

Assessment of occupational injuries in Tendaho Agricultural Development S.C, Afar Regional State

Osman Yiha¹, Abera Kumie²

Abstract

Background: The status of occupational injuries in workplaces in general and agriculture sectors in particular is ill defined in Ethiopia. Pocket studies in developing countries indicate that occupational injury due to an unsafe working environment is increasing.

Objectives: To determine the magnitude of occupational injury and describe factors affecting its happening among workers of Tendaho State Farm located in Afar Region.

Methods: Cross-sectional study design was employed to assess occupational injuries among randomly selected 810 workers in August, 2006. A structured questionnaire based interviews, work environment observation, physical examination of study subjects for injury, and reviewing medical records for injury were used to collect the data.

Results: The overall occupational injury prevalence rate was 783 per 1000 exposed workers per year. Seventy (11%) injured workers were hospitalized. Most (90%) of hospitalization was for more than 24 hours. Only one death was reported in the preceding 12 months prior to the study. A total of 6153 work-days were lost, at an average of 11.4 days per an injured worker per year. Working more than 48 hours per week [AOR: 8.27, 95% CI:(4.96-13.79)], absence of health and safety training [AOR: 2.87, 95% CI: (1.02-8.06)], sleeping disorder [AOR: 1.64, 95% CI: (1.12-2.41)], alcohol consumption [AOR: 1.72, 95% CI: (1.06-2.80)], job dissatisfaction [OR: 1.83, 95% CI: (1.30-2.58)] and absence of protective devices [OR: 3.18, (1.40-7.23)] were significant factors that contributed to the prevailing occupational injuries.

Conclusion: Multiple factors related to the work organization and employee's behavior increased the risk of occupational injuries. Continued on the job training, sustained work place inspections and proving occupational health and safety services should get emphasis in work places. [*Ethiop. J. Health Dev.* 2010;24(3):167-174]

Introduction

Occupational injuries pose a major public health and development problems in work places. Workplace related injuries are by large preventable with the use of appropriate occupational safety and health services (1-3). Of the total 3 billion workers in the world, over 85% work and live without any access to occupational safety and health services (4). Occupational injuries in developing countries are a major concern (5). It is estimated that 250 million occupational injuries, 160 million work-related diseases and 2 million deaths occur each year resulting in a loss of roughly 4% of the world gross national product due to workers' compensation, loss of workdays, interruption of production, retraining, and medical expenses and the 1:14 (5, 6). More than 350,000 workers die each year due to injury, significant proportions occurring in low and middle income countries (7).

Agriculture is one of the most hazardous sectors in both developing and industrialized countries (8). Agricultural workers are under-protected compared to workers in other sectors. They suffer markedly with higher rates of accidents and fatal injuries than workers of industries (8). The most vulnerable groups are daily laborers in plantations, seasonal workers, and temporary workers who are underserved with minimum occupational health services (8). At present, the rapid developmental changes aiming at improving quality of life, are affecting both the

health of the employees and the environment particularly in Africa. The introduction of new technologies, new chemical substances and materials have led to new occupational injuries and diseases, while the traditional hazards such as high dust, noise and heat have not been adequately dealt with (6, 9).

There are various reasons for the poor occupational safety situation in developing countries: Such as use of out-dated machinery, poor maintenance and little safety guarding of machinery, inadequate training of workers; poor design of equipment and workstations; and lack of personal protective equipment. (10). While unsafe working environments commonly cause most workplace injuries, human factors such as young age, sex, lack of experience, job dissatisfaction, sleep disorders, smoking habit, excess alcohol use, and lack of physical activity are inherent factors (11-13).

Agricultural or connected workers are marginalized occupational group whose living and working conditions may place them at increased risk for occupational injury. In developing countries, farm related injuries predominate, where an estimated 63% of the population is involved in agricultural activities (14). As a matter of fact the nature and type of farm related activities are multiple. The prevention of farm-related injuries, therefore, requires multiple approaches (14). Limited studies in the field of occupational health hazards have

¹Tel: +251911876059, e-mail: osmanyiha@yahoo.com, P.O.Box: 120869 Addis Ababa;

²School of Public Health, Addis Ababa University, P.O.Box: 9086, Fax +251115517701, Tel: +251911882912, E-mail: aberakumie2@yahoo.com

indicated that the magnitude of occupational injury is grave in Ethiopia (15). Limited data about health issues condition in agriculture predominate in working places in Ethiopia is a problem to affects in that productivity. Tendaho Agricultural Development S.C is one of the oldest public owned agricultural enterprises mainly producing lint cotton. This study was initiated with a hypothesis that unsafe working environment in an agrarian workplace is related to increased occupational injuries that could have been prevented. This study aimed at assessing the extent of occupationally related injury and describing factors contributing to it.

