

# Level of Stress in Ganale Dawa Hydropower Dam construction workers: A Cross Sectional Study

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## Research

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# Abstract

## Background:

Stress is the harmful physical and emotional response caused by an imbalance between the perceived demands and the perceived resources and abilities of individuals to cope with those demands. In the developing world, work-related stress is an issue of growing concern. Work-related stress can severely impact workers' general achievement levels in a negative way concerning both efficiency and accuracy. Thus striving to determine the level of stress at a job and its contributory factors will be insatiable input for intervention.

## Method:

An institutional-based cross-sectional study was conducted to assess the prevalence and associated factors of job stress among Ganale Dawa 3D Hydropower Dam construction workers from April 1-22, 2018. Data were collected using a structured questionnaire on 405 workers. Multivariable logistic regression analysis with a 95% confidence interval (CI) was used to identify the factors significantly associated with a good level of food hygiene knowledge. P-value less than 0.05 was used to declare statistical significant association.

## Result:

A quarter of construction workers, 24.7% [95% CI: (20.5%, 28.0%)] suffered from stress in their workplace. Being at young (AOR: 3.07, 95% CI: 1.45, 6.47) and middle (AOR: 3.94 95% CI: 1.27, 12.24) ages; sustain injury in 12 months (AOR: 2.60 95% CI: 1.40, 4.80), shiftwork (AOR: 2.22 95% CI: 1.03, 4.79) and working over 48 hours per week (AOR: 4.54 95% CI: 2.40, 8.56) were significantly associated with stress.

## Conclusion:

This study showed that construction work is one of the most stressful occupations. It also suggests that age of workers, history of injury within 12 months of the study, shift work, and working over 48 hours per week were significantly associated with stress. Therefore, much has to be done by introducing flexible working hours that do not exceed 48 hours per week, avoiding long hours of shift work longer than 8 hours and protecting the workers from work-related injury.

## Background

The construction industry employed 1.4 percent of 31.4 million employed Ethiopians (1). The industry remains one of the dangerous jobs (2-4) involving complicated physical environments with various hazards such as working with heavy equipment, working at the height (4), exposure to chemical products (5), and irregular or extended working hours (4, 6). Construction workers are blue-collar in which their work is characterized by restricted control over tasks (4) or schedule and may be required to do

repetitive, monotonous, or physically demanding work, be exposed to loud noise or extreme temperatures, and experience limited mobility and support within the organizational structure(7).

According to National Institute of Occupational Safety and Health(NIOSH) definition, job stress is a harmful physical and emotional response generated when there is an imbalance between job requirements and worker's ability, resources, and demand(8). Occupational stress has been one of the main problems that bother people's work and life(9) contributing factor to organizational inefficiency, high staff turnover, absenteeism, and decreased job satisfaction(10), and it becomes a defining element of construction workers(6). Some estimates (3) elucidate construction workers are 1.7 times more likely to suffer from stress than workers in other industries. A study claims that stress consequently exposes to insomnia, headache, and sleeping problems were frequently indicated as the result of stress(11).

It has been imperative that job stress is a precursor of accident occurrences(12), a reality of modern workplaces (8). Stress interferes with individuals' attention on their work and subsequently results in disregarding safety precautions(13), thereby increasing injury rates(4). Around 0.7% of workers in the construction sector reported suffering from stress, depression or anxiety(14). In Europe, the estimated cost of work-related depression is €617 billion a year, including the contribution of loss of productivity (€242 billion), healthcare costs (€63 billion) among others(15). According to workers' compensation data for 2014, 21.5% of Australian construction workers, compared with 17.5% of the general adult population, were affected by a mental health condition(16). Stress increases the probability of suicidal ideation(16). Construction workers also have the third-highest stress levels of any occupation worldwide (4). There is no sufficient data about the stress and associated factors in Ethiopia. Therefore, this study aimed at assessing the prevalence and associated factors of stress among hydropower construction workers in south east Ethiopia.

## Methods

### Study design and study settings

An institutional-based cross-sectional study was conducted to assess the prevalence and associated factors of job stress among Ganale Dawa 3D Hydropower Dam construction workers from April 1-22, 2018. This hydropower dam construction project is an Ethiopian government project located at Guji Zone, in Oromia Regional State, 640 km from far from Addis Ababa, South-East part of Ethiopia.

### Sample size determination

Single population proportion formula(17) was used to determine the sample size for the prevalence of stress with the following assumptions: (prevalence of job stress among hydropower dam construction workers 50% as there was no previous study to allow greater variability), 95% confidence interval, 5% margin of error and 5% oversampling for unexpected events. Study subjects were selected using a computer-generated simple random sampling technique from workers' payroll logbooks.

