

Occupational Hazards Exposure and Knowledge, Attitude and Practice towards Meat Safety amongst Abattoir Workers, Hawassa City, Southern Ethiopia

Tolera ST¹, Mengistu DA¹

¹College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

ABSTRACT

Introduction: Food-borne diseases and occupational problems due to poor knowledge, attitudes, and practice towards safe food handling practices in developing countries are common. The purpose of the study was to determine occupational hazards exposure and to assess knowledge, attitude, and practice towards meat safety among abattoir workers.

Methods: A cross-sectional study was carried out on 216 abattoir workers from December 1st, 2017 to February 30th, 2018 in Hawassa city. Systematic random sampling and semi-structured questionnaires were used to collect data. Ethical approval for data collection was obtained from Hawassa University.

Results: The study indicated that the majority of them had fair knowledge (42.3%), positive attitude (43.8%), and fair practice (45.3%) towards food safety and compliance with abattoir law. The study also revealed the positive relationship between knowledge and attitude ($p < 0.01$); knowledge and practice ($p < 0.001$), attitude and practice ($p < 0.01$). The main three frequently reported occupational hazards were ergonomic hazard (19.7%), mechanical hazard (18.9%), and psychological hazard (16.7%).

Conclusion: The study concluded that there was a poor level of knowledge, negative attitudes, and poor practices of abattoir workers towards meat handling, and compliance with the abattoir law. The study also found that occupational-related hazards most common in this work setting, which are persisting, needed to be improved, through training and occupational health and safety service.

Key words: Abattoir Workers, Food safety, KAP, Occupational hazards

Introduction

According to World Health Organization (WHO), food safety refers to the conditions and practices that prevent contamination of foods from toxic chemicals or microbes remains a major public health

concern around the globe.¹ However, recent food safety failures have attracted widespread attention resulting in public confusion, which leads to foodborne diseases within a community and the global burden of foodborne diseases estimates 600 million people, almost one in tenth fall ill every year and 420, 000 die.²

DOI: <https://doi.org/10.3126/ijosh.v11i2.36306>

Conflicts of interest: None
Supporting agencies: None

Date of submission: 11.11.2020
Date of acceptance: 28.06.2021
Date of publication: 30.06.2021

Corresponding Author

Sina Temesgen Tolera
Assistant Professor College of Health and Medical Sciences
Haramaya University, Harar, Eastern Ethiopia
Contact phone: +251913023634 or 251975800557
E-mail: sina.temesgen@haramaya.edu.et
ORCID ID: <https://orcid.org/0000-0002-6489-3923>

The United States for Communicable Disease and Control (CDC) revealed that every year there causing ~76 million illnesses, 325,000 hospitalizations, and 5,000 deaths per annum due to foodborne disease.³ Still little efforts are being made in the developing countries, to address these public health challenges.⁴ Moreover, developing regions are facing a substantial technological updating to ensure the organizational and growing rate of occupational risk.⁵ A massive job loss



This journal is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

has increased feelings and perceptions of uncertainty and job insecurity within the workforce like an abattoir.⁶

Abattoir is one of the possible occurrences of health hazards that could result in occupational diseases or may aggravate the existing ill-health of non-occupational origin.⁷ In recent times, occupational hazards are the major source of morbidity and mortality among all workers.⁸ Occupational hazards have continued to rise in the past decades, resulting in increasing rates of occupational exposure.⁹ The common occupational hazards experienced in abattoirs are physical,¹⁰ chemical, mechanical, electrical biohazards^{11,12} and psychosocial hazards.¹³

Various studies conducted in developing countries indicated low knowledge, attitude and practice of the workers towards meat safety and low awareness of Occupational Health and Safety (OHS) protection; lack of occupational health service¹³, inadequate food safety laws, weak regulatory systems, lack of education and legislation,¹⁴ job in-satisfaction long time performance¹⁵, are some factors for these problems.