Methods

Study design and area: Institution based cross-sectional study design was employed to assess occupational injuries among Tendaho Agricultural Development S.C workers, Afar Regional State in August, 2006. The public owned state farm is located at Dubti Woreda, Afar Regional State, which is 580 km away the north-east of Addis Ababa (Figure 1). This plant was established in November 1960 by Mitchell Cotts P.L.C of UK. Tendaho Agricultural Development S.C constitutes Dubti State Farm, Detbahri State Farm and Dubti Ginning Factory. Unit farms, farm mechanizations, pest controls, workshops, power supply, ginning, baling and cotton seed processing are working sections. The company mainly cultivates cotton producing lint cotton for textile factories and cotton seed for oil factories. In addition, the company provides ginning service for out-growers. Tendaho Agricultural Development S.C has a total of 4930 employees, of whom 712 were permanent and 4218 temporary at the time of the survey.

Sample size determination and sampling method: A sample of 828 workers was determined based on single population proportion formula. A proportion of 50% occupational injury, Z score of 1.96 corresponding to 95% certainty and a 3% margin of error, 10% contingency for non-response and correcting for finite source population were used for the sample calculation. Study subjects were employees of the State Farm who were available at the time of the study. No discrimination was made between temporary and permanent employees. A stratified multi stage sampling was applied in order to include respondents for data collection. The enterprise was first stratified into three departments: Dubti state farm, Detbahri state farm and Dubti ginning factory, assuming that occupational injuries vary with the nature of the work and working condition. Each department was further sub-stratified by sections that had the required sample size based on proportional allocation to size. Sampling frame was a list of all employees of working sections that taken from the payroll of the enterprise. Finally, the study subjects were selected using a simple random sampling technique from each selected sections.

Data collection and instruments: Eight nurses using structured and pre-tested questionnaire administered data collection. One environmental health technician and one public health professional supervised the data collection

process. Training for data collectors and supervisors, counter checking of daily filled questionnaire and supervision were undertaken regularly in order to maintain the quality of data. Work environment observation using a structured checklist involving physical hazards that could be observed organoleptically. One of the supervisors had wide experiences in evaluate the level of hazards related to noise, heat, and machinery safety issues. Physical examination by trained nurses and reviewing injury records were also employed to complement self-reported information. The questionnaire included variables related to demographic, socio-economic, environmental, and behavioral characteristics of respondents in relation to incurred injury.

Operational definitions:

Occupational injury for the purpose of this study was defined as any personal injury, disease or death resulting from an accident in the course of work for the past one year prior to this study. Only incidence of the event for a given time is recorded as an injury.

Job satisfaction: a state of pleasurable emotional feeling reported by the worker as the result of one's job. It is a subjectively perceived response of in study participants to their job.

Excessive heat: heat is recorded as excessive if a worker is found sweating when naked or with light clothing; if the investigator feels a sudden heat wave and or sweating when entering to the workplace.

Excessive noise: noise that makes it difficult to communicate among neighbor workers without shouting at a distance of about one meter.

Data management and analysis: Collected data were entered and cleaned using EPI INFO (version 6.04; Center for Diseases Control and Prevention, Atlanta, GA, USA and World Health Organization, Geneva, Switzerland) and analyzed using SPSS statistical package (version 11; SPSS Inc., Chicago, IL, USA). Data is presented using frequencies and tables. Findings of observations on work environment were qualitatively judged and textually summarized as a presence of hazard or not.

