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Time to Return to Work After an Occupational Injury and Its Prognostic factors Among Employees of Large-Scale Metal Manufacturing Facilities in Ethiopia: A Retrospective Cohort

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ABSTRACT

BACKGROUND: Globally, occupational risk factors are thought to be responsible for at least 1.9 million deaths and 90 million disability-adjusted life years per year. Occupational injury survivorship has increased in Ethiopia in recent years. However, the vast majority of the victims are young people who are impacted in their everyday life as a result of occupational injuries. While research in developed countries has revealed several factors related to early return to work, there have been very few studies of significance in underdeveloped countries, including Ethiopia.

METHODS: Metalworkers who had an occupational accident between January 1, 2017, and December 31, 2021, were investigated in a facility-based retrospective cohort. Data was collected from 422 medical records and registration books using a standardized abstraction tool. STATA 15 was used to analyze the data. The median time it took to return to work was computed. The Kaplan Meier survival curve was used to estimate the time to return to work across covariates. A multivariable Cox proportional hazard model was used to identify statistically significant predictors of return to work.

RESULTS: After a median of 45 days away from work, 310 of the 422 (73.5%) cases returned to work (95% CI 39.7-50.2). The total incidence density of return to work was 1.21 (95% CI = 1.01-1.30) per 100 person-days observed. Professional certification (AHR: 2.15, 95% CI: 1.62-2.87), working as a rigger (AHR: 1.59, 95% CI 1.20-2.10), having dependents at home (AHR = 1.59, 95% CI = 1.09-2.64), and injuries caused by body movement without any physical stress (AHR = 2.61, 95% CI = 1.92-3.56) were all associated with return to work.

CONCLUSION: Return to work is influenced by a range of factors other than the type or severity of the injury incurred. Multidisciplinary approaches such as clinical treatment and rehabilitation, ergonomics interventions, and economic and social assistance should be prioritized in the efforts to aid employees' return to work.

KEYWORDS: Determinants, return to work, metalworkers, work-related injury, survival

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Introduction

Occupational injury is referred to as any personal injury, disease, or death caused by an occupational accident. Every year, millions of people are unable to work, either temporarily or permanently, as a result of these injuries.[1] Globally, occupational risk factors are thought to be responsible for at least 1.9 million deaths and 90 million disability-adjusted life years (DALYs) per year.[2] Aside from being an individual-level issue, the loss of labor force due to occupational injuries can have a considerable economic impact. While the effects on employees and their families are not accounted for in the following cost estimate, the International Labour Organization (ILO) estimates that occupational accidents and diseases cost the global economy about 4% of Gross Domestic Product (GDP) each year (roughly 2.8 trillion US dollars).[3]

When an injury occurs, it is vital to focus on reducing the human and financial costs by restoring the worker to safe and productive work as soon as medically practicable. Employees who can continue working after an injury or gradually return to work while recovering are more likely to recover faster and go on with their lives. Maintaining a daily routine and regaining control and independence requires remaining connected to one's workplace, even if one's professional responsibilities have shifted. This promotes physical recovery as well as mental health and overall well-being.[4] If a person is absent from work for 20 days, they have a 70% chance of returning to work; if they are absent for 45 days, their chances of returning to work drop to 50%; and if they are absent for more than 70 days, their chances of returning to work plummet to 35%.[5]

The strategy of safely reinstating employees to work promptly is known as return to work (RTW).[6] The identification of characteristics that predict early return to work after an injury would direct intervention strategies to reduce the proportion of workers who advance from injury to a disability, reduce the length of time off work, and increase the rate of return to work.[7] RTW rates reported in surveys done around the developed world range from 29% to 100%, with a median rate of 67%.[4,8,9] In these studies, education level, hospitalization, socioeconomic status, having insurance coverage, age, injury severity, injury locus, injury nature, pain in the injury locus, self-report health status, and pre-injury monthly salary all affected early RTW time (Time between injury and first return to work).[10-12]

Ethiopia is an agrarian country that is quickly industrializing. The manufacturing sector has grown at a rate of almost 18% each year on average.[13] Over the last 5 years, the impact of the manufacturing industry on national GDP has been estimated to have increased by around 11%. The Ministry of Labour and Social Affairs (MOLSA) is the government agency in charge of ensuring worker safety and health in both private and government-owned establishments.[14]

The pooled proportion of occupational injuries in Ethiopia is, 44.66% (95% CI: 43.83, 45.49) according to a Systematic Review and Meta-analysis.[15] Occupational injury investigations have demonstrated that Ethiopian metal workers suffer from cuts, fractures, and dislocations, as well as puncture, abrasion, suffocation, burns, eye injuries, and piercing injuries.[16,17] In Ethiopia, the rate of surviving an occupational injury has risen dramatically in recent years. The majority of the victims, however, are young people whose daily activities have been impaired as a result of workplace injuries.[14] While certain factors related to early RTW have been established in studies undertaken in the developed world, there have been very few studies of significance from developing countries including Ethiopia.

Long absences from work are associated with significant personal, societal, and economic costs.[18] As a result, determining the time to return to work following an occupational injury is critical. Hence, this study aimed to determine the time to return to work after an occupational injury and its predictors among the employees of large-scale metal manufacturing factories in Central Ethiopia. The findings of this study will help occupational health and safety policymakers and program planners to inform, develop, execute, and evaluate occupational safety and health (OSH) policies and programs that are critical for preventing workplace injury.