The objective of this study was to determine occupational hazards exposure and to assess knowledge, attitude, and practice towards meat safety among abattoir workers.

Methods

A cross-sectional study was conducted at the Hawassa Municipality Abattoir (HMA), from December 1st to February 30th, 2018. The abattoir is located in the subcity of Monopol, which is approximately 4-5 km from the center of the Hawassa city administration. Hawassa City is located 275 km south of Addis Ababa, the capital city of Ethiopia. The city has a total population of 258,808, of whom 133,123 are men and 125,685 women.¹⁶ The city has licensed the municipality abattoir operation, which is distributing of livestock 12,652kg/day and 4,566,408kg/year of meat production from 63 and 22,832 of livestock respectively and also creates job opportunity for more than 400 individuals.¹⁷

All permanent, contract, and daily wage abattoir workers who were actively working in the abattoir, and willing to participate in the study were included. Workers on annual leave, maternal leave, and also those who were not willing to participate in the study were excluded.

The sample size was estimated using a single proportion formula: $n = \frac{z^2 pq}{d^2}$, where: n is the required sample size, z is the reliability coefficient at 95% confidence interval (1.96), p is the population proportion, q is equal to $1-p$, and d is the acceptable error (0.05). To the best of our knowledge, there is no previous work on knowledge, attitude, and practice/ KAP/ of towards meat safety and occupational exposure, and the population proportion i.e p assumed to (0.5).

Therefore, sample size (n) become,

$$n = \frac{(1.96)^2 (0.5) (0.5)}{(0.05)^2} = \frac{3.8416 (0.25)}{0.0025} = 384$$

But, the current total population (i.e 400) from three abattoirs is less than 10,000, so we used correction formula as the following:

$$nf = \frac{ni}{1 + \frac{ni}{N}}$$

where, nf = final sample size; ni = standard sample size, and N = total sample was taken.

$$\text{Hence: } nf = \frac{384}{1 + \frac{384}{400}} = 196.$$

By adding 10% of the sample size for the non-response rate, the final sample size (nf) was 216 respondents.

From 400 abattoir workers, 216 of them were recruited for the study. Accordingly, 108 workers were selected from a total of 200 permanent workers; 60 out of 111 contracts, and 48 out of 89 daily workers.

To proceed with the assessment, twelve (12) knowledge questions were prepared for abattoir workers. Each question had two choices; i.e. a correct answer was given 1 score, whereas a 0 score was given for a wrong answer. They were used to classify into three levels. The scores for knowledge varied from 1 to 12 points and were classified into three levels as follows. 1: Good knowledge: 8–12 scores; 2: Fair knowledge: 6–7 scores; and 3: Low knowledge: less than 6 scores.^{18,19}

Moreover, twelve (12) positive statements were developed regarding the attitude of the abattoir workers towards meat handling, and compliance using Likert scale such as strongly agree, agree, neither agree nor disagree, disagree and strongly disagree and scores 5, 4, 3, 2, and 1, respectively. The scores varied from 0 to 60, and scores were classified into three levels 1: Positive attitude: 48–60 scores; 2: Neutral attitude: 36–47 scores; and 3: Negative attitude: less than 36 scores, which was adopted.^{18,19}

Furthermore, twelve (12) questions were developed and varied from 0 to 24. The twelve items were assessed as zero-one indicator (dichotomous) variables. The variables were given the value zero (0) for “No” and value One (1) for “Yes.” These scores were classified into 1: Good practice level: 19–24 scores; 2: Fair practice level: 14–18 scores; and 3: Poor practice level: less than 14 scores, which was adopted.^{18,19}

In addition, occupational hazards were assessed based on the Severe, Management, Urgency, Acceptance and Growth (SMUAG) model developed by Mcguire; namely, if the workers were severely exposed, they were ordered to select 7 quantitative number; if those were mildly exposed (5–6); if workers were exposed at low level (2–4), and if they weren't exposed (0-1).²⁰

To ensure the quality of the study the questionnaire was prepared in both closed and open-ended questions of English version for actual data collection purpose. Pre-testing of the questionnaires was also demonstrated on ten *Tula subcity* abattoir workers.