Crude and adjusted odds ratio with 95% CI was employed to determine the presence of an association between the pre-supposed factors and occupational injury. Multivariate logistic regression analysis was also made to observe the relative effects of independent variables (socio-economic, environmental and behavioral factors) on the dependent variables (occupational injuries) by controlling the effect of confounding factors. To avoid many variables and unstable estimates in the subsequent model, only variables that reached a p-value less than 0.3 at the bivariate analysis were kept in the subsequent model analysis (16). First, the effect of selected socio-economic factors on the magnitude of occupational injuries was assessed. In the second step of analysis, environmental factors were included, and their effect was seen in the presence of socio-economic

factors. Finally, behavioral factors were added to see the effect of selected behavioral factors in the presence of socio-economic and environmental factors.

Ethical consideration: Ethical clearance for this study was obtained from Addis Ababa University, Medical Faculty and permission was secured from Tendaho Agricultural Development S.C. Informed consent was also obtained from each respondent. Observed injuries were referred to the enterprise health center. Health education on how to prevent injury in workplace was rendered to workers of each department after the completion of data collection. The result of the study was communicated to enterprise managers for them to take action.

Results

Socio-demographic characteristics: From the total sample size of 828 workers 18 refused to participate that made the response rate of 97.8 %. Majority of study participants, 630 (77.8%), were male and 180 (22.2%)

were female. The mean (\pm SD) age of survey respondents was 31.7 (\pm 11.1) years while there median was 28 years (IQR=18 years). Four hundred seven (50.2%) respondents were illiterate. Most of the study participants, 723 (89.3%), were daily laborers and 87 (10.7%) were technical workers. Four hundred eighty seven (60.1%) respondents had six years and above service duration and 323 (39.9%) had five years and below. The majority, of the 702 (86.7%), respondents had monthly enumeration of about Birr 150.

Occupational injury characteristics: The majority, 634 (78.3%), of them had on the incident at job that resulted in occupational injury during the past 12 months providing an overall prevalence of 783 injuries per 1000 exposed workers per year. Regarding frequency of injury in the past 12 months, 194 (30.6%) had once, 177 (27.9%) twice, 99 (15.6%) three times and 164 (25.9%) more than 3 times, which made 3.7 injuries per worker per year (Table 1).

Table 1: Distribution of Occupational Injuries in the Past 12 Months among Respondent workers, Tendaho Agricultural Development S.C, Afar Regional State, August 2006

Characteristics	DubSF(n=425) Number (%)	DGF(n=99) Number (%)	DetSF(n=286) Number (%)	Total(n=810) Number (%)
Occupational injuries in the Past 12 months	292 (68.7)	77 (77.8)	265 (92.7)	634 (78.3)
Number of occurrence				
Once	103 (35.3)	36 (46.7)	55 (20.8)	194 (30.6)
Twice	55 (18.8)	13 (16.9)	109 (41.1)	177 (27.9)
Three times	34 (11.6)	3 (3.9)	62 (23.4)	99 (15.6)
More than three	100 (34.3)	25 (32.5)	39 (14.7)	164 (25.9)
Occupational injuries in the Past 2 weeks	69 (16.2)	9 (9.1)	3 (1.0)	81 (10.0)
Number of occurrence				
Once	57 (82.6)	2 (22.2)	3 (100)	62 (76.5)
More than once	12 (17.4)	7 (77.8)	0	19 (23.5)

Note: DubSF=Dubti state farm; DGF=Dubti ginning factory; DetSF=Detbahri state farm.

Assessing the injuries, finger: 306 (32.0%), lower leg: 195 (20.4%), eyes: 117 (12.2%), toes 104 (10.9%), and lower arm 100 (10.4%) were the predominantly affected parts of the body. Laceration: 370 (36.9%), cuts: 116 (11.6%), puncture: 109 (10.8%), eye injury: 109 (10.8%), crushing: 103 (10.2%) and heat strain: 60 (6.0%) were commonly /?/ seen injury types. The majority, 457 (53.6%), of injuries were caused by hand tools, 95 (11.2%) by splinting or splashing objects, 77 (9.0%) were falling accidents, 68 (8.0%) were being hit by falling objects and 44 (5.2%) were by lifting heavy objects.

Severity of occupational injuries: Out of 634 injured respondents, 70 (11.0%) were hospitalized. Regarding the length of hospitalization, 7 (10.0%) were for 1 day, 25 (35.7%) were between 24 hours and 4 days, 25 (35.7%) were 5-10 days, and 13 (18.6%) were admitted for more than 10 days. One death was also reported due to severe head injury while working in the ginning section in the past 12 months. A total of 6153 work days were lost among 634 injured respondents. On the

average, 11.4 days were lost per an injured worker per year.

