M, Jovanoviæ M (2004). Multidisciplinary aspects of occupational accidents and injuries. Journal of University of Nis, Series: Working and Living Environmental Protection Vol. 2, No 4: 325 – 33.
- Kisner S, Pratt S (2005). Occupational fatalities among older workers in the United States: J. Occup Environ Med;39:715–21.
- Kuijer P, Dresen M (2002). World at work: Refuse collectors.
- Kuijer PPF SJ, Frings-Dresen MH (2010). Health and Safety in Waste Collection: Towards Evidence-Based Worker Health Surveillance. American journal of industrial medicine vol.53:1040–64.
- Liv X (2004). Relationship Occupational injuries with social and economic factors. ;22:86 89.
- Lund F, Marriott A (April 2011). Occupational Health and Safety and the Poorest. Contract No. 88.
- Mardi N (2008). Ready reckoner on municipal solid waste management for urban local bodies. Chennai vol.5. November
- Melamed S, Oksenberg A (2002). Excessive Daytime Sleepiness and Risk of Occupational Injuries in Non-Shift Daytime Workers daytime sleepiness sleep, Vol. 25, No. 3.
- Milhem AKM (2004). Investigation of Occupational Health and Safety Hazards among Domestic Waste Collectors in Bethlehem and Hebron Districts.
- Nakata A, Ikeda T, Takahashi M, Haratani T, Fujioka Y, Fukui S (2005). Sleep-related Risk of Occupational Injuries in Japanese Small and Medium-scale Enterprises. Industrial Health 43, 89–97.
- Niu S (2010). Ergonomics and occupational safety and health. An ILO perspective. J. Appl. Ergon. vol.41 ,744 - 753.
- Olorunnishola, Taylor AK, Byrd L (2010). Occupational injuries and illnesses in solidwaste industry. a call for action. journal of Morgan State University School of Community Health and Policy. 20(2):211-23.
- Pandey R (2005). Solid Waste Management Practice and Health Implicatio. A Case of Kathmandu Metropolitan City, Nepal The Himalayan Review 2004 - 2005 vol.35 -36: 33-47.
- Piedrahita H (2006). Costs of Work Related Musculoskeletal Disorders (MSDs) in Developing Countries. Colombia Case, Department of Human Work Sciences. Lulea University of Technology. International Journal of Occupational Safety and Ergonomics (JOSE) 12 No 4 :379–86.
- Rushton L (2003). Health hazards and waste management. British Medical Bulletin.
- Safe work Australia (2009). Work related injuries in Australia 2005-2006, factors affecting application for workers' compensation, August.
- Safe Work Australia. March 2012. work-related traumatic injury fatalities.
- SAG (2006). Workers' Perceptions of Workplace Safety:An African Perspective. Department of Social Psychology. University of Helsinki. Finland International J. Occupational Safety and Ergon. (JOSE);12 No 1:31–42.
- Standard drink [cited 2012 February 22 at 05:30pm]; available at www.alcoholanswers.org/alcohol.../alcohol-related-questions.cfm].
- Takala J, Urrutia M, Hämäläinen P, Saarela KL (2009). The global and European work environment numbers, trends, and strategies. SJWEH Suppl vol. 7:15–23.
- Terry LB, Slavova S, Tang M (2011). Injuries among solid waste collectors in the private versus public sectors. Waste Management & Research; July; 29(10) 1043–52.
- TJayakrishnan, Jeeja M (2010). Unmet needs of solid waste management workers at Calicut Corporation area. In: As part of

- Centre of Excellence on Solid and Liquid Waste Management MoUD, editor: Government of India. 24th, 25th & 26st June
- UNEP (2006-2009). Engaging Governments an Industry in Demonstrating 3R Principles through Integrated Waste Management.
- Vianda SS, Johanne SHS, M FPS, Lips P (2004). Consequences of falling in older men and women and risk factors for health service use and functional decline Age and Ageing; Vol. 33 No. 1.
- Wang L, Wheeler K, Bai L, Stallones L, Dong Y, Xiang JGH (2010). Alcohol Consumption and Work-Related Injuries Among Farmers in Heilongjiang Province, People's Republic of China. American Journal Of Industrial Medicine; vol.53:825–35
- Wilkins K, Mackenzie S (2007). Work injuries Health Reports Statistics August; vol. 18, No. 3.
- Window J (2006). Musculoskeletal Disorders of Refuse Collectors emptying litter bins which are housed inside street furniture: University of South Australia.
- Worrell TG (2004). School Psychologists' Job Satisfaction: Ten Years Later: Virginia Polytechnic Institute and State University. May
- Yiha O, Kumie A (2006). Assessment of occupational injuries in Tendaho Agricultural Development S.C, Afar Regional State Ethiop J Health Dev. August
- Zangirolani L, Cordeiro R, Stephan C (2007). Spatial distribution of risks for work related injuries in a city of Southeasterne Brazil. university of Campinas, Department of Preventive and Social Medicine.

How to cite this article: Gizaw Z., Gebrehiwot M., Teka Z., Molla M. (2014). Assessment of occupational injury and associated factors among municipal solid waste management workers in Gondar town and Bahir Dar City, northwest Ethiopia, 2012. J. Med. Med. Sci. 5(9):181-192