Regarding data analysis, data was entered on Epi-data version 6.1, and exported to SPSS, Version 20 for analysis. In addition, chi-square (X^2) was used to determine the degree of association between dependent, and independent variables. The correlation coefficient (r) was used to determine the strength between dependent, and independent variables.^{21, 22}

The cut point of statistical significance for variables was a p-value of 0.05 (95% confidence interval) for multivariate while a p-value of 0.01 was used for bivariate analysis. The cut points for knowledge, attitude, and practice are 80.0%–100 % for the first score, 60%–79% for the second score, and less than or equal to 59% for the third score, which is adopted from the previous studies.^{18, 19}

Ethical clearance to conduct this study “Grant research for post-Graduation Competition (HU_CRG_PG_02_2017) was provided by Hawassa University Research Office and Ethics Committee of Hawassa University.

Results

The response rate of the study was 93.05 % (n=201). Of these, the majority of the participants were males (93.6%, n=187). Majority, 55.22% (n=111) were single and 39.30% (n=79) of them attended from grade five to eight (Table 1).

Almost three fourth (77.61%) of the workers didn't know that if meat processing is not done in a hygienic condition, it can lead to the spread of diseases to the general public.

The following table also showed that few of the respondents had poor knowledge (n=32, 15.9%), negative attitude (n=37, 18.4%), and poor practice (n=35, 17.4%). Sex, age, marital status, educational status, work experience, income and position of the abattoir workers had a statistically significant association with their knowledge levels, attitude levels and practice levels ($p \leq 0.05$) (Table 2).

Pearson's correlation revealed there is a statistically significant positive and very strong correlation between knowledge and attitude ($r = 0.96$, $p < 0.01$), knowledge, and practice ($r = 0.95$, $p < 0.01$), attitude and practice ($r = 0.93$, $p < 0.01$). The result confirms the relationship between knowledge, attitude and practices towards meat handling and compliance with abattoir law (Table 3).

Among two hundred-one (201) respondents, fifty-two (52) of them reported that they were exposed to ergonomics hazard, mechanical hazard, psychological hazard, biological hazard, electrical hazard, physical hazard, and chemical hazard. (Table 4).

Sociodemographic information of abattoir workers such as age, working hours within a day, work experience, length of employment, the nonexistence of health and safety training, alcohol consumption, working position or posture of the workers, educational status, and satisfaction of job, individual illness, history, and rest break were considered in this study. (Table 5)

Table 1: Sociodemographic characteristics of Hawassa abattoir workers

Sociodemographic	Categories of Variables	Respondents (n=201)	
		Frequency	Percentage
Sex	Male	187	93.03
	Female	14	6.97
Age	18-26 years	50	24.88
	27-34 years	98	48.76
	35-42 years	43	21.39
	> 42 years	12	5.97

Marital status	Single	111	55.22
	Married	82	40.80
	Divorced	8	3.98
Educational status	Cannot read and write	11	5.47
	Able to read and write	23	11.44
	Grade 1 – 4	17	8.46
	Grade 5 – 8	75	37.31
	Grade 9 – 10	62	30.85
	Grade 11 – 12	7	3.48
	Certificate/Diploma	11	5.47
	Degree and above	3	1.49
Working Experience	Less than 1 year	17	8.46
	Between (1 – 4) years	118	58.71
	Between (5 – 8)years	23	11.44
	Between (9 – 12) years	13	6.47
	Greater than 12 years	30	14.93
Income monthly salary	less than 1123 (in Birr*)	10	4.98
	Between (1124-2008)	70	34.83
	Between (2009– 3278)	112	55.72
	Between (3279-3740)	6	2.99
	Greater than 3740	3	1.49
Positions of participants	Workers	153	76.12
	Butcher	40	19.90
	Meat inspector	5	2.49
	Veterinarian	3	1.50