Working Environment and Behavioral Characteristics:

The majority of study participants, 709 (87.5%), were at work for more than 48 hours per week. Most, 789 (97.4%), of them had never been involved in occupational health and safety on job training. One hundred eighty eight (23.2%), 216 (26.7%), and 86 (10.6%) of participants drank alcohol, chewed "khat" and smoked cigarette, respectively. Four hundred ninety three (60.9%) respondents had sleeping disorders, 163 (33.1%) had evening or mid-night shifts. Five hundred thirty two (65.7%) of the respondents were not satisfied with their present job. Most study participants, 786 (97.0%), did not use personal protective devices at work places (Table 2). The main reason for not using personal protective devices was absence of the devices, for 773 (98.3%) of the workers and absence of health and safety training among 246 (31.3%) workers.

Table 2: Reported Work Environment and Behavioral Characteristics of Workers, Tendaho Agricultural Development S.C, Afar Regional State, August 2006

Characteristics	DubSF(n=425) Number (%)	DGF(n=99) Number (%)	DetSF(n=286) Number (%)	Total(n=810) Number (%)
Hours worked/week				
≤48	51(12.0)	27 (27.3)	23 (8.0)	101 (12.5)
48+	374 (88.0)	72 (72.7)	263 (92.0)	709 (87.5)
Had safety training	14 (3.3)	1 (1.0)	6 (2.1)	21 (2.6)
Used alcohol	68 (16.0)	22 (22.2)	98 (34.3)	188 (23.2)
Chewed khat	89 (20.9)	41 (41.4)	86 (30.1)	216 (26.7)
Smoked cigarette	26 (6.1)	13 (13.1)	47 (16.4)	86 (10.6)
Had sleeping disorder	243 (57.2)	47 (47.5)	203 (71.0)	493 (60.9)
Had job satisfaction	154 (36.2)	30 (30.3)	94 (32.9)	278 (34.3)
Used PPD	1 (0.2)	22 (22.2)	1 (0.3)	24 (3.0)

Note: DubSF=Dubti state farm; DGF=Dubti ginning factory; DetSF=Detbahri state farm
PPD= Personal protective devices.



Figure 1: Location of study site, Tendaho State Farm, Dubti Wereda, Afar Region, Ethiopia

Findings of expert observation indicated the following workplace hazards: unsafe building lay out, excessive heat, dust, noise, unguarded machine, exposed electric wires, organic solvents like naphtha and acids. Warning signs and health and safety instructions or procedures did not exist at all in all the working sections. All working sections had not first aid equipment except the clinic at central level. Occupational safety and health committees were not available in the enterprises at the time of the survey. No regular visits and inspection are made on health and safety conditions of workplaces.

Bivariate analysis for socioeconomic, environmental and behavioral factors: The age of the worker was significantly associated with occupational injuries. Workers in the 17 to 29 age group had less occupational injuries than those who were 30 years old and above [OR: 0.66, 95% CI: (0.47-0.92)]. Work experience of the worker was also significantly associated with occupational injuries. Workers, who had 5 years and less working experience were less likely to be injured

compared to those who had 6 years and above working experience, [OR: 0.70, 95% CI: (0.50-0.98)] (Table 3).

Study participants, who were used to work more than 48 hours per week, were 8 times more likely to be injured compared to those who worked 48 hours and less [OR: 8.74, 95% CI: (5.57-13.71)]. Similarly, workers without health and safety training were about 6 times more susceptible to injury than those who had training [OR: 6.24, 95% CI: (2.54-15.31)] (Table 4). Workers who were used to drink alcohol were more likely to be injured than those who do not consume [OR: 1.62, 95% CI: (1.05-2.48)]. Similarly, those who had sleeping disorder were about 2 times more likely to be injured than those who had no such disorder [OR: 2.31, 95%CI: (1.65-3.24)]. Study participants who were not satisfied with their assigned job were also more likely to be injured than those satisfied [OR: 1.83, 95% CI: (1.30-2.58)]. Similarly, workers who were not used to wear personal protective devices were about 3 fold more likely for

¹Tel: +251911876059, e-mail: osmanyiha@yahoo.com, P.O.Box: 120869 Addis Ababa;

²School of Public Health, Addis Ababa University, P.O.Box: 9086, Fax +251115517701, Tel: +251911882912, E-mail: abarakumie2@yahoo.com

injury in crude odds ratio [OR: 3.18, 95% CI: (1.40- 7.23)] (Table 4).

