PLOS ONE

RESEARCH ARTICLE

# The magnitude and factors associated with work-related back and lower extremity musculoskeletal disorders among barbers in Gondar town, northwest Ethiopia, 2017: A cross-sectional study

**Tesfaye Hambisa Mekonnen***

Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

* tajan2022@gmail.com



OPEN ACCESS

**Citation:** Mekonnen TH (2019) The magnitude and factors associated with work-related back and lower extremity musculoskeletal disorders among barbers in Gondar town, northwest Ethiopia, 2017: A cross-sectional study. PLoS ONE 14(7): e0220035. https://doi.org/10.1371/journal.pone.0220035

**Editor:** Mohammed S. Orloff, University of Arkansas for Medical Sciences, UNITED STATES

**Received:** December 10, 2018

**Accepted:** July 7, 2019

**Published:** July 22, 2019



**Data Availability Statement:** All relevant data are within the manuscript and Supporting Information files.

**Funding:** The author received no specific funding for this work.

**Competing interests:** The authors have declared that no competing interests exist.

## Abstract

### Background

Work-related back and lower extremity disorders often present remarkable health and economic burdens on societies. Occupational barbers are usually neglected in research and policy actions, mainly in developing countries, and are hence more vulnerable to the conditions. So far, information about the factors influencing back and lower extremity disorders among barbers in Ethiopia is unknown. Therefore, the aim of this study was to determine the prevalence and factors affecting back and lower extremity disorders among barbers in Gondar town, Ethiopia.

### Methods

A cross-sectional study was conducted from April to May 2017. A sample of 434 barbers recruited using the systematic random sampling technique. A pre-tested standardized Nordic Musculoskeletal questionnaire was interviewer-administered for data collection. Data were analyzed using statistical package for social sciences (SPSS) version 20. The significance of associations was evaluated at $\leq$0.05 p-value with a 95% confidence intervals (CI) and adjusted odds ratios (AOR).

### Results

The response rate was 98.8% (N = 429). The mean age and mean length of employment were 26.38 (standard deviations (SD) ± 4.78) and 4.91 years, respectively. The prevalence of work-related low back pain in the previous 12 months and in the last 7 days was 55.7% (N = 239) [95% CI (51.0, 60.4)] and 32.6% (N = 140), respectively. About 40.6% (n = 97) of the participants with back pains indicated their activities were limited. The prevalence of knee/leg and ankle pain was 39.4% (N = 169) and 25.6% (N = 110), respectively. Out of the participants, 17% (n = 41) sought treatment services. Less than half, 40.6% (n = 97) said they

perceived high disability, while 38.1% (n = 91) explained their pain was intense (severe). Age [AOR: 2.001; 95% CI (1.174, 4.346)], alcohol use [AOR: 2.283; 95% CI (1.376, 3.789)], lack of safety training [AOR: 0.110; 95% CI (0.032, 0.271], working posture [AOR: 0.142; 95% CI (0.045, 0.215)], and length of employment [AOR: 1.650.132; 95% CI (1.107, 2.140] were significantly associated factors.

## Conclusions

Back and lower extremity musculoskeletal pain and disability were found to be prevalent among Ethiopian barbers and to be associated with age, alcohol use, safety training, work postures, and length of employment. We believe that programs for management of musculoskeletal disorders need to address these factors.

**Abbreviations:** AOR, adjusted odds ratio; BMI, Body mass index; BSc, Bachelor of Science; CI, Confidence interval; ETB, Ethiopian Birr; Km, Kilometers; MPH, Masters of public Health; MSc, Masters of Science; OR, Odds ratio; SD, standard deviation; UK, United Kingdom; US, United States of America; LEDS, lower extremity disorders.

## Background

The barbershop sector is one of the precarious occupations, which is inherently associated with several workplace risk factors [1]. The combination of exposures to various physical, chemical, ergonomic, psychosocial, and biological hazards in this occupation is usually noticeable [2–4]. Consequently, barbers are often very susceptible to the various adverse health outcomes, like work-related musculoskeletal disorders [5]. In this sector, work characteristics, such as fixed or constrained body positions, continual repetition of movements, force concentration on small parts of the body, like the hand or wrist, pace of work that does not allow adequate recovery between movements, vibration, and temperature lead to the developments of musculoskeletal disorders [6–9].