*Birr: Ethiopian Currency; 1Dollar=28.88(2019)

Table 2: Association of sociodemographic and knowledge, attitude and practice of workers

Variables	Freq. (%)	Sex	Age	Marital status	Education	Experience	Salary income	Position
Knowledge								
Good	84(41.8)							
Fair	85(42.3)	46.50 ^a	128.32	125.79	122.4	137.66	133.60	90.81 (0.00)
Poor	32(15.9)	*(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Attitude								
Positive	88(43.8)							
Neutral	76(37.8)	42.22	129.1	131.5	118.70	143.10	123.42	96.75 (0.00)
Negative	37(18.4)	(0.00)	(0.00)	(0.00)	((0.00)	(0.00)	(0.00)	
Practice								
Good	75(37.3)							
Fair	91(45.3)	42.40	134.6	115.6	121.90	135.8 (0.00)	133.14	89.49 (0.00)
Poor	35(17.4)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	

Notes: (a) shows Pearson's Chi square (X²), while * is significant value at 0.05 (CI=95%); Knowledge level: Min=5, Max=12; Attitude: Min=24, Max=60; Practice: Mini =15, Max=124

Table 3: Correlation between level of knowledge, attitude and practice of abattoir workers

KAP Variables	Respondents (n=201)	
	Pearson Correlation (r)	(p-value)
Knowledge – Attitude	0.96 ^c	0.00*
Knowledge – Practice	0.95 ^c	0.00*
Attitude –Practice	0.93 ^c	0.00*

Subscript (c) shows Linear-by-Linear Association Correlation coefficient (r), Asterisk (*) is significant p<0.01 (2-sided)

Table 4: Self-reported Occupational Hazard Exposures among Hawassa Abattoir Workers

Identified Hazard	(n=52)				Mean (SD)
	Severe F (%)	Mild F (%)	Low F (%)	None F (%)	
Ergonomic hazard	26(50.00)	20(38.00)	5(10.00)	1(1.90)	13.00(11.90)
Mechanical Hazard	25(48.00)	17(33.00)	10(19.00)	-	13.00(10.60)
Psychological Hazard	22(44.20)	21(40.40)	7(13.50)	1(1.90)	12.75(10.40)
Biological Hazard	19(37.40)	23(45.30)	8(15.40)	1(1.90)	12.75(10.00)
Electrical Hazard	18(37.00)	25(48.00)	6(11.00)	2(4.00)	12.75(10.60)
Physical Hazard	11(21.20)	33(63.40)	7(13.50)	1(1.90)	13.00(13.90)
Chemical Hazard	10(20.00)	16(30.00)	21(40.00)	5(10.00)	13.00(6.98)

NB: Numbers in parentheses are frequency of risk quantity with the percentage of the respondents

Table 5: Factors associated with occupational hazards among Hawassa abattoir workers