Table 3: Selected Socio-economic Determinants of Occupational Injuries, Tendaho Agricultural Development S.C, Afar Regional State, August 2006. (n=810)

Characteristics	Injured		Crude OR 95% CI
	Yes	No	
Sex			
Male	487 (77.3)	143 (22.7)	0.76 (0.50-1.16)
Female	147 (81.7)	33 (18.3)	1.00
Age group			
17-29 years	320 (74.9)	107 (25.1)	0.66 (0.47-0.92)*
≥30 years	314 (82.0)	69 (18.0)	1.00
Educational level			
Illiterate	327 (80.3)	80 (19.7)	1.27 (0.91-1.79)
Literate	307 (76.2)	96 (23.8)	1.00
Job category			
Daily laborer	567 (78.4)	156 (21.6)	1.08 (0.64-1.84)
Technical	67 (77.0)	20 (23.0)	1.00
Work experience			
≤5 years	241 (74.6)	82 (25.4)	0.70 (0.50-0.98)*
6+ years	393 (80.7)	94 (19.3)	1.00
Monthly salary			
≤ 200 Birr	556 (78.6)	151 (21.4)	1.18 (0.73-1.92)
201+	78 (75.7)	25 (24.3)	1.00

* Significant at $p < 0.05$.

Table 4: Selected Work Environment and Behavioral Factors Related to Occupational injuries, Tendaho Agricultural Development S.C, Afar Regional State, August 2006. (n=810)

Characteristics	Injured		Crude OR 95% CI
	Yes	No	
Drink alcohol			
Yes	158 (84.0)	30 (16.0)	1.62 (1.05-2.48)*
No	476 (76.5)	146 (23.5)	1.00
Chew khat			
Yes	170 (78.7)	46 (21.3)	1.04 (0.71-1.51)
No	464 (78.1)	130 (21.9)	1.00
Smoke cigarette			
Yes	70 (81.4)	16 (18.6)	1.24 (0.70-2.19)
No	564 (77.9)	160 (22.1)	1.00
Have sleeping disorder			
Yes	414 (84.0)	79 (16.0)	2.31 (1.65-3.24)***
No	220 (69.4)	97 (30.6)	1.00
Job satisfaction			
Yes	198 (71.2)	80 (28.8)	1.00
No	436 (82.0)	96 (18.0)	1.83 (1.30-2.58)***
Use PPD			
Yes	13 (54.2)	11 (45.8)	1.00
No	621 (79.0)	165 (21.0)	3.18 (1.40-7.23)**
Hours worked per week			
<48	38 (37.6)	63 (62.4)	1.00
48+	596 (84.1)	113 (15.9)	8.74 (5.57-13.71)***
Have health and Safety training			
Yes	8 (38.1)	13 (61.9)	1.00
No	626 (79.3)	163 (20.7)	6.24 (2.54-15.31)***
Work department			
Dubti state farm	292(68.7)	133 (31.3)	0.18 (0.11-0.28) ***
Dubti ginning factory	77(77.8)	22 (22.2)	0.28 (0.15-0.53) ***
Detbahri state farm	265(92.7)	21 (7.3)	1.00

***significant at $p < 0.001$, **significant at $p < 0.01$, *significant at $p < 0.05$, PPD: Personal Protective Device.

Logistic regression analysis

The final condensed model indicated variables that maintained association with occupationally induced injury. Workers between 17 to 29 age [AOR: 0.46, 95% CI: (0.31-0.69)], workers who used to work more than 48 hours per week [AOR: 8.27, 95% CI: (4.96-13.79)], workers without health and safety training [AOR: 2.87, 95% CI: (1.02-8.06), workers addicted to alcohol [AOR:

1.72, 95% CI: (1.06-2.80)] and workers with sleeping disorders [AOR: 1.64, 95% CI: (1.12-2.41)] were predicting factors. Although work experience, job satisfaction and use of personal protective devices showed significant association in bivariate analysis, they did not show an association in the final step of the multivariate analysis (Table 5).

