

Occupational Injuries Among Building Construction Workers in Gondar City, Ethiopia

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Abstract

Introduction: Construction industry has been identified as one of the most hazardous industries both in industrialized and industrializing countries. Work-related injuries in construction sector present a major public health problem resulting in serious social and economic consequences that could be prevented if appropriate measures are taken.

Method: Institution-based cross-sectional study was conducted from May 1 – 20, 2009 at six licensed construction sites in Gondar city. A total of 401 building construction workers were included in the study by using simple random sampling technique. Data were collected through interviews using structured and pre-tested questionnaire and the collected data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 13.0.

Results: The prevalence rate of work-related injuries in the preceding one year was 38.7%. Of the total injuries, more than half (68.39%) were reported by males while the rest reported by females workers. The leading causes of injuries were fall from ground level (21.3%) followed by overexertion during lifting (20.6%), and fall from elevation (16.1%). Old age, being male, job dissatisfaction, lack of vocational training and working overtime were found to elevate the odds of having occupational injuries among construction workers.

Conclusion: The study revealed that occupational injuries were common among building construction workers. Therefore, counter measures such as creating awareness of risk factors, avoiding overtime work, providing training and personal protective devices could be effective to decrease prevalence of occupational injuries.

Impact on industry: The research will be helpful to know the extent of problem and to suggest some interventions.

Keywords: Building construction workers; Occupational injuries; Fall from ground level; Personal protective devices; Ethiopia

Introduction

Construction work involves a serious of occupational risks, such as work at heights (use of scaffolding, gangways and ladders), excavation work (use of explosives, earth moving machines), lifting of materials (use of cranes, hoists), and so on, which are specific to the sector. Thus, construction is often classified as a high-risk industry as it has historically been plagued with much higher and unacceptable injury rates compared to other industries [1,2]. Accidents at construction sites are identified as a major public health problem throughout the world [3]. Even though the number of fatal occupational accidents in the construction industry all over the world is difficult to quantify as information on this issue is not available for most countries, it would be reasonable to estimate that at least 55,000 fatalities occur at construction sites around the world every year. This means globally one fatal accident occur in this sector approximately every ten minutes [1]. According to reports published by the Construction Industry Institute, injuries and fatalities occur in the construction industry at a rate more than 50% higher than all other industries. Each work day, three or four construction workers die from injuries on the job in the U.S. at a rate of 18.6 per 100000 full-time workers, totaling more than 900 deaths per year [3]. The estimated direct and indirect costs of fatal and nonfatal construction injuries totaled about \$13 billion annually in this world. The medical expenses of nonfatal injuries alone cost more than \$1.36 billion per year [4].

Developing countries like Ethiopia are striving hard to improve their basic amenities by building schools, hospitals, housing complexes, shops, offices, highways, power plants, industries, bridges and other

infrastructures. However, all these construction activities are carried out by unskilled labor forces at cheap rate. Occupational injuries and accidents among these workers are high due to illiteracy, poverty, lack of health and safety training and information on health hazards and risks at the work place. Such workers are known to face rapidly changing workplaces, a high degree of competition and bouts of unemployment [5,6]. Hence, in developing countries the occupational health and safety hazards faced by construction workers are greater than those in industrial countries. The impact is also 10 to 20 times higher in these countries, where the greatest concentration of the world's workforce is located [7,8]. However, even though work-related injuries present a major public health problem resulting in serious social and economic consequences, it can be prevented if appropriate measures are taken [9]. In Ethiopia, little work has been done on occupational health and safety aspects of building construction workers and as per literature review there is lack of data about prevalence and determinant factors of occupational injuries among these workers. Therefore, the present study attempted to contribute in determining magnitude and factors

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related to work related injuries among building construction workers in Gondar city, Ethiopia.

Methods

Study design

Institutional-based cross-sectional study was conducted from May 1-20, 2009 at six licensed construction sites existing in Gondar city.

Sample size determination and sampling technique

The required sample size was determined by using single population proportion formula. For the calculation, 95% confidence level, 5% marginal error and 50% injury prevalence (because there was no previous study) were assumed. Based upon the job description, the study populations were stratified in to seven different strata i.e. daily laborer, plasterer, carpenter, mason, welder /electrician, painter, and driver/operator. The number of samples from each stratum was determined by using proportional allocation formula. Finally, simple random sampling technique was employed to select 403 sample sizes from the strata

Data collection procedure

Structured and pretested questionnaire, consisting of both closed and open-ended questions was utilized to collect the data (Annex-1). Five final year Occupational Health and Safety students and two Occupational Health and Safety professionals were recruited to work as data collectors and supervisors, respectively. The data were collected by interviewing building construction workers using the Amharic version of the questionnaire. The questionnaire was prepared in English and translated to Amharic (native language) and then back to English by different independent language experts to verify the consistency and content of translation. Detailed information about the socio-demographic, behavioral and work environment characteristics, awareness and practice towards occupational health among construction workers and episodes of injuries in the preceding one year were collected.