Work-related musculoskeletal disorder (WMSD) is one of the major public health concerns resulting from the growing demands of healthcare service utilization, temporary and permanent disability, and reduced quality of life it usually incurs [8,10]. Moreover, it is a contemporary occupational health problem, representing reduced productivity, absence from work, and rising compensation premiums [10,11]. For instance, in the United Kingdom (UK), an estimated 6.6 million working days were lost due to work-related musculoskeletal disorders, constituting 24% of all days lost due to work-related ill-health in 2017/18 [12]. Of these, work-related back and lower limb disorders accounted for 2.2 and 1.7 million days lost, respectively. A study in Turkey also demonstrated that WMSD account for 34% of all work days lost due to occupation-related diseases [8].

Barbershop occupations are also associated with the hazardous nature of working conditions, exposing barbers to the risks of musculoskeletal disorders [2,12,13]. Barbers often stand long hours and bend/twist their backs forward or sideways during their activities that boosts the developments of back and lower limb disorders [14,15]. Thus, scholars conclude that the prevalence of work-related back and lower extremity disorders among barbers is pervasive. For instance, recent studies showed that prevalence was 76.3% in Nigeria [16], 27.4% in Turkey [5], and 39% in Brazil [17]. Similarly, a study conducted in Greece reported a 28% prevalence of knee pain [18]. Studies in Iran showed that the prevalence of leg pain was 31% [15] and 66.5% [19]. Other studies reported the prevalence of lower extremity disorders to be between 52.3 and 67.7% [20,21].

Several investigations reveal that a number of occupational factors determine the developments of back and lower limb disorders. In fact, literature demonstrates that socio-

demographic factors, like sex, age, marital status, and experience [8,22,23] markedly influence the experience of back and lower limb musculoskeletal pains. Moreover, workplace factors, including working hours, job tenure, type of activity (static and/or dynamic), shift work, safety training, working posture, rest breaks [19,23–28], and psychosocial factors, such as job satisfaction and stress [22,24,26,29] predict the likelihood of sustaining back and lower extremity musculoskeletal disorders. Behavioral styles, like alcohol consumption [30], physical activities [24,29,31] and body mass index [19,27,32], and previous history of systemic illnesses [22,33] were also reported as potential risk factors of back and lower limb disorders.

In Ethiopia, informal sectors, including barbershop industries, are vastly growing. Health and safety protection of the workers in these sectors is, however, usually disregarded both in research and policy action. In these sectors, despite the ever mounting manpower in poor working conditions that predispose them to various disorders, research about prevalence and factors associated with work-related back and lower extremities musculoskeletal disorders is scant. Therefore, the objective of this study was to explore the prevalence and work-related factors of back and lower extremity musculoskeletal disorders among barbers in Gondar town, northwest Ethiopia.

## Methods

### Study design and period

A cross-sectional study was conducted from April to May 2017 to explore the prevalence and occupational factors associated with back and lower extremities musculoskeletal disorders among barbers in Gondar town.

### Study setting and area

This study was conducted on barbers in Gondar town, northwest Ethiopia. The town is one of the tourist destinations in the Amhara Regional State, northwest Ethiopia, 747 km from Addis Ababa, the capital of the country. According to the 2007 Central Statistical Agency (CSA) report of Ethiopia, the town had a total population of 207,044 of whom 108,924 were women. During the data collection, there were 1150 barbershop professionals in the about 20 kebeles.

### Source and study population

All barbers in Gondar town were the source population. The randomly selected barbers in the selected kebeles were our study population. Barbershop professionals who had worked for at least 12 months in the study area prior to the study were included, whereas those who were on sick, annual, maternity, and family leaves and those who had previous history of back pains, car accidents, and injuries were excluded.