Methods and Materials

Study setting

Addis Ababa is the capital and largest city of Ethiopia. The population of the city is estimated to be 5 227 794 people.[19] The city accounts for 29% of Ethiopia's urban GDP and 20% of the country's urban employment. Manufacturing businesses employ 12.5% of the total workforce in the city. Together, these businesses account for over 36% of the city's GDP. As of 2019, Addis Ababa has 35 large-scale metal manufacturing factories.[20]

Study design and period

Employees with work-related injuries in 11 metal manufacturing enterprises were investigated in this retrospective cohort study. Employment accidents and occupational diseases must be reported to the ministry of labor and social affairs' occupational safety, health, and working environment department (OSHWED). The labor proclamation 377/2003 mandates the archiving of accident records in manufacturing industries where the direct medical cost exceeds 2000 Ethiopian Birr (about USD 40).[21]

Study population

Workers in the specified metal manufacturing industries who suffered an occupational accident between January 1, 2017, and December 31, 2021, made up the study population.

Eligibility criteria

Workers with missing or incompletely coded explanatory factors were excluded. The follow-up period was limited to 5 years between January 1, 2017, and December 31, 2021, with any injury occurring before or after that time not being considered. Workers who were involved in fatal accidents were likewise excluded. Metalworkers who were injured at work twice or more were only investigated for the first time they were injured. Finally, only those who worked in the metalwork department of the chosen facilities were included, with administrative workers being excluded to ensure consistency in the assessment of explanatory variables.

Sample size determination

The sample size was calculated using a single population formula since no studies were found on RTW among metalworkers in our context. The sample size was calculated using single population proportion formula after considering the following assumptions: 50% proportion, 95% confidence level ($Z\alpha/2 = 1.96$), 5% margin of error (d). The final sample size was 422 considering 10% incomplete data.

Sampling procedures

The Addis Ababa Bureau of Labour and Social Affairs, as well as the Metal Industry Development Institute of the Ministry of Industry, provided a comprehensive list of existing large-scale metal manufacturers in Addis Ababa. After that, 11 factories were chosen for the study, (30% **Sampling ratio), using**

simple random sampling. The accident registry for the selected establishments was then reviewed for employees who incurred occupational injuries between January 1, 2017, and December 31, 2021. This procedure resulted in the extraction of 507 recorded occurrences. A total of 61 records were then removed due to missing characteristics of interest, such as demographic and injury-related factors. Finally, to select the needed number of records, a simple random sampling technique was used.

Data collection and quality management

After researching various publications in the field of interest, a data abstraction checklist was created by the investigation team. A pre-test was conducted on 5% of records at a Metal manufacturing plant in Adama city, and adjustments were made based on the result. From January 1 to 30, 2022, three nurses who worked in the trauma and orthopedics wards of Addis Ababa University Black Lion Hospital extracted all of the information needed from the selected companies' occupational injury registry, including demographic characteristics (eg, gender, birth date, marital status) and clinical status (injured body part, nature, cause, and hospital admission).

In addition, data on education level, job category, and average monthly salary in the 3 months before the injury, compensation provided, and the number of dependents was gathered from the company's personnel files and payroll registers. Two public health professionals were on hand to supervise and monitor the data collection. Before and after data entry, supervisors, data clerks, and investigators double-checked the accuracy and consistency of the data.

Study Variables

Time to return to work is the dependent variable (number of days)

Independent variables include demographics (eg, gender, birth date, marital status) and clinical status (injured body part, cause, and admission status), job category, average monthly salary in the 3 months before the injury, and the number of dependents.

Operational Definition

Occupational Injury: Any personal injury, disease, or death caused by an occupational accident is referred to as an occupational injury.

Event: return to work within 90 days

Censored: an injured employee who was on leave for 90 days and did not return, died, was transferred, or had an unclear outcome status

Time to return to work: The duration of injury-related absenteeism was defined as the time between the date of the work-related injury and the first date of resuming work. Private-sector workers should be paid 100% of their regular salaries for the first 3 months of leave, 75% for the next 3 months, and at least 50% for the remaining 6 months, according to Ethiopian Labour Proclamation No. 1156/2019.[22] As a result, RTW was divided into 2 categories in the current analysis: less than 3 months and 3 months or more, to account for the time when an employee is paid a full month's wage as required by law. The dichotomization used a coding of 1 to represent an event and 0 to represent censored data (the data for which we do not know the exact event time).

Injury cause: The following injury types and mechanisms were coded and grouped according to the International Classification of Diseases, 10th revision (ICD-10): Falls; loss of machine/tool control; Body movement without any physical stress (defined as injuries sustained as a result of stepping on sharp objects, running, walking, running into, or being hit against something); and body movement under or with physical stress (defined as injuries due to lifting, carrying a load and other physically strenuous movements including slips).[23]

Injury location on the body: Injury location refers to the exact region of the body where the injury happened and is divided into 4 categories: upper extremity (shoulder, arm, forearm, wrist, and hand injuries); lower extremities (injuries reported on the hip, thigh, leg, ankle, and foot); spinal cord (reported injuries of the bones, muscles, tendons, and other tissues that reach from the base of the skull to the tailbone); and, head and neck injuries.