Data quality assurance

The quality of data was ensured through training of data collectors and supervisors, checking the completeness, accuracy, and uniformity of the collected data at each day of data collection.

Data analysis

The data were entered, cleaned and analyzed using SPSS software version 13.0. Descriptive statistics like frequency distribution mean and percentage calculation was made for most of the variables. Bivariate and multivariate logistic regression analyses were performed to identify factors affecting prevalence of occupational injuries. Finally, the results were presented with adjusted odds ratio (AOR) and 95% confidence interval (CI).

Ethical clearance

Ethical clearance was obtained from the Institutional Review Committee of School of Public Health, College of Medicine and Health Sciences, University of Gondar. Permission was also obtained from the local administrative bodies and concerned construction companies. Verbal consent was also obtained from every study subject after clearly half of the injuries (68.39%) were reported by males and the rest by the female workers. Among the injured workers, 61.3% faced injury once whereas, 38.7% of them experienced more than once. The leading causes of injuries were fall on ground level (21.3%) followed by

overexertion during lifting (20.6%), fall from elevation (16.1%), being struck by falling object (14.8%), cut by sharp objects (11%) and others (16.1%) like electrocution, vehicle accident, building collapse, machine accident etc. Regarding post injury measures, 52.3% workers got treatment from nearby health institution, 23.2% tried self medication with locally available materials, 10.3% got first explaining the purpose of study. Confidentiality of the data was strictly maintained throughout the study period.

Results

From the total of 403 selected building construction workers, 401 participated in the study. This forms a response rate of 99.5%. Male study participants accounted to 61.6% of all study participants. The age of the respondents' range from 14–57 years with a mean (\pm standard deviation) age of 25.3 ± 8.4 years. Majority (75.3%) of the workers were in the age group of 14–29 years followed by 30-44 (19.7%) and 45-57 years (5%), respectively. Table 1 summarizes the socio demographic characteristics of the study participants.

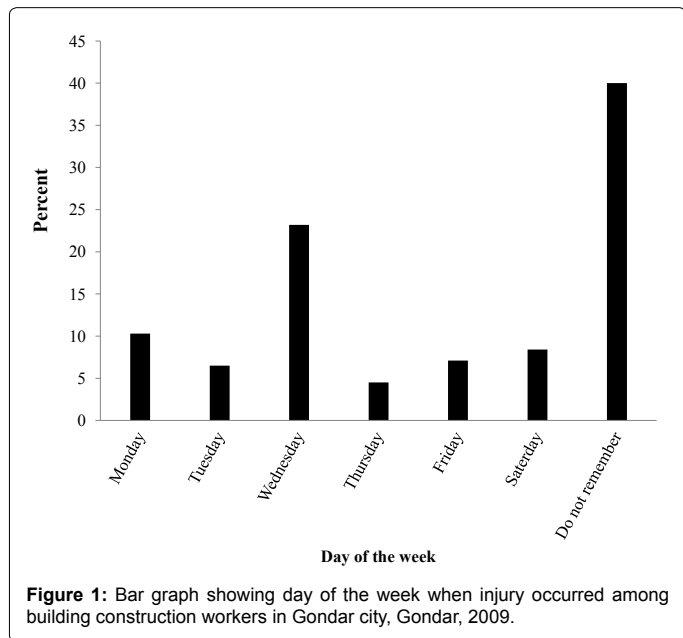
Out of the total 401 study subjects, 38.7% had experienced work-related injuries at least once in the previous one year recall period; of which more than half at the site, 7.1% got treatment from traditional healers and the rest 7.1% did not take any measure due to less injury extent. Self medication by workers may be at site or at their respective homes which mostly include bandaging the injured body part with piece of cloth, softening the injured body parts with butter and pouring the stressed muscles with cold or hot water.

Characteristic	Frequency	Percent	
Sex	Male	247	61.6
	Female	154	38.4
Age	14-29	302	75.3
	30-44	79	19.7
	45+	20	5.0
Marital status	Single	204	50.9
	Married	161	40.1
	Widowed	28	7.0
	Divorced	8	2.0
Religion	Orthodox	341	85.0
	Muslim	36	9.0
	Others	24	6.0
Educational level	Cannot read and write	69	17.2
	Read and write only	24	6.0
	Elementary	120	29.9
	Secondary & above	188	46.9
Occupation	Daily laborer	230	57.3
	Plasterer	64	16.0
	Carpenter	40	10.0
	Mason	32	8.0
	Welder/electrician	13	3.2
	Painter	12	3.0
	Driver/operator	10	2.5
Service year	<1	234	58.4
	1-5	130	32.4
	Above 5	37	9.2
Monthly salary in Birr	200-600	288	71.8
	>600	113	28.2

Others: protestant and catholic

Table 1: Socio-Demographic Characteristics of building construction workers in Gondar city, Gondar, 2009.