Table 5: Summary of Logistic Regression Analysis of the Relative Effect of Socio-economic, Environmental and Behavioral Factors on the Magnitude of Occupational Injuries, Tendaho Agricultural Development S.C, Afar Regional State, August 2006

Characteristics	Crude OR (95% CI)	Adjusted OR (95% CI)		
		Model 1	Model 2	Final Model
Model 1 (socioeconomic variables)#				
Sex				
(Male Vs Female†)	0.76 (0.50-1.16)	0.88 (0.55-1.39)		
Age group in years				
(17-29 Vs 30+†)	0.66 (0.47-0.92)*	0.71 (0.49-1.09)	0.45 (0.30-0.66)**	0.46 (0.31-0.69)**
Educational level				
(Illiterate Vs Literate†)	1.27 (0.91-1.79)	1.17 (0.81-1.67)		
Work experience				
(≤ 5 Vs 6+ years†)	0.70 (0.50-0.98)*	0.91 (0.59-1.40)		
Model 2 (socioeconomic + work environment variables)#				
Hours worked per week				
(< 48† Vs 48+)	8.74 (5.57-13.71)**		9.45(5.84-15.29)**	8.27 (4.96-13.79)**
Health and safety training				
(Yes† Vs No)	6.24 (2.54-15.31)**		3.31(1.18-9.30)*	2.87 (1.02-8.06)*
Model 3 (socioeconomic + work environment variables + behavioral variables)#				
Drank alcohol				
(Yes Vs No†)	1.62 (1.05-2.48)*			1.72 (1.06-2.80)*
Sleeping disorder				
(Yes Vs No†)	2.31 (1.65-3.24)**			1.64 (1.12-2.41)*
Job satisfaction				
(Yes† Vs No)	1.83 (1.30-2.58)**			1.10 (0.73-1.64)
Use PPD				
(Yes† Vs No)	3.18 (1.40-7.23)**			1.68 (0.61-4.62)

#: Only variables reached p-value less than 0.3 were kept in the subsequent analysis, and displayed in the table

†: Reference group * Significant at p<0.05 ** Significant at p<0.01 PPD: Personal Protective Devices.

Discussion

The overall prevalence rate of occupational injury, 783 per 1000 exposed workers in the past 12 months, was high in this study compared to studies in industrial settings that indicated injury rate of 80 per 1000 workers per year in urban factories: Addis Ababa (17), had injury rate of 200 per 1000 workers per year Akaki textile factory (18), 184 per 1000 among full-time employees in construction industry, Egypt (19), had 335 per 1000 workers per year in small and medium scale industrial workers Gondar (20). Agricultural workers are known to suffer markedly with high rates of injuries compared to other workers particularly in developing countries (8, 14). In addition, daily laborers in plantation and temporary workers are among the most vulnerable groups in agricultural workplaces (8). The high rate of injury show in this study, compared to studies involving industrial workers (17-20) could be attributed to poor

promotive and preventive occupational health and safety measures at workplaces. The absence of workplace supervision and health & safety training, limited use of personal protective devices, prolonged duration of working hours, and being a daily laborer were major factors that accounted the occurrence of injury in our study. Daily laborers were the most exposed work force to occupational hazard, a situation that does not encourage having a formal bargaining power with the organization in terms of ensuring the provision of safe working environment.

The data indicated that laceration, cuts, punctures, eye injury, crushing and heat strain were common injury types of the prevailing work place hazards. A study made on farm related injuries and fatalities in Alberta, North America also showed that laceration was the most common type of injury (14). The types of injury were

¹Tel: +251911876059, e-mail: osmanyiha@yahoo.com, P.O.Box: 120869 Addis Ababa;

²School of Public Health, Addis Ababa University, P.O.Box: 9086, Fax +251115517701, Tel: +251911882912, E-mail: abarakumie2@yahoo.com

also consistent in studies undertaken in textile factories (18) and medium and small scale industries in Ethiopia (20). Experience of injury in other workplaces was also consistent (21).