The median time of return: is the time when 50% of the injured workers had returned to work.

Dependents to support: According to the Ministry of Labour and Social Affairs, a dependent is anyone who a person claims on their income tax return for a certain tax year. A biological or adoptive kid, a brother, sibling, or parent are all on this list.[24]

Professional metal work certification: Metal workers who have completed and received certification from Ethiopia's Center of Excellence for Engineering and Welding Training and Technology Center, or any of Ethiopia's Federal or Regional Technical & Vocational Education & Training (TVET) colleges.[25]

Data Analysis

Descriptive statistics

Epi-data for Windows was used to enter data, and STATA version 15 was used to analyze it. Categorical variables were summarized using percentages and frequencies. Depending on the nature of the variable, the results were displayed in the form of tables, and texts. A box plot was used to check the distribution of continuous variables. To summarize normally and non-normally distributed continuous variables, the mean with standard deviation and median with inter-quartile range were employed, respectively.

However, because the mean cannot offer accurate information due to censoring, the median was estimated in the case of survival time. The Kaplan Meier survival curve was used to compare groups and describe the proportion of injury-related absenteeism with time after a work-related injury. The null hypothesis that there is no difference in the distribution of survival times was tested using the log-rank test. To find out which characteristics were associated with the time it took to return to work, we used bivariate analysis using Cox proportional hazards regression.

The multivariable model included all factors with a *P*-value of .25 or below that had an association with the outcome variables. A multivariable Cox proportional hazard model was used to examine the independent effects of covariates on the hazard of return to work. The presence of a significant association between return to work and covariates was declared by using adjusted hazard ratios with a 95% confidence interval (CI) and a *P*-value < .05. A global test using (estat phtest) was used to check the proportional hazard assumption in Stata. The null hypothesis that the effect of covariate is the same over time was tested using the global test. The Variance Inflation Factor was used to check for multicollinearity (VIF).

Result

Socio-demographic characteristics of metalworkers

Males made up 398 (94.3%) of the 422 employees. Metalworkers were 30 years old on average (IQR = 27-33). They were married or cohabiting with their partner in 59% of cases. Two hundred five employees (48.6%) had completed professional training in their fields. At the time of the accident, 185 (43.8%) had families to support. Pre-injury wages for 117 workers (27.7%) were less than 2500 Ethiopian Birr. Before their injury, the majority of the workers (54.7%) had worked in the factories for less than 5 years (Table 1).

Injury characteristics

Seven workers were awarded compensation for their work-related injuries. In terms of the site of injury, the upper extremity accounted for a large number of injuries (144, 34.1%). Regarding the documented cause of injuries, 42.7% were attributed to injuries sustained as a result of stepping on sharp objects, running, walking, running into, or being hit against something. Machinists made up 30.1% of the metalworkers (Table 2).

Return to work after an injury

Three hundred ten of the 422 cases (73.5%) returned to work after a median of 45 days missed from work (95% CI 39.7-50.2). The remaining 100 (23.6%), 11 (2.6%), and 1 (0.24%) workers arrived after 90 days, did not try to work in the same institution again, and earned the full amount of disability benefits, as per national standards respectively. A total of 25 498 person-days were contributed by the workers in the study (Figure 1).

Table 1. Frequency and percentage distribution of socio-demographic characteristics of metal workers with recorded occupational injury incidents from January 2017 to December 2021.

VARIABLES	FREQUENCY	PERCENT
Age on injury		
⩽35 years	67	15.9
36-54	175	41.5
>55	180	42.7
Sex of worker		
Male	398	94.3
Female	24	5.70
Marital status		
Married/cohabitating	249	59.0
Single/widow/widower	173	41.0
Professional metal work certification		
Yes	205	48.6
No	217	51.4
Workers have dependents to support		
Yes	185	43.8
No	237	56.2
Pre-injury salary		
<2500 Ethiopian Birr	117	27.7
2500-5000 Ethiopian Birr	247	58.5
>5000 Ethiopian Birr	58	13.7
Pre-injury service year in the factory		
<5 years	231	54.7
5-10 years	142	33.6
>10 years	49	11.6
Educational status of worker		
No formal education	41	9.7
Primary education (grades 1-8)	135	32.0
Secondary education (grades 9-12)	122	28.9
Diploma and above	124	29.4

In the cohort, the overall incidence density of early return to work was 1.21 (95% CI = 1.01-1.30) per 100 person-days of observation (PD) or 36.3 (95% CI = 30.30-39.0) per 100 person-months of observation (PM). Within 30, 60, and 90 days, the incidence density of return to work was 1.2 per 100 PD, 1.32 per 100 PD, and 1.44 per 100 PD, respectively. Workers

Table 2. Injury characteristics of metal workers with recorded occupational injury incidents from January 2017 to December 2021.