### Data collection instrument and quality control

A pre-tested, semi-structured questionnaire containing sociodemographic and behavioral variables on of dam construction workers were collected. Three BSc Nurse Professionals undertook the interview. Training about the data collection tool, techniques, the purpose of the study, and ethical issue was given for data collectors for two days.

The principal outcome variable of this study, job stress, was measured by using the workplace stress scale as yes (16 to 40) and no (lower than or equal 15)(18). In turn, PPE utilization of workers ascertained was observed wearing the PPE that was necessary to be worn during a particular activity(19). The occupational injury was defined as any physical injury resulted from an accident in the course of construction work in the past year prior to the study (19). It was assessed by asking whether the study participant encountered accidents over the past one year before the study. Job satisfaction was assessed by score measured using the generic job satisfaction scale as yes (32–40) and no (8–31) (20). A study participant who drinks at least five drinks of alcohol per week for men and two drinks per week for women for at least one year was taken as alcohol drinker (19). A study subject who was smoking one cigarette a day for at least one year was considered as smoker (19). A Khat chewer in the current study means someone who chews Khat (a mildly psychoactive substance) three times a week for at least one year (19).

## Data processing and analysis

The data were entered using Epi-Info 7, and analysis was performed using SPSS 20.0. All chi-square assumptions for binary logistic regression were checked before undertaking the bivariable and multivariate analysis. To determine predictor variables for job stress, a binary logistic regression model was fitted, and variables at a  $p$ -value  $< 0.2$  during the bi-variable analysis were included in the multivariable logistic regression analysis.

Finally, variables found to be significant at a  $p$ -value  $< 0.05$  in the final model were declared as associated factors. Crude odds ratios (COR) and adjusted odds ratios (AOR) with 95% confidence interval were reported.

## Result

Four hundred and five study subjects participated in the current study. The majority (97%) of the study subjects were male. Two hundred and fifty (61.7%) of the respondents were not married. Two hundred and ninety-five (72.8%) of the study participants reported PPE utilization at all times. One hundred (24.7%) of them experiences stress due to their work. The majority (81.7%) of workers received workplace safety training at least once in a year (Table 1).

Table 1  
Sociodemographic and behavioral characteristics of study participants  
(n = 405)

Variables	Frequency(n)	Percent (%)
Sex		
Male	393	97
Female	12	3
Age (years)		
14–29	276	68.1
30–44	89	22
≥ 45	40	9.9
Marital status		
Married	155	38.3
Not married	250	61.7
Shift work	210	51.9
Drinking alcohol	131	32.3
Sleeping problem	101	24.9
Job satisfaction	289	71.4
Job stress	100	24.7
Safety training		
Yes	331	81.7
No	74	18.3
Working hour per week		
≤ 48 hours	266	65.7
> 48hours	139	34.3

## Factors Associated With Stress

Variables with a p-value of less than 0.2 during bivariable analysis were tested for association with stress using multivariable logistic regression. Age, education, injury in the last 12 months, working shifts, and job hours per week were factors associated with stress level among hydropower construction workers at the final model with significance at p-value less than 0.05. The odds of stress among respondents aged

14–29 and 30–44 years were 3-fold (AOR: 3.07, 95% CI: 1.45, 6.47) and 4-fold (AOR: 3.94, 95% CI: 1.27, 12.24) as compared to those aged greater than 45 years. Workers who have encountered injury in 12 months were 2.6 times more likely to be stressed as compared to without injury (AOR: 2.60, 95% CI: 1.40, 4.80). Study subjects who worked more than 48 hours were present 4.5 times more likely to suffer from stress as compared with those working less than forty-eight hours per week (AOR: 4.54, 95% CI: 2.40, 8.56). (Table 2).

Table 2  
Bivariable and multivariable analysis of factors associated with stress among Genale-Dawa 3D hydropower dam construction workers (n = 405)

Variables	Stress		COR(95%)CI	AOR(95%)CI
	Yes	No		
<b>Age</b>	85	191	3.15(1.59,6.23) **	3.07(1.45,6.47) *
14–29	11	78	4.00(1.38,11.60) **	3.94(1.27,12.24) *
30–44	4	90	1	1
≥ 45				
<b>Current marital status</b>	51	144	1	1
married	49	161	2.01(1.27, 3.18) **	0.99(0.53,1.82)
not married				
<b>Working shift</b>	31(15.9)	164(84.1)	1	1
day	69(32.9)	141(67.1)	2.58(1.60,4.18) ***	2.22(1.03,4.79) **
night				
<b>Injury in last 12month</b>	27	144	1	1
no	73	68.8	2.41(1.47,3.96) ***	2.60(1.40,4.80) *
yes				
<b>Work hours per week</b>	78	188	1	1
≤ 48 hours	22	117	2.20(1.30,3.73) **	4.54(2.40,8.56) ***
> 48hours				
<b>Drink alcohol</b>	42	232	1	1
no	58	73	3.38(2.11,5.40) ***	2.18(0.90,5.27)
yes				

**Note:** - \*\*\* significant at P-value < 0.0001 \*\* significant at P-value < 0.01, \* Significant at P-value < 0.05, COR: Crude Odds Ratio, AOR: Adjusted Odds ratio, CI: Confidence interval.