Various factors are involved in the cause of an injury. Machinery accounted for 55% of all injury accidents per year (14). Other studies carried out among industrial settings also showed that machinery, falling, hand tools, splinters, struck by / against an object, and being hit by falling objects are common causes of occupational injuries (18-20, 22). This study also revealed that hand tools were the most common cause of injury which is inconsistent with other studies (14,18-20,22) that showed machinery as the main concern. The difference in the variation of cause of injury is linked to the difference in the type of work forces engaged in urban factory and rural agriculture development. In our study, nearly 90% of workers were temporary and daily laborers who were more involved in intensive manually implemented activities that expose them to injuries caused by hand tools than machinery. In addition, these agricultural workers had limited access to basic safety training and use of personal protective devices. The discriminative nature of occupational health and safety services really was not useful as it impacts productivity as the cost of handling injuries could not be ignored.

The location of injury involving fingers, hands, and legs in our study was consistent very with other studies (14, 17-20). Sustained finger and hand injuries were observed in fruit farms (23). The mobility of these body parts while working with the use of hand implements, and lack of safety precaution could explain the situation.

Workplace observation revealed that most working sections were with unsafe building, old and unguarded machineries, poor ventilation, excessive heat, dust, without safety & warning signs, and absence of health and safety instructions. The magnitude and extensiveness of uncontrolled working environment are common in workplaces of many developing countries (17,18,20,22,24).

Another factor of interest is the relationship between age and injury. This study showed that young age between 17 to 29 years was less likely to be injured compared to those who were 30 years and above, which is contrary to other findings (12,17-19,25). Our observation (data not indicated) daily laborers in the study area were illiterate, job unsecured, and not having a formal employment opportunity due to the temporary nature of the Tendaho State Farm. The reserve of young laborers is abundant in and around the study area with the possibility of enhancing the age homogeneity among them. Young workers are attached to their temporary job as a source of living, involved without any safety training. Repeated work exposures using hand tools by young temporary workers might be an opportunity of work adaptation to a known work setting that could enhance injury prevention

and stable the injury rate. On the other hand, we have found that long years of service is inherent in older aged participants who could be addicted to drug (alcohol and 'khat') there by increasing susceptibility to injury. 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 which could expose them for occupational injuries.

The work of young workers that can be refilled frequently with new ones can be linked to work experiences. Short service years in the present job were a risk factor (25), while this had a reciprocal relationship in our study as shown in the bivariate analysis. The relationship was lost after controlling other factors. In a community based study involving employed people, laborers followed by farmers had the highest risk of attaining risk of injury (12).

Job dissatisfaction, sleep disorders, and excess alcohol are common risk factors of occupational injuries (11,12,20,26,27) These risk factors were also consistent among construction workers (28). This study also confirmed that behavior of study subjects had an association with the occurrence of injury. Unduly workload that enhances fatigue and ignorance to limited access to health and safety information were also important parameters affecting injury.

This study has inherent limitations in the subjectivity of heat and noise measurement. This happened due to lack of basic instruments. In conclusion, the magnitude of occupational injury in agriculture-oriented work place was very high. The economical impact while compensating and medically handling the injuries, and lost healthy workdays cannot be undermined. Factors related to the occurrence of occupational injuries were very preventable. Hence, the implementation of basic occupational health and safety services with the provisions of personal protective devices with the follow up of their appropriate utilization, not spending more than 48 hours per week at work, ensuring sustained work place inspections, and promotions of the right to know through information dissemination, education and/or training on occupational health and safety to all categories of workers are highly advised.

Acknowledgments

We would like to thank the School of Public Health at the Faculty of Medicine, Addis Ababa University for funding this study; Tendaho Agricultural Development S.C main office, Dubti State Farm, Dubti Ginning Factory and Detbahri State Farm management staffs, who facilitated the field work for data collection; and study participants for their willingness to be involved in this study.