### Sample size determination

Sample size was calculated using OpenEpi software with population (N) of 1150 barbers, 50% (P) hypothesized frequency of outcome variable, and 4% absolute precision with 95% CI at Z = 1.96 critical value using the formula: $n = [Np\ (1\text{-}p)]/\ [(d^2/Z^2_{1\text{-}\alpha/2}{}^*(N\text{-}1) + p^*(1\text{-}p)]$. Assuming a 10% for no responses, the final sample was = 395+39 = 434.

### Data collection tools and procedures

The systematic random sampling technique was used to recruit eligible samples. An interviewer-administered questionnaire was employed for data collection. We assessed self-reported (Yes/No) prevalence of back and lower extremity musculoskeletal disorders using a

standardized Nordic Musculoskeletal Questionnaire. The instrument was previously endorsed as appropriate for interview data collection technique [34]. The standardized questionnaire has been applied in intensive studies in the literature, including Ethiopia [33,35,36]. The satisfaction of barbers with their jobs was evaluated using a generic job satisfaction scale questionnaire [37]. We also assessed perceived job stress using the new job stress scale [38]. Perceived severity and disability of conditions were evaluated according to the Von Korff pain severity grading [39]. The other detailed contents of the questionnaire comprised of four parts. The first part contained socio-demographic factors, like sex, age, religion, educational status, marital status, monthly salary, and work experience. The second category covered organizational/work-place factors, including working hours per day, health and safety training, number of customers per day, pre and periodic medical examinations, shift work, working posture, and rest break. The third component encompassed health and psychosocial factors, like previous history of systemic illnesses, job satisfaction, and job stress. The behavioral style part covered details of factors, like physical exercise (Yes/No), smoking (Yes/No), handedness (right/left), and body mass index (BMI) (Weight divided by height square).

## Data quality control

The designing of appropriate data collection tools was given priority. The questionnaire was first developed in English and translated in to local language 'Amharic' and back to English by language experts to ensure consistency. Eight environmental and occupational health and safety final year students in the College of Medicine and Health Sciences at the University of Gondar were involved in data collection after they took adequate training and orientation. Four well experienced supervisors were recruited from the Environmental and Occupational Health and Safety department. The data collectors and supervisors took the orientation on issues relating to the clarity of the questions, objectives of the study, confidentiality of information, and the voluntary involvement (consent) in the study. The principal investigator supervised both data collectors and supervisors. To test the validity and reliability of the questionnaire, a pre-test was conducted on 18 samples in a kebele not included in the final survey. A few modifications, such as minimizing the number of questions were made, and some misinterpretations and ambiguities corrected, based on the pretest analysis.

## Methods of data analysis

The data were manually cleaned for completeness, coded, and entered in to EPI info version 7.1.5.2 and exported to SPSS version 20 software for analysis. Frequency distributions, percentages, means, and standard deviations were used to describe results. The reliability of the standardized Nordic Musculoskeletal Questionnaire was tested using Cronbach's Alpha and found a reliable Cronbach's Alpha = 0.79. The 10- items generic job satisfaction scale questionnaire was also examined for reliability and Cronbach's Alpha was found to be 0.911. The 22 item job stress scale questionnaire was also checked for reliability and found Cronbach's Alpha = 0.87. The instruments were, therefore, tolerable for their consistencies in repeating what have previously been measured using the tools. The associations between the dependent variable (back and lower extremities musculoskeletal disorders) and independent variables were examined using a binary logistic regression analysis. Accordingly, explanatory variables with a $< 0.2$ p-value in a bivariate analysis were exported to a multivariable logistic regression model to further investigate the potential effects of confounders. A forward variable selection method was used to drag variables in to the multivariable logistic regression model. The goodness of fit model was checked by Hosmer and Lemeshow and found to be good model fitness with a 0.818 p-value. The odds ratios with 95% confidence intervals (CI) were calculated to evaluate

the strength and a cut off ≤ 0.05 p-value was established to ascertain the significance of associations.