Concerning the day of injury, 23.2% of the workers injured on Wednesday followed by Monday (15%) although many workers (40%) did not remember the exact day of injury (Figure 1). More than half



Characteristic	Frequency	Percent
Ever heard occupational health hazards	Yes	213 (46.9)
	No	188 (53.1)
Have periodic health check up	Yes	40 (10)
	No	361 (90)
Reason for not using PPE	No provision of PPE	388 (96.8)
	Not comfortable	6 (1.5)
	Other	7 (1.7)

PPE: personal protective equipment; Others: using PPE has no value, decrease work performance

Table 2: Building construction workers awareness and practice towards occupational health in Gondar city, Gondar, 2009.

Variables	Injury		Crude OR (95%CI)	Adjusted OR (95% CI)	p-value	
	Yes	No				
Age	14-29	105	197	1.00		
	30-44	36	43	1.57 (0.95,2.60)	1.47 (0.82, 2.63)	
	45+	14	6	4.38 (1.63,11.73)*	3.16 (1.03, 9.64)*	.044
Sex	Male	106	141	1.61(1.06, 2.46)*	2.01 (1.20, 3.37)*	.008
	Female	49	105	1.00		
Work hours per day	> 8 hours	47	6	18.12 (7.51,43.73)*	14.06 (5.67, 34.86)*	.000
	< 8 hours	6	4	3.47 (0.96,12.56)	3.30 (0.88, 12.35)	
	8 hours	102	236	1.00		
Satisfied with current job	No	86	88	1.00		
	Yes	69	158	0.45(0.3,0.67)	0.55(0.34, 0.90)*	.018
Underwent vocational training	No	144	207	2.47 (1.22,5.0)*	2.37 (1.08, 5.22)*	.032
	Yes	11	39	1.00		
Smoking	No	130	225	1.00		
	Yes	25	21	2.06 (1.11,3.83)*	0.97 (0.44, 2.46)	

*-significant at p-value <0.05

Table 3: Multivariate logistic regression analysis for potential factors associated with injury among building construction workers in Gondar city, Gondar, 2009.

(53.1%) of the workers did not hear (had no awareness) about the existence of occupational health hazards. Beside this, majority of the workers (90%) did not have periodical health check up and none of the study participant was found to use personal protective equipment (PPE) at all during work (Table 2). Majority of the workers (87.5%) did not take vocational training for the activities they perform and none of the workers attended any kind of occupational health and safety training. About 72% of the workers reported that they did not have any kind of health services in their company. Even those who reported availability of health services, 92.8% of them reported only first aid services whereas, the rest 3.6% each reported preventive and 3.6% treatment services.

The result of multivariate logistic regression analysis showed that the prevalence of occupational injury among building construction workers was significantly associated with age, sex, job satisfaction, lack of vocational training, and total work hours/day. Workers above ≥ 45 years in age were 3.16 times more likely to be injured than workers found in the age group between 14–29 [AOR: 3.16, 95% CI: (1.03, 9.64)] however, no statistically significant association was found between workers in the age range of 14-29 and 30-44 years [AOR: 1.47, 95% CI: (0.82, 2.63)]. Similarly, occupational injuries were significantly associated with workers gender i.e. males were 2.01 times [AOR: 2.01, 95% CI: (1.20, 3.37)] more likely to experience injury than females. Likewise, job satisfaction showed statistically significant association with occupational injury; construction workers who reported current job satisfaction were 45% less likely to face injury compared to their counter parts [AOR: 0.55, 95% CI: (0.34, 0.90)]. Also, workers who did not undergo vocational training were 2.37 times more likely to have injury than those who underwent vocational training [AOR: 2.37, 95% CI: (1.08, 5.22)]. In addition, working > 8 hours/day raised the odds of occupational injury by 14.06 folds compared to those who worked for 8 hours/day [AOR: 14.06, 95% CI: (5.67, 34.86)] (Table 3).

Discussion

The study results revealed that out of total participants 38.7% of the workers experienced occupational injuries at least once in the previous one year recall period. This finding was markedly higher than that of the study done in India, where the prevalence rate of injury was 22.92%.

[10]. This discrepancy in the prevalence of work-related injuries may be linked to the difference between the two countries in level of development, status of workforce, strengths of occupational health and safety services and diversity and complexity of work tasks, and environments. The other reason might be connected to the difference in the method of data collection.