## Discussion

The study was done on construction workers' stress levels and associated factors at dam construction in southeast Ethiopia. Age of workers, being the victim of injury within the previous 365 days of work and work, did for more than 48 hours in a week, were significantly associated with manifesting stress.

Among respondents, the proportion of workers experiencing stress was 24.7%, with 95%CI (20.5%, 28.0%). Similar findings were reported from car manufacturing workers of Iran 21.3%(21). In contrast, the result was lower than studies done building construction workers in India 85% (11), Malaysian police officers 38.8%(22), construction managers in Britain 68.2%(23). This may be due to differing definitions, stress types, measurement tools, study population, and wealth status of study subjects. Being at the age range 14 up to 44 appears to be a risk factor for stress. These age groups may lack the necessary skills that developed through time and nature to manage and assimilate stress arising due to occupational & socio-cultural causes. Middle-aged men were more likely to appraise their problems both as challenges and as annoyances than the older men(24).

A history of injury within a year predisposes construction workers to stress. Experiencing injury is an ordeal with a wide range of consequences, including medical cost, fear of losing jobs, decrease performance, sensitive and vigilance to the possibility of a similar injury, probable reduction in social events. Some researchers(2) corroborate our arguments by showing the correlation between injury incident and emotional stress; in turn, accidents are predicted by the level of job control(5). Besides, the reciprocal influence of job stress on the incident level is widely documented. High job stress among firefighters was associated with both the occurrence of occupational injury and also with an increased frequency of injuries(25).

Working in shifts exposed workers to stress. Shift systems involves engagement of work with a periods of 6–12 hours at a time with corresponding changes of two up to four times in 24 hours (26). It will be a matter of fact shift work made people unable to met their social duties and interfering with time for proper sleep and recreation that comes with stress as consequences. As Harrington(26) puts rest is a night time activity, work a daytime activity.

This is in line with a study among healthcare workers in Medellin, Colombia(27)... The results showed that regardless of the amount of shift work they performed, nurses reported moderate job stress(28).

Approximately one-third of the world's workforce (36.1 percent) now works excessive hours – defined as regularly working more than 48 hours per week(29). Engagement in an extended hour of work(30) results in stress. It will be exacerbated when combined with 12-hour shift work is a routine of the workplace(31). A workload(2, 32), which is a typical attribute of extended hour work also indicated as a predictor of stress. Research witnessed as workers increase working hours from 40 to longer hours depressive symptoms, stress occurrence likelihood also increases in research done among Korean firefighters (33), Korean survey(34), and white-collar workers(35). Too much work(23) that often can be equated with long working hours also corroborates our findings.

This research is not immune to potential limitations. The sample size drawn is relatively smaller and would have an impact on the strength of the conclusion. Moreover, scarcity of related literature gives a hard time for comparing which results lack of robust discussion.

## Conclusion

This study into stress among hydropower dam construction workers revealed stress is not a rare consequence for those who work in such construction, in which 1 out of 4 participants are victims. This is supporting the very notion of stress among construction workers is a universal issue. Age of workers, being the victim of injury within the previous 365 days of work, and work have done for more than 48 hours in a week were significantly associated with manifesting stress. Hydropower construction firms should work on stress management programs focusing on 44 employees. Besides, working on the overall improvement of health safety status will contribute to the reduction of stress victims.

## Abbreviations

### AOR

Adjusted Odds Ratio; **CGGC**: China Guzeuba Group Company; **CI**: Confidence Interval; **COR**: Crude Odds Ratio; **GDP**: Gross Domestic Product **Km**: Kilometer; **ILO**: International Labour Organization; **MW**: Mega Watts; **OSHA**: Occupational Safety and Health Administration; **SPSS**: Statistical Package for Social Sciences; **USD**: United States Dollar; **VIF**: Variance inflation factor

## Declarations

### Ethical approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of the University of Gondar and a supportive letter was written to Guji zone labour and social affair office and to the Genale Dawa 3D hydropower project CGGC management. Permission to conduct this study was obtained from CGGC management, informed oral consent was obtained from each study subject.

### Consent for publication

Not applicable

### Availability of data and materials

The dataset is accessible at the corresponding author upon a reasonable request.

### Competing interests

The authors declare that they have no competing interests



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## Authors' contributions

**JH** designed the protocol; participate in data collection; entered data into Epi-Info epidemiological software; analyzed the data and supervised the overall research process. **HD** designed the protocol, supervised the overall research process and prepared the manuscript. **DGY** designed the protocol and supervised the overall research process. All the authors read and approved the final manuscript.

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