### Operational definition

**Back and lower extremity musculoskeletal disorders:** Having had trouble (ache, pain and discomfort) in low back (small of the back), one or both hips/thighs, one or both knees, one or both ankles/feet any time during the last 12 months [34]

**Perceived severity:** A pain intensity score of ≥50 or < 3 disability points [39]

**Perceived disability:** A pain disability point score of 3–6 points [39]

**Stressed worker:** The new job stress scale score above the overall mean score [38]

**Job satisfied worker:** The generic job satisfaction scale score of 32 or above [37]

### Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Ethical Review Board (IERB) of the University of Gondar, College of Medicine and Health sciences, Institute of Public Health (Reference #: EOHS/435/2009). We communicated the letter to each owners of the barbershops selected for inclusion. We also obtained verbal informed consent from each respondent. Confidentiality of data was maintained. Only aggregate data were used. Any involvement in the study was carried out with the full consent of the person willingly participating in the study.

## Results

### Socio-demographic characteristics

A total of 429 barbers participated with a response rate of 98.8%. The majority, 86.9% (N = 373) of the participants were males. A high proportion, 85.8% (N = 368) of the respondents' age was ≤ 30 ranging from 17 to 50 with a mean of 26.38 (SD ±4.78) years. About 10.5% (N = 45) of the participants said they could not read and write, whereas 49.7% (N = 213) attended secondary schools. More than half, 60.6 (N = 260) of the participants were unmarried. Few, 7% (N = 30) of the interviewees' monthly salary was < ETB 1100 and 57.6% (N = 247) reported their monthly salary was ETB 1101–1700 (**Table 1**).

### Behavioral and psychosocial characteristics of the participants

Among the respondents, 35.9% (N = 154) reported they were alcohol users. A total of 42.0% (N = 180) participants reported they were chat chewers, whereas 81.1% (N = 348), 13% (N = 567), and 5.6% (N = 24) were never smokers, current smokers, and passive smokers, respectively. Regarding physical exercises, 30.5% (N = 130) reported they performed physical exercise. About 10.0% (N = 43) stated they had exercises for 1–2 hours per day, 9.6% (N = 41) for >2 hours per day, 7.2% (N = 31) 1–3 times per week, and 4.2% (N = 18) every day. Thirty-one percent (N = 137) of the barbers pointed out they had systemic illnesses. Out of the interviewees, 66.7% (N = 286) explained they were not satisfied with their jobs, whereas 24% (N = 103) reported they perceived stress due to their work.

### Occupational characteristics of the study participants

About more than half, 60.4% (N = 259; p = 0.258) of the participants showed that their pattern of employment was temporary while the remaining reported they were permanent. The majority of barbers, 79% (N = 339; p = 0.077) said they were employed by others and the remaining indicated they were self-employed. Seventy-four percent (N = 319; p = 0.0001) of the participants indicated they worked > 8 hours per day. Only 7.9% (N = 34; p = 0.859) of the barbers

**Table 1. Socio-demographic characteristics in relation to back and LEDs, Ethiopia, 2017.**

| Variables (N = 429) | Frequency | Percentage (%) | P-value |
|---|---|---|---|
| **Sex** | | | |
| Male | 373 | 86.9 | |
| Female | 56 | 13.1 | 0.177 |
| **Age** | | | |
| ≤ 30 years | 368 | 85.8 | |
| >30 years | 61 | 14.2 | 0.001 |
| **Marital status** | | | |
| Married | 134 | 32.2 | |
| Single | 260 | 60.6 | |
| Divorced | 35 | 8.2 | 0.060 |
| **Educational status** | | | |
| Cannot read and write | 45 | 10.5 | 0.178 |
| Primary education (1–8) | 72 | 16.8 | |
| Secondary education (9–12) | 213 | 49.7 | |
| Above secondary education | 99 | 23.1 | |
| **Monthly salary** | | | |
| <1100 ETB | 30 | 7.0 | 0.149 |
| 1101–1700 ETB | 247 | 57.6 | |
| >1700 ETB | 152 | 35.4 | |
| **Religion** | | | |
| Orthodocs | 348 | 81.1 | 0.125 |
| Catholic | 12 | 2.8 | |
| Protestant | 34 | 7.9 | |
| Muslim | 35 | 8.2 | |
| **Experience** | | | |
| ≤ 5 years | 308 | 71.8 | |
| >5 years | 121 | 28.2 | 0.008 |