The three leading cause of injuries were fall from ground level (21.3%) followed by overexertion during lifting and carrying (20.6%), and fall from height (16.1%). The fall injuries together constitute about 37.4 % among the total injuries. Tripping over debris, difficult work terrain (e.g., rocky, muddy, uneven), slope of the lot, lack of backfill around the foundation, and difficult access and/or egress from the building were the main reasons contributing to fall from same level [11]. The finding of the present study was relatively consistent with that of report from Egypt [12], where fall cases represent a significant portion of occupational injuries among construction workers. It was also, similar with other studies conducted in USA [13,14]. In line with the study done in USA [14], comparatively more workers (23.2%) were injured on Wednesday. Most of the workers (53.1%) had no awareness about the presence of occupational health hazards associated with their work and they totally denied access to any of occupational health and safety trainings. In most developing countries construction skills are still mainly acquired through an informal apprenticeship system. In Egypt 85% of craftsmen are trained through traditional apprenticeships [15], and a similar situation prevails in Brazil, India, Kenya and Mexico. Even though vocational training schools do exist in most countries, many workers and contractors see formal training as an unnecessary expense rather than an investment [16]. PPEs are designed to protect against health hazards and accidents. Hard hats, safety glasses, safety boots, masks, and aprons are designed to prevent or reduce the severity of injury during an accident. The construction regulation broadly requires that such protective clothing, equipment, or devices be worn "as are necessary to protect the worker against the hazards to which the worker may be exposed" [17]. However, in this study, none of the worker was found to use PPE during work. This could be due to the fact that lack of provision of PPEs from the employer and some of the workers didn't know the importance of different PPEs in prevention and control of exposure to different occupational hazards and injuries in construction site. This study investigated greater chance of occupational injuries in male workers than females [AOR: 2.01, 95% CI: (1.20, 3.37)]. This difference in chance of getting occupational injury between the sexes of workers might be connected with several factors which can increase the risk of injury such as the difference in task (commonly males do harder tasks); work environment, work organization and so on. Construction workers aged ≥ 45 years were 3.16 times more likely to be injured compared to workers in 14–29 years age range [AOR: 3.16, 95% CI: (1.03, 9.64)]. This might be due to the fact that reduced physical capabilities like strength, balance, and processing speed further increase the risk of injury with older age [18]. In contrary, the risk of work-related injury decreased with job satisfaction (AOR=0.55 95% CI 0.34, 0.90). An increasing number of studies have considered job satisfaction as pervasive and influential factor in the occurrence of work-related injuries in the work environment [19]. This could be linked to fact that when the workers do not satisfied with their job, they could not experience meaningfulness, greater responsibility, and better use of their knowledge and skills in their job and such situation leads to decreased safety in their work and increased occupational injuries. Essentially, when job satisfaction is increased, on- task activities are enhanced, leading to greater attention to safety motivation, knowledge, and compliance [20]. Thus, increasing employee job satisfaction could

be as important as eliminating physical hazards in the workplace [21]. Consistent with the national databases report from Germany [22], working > 8 hours/day raised the odds of occupational injury by 14.06 folds compared to those who work 8 hours/day [AOR: 14.06, 95% CI: (5.67, 34.86)]. The reason could be explained by the fact that fatigue associated with long hours of work that may increases the likelihood of work related injuries, and that exceptionally long hours may also result in injuries associated with breaching physical endurance limits [23]. Also, workers who did not undergo vocational training on their current work were 2.37 times more likely to have injury than those workers who underwent vocational training [AOR: 2.37, 95% CI: (1.08, 5.22)]. This finding indicates the importance of provision of training in prevention and control of occupational hazards and accidents.

Conclusion

The study depicted that occupational injuries were common among building construction workers in the study area; the prevalence of the injuries were associated with preventable and modifiable factors such as lack of PPE, working overtime, lack of vocational training and workers dissatisfaction with their job. Furthermore, most of the building construction workers in this study were unaware about the presence of occupational health hazards associated with their work and they denied access to personal protective equipments and health and safety trainings. Therefore, counter measures such providing health and safety training and personal protective devices, creating awareness of risk factors, avoiding overtime work and provision of other occupational health and safety services may decrease injuries among building construction workers.

Authors' Contribution

Mesafint Molla: Initiated the research, wrote the research proposal, conducted the research, did data entry and analysis and wrote the manuscript.

Kassahun Alemu: Involved in the write up of the proposal, conducted the research, did data analysis and wrote the manuscript.

Getahun Kebede: Involved in the write up of the proposal, conducted the research, did data analysis and wrote the manuscript.

Hardeep Rai Sharma: Involved in the write up of the proposal, conducted the research, did data analysis, and wrote the manuscript

Walelegn Worku: Involved in the write up of the proposal, conducted the research, did data analysis, and wrote the manuscript.

All authors read and approved the final manuscript.

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