VARIABLES	FREQUENCY	PERCENT
Compensation awarded for injury		
Yes	7	1.7
No	415	98.3
Injury site		
Head and neck	89	21.1
Upper extremity	144	34.1
Lower extremity	64	15.2
Spine	125	29.6
Documented cause of injury		
Body movement without any physical stress	180	42.7
Body movement with physical strain	66	15.6
Fall	56	13.3
Loss of machine/tool control	120	28.4
Profession/department		
Rigger	113	26.8
Machinist	127	30.1
Fabricator and laborer	182	43.1

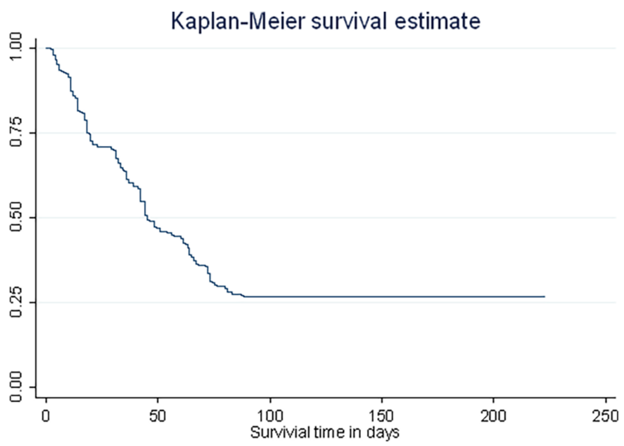

Figure 1. The overall Kaplan-Meier survival estimate curve of metal workers with recorded occupational injuries from January 2017 to December 2021.

who had dependents to support had a return to work incidence density of 2.4. Incidence density was 1.92 per 100 PD for those who were professionally certified (Table 3).

Table 3. Return to work among metal workers with recorded occupational injury incidents from January 2017 to December 2021.

VARIABLES	RTW [N (%)]	PERSON TIME IN DAYS
Age on injury		
⩽35 years	60 (19.4)	3362
36-54	127 (41.0)	10 461
>55	123 (39.7)	11 675
Sex of worker		
Male	288 (92.9)	24 440
Female	22 (7.1)	1058
Marital status		
Married/cohabitating	180 (58.1)	15 487
Single/widow/widower	130 (41.9)	10 011
Professional metal work certification		
Yes	186 (60.0)	9653
No	124 (40.0)	15 845
Workers have dependents to support		
Yes	149 (48.1)	9966
No	161 (51.9)	15 532
Pre-injury salary		
<2500	90 (29.0)	6933
2500-5000	177 (57.1)	15 277
>5000	43 (13.9)	3288
Pre-injury service year in the factory		
<5 years	163 (52.6)	14 450
5-10 years	106 (34.2)	8467
>10 years	41 (13.2)	2581
Educational status of worker		
No formal education	34 (11.0)	2168
Primary education (grades 1-8)	99 (31.9)	8149
Secondary education (grades 9-12)	86 (27.7)	7659
Diploma and above	91 (29.4)	7522
Compensation awarded for injury		
Yes	5 (1.6)	458
No	305 (98.4)	25 040

(Continued)

Table 3. (Continued)

VARIABLES	RTW [N (%)]	PERSON TIME IN DAYS
Injury site		
Head and neck	113 (36.5)	7853
Upper extremity	82 (26.5)	8145
Lower extremity	46 (14.8)	4273
Spine	69 (22.3)	5227
Documented cause of injury		
Body movement without physical stress	163 (52.6)	7884
Body movement with physical strain	56 (18.1)	3102
Fall	45 (14.5)	3139
Loss of machine/tool control	46 (14.8)	11 373
Profession/department		
Rigger	105 (33.9)	4906
Machinist	89 (28.7)	7898
Fabricator and laborer	116 (37.4)	12 694

Kaplan-Meier estimate of median survival time to RTW among covariates

Table 4 illustrates the median RTW time for all metal employees who returned to work, based on the other study characteristics. The median RTW time for female and male patients was 45.07 and 42.08 days, respectively, according to the Kaplan-Meier analysis. Females have a faster recovery time than males ($X^2 = 4.09$, P-value = .044), according to the Log-rank test. Furthermore, patients aged 36 to 55 years had a much longer median RTW time than those aged 35 years; however, the difference was not statistically significant across the age groups. Metalworkers with professional certification had a median RTW of 42 days.

There was a statistically significant difference between certified and uncertified workers ($X^2 = 46.13$, $P < .001$). The log-rank test also demonstrated that the survival time of workers' RTW varied considerably depending on their occupation ($X^2 = 95.4$, P-value < .001) and the reported cause of injury ($X^2 = 31.24$, P-value < .001). Likewise, the survival functions for injury cause and work department were not equal ($P < .05$) (Table 4).

Prognostic factors associated with positive RTW outcomes

The Cox regression model censored at 90 days identified age, certification, dependents to support, educational status of the worker, injury site, recorded cause of injury, and working department as being associated with return to work in the bivariate Cox regression analysis.

Certification, dependents to support, documented cause of injury, and working department were revealed to be significant predictors of time to return to work following an occupational accident after fitting the multivariable Cox model. For the significantly associated variables, the proportional hazard assumption was met. Those who gained their skills through professional training were twice as likely to return to work within 90 days as those who were not certified. (AHR: 2.15, 95% CI: 1.62-2.87). Similarly, metal workers who worked as riggers were 1.59 times more likely than fabricators and laborers to return to work (AHR: 1.59, 95% CI 1.20-2.10).

Metalworkers with dependents at home were 1.5 times more likely to return to work (AHR = 1.59, 95% CI = 1.09-2.64) than those with no dependents recorded on the employee register. Similarly, workers who were injured as a result of stepping on sharp items, jogging, walking, running into, or being hit against objects were 2.61 times more likely to return to work than those who were injured as a consequence of losing control of machines and/or tools (AHR = 2.61, 95% CI = 1.92-3.56) (Table 5).