Variables	Freq.	%	Crude OR(95%CI)	Adjusted OR (95%CI)	(p-value)
Age					
Less than 30 years	37	71.15	1	1	
Greater than 30 years	15	28.85	2.01(1.68, 5.32)	2.89 (1.19,3.45)	0.00*
Work experience					
Less than 5 years	36	69.23	1	1	
Greater than 5 years	16	30.77	2.99(1.78, 45.65)	3.24 (1.32, 1.87)	0.00*
Job satisfaction					
Satisfied	26	50.00	1	1	
Not satisfied	36	69.23	2.11 (1.23, 2.24)	2.67(1.01, 2.27)	0.00*
Level of education					
Cannot read and write	13	25.00	1.76(1.01, 2.34)	1.45(0.73, 3.53)	0.11
Can read and write	39	75.00	1	1	1.00
Alcohol drinking					
No	40	76.92	1	1	
Yes	12	23.08	2.99(2.65, 6.01)	2.99 (1.27, 3.12)	0.00*
History of systemic illness					
No	45	86.54	1	1	
Yes	7	13.46	1.43(1.12, 2.13)	1.11(0.26, 4.12)	0.18
Working posture					
Bending/awkward	5	9.62	0.90(0.55, 1.76)	1.226(0.23, 1.23)	0.10
Static work/frequent standing	38	73.08	1.01(0.55, 1.76)	1.34 (0.15, 0.32)	0.00*
Alternative postures	9	17.31	1	1	
Working hours/day					
Less than 8 hours	21	40.38	1	1	
Greater than 8 hours	31	59.62	2.01(1.39, 2.93)	2.95(0.91, 2.73)	0.00*
Rest break					
No	19	36.54	0.89(0.81, 1.90)	1.24(1.61, 1.95)	0.12
Yes	33	63.46	1	1	
Safety training					
No	42	80.77	1.80(0.38,1.44)	2.00(0.12, 0.38)	0.00*
yes	10	19.23	1	1	

NB * indicates significant at $p \leq 0.01$ in a bivariate analysis, while ** shows Significant in multivariate analysis at $p \leq 0.05$; ETB = Ethiopian birr (1USD=28.68 (Year: 2018)); N = Number; OR = Odds ratio.

Discussion

The current finding is inconsistent with a study conducted in Terengganu abattoir, Malaysia.¹⁸ As a contrast, in a study conducted in south-western Nigeria, only age, education and working experience were significantly associated with the knowledge level of safe meat handling,²³ only sex had a significant association with the level of knowledge among the abattoir workers.²³ Although the discrepancy between the two studies might be due to place and type of employment.

Moreover, among all participants, a high percentage of them agreed that it is important to use potable water to wash working surfaces and cutting tools after disinfection. Regardless of its percentage, the finding is consistent.²³ On average, a high percentage of abattoir workers agreed that they should not handle meat with an open wound; and do sneezing or coughing without covering their noses or mouth as it could contaminate the meat. This finding was slightly similar to the finding obtained from an abattoir, south-western Nigeria²³ but, inconsistent with finding obtained from Jigjiga abattoir, Ethiopia.²⁴

Moreover, more than half the number of abattoir workers replaced knives and sterilized them after each meat processing; protected themselves hygienically and cleaned the abattoir environment regularly; they did not process meat when they were ill, especially due to gastroenteritis and cough. Overall, more than forty-five percent of abattoir workers had fair practice. The current finding shows that sex, age, marital status, education, work experience, salary income, and position of the workers had a statistically significant association with meat handling practice. Except for salary income and position, this finding is consistent with the study conducted in south-western Nigeria, in terms of the variables like age, gender, education, and working experience.²³

Regarding the correlation between knowledge, attitude and practice of the workers, a study found that there was a statistically significant positive relationship between knowledge and attitude; knowledge and practice; and attitude and practice.²⁵ That means attitude and practice of abattoir workers are the determinant factor for the knowledge of abattoir workers; while attitude and knowledge of abattoir workers are also a determinant factor for their practice. This finding is inconsistent with a study conducted in Terengganu abattoir.¹⁸

Furthermore, the current study indicated that abattoir workers' worst score for practice about occupational hazards before starting the work than during work and after the work in Hawassa abattoir. This is inconsistent with the study conducted in Terengganu abattoir; Malaysia.¹⁸