**Keys:** ETB = Ethiopian birr (currency); N = number; LEDs = lower extremity disorders

https://doi.org/10.1371/journal.pone.0220035.t001

reported that they took safety training, and 22.1% (N = 95), 25.2% (N = 108), and 52.7% (N = 226; p-value = 0.012) reported their payment scheme was monthly, hourly, and per piece, respectively. Forty-four percent (N = 215; p = 0.031) revealed that they did not use rest break at their workplaces. The respondents presented that 7.5% (N = 32), 25.6% (N = 110), and 66.9% (N = 287; p = 0.256) of them spent 1–5, 6–10, and > 10 hours standing per day, respectively. The study also found that 37.1% (N = 159; p = 0.016) of the participants indicated their working posture was awkward/bending/twisting/, 41.7% (N = 179) static posture/frequent standing, and 21.2% (N = 91) alternate/flexible postures.

## Prevalence of back and lower extremity musculoskeletal disorders

The prevalence of low back pain in the past 12 months and 7 days was 55.7% (N = 239) [95% CI (51.0, 60.4)] and 32.6% (N = 140), respectively. There was no statistically significant difference between male and female participants (p = 0.603). About 42.2% (n = 101; p = 0.001) of the respondents with back and lower extremity disorders indicated that they experienced the symptoms in more than a single body site (co-morbid). Of the participants, 40.6% (n = 97; p = 0.0001) indicated their activities were limited because of the complaints. Lower body sites

represented with the symptoms included hip/thigh 28.9% (N = 134), knee/leg 39.4% (N = 169), and ankle/feet pains 25.6% (N = 110). About 45.6% (n = 109) of the participants with lower extremity disorders demonstrated that they experienced them in the last 7 days and 21.3% (n = 51) were prevented from their activities due to the conditions. Out of the total indicated disorders of back and lower body sites, 21.3% (n = 51) revealed they sought treatment services and 40.6% (n = 97) said they perceived high disability, while 38.1% (n = 91) explained their pain was intense (severe).

### Factors associated with back and lower extremity musculoskeletal disorders

A bivariate analysis showed that age, working hours, work experience/length of employment, lack of health and safety training, alcohol drinking, working posture, educational level, job satisfaction, history of systemic illness, and rest break were the factors substantially associated with work-related back and lower body disorders.

After controlling for confounders in a multivariable logistic regression analysis, age, length of employment, alcohol use, lack of safety training, and working posture remained to considerably influence the developments of back and lower extremity disorders. Accordingly, participants aged $>$ 30 years were 2.001 times more at risk for developing back and lower extremity disorders than those aged $\leq$ 30 years [AOR: 2.001; 95% CI (1.174, 4.346)]. The odds of experiencing back and lower extremity disorders were 2.283 times more likely among alcohol users than non-users [AOR: 2.283; 95% CI (1.376, 3.789)]. Moreover, 89% of the likelihood of developing back and lower extremity disorders was prevented among participants who took safety and health training than those who did not [AOR:0.110; 95% CI (0.032, 0.271)]. Barbers who had worked in flexible/alternative work postures were 85.8% less likely to develop back and lower extremity disorders than those who worked in static/frequent standing work postures [AOR: 0.142; 95% CI (0.045, 0.215)]. Back and lower extremity disorders were 1.650 times more likely to be experienced among barbers with $>$5 years of employment compared to those with $\leq$ 5 years (**Table 2**).