Discussion

The goal of this study was to investigate RTW and its prognostic factors among metalworkers in Ethiopia. Returning to work is an important indicator of real-world functioning. Individuals who are unable to return to work as a result of an injury are more likely to develop physical ailments and have a difficult psychosocial transition.[4] Inactivity and loneliness, suicide, lost work opportunities, and strained personal finances are among the consequences observed in people on prolonged sick leaves.[2]

Three hundred ten cases (73.5%) successfully returned to work after a median absence of 45 days during the 90-day follow-up period. The workers in the cohort contributed a total of 25 498 person-days. The overall incidence density of return to work was 1.21 (95%, CI; 1.01-1.30) per 100 person-days observation. The median absence duration in this study was similar to a study conducted among vehicle assembly workers in central China (43 days) but less than the 92 days recorded among Iranian workers.[4,12] Medical, psychological, social, occupational, and compensation policy variables have all been implicated in reported disparities in RTW between countries in the past.[26] Moreover, work interventions, as well as more stringent compensation policies contribute to shorter RTW in developing nations.[4] When an employee suffers an occupational injury in Ethiopia, the employer is responsible for any medical, pharmaceutical, hospital, and other expenses, as well as disability and death benefits that the accident necessitates. While the Ethiopian Labour Proclamation, the Ethiopian Civil Code, and other labor regulations explicitly outline employers' liability for occupational injuries, employers are free

Table 4. The Kaplan Meier estimates of mean survival time for metalworkers with recorded occupational injury incidents from January 2017 to December 2021.

VARIABLES	ESTIMATE OF RTW [NUMBER OF DAYS]	SE	LOG-RANK ESTIMATES
Age on injury			
⩽35 years	44.00	1.74	X^2 = 8.09
36-54	48.00	5.71	*P*-value = .017
>55	48.00	6.70	
Sex of worker			
Male	45.07	3.80	X^2 = 4.09
Female	42.08	6.03	*P*-value = .044
Marital status			
Married/cohabitating	51.00	5.52	X^2 = 0.65
Single/widow/widower	44.00	1.92	*P*-value = .049
Professional metal work certification			
Yes	42.00	2.11	X^2 = 46.13
No	66.00	6.79	*P*-value < .001
Workers have dependents to support			
Yes	42.00	1.94	X^2 = 7.79
No	51.00	4.83	*P*-value = .005
Pre-injury salary			
<2500	45.00	6.81	X^2 = 7.29
2500-5000	45.00	4.07	*P*-value = .695
>5000	44.00	9.49	
Pre-injury service year in the factory			
<5 years	45.00	4.22	X^2 = 2.02
5-10 years	48.00	5.95	*P*-value = .363
>10 years	44.00	3.93	
Educational status of worker			
No formal education	44.00	5.86	X^2 = 1.24
Primary education (grades 1-8)	48.00	7.74	*P*-value = .743
Secondary education (grades 9-12)	45.00	7.09	
Diploma and above	44.00	4.25	
Compensation awarded for injury			
Yes	74.00	10.47	X^2 = 0.22
No	45.00	2.68	*P*-value = .643
Injury site			
Head and neck	44.00	1.76	X^2 = 5.02
Upper extremity	49.00	4.11	*P*-value = .17
Lower extremity	64.00	10.38	
Spine	44.00	9.95	

(Continued)

Table 4. (Continued)

VARIABLES	ESTIMATE OF RTW [NUMBER OF DAYS]	SE	LOG-RANK ESTIMATES
Documented cause of injury			
Body movement without physical stress	36.00	2.87	$X^2=95.4$
Body movement with physical strain	33.00	7.10	*P*-value < .001
Fall	44.00	2.49	
Loss of machine/tool control	69.00	6.76	
Profession/department			
Rigger	42.00	2.63	$X^2=31.24$
Machinist	45.00	7.24	*P*-value < .001
Fabricator and laborer	63.00	7.04	

Table 5. Adjusted hazard ratio, 95% confidence interval and *P*-value of RTW variables that were included in the Multivariable Cox Regression Analysis.