The participants aged greater than 30 years were 2.89 times more at risk for developing occupational-related problems than those aged less than 30 years [AOR: 2.89; 95% CI (1.19,3.45)]. This finding is consistent with other similar studies.^{26, 27} The study revealed that back disorder pain was 3.24 times more potential to be experienced among abattoir workers with greater than 5 years of working service compared to those with less than 5 years [AOR:3.24; 95% (1.32, 1.87)]. This study is consistent with a study conducted in Mekele, Ethiopia that showed the respondents who worked for 5 or fewer years in the same job were 2.89 times [AOR=2.89, 95%CI: 1.88-4.43] more likely to experience an occupational injury than respondents who worked for more than 5 years in the same job.²⁷ This finding is also consistent with another similar study.²⁸ The study also revealed that the Odds of occupational problems were 2.67 times more probable among job satisfiers than non- job satisfiers [OR: 2.67; 95% (1.01, 2.27)]; while the odds of occupational injuries were almost three (2.99) times more probable among alcohol consumers than non-alcohol consumers [AOR: 2.99; 95% CI (1.27, 3.12)]. This finding is similar to another study.²⁵ Moreover, the incidence of occupational hazards is 2.95 times more probable for those working more than 8 hr. than those who were working less than 8 hr. [AOR:2.95; 95% (0.91, 2.73)]. The same study revealed that the respondents who worked for more than 48 hours a week were 2.73 times [AOR=2.73, 95%CI: 1.92-3.87] more likely to experience an occupational injury than respondents who worked for 48 or fewer hours a week.²⁸

Furthermore, abattoir workers who had worked in flexible or alternative work postures were more than seventy percent less likely to develop occupational problems [AOR: 1.34; 95% (0.15, 0.32)] than those who worked in static or frequent standing work position/postures. In addition, more than eighty percent of the likelihood of developing occupational problems was prevented among participants who have been taking safety and health training more than 2 times compared to those who did not get the training [AOR:2.00; 95% (0.12, 0.38)].

Limitation of the study

The study was focused only on one big abattoir found in Hawassa city of Sidama State, which does not represent the abattoirs found in other parts of Ethiopia. The investigation of occupational hazards was self-reported data elicited through interviews, which could be subject to recall bias.

Conclusion

The study concluded that the continuing poor level of knowledge, negative attitudes, and poor practices of abattoir workers toward the safe handling of meat, and compliance with the abattoir law, need to be improved, through workshops and training. In addition, major occupational hazards persist, and occupational health and safety services should be encouraged to manage them.