References

1. Igor A. Health Promotion in the work place. *An international Journal of health development* 1998;19(4):390-396.
2. World Health Organization. *Occupational Health Programs* 1972;26(12):537-546.
3. World Health Organization. Guidelines for conducting community surveys on injuries and violence 2004.
4. Rantanen J. Basic Occupational health services. *African newsletter on occupational health and safety* 2005; 15(2):34-37.
5. Machida S, Bachoo P. Guidelines on occupational safety and health management systems. *African news letter on occupational health and safety* 2001;11(3):68-69.
6. Eijkemans G. *Occupational Health & Safety in Africa* WHO/ILO 2004;14(2):28-29.
7. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: WHO; 2009.
8. International Labor Organization. Safety and Health in agriculture. 88th session, 30 May-15 June 2000, report VI.
9. Mohammed G. Ergonomics in small-scale grain mills in Nigeria. *African newsletter on Occupational health and safety* 2005;15(1):7-10.
10. Barry S, David H. Occupational Health recognizing and preventing work related diseases, 3rd ed 1995; pp.145-159.
11. Chau N, Mur JM, Touron C, Benamghar L, Dehaene D. Correlates of occupational injuries for various jobs in railway workers: a case-control study. *J. Occup. Health* 2004;46(4):272-80.
12. Bhattacharjee A, Chau N, Sierra CO, Legras B, Benamghar L, Michaely JP, Ghosh AK, Guillemain F, Ravaud JF, Mur JM. Relationships of job and some individual characteristics to occupational injuries in employed people: a community-based study. *J. Occup Health* 2003;45(6):382-91.
13. Jennings NS. Standards in mining safety and health. An ILO perspective, *African news letter on occupational health and safety* 2001;11(1):20-23.
14. Gil HJC, Kumar S, Jones E. Farm related injuries and fatalities in Alberta. *International Journal of industrial ergonomics* 1999;23:539-547.
15. Faris K. Survey of Occupational Safety and Sanitary conditions in small-scale enterprise in Jimma South Western Ethiopia. *Ethiop. J. Health. Dev* 1998;12(3):183-190.
16. Victoria CG, Huttly SR, Fuchs SC, Olinto MTA. The role of conceptual frameworks in epidemiological analysis: *A hierarchical approach. Int. J. Epid* 1997;26(1):224-227.
17. Fulle A. Injuries in urban factories of Ketena one, Addis Ababa. Masters Thesis, Addis Ababa University 1998.
18. Senbeto E. The incidence of injuries and their determinants in Akaki textile factory, Addis Ababa. Masters Thesis, Addis Ababa University 1991.
19. Alazab R. Work-related diseases & occupational injuries among workers in the construction industry in Egypt. *African newsletter on occupational Health & Safety* 2004;14(2):37-42.
20. Tadesse T, Kumie A. Prevalence and factors affecting work-related injury among workers engaged in Small and medium-Scale Industries in Gondar Wereda, north Gondar zone, Amhara Regional State, Ethiopia. *Ethiop J Health Dev* 2007;21(1):25-34.
21. Susan P, Baker, Brian O'Neill, Marvin J. Ginsburg. Occupational injury. The injury fact book, 1992;114-194.
22. Department of Hygiene and Environmental Health, Ministry of Health. A report on occupational health and safety assessment in selected factories in Ethiopia 1996; pp1-28 (unpublished report).
23. Marais S, Kritzinger A. Farm worker injuries on Western Cape fruit farms: the role of the lay health worker. *Curationis* 2005;28(4):86-92.
24. Occupational health & Safety workshop proceedings. Ethiopian Public Health Association in collaboration with ILO. Addis Ababa, 1995, pp1-38.
25. Gauchard GC, Mur JM, Touron C, Benamghar L, Dehaene D, Perrin P, Chau N. Determinants of accident proneness: a case-control study in railway workers. *Occup Med (Lond)* 2006;56(3):187-90.
26. London L, Nell V, Thompson ML, Myers JF. Health status among farm workers in the Western Cape--collateral evidence from a study of occupational hazards. *S Afr Med J* 1998;88(9):1096-101.
27. Nakata A, Ikeda T, Takahashi M, Haratani T, Hojou M, Swanson NG, et al. The Prevalence and Correlates of Occupational Injuries in Small-Scale Manufacturing Enterprises. *J Occup Health* 2006;48(5):366-76.
28. Chau N, Mur JM, Benamghar L, Siegfried C, Dangelzer JL, François M, et al. A. Relationships between certain individual characteristics and occupational injuries for various jobs in the construction industry: a case-control study. *Am J Ind Med* 2004;45(1):84-92.