VARIABLES	TOTAL [N (%)]	RTW [N (%)]	CRUDE HR (95% CI)	ADJUSTED HR (95% CI)	*P*-VALUE
Age on injury					
⩽35 year	67	60 (19.4)	1.54 (1.13-2.10)	1.13 (0.81-1.57)	.461
36-54	175	127 (41.0)	1.09 (0.85-1.40)	0.96 (0.74-1.26)	.813
>55	180	123 (39.7)	1	1	
Certification					
Yes	205	186 (60.0)	2.16 (1.71-2.72)	2.15 (1.62-2.87)***	**.001**
No	217	124 (40.0)	1	1	
Dependents to support					
Yes	185	149 (48.1)	1.36 (1.09-1.70)	1.59 (1.09-2.64)*	**.042**
No	237	161 (51.9)	1	1	
Educational status of worker					
Diploma and above	41	91 (29.4)	1.76 (1.1-4.74)	1.03 (0.68-1.54)	.29
Secondary education (grades 9-12)	122	86 (27.7)	1.40 (1.07-2.39)	1.07 (0.80-1.44)	.12
Primary education (grades 1-8)	135	99 (31.9)	1.00 (0.75-1.32)	0.98 (0.73-1.35)	.18
No formal education	124	34 (11.0)	1	1	
Injury site					
Head and neck	89	113 (36.5)	1.40 (0.66-3.00)	1.27 (0.92-1.72)	
Upper extremity	144	82 (26.5)	1.94 (1.01-3.71)	0.96 (0.69-1.34)	
Lower extremity	64	46 (14.8)	1.68 (0.02-3.27)	0.93 (0.64-1.42)	
Spine	125	69 (22.3)	1	1	
Documented cause of injury					
Body movement without physical stress	180	163 (52.6)	2.98 (2.23-3.98)	2.61 (1.92-3.56)***	**.001**
Body movement with physical strain	66	56 (18.1)	1.30 (0.72-1.96)	1.52 (0.93-2.32)	.069
Fall	56	45 (14.5)	1.11 (0.74-4.89)	1.14 (0.71-1.68)	.002
Loss of machine/tool control	120	46 (14.8)	1	1	

(Continued)

Table 5. (Continued)

VARIABLES	TOTAL [N (%)]	RTW [N (%)]	CRUDE HR (95% CI)	ADJUSTED HR (95% CI)	*P*-VALUE
Profession/department					
Rigger	113	105 (33.9)	2.04 (1.56-2.66)	1.59 (1.20-2.10)**	**.01**
Machinist	127	89 (28.7)	1.18 (0.89-1.56)	1.19 (0.74-1.89)	
Fabricator and laborer	182	116 (37.4)	1	1	

Abbreviations: Key: 1, reference category; AHR, adjusted hazard ratio; CHR, crude hazard ratio.
Bold entries indicate Statistically significant factors.
*Statistically significant at *P*-value < .05. **Statistically significant at *P*-value ⩽ .1. ***Statistically significant at *P*-value < .001.

to choose whether or not to purchase insurance to cover these risks.[24]

Both modifiable and non-modifiable prognostic variables were found to be significantly associated with shorter of injury-related absenteeism in this study. To promote safe behaviors in any workplace, a high level of knowledge and scientific evidence is essential.[27] Professional certification necessitates the completion of basic training programs that teach workers how to avoid known hazards by operating and maintaining equipment and materials properly.[28]

Workers who acquired their abilities through professional training were twice as likely to return to work in the current study as those who were not licensed. This was also true in South Korea, where injured workers with a certification had a higher rate of return to work.[29] The impact of inadequate new and refresher training is expected, given the few opportunities for metalworkers to get more than a basic awareness of safe practices. Limited professional training prospects, however, are not insurmountable barriers to safety, especially if further research is done to establish techniques for incorporating onsite training that may be adapted to job site demands.

Returning to work following sick leave, on the other hand, does not always mean that a person has entirely recovered from their medical concerns. A multitude of personal and situational factors can influence an employee's return time. The first is healthcare access; while Ethiopia's healthcare system is rapidly growing, access to high-quality medical care remains limited. The Ethiopian government technically provides free healthcare to its residents. Overcrowding exists at government hospitals. These hospitals are understaffed and lack adequate equipment.[30]

Likewise, after an injury, financial constraints can affect an employee's decision-making balance, contributing to the decision to return to work too soon.[31] Having dependents to support was associated with RTW in the present study. While the clinical significance of having dependents to support appears to be evident in the current study, more research is needed to determine whether returnees resume work because they have regained full vocational capacity or because they are afraid of losing their jobs. What is known is, Ethiopia's social protection policy has been marked by limited geographical coverage, insufficient inter-sectoral linkages and coordination, weak institutional capacity, and a lack of clarity regarding responsibilities for delivering social protection.[32] As a result, more work needs to be done to implement family-friendly policies, rehabilitate and/or reintegrate victims of occupational injuries and diseases back into the workforce, and compensate injured workers and their families.

One shortcoming in the safety literature is the lack of precise and consistent construct definitions and conceptualizations, particularly on the predictor side. As a result, there are contradictions among investigations, and empirical results may not always match theoretical predictions.[33] Experience has previously been proven to be a strong predictor of a positive return to work outcome.[4] In the current investigation, this was not the case. While individual and situational antecedents of safety performance behaviors and outcomes are crucial, it is also necessary to draw on theoretical models of worker performance and work climate and commit more effort to foster knowledge sharing by enlisting the help of seasoned metal workers in the study area.

Metal fabrication is a physically and mentally demanding vocation. In 2018, there were 4.1 recordable cases of nonfatal occupational injuries per 100 employees in the metal fabricating sector. Lacerations and punctures, strains and sprains, muscle and ligament tears, poor posture, and burns are some of the most prevalent injuries.[34] Working as a fabricator was found to be a prognostic factor for poor RTW outcomes in the current study. As a result, in Ethiopia's metal industries, understanding what metal injuries fabricators are sensitive to is critical for raising awareness and preventing repeat occurrences in environments where hazards are pervasive, compliance costs are high, and enforcement capacity is limited.