References

- World Health Organization. Occupational hazard and its implication of work area and workers. Geneva: Switzerland; 2014 [Assessed March 10, 2018]. Available from https://en.wikipedia.org/wiki/Occupational_hazard 2014
- World Health Organization. FOOD SAFETY: What you should know. Reg Off South-East Asia: World Health Organization; 2015 [Assessed March 10, 2018].p.145–52.
- Centre for Disease Control. Surveillance for foodborne disease outbreaks, United States, 1988–1992. *Morb Mortal Wkly Rep.* 2015;4(5):1–73.
- Aluko OO, Ojeremi TT, Olaleke DA, Ajidagba EB. Evaluation of food safety and sanitary practices among food vendors at car parks in Ile-Ife, southwestern Nigeria. *Food Control.* 2016;40:165–71.
- Giorgi G, Arcangeli G, Mucci N, Cupelli V. Economic stress in the workplace: the impact of fear of the crisis on mental health. *Work.* 2015;51:135–42.
- Mucci N, Giorgi G, Roncaioli M, Perez JF, Arcangeli G. The correlation between stress and economic crisis: a systematic review. *Neuropsychiatr Dis Treat.* 2016;12 983–93.
- World Health Organization. Occupational health, a manual for primary health care workers. Regional Office for the Eastern Mediterranean: World Health Organization; 2010.
- Driscoll T, Takala J, Steenland K, Corvalen C, Fingerhut M. Review of estimates of the global burden of injury and illness due to occupational exposures. *J Ind Med.* 2005;48:491–502.
- Susonic BK, Balcon ZK, Zocin BF. Occupation infections among abattoir workers in Israel. *Occupation J.* 2007;4:50–3.
- National Institute for Occupational Safety and Health. Workplace Safety and Health Communicable Disease Control - Chemical Safety. United States: Center for Disease Control; 2015.
- Ann SM, Frisco C, Isam TK, Ahmed NA. Role of education and training levels of slaughterhouse workers in the cross contamination of carcasses. *Int J Postharvest Technol Innovation.* 2006;1(2):142–54.
- Fasanmi EF. The increasing importance of zoonosis in African Countries. *The Nig Vet J.* 2006; 6:5–10.
- United States Department of Labor. Occupational Safety and Health Administration. Recommended Practices for Safety and Health Programs; available on <https://www.osha.gov/safety-management/hazard-prevention>
- Subratty AH, Gurib FBH. Consumers' concern about the meat product quality offered for sale in Mauritius. *Nutrit Food Sci.* 2013;33(2):80–3
- Mekonnen H, Habtamu T, Kelali A, Shewit K. Food safety knowledge and practices of abattoir and butchery shops and the microbial profile of meat in Mekelle City, Ethiopia. *Asian Pac J Trop Biomed.* 2013;3(5):407–12.
- Summary and statistical report of the 2007 population and housing census. Federal Democratic republic of Ethiopia population census commission, Central Statistic Agency. Addis Ababa, Ethiopia.2008. Available from : [https://www.ethiopianreview.com/pdf/001/Cen2007_firstdraft\(1\).pdf](https://www.ethiopianreview.com/pdf/001/Cen2007_firstdraft(1).pdf)
- Hawassa Municipality. Annual Data Report from Hawassa Municipality abattoir office. Hawassa: Hawassa Municipality; 2018.
- Abdullahi A, Azmi H, Norizhar K, Ahmadu S, Yusha'u SB, Pei LL. Knowledge, attitude, and practice toward compliance with abattoir laws among the abattoir workers in Malaysia. *International Journal of General Medicine.* 2016;9:79–87.
- Nahida A. Knowledge, attitude and practice towards prevention of dengue fever among the people in male, Maldives [Dissertation]. Thailand: Chulalongkorn University; 2007.
- McGuire RK. Seismic Hazard and Risk Analysis. Earthquake Engineering Research Institute. Boulder, Colorado. 2004 Available from: https://faeng.ufms.br/files/2019/06/PGA_Seismic-Hazard-And-Risk-Analysis_McGuire_2004.pdf
- Evans JD. Straightforward statistics for the behavioral sciences. Pacific Grove, CA: Brooks/ColePublishing; 1996.

22. Cohen J. Statistical power analysis for the behavioral sciences. In: Hillsdale NJ. 2nd Ed. New Jersey: Lawrence Erlbaum. 1988;8:6
23. Adesokan HK, Raji AOQ. Safe meat-handling knowledge, attitudes and practices of private and government meat processing plants' workers: implications for future policy. *J Prev Med Hyg.* 2014;55(1):10–16.
24. Tegegne HA, Phyo HWW. Food safety knowledge, attitude and practices of meat handlers in abattoir and retail meat shops of Jigjiga Town, Ethiopia. 2017;1 (1):E320-24.
25. Kunar BM, Bhattacharjee A, Chau. Relationships of job hazards, lack of knowledge, alcohol use, health status and risk taking behavior to work injury of coal miners: a case-control study in India. *J Occup Health.* 2008; 50:236-44.
26. Tesfaye H. Mekonnen. Magnitude and factors associated with work-related back and lower extremity musculoskeletal disorders among barbers in Gondar town, Ethiopia. 2017; 14(7):56-76:
27. Berhe A, Yemane D, Gebresilassie A, Terefe W, Ingale L. Magnitude of Occupational Injuries and Associated Factors among Small Scale Industry Workers in Mekelle City, Northern Ethiopia. *Occup Med Health Aff.* 2015; 3:197.
28. Takele T, Abera K. 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; 21:25-34.