## Discussion

This study employed a workplace-based cross-sectional design to evaluate the prevalence and factors associated with back and lower limb musculoskeletal disorders among barbers in Gondar town, northwest Ethiopia. The prevalence of low back pain in the previous 12 months was 55.7% (N = 239) [95% CI (51.0, 60.4)]. This finding was relatively equivalent to that of a study conducted in Greece (53%) [18]. The possible reason for this might be the similarity of the working environment and conditions of barbershop occupations across countries. Another probable suggestion might be the fact that informal sectors are often not included in the national labor laws and regulations in many countries. The exclusion of these sectors in the national laws probably leads to poor access to occupational health and safety services, which further proliferates the situations. However, our finding indicates a higher prevalence compared to the studies in the UK (4.9%) [40] and Brazil (39%) [17]. On the other hand, we found a lower magnitude of low back pain disorders compared to a study in Nigeria (76.3%) [16]. The difference could be due to the availability/unavailability of workplace health and safety services, illness and injury management and reporting procedures, and data collection methods.

Our result shows that the level of ankle/feet pain was 25.6% (N = 110) [95 CI (21.4, 29.6)] and that of knee/leg 39.4% (N = 169) [95 CI (35.0, 44.3)]. A previous report in Iran (70.7%) found a higher prevalence of ankle/feet pain than our investigation did [19]. The study also reported a higher magnitude (66.5%) of knees/legs pain. About 28.9% (N = 124) [95 CI (24.7,

**Table 2. Factors associated with back and lower extremity disorders among barbers, 2018.**

| Variables (N = 429) | Back and lower extremity disorders | | | | |
|---|---|---|---|---|---|
| | Yes | No | Crude OR (95%CI) | Adjusted OR (95%CI) | P-value |
| **Age** | | | | | |
| ≤ 30 years | 196 | 172 | | 1 | |
| >30 years | 43 | 18 | 2.096(1.482, 4.925) | 2.001 (1.174,4.346) | 0.0001** |
| **Level of education** | | | | | |
| Cannot read and write | 55 | 31 | 1.533(0.970,2.535) | 1.025(0.157, 3.312) | 0.103* |
| Can read and write | 184 | 159 | 1 | 1 | 1 |
| **Work experience** | | | | | |
| ≤ 5 years | 159 | 149 | 1 | | |
| >5 years | 80 | 41 | 1.828(1.417,3.433) | 1.650 (1.107, 1.140) | 0.001* |
| **Working hours/day** | | | | | |
| ≤ 8 hours | 50 | 59 | 1 | 1 | |
| >8 hours | 189 | 131 | 1.702(1.087,2.627) | 1.345(0.813, 2.226) | 0.071* |
| **Safety training** | | | | | |
| No | 209 | 186 | 0.498(0.183,1.243) | 0.110(0.032, 0.271) | 0.0001* |
| yes | 30 | 4 | 1 | 1 | |
| **Alcohol drinking** | | | | | |
| No | 132 | 143 | 1 | 1 | |
| Yes | 107 | 47 | 2.466(2.435, 5.973) | 2.283 (1.376, 3.789) | 0.000** |
| **History of systemic illness** | | | | | |
| No | 156 | 136 | 1 | 1 | |
| Yes | 83 | 54 | 1.339(1.344, 3.149) | 1.028(0.161, 3.901) | 0.182* |
| **Working posture** | | | | | |
| Bending and twisting/awkward posture | 84 | 75 | 0.803(0.543, 1.649) | 0.126(0.134, 1.134) | 0.102* |
| Static work/frequent standing | 102 | 77 | 0.949(0.543, 1.649) | 0.142 (0.045, 0.215) | 0.0001** |
| Alternative postures | 53 | 38 | 1 | 1 | |
| **Rest break** | | | | | |
| No | 111 | 104 | 0.717(0.505, 1.100) | 1.035(0.613, 1.747) | 0.122* |
| Yes | 128 | 86 | 1 | 1 | |
| **Job satisfaction** | | | | | |
| Satisfied | 86 | 57 | 1 | 1 | |
| Not satisfied | 153 | 133 | 0.762(0.977, 2.244) | 1.229(0.702, 2.104) | 0.140* |

Keys:-

* = Significant at a <0.2 p-value in a bivariate analysis

** = Significant in multivariate analysis at a <0.05 p-value

ETB = Ethiopian birr; N = Number; OR = Odd ratio; CI = Confidence interval; N = number; LEDs = lower extremity disorders

https://doi.org/10.1371/journal.pone.0