Workplace ergonomics that are not up to standard can be costly. Employees whose workplaces are not designed with ergonomics in mind are more likely to suffer from a range of health problems.[35] In an ergonomic workplace, tasks and tools are designed to meet individual capabilities and constraints so that people can execute their jobs without being injured.[36] Workers who were injured as a result of lifting, carrying a load, falling, or losing control of machinery were more likely to have prolonged absenteeism, resulting in worker and process downtime in the current study. Worker productivity, morale, and wellbeing are all affected by ergonomic factors. Effective workplace ergonomic interventions focusing on the workers at risk and the relevant ergonomic prognostic factors are thus very important.

Finally, the types of injuries and mechanisms studied in this study differed from those found in other investigations. Falls, loss of machine/tool control, body movement without physical stress, and body movement under or with physical stress were identified as the causes of occupational injury in this study. Other studies in the manufacturing sectors of more developed countries have found fracture, contusion/compression, cutting/avulsion, and burn as the most prevalent types of reported events. While workload and assessment tool differences influence the type and mechanism of injury, injuries in Ethiopia are more pronounced due to the county's OSH services not being resilient enough to meet the expanding needs for workers' health.[24]

Study Limitations

The heavy reliance on categories and classification, such as ICD codes, which are often subjective, is a significant drawback in the present study. The statistical model's failure to account for the influence of injury severity, treatment/rehabilitation, organizational factors, and co-morbidity in determining the time to return to work is another flaw worth addressing. Furthermore, because records with missing information or charts for certain cases were omitted, selection bias may have occurred. Despite its flaws, the findings of this study could very well be useful for workplace health promotion and safety management.

Future direction for research

To further comprehend the prognostic factors for return to work, clinical trials involving psychological, pain-related, and work-related aspects should be done across a wide spectrum of health and injury conditions. Large prospective cohort studies could be useful for identifying prognostic factors over longer periods and assessing if disparities in economic status, pay, *decision* capacity, critical reasoning, and *locus* of control affect RTW outcomes. Qualitative or mixed methods research may also uncover mechanisms that help to explain how modifiable factors work. Other possible research areas include challenges relating to people who work in manufacturing enterprises that are not related to metal work. This could provide a more thorough view of Ethiopia's industrial industry. Finally, because training and certification were revealed to be significant predictors of RTW in this study, future research may need to focus on the type, frequency, and content of training required.

Conclusion

Return to work is influenced by a range of factors other than the type or severity of the injury sustained. The factors that influence an early return to work are plentiful (age, certification, dependents to support, educational status of the worker, injury site, recorded cause of injury, and working department). As a result, multiple interventions can be used to target these prognostic factors. Multidisciplinary measures such as clinical treatment and rehabilitation, ergonomics interventions, and economic and social aid should be prioritized in programs designed to help workers return to work. While every effort should be made to ensure a quick and painless return to work, returning too soon may raise the risk of recurrent or repeated sick leave. As a result, in assessing individual cases, there is a need for continued and increased engagement among employees, employers, and relevant public health professionals. This will go a long way toward ensuring that the rehabilitation process is tailored to the individual to achieve a more effective and meaningful return to work.

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Author Contributions

AT was the principal investigator of the study leading from the conception, design and supervising the data collection process to the final analysis and preparation of the manuscript. AH,HTD participated in the design of the study, Supervised data collection activities, invloved in the data analysis and preparation of the manuscript. FE,AA,DS and AG reviewed the design of the study, the data collection process and preparation of the manuscript. All authors read and approved the final manuscript.

Availability of Data and Materials

All the data supporting the findings are included in this paper

Ethics Approval and Consent to Participate

All methods used in this study were carried out under all relevant guidelines and regulations (Declaration of Helsinki). The Ethical Review Committee at Dilla University provided ethical clearance. The Addis Ababa City Health Bureau provided the required letter of support. In addition, all data gathered for the study was kept private and secure.

REFERENCES

1. Khanzode VV, Maiti J, Ray PK. Occupational injury and accident research: A comprehensive review. *Saf Sci*. 2012;50:1355-1367.
2. GBD 2016 Occupational Risk Factors Collaborators. Global and regional burden of disease and injury in 2016 arising from occupational exposures: a systematic analysis for the Global Burden of Disease Study 2016. *Occup Environ Med*. 2020;77:133-141.
3. Niu S. Ergonomics and occupational safety and health: an ILO perspective. *Appl Ergon*. 2010;41:744-753.
4. He Y, Hu J, Yu ITS, Gu W, Liang Y. Determinants of return to work after occupational injury. *J Occup Rehabil*. 2010;20:378-386.
5. Parker SK, Jorritsma K. Good work design for all: Multiple pathways to making a difference. *Eur J Work Organ Psychol*. 2021;30:456-468.
6. Cullen KL, Irvin E, Collie A, et al. Effectiveness of workplace interventions in return-to-work for musculoskeletal, pain-related and mental health conditions: an update of the evidence and messages for practitioners. *J Occup Rehabil*. 2018;28:1-15.

7. Mikkelsen MB, Rosholm M. Systematic review and meta-analysis of interventions aimed at enhancing return to work for sick-listed workers with common mental disorders, stress-related disorders, somatoform disorders and personality disorders. *Occup Environ Med*. 2018;75:675-686.
8. Kenny DT. Returning to work after workplace injury: Impact of worker and workplace factors. *J Appl Rehabil Couns*. 1998;29:13-19.
9. Emegwa LO. Determinants of sick leave duration following occupational injuries among workers in the county of Gävleborg, Sweden. *Occup Med Health Aff*. 2014;2:2.
10. Cancelliere C, Donovan J, Stochkendahl MJ, et al. Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews. *Chiropr Man Therap*. 2016;24:1-23.
11. Steenstra I, de Bruin L, Mahood Q, et al. Prognostic factors for duration of sick leave in patients sick listed with acute low back pain: an update of a systematic review of the literature. *Occup Environ Med*. 2011;68:A74-A5.
12. Abedzadeh-Kalahroudi M, Razi E, Sehat M, Asadi-Lari M. Return to work after trauma: a survival analysis. *Chin J Traumatol*. 2017;20:67-74.
13. Seid Y, Taffesse AS, Ali SN. Ethiopia: An agrarian economy in transition. WIDER working paper; 2015.
14. Jilcha Sileyew K. Systematic industrial OSH advancement factors identification for manufacturing industries: a case of Ethiopia. *Saf Sci*. 2020;132:104989.
15. Alamneh YM, Wondifraw AZ, Negesse A, Ketema DB, Akalu TY. The prevalence of occupational injury and its associated factors in Ethiopia: a systematic review and meta-analysis. *J Occup Med Toxicol*. 2020;15:14.
16. Berhan E. Prevalence of occupational accident; and injuries and their associated factors in iron, steel and metal manufacturing industries in Addis Ababa. *Cogent Eng*. 2020;7:1723211.
17. Habtu Y, Kumie A, Tefera W. Magnitude and factors of occupational injury among workers in large scale metal manufacturing industries in Ethiopia. *OALibJ*. 2014;1:1-10.
18. Gabbe BJ, Sleney JS, Gosling CM, et al. Financial and employment impacts of serious injury: a qualitative study. *Injury*. 2014;45:1445-1451.
19. CSA and ICF. *Ethiopia Demographic and Health Survey, 2016*. CSA and ICF; 2017.
20. Matebe B. *The Practices, Challenges and Achievements of Labor Inspection With Respect to Manufacturing and Construction Sectors: A Case Study of Bole Sub City*. Addis Ababa City Administration; 2018.
21. Gazeta FN. The Federal Democratic Republic of Ethiopia, Labour Proclamation No. 377/2003, 10th year, No. 12, February. Addis Ababa. 2004:2453-2504.
22. FDRE House of People's Representative. Labour Proclamation No.1156/2019. Federal Negarit Gazeta of The Federal Democratic Republic of Ethiopia. 2019; 25(89):11691-11792.
23. Hedegaard H, Johnson RL, Garnett M, Thomas KE. The International classification of diseases, 10th revision, clinical modification (ICD–10–CM): external cause-of-injury framework for categorizing mechanism and intent of injury. *Natl Health Stat Report*. 2019;136:1-22.
24. Kumie A, Amera T, Berhane K, et al. Occupational health and safety in Ethiopia: a review of situational analysis and needs assessment. *Ethiop J Health Dev*. 2016;30:17-27.
25. Beyene Gebrezgiabher B, Tetemke D, Yetum T. Awareness of occupational hazards and utilization of safety measures among welders in Aksum and Adwa towns, Tigray Region, Ethiopia, 2013. *J Environ Public Health*. 2019;2019:4174085.
26. Anema JR, Schellart AJ, Cassidy JD, Loisel P, Veerman TJ, van der Beek AJ. Can cross country differences in return-to-work after chronic occupational back pain be explained? An exploratory analysis on disability policies in a six country cohort study. *J Occup Rehabil*. 2009;19:419-426.
27. Schulte PA, Pandalai S, Wulsin V, Chun H. Interaction of occupational and personal risk factors in workforce health and safety. *Am J Public Health*. 2012;102:434-448.
28. Cumberland DM, Petrosko JM, Jones GD. Motivations for pursuing professional certification. *Perform Improv Q*. 2018;31:57-82.
29. Bae SW. Effect of professional certification on employees' return-to-work rate after occupational injuries in Korea: focusing on vulnerable groups. *Environ Health Prev Med*. 2021;26:6.
30. Magge H, Kiflie A, Nimako K, et al. The Ethiopia healthcare quality initiative: design and initial lessons learned. *Int J Qual Health Care*. 2019;31:G180-G6.
31. Boštjančič E, Galič K. Returning to work after sick leave – the role of work demands and resources, self-efficacy, and social support. *Front Psychol*. 2020;11:661.
32. Knippenberg E, Hoddinott J. Shocks, social protection, and resilience: Evidence from Ethiopia. *Gates Open Res*. 2019;3:702.
33. Christian MS, Bradley JC, Wallace JC, Burke MJ. Workplace safety: a meta-analysis of the roles of person and situation factors. *J Appl Psychol*. 2009;94:1103-1127.
34. Berhan E. Management commitment and its impact on occupational health and safety improvement: a case of iron, steel and metal manufacturing industries. *Int J Workplace Health Manag*. 2020;13:427-444.
35. Konz S, Johnson S. *Work Design: Occupational Ergonomics*. CRC Press; 2018.
36. Grooten WJA, Johansson E. Observational methods for assessing ergonomic risks for work-related musculoskeletal disorders. A scoping review. *Rev Cienc Salud*. 2018;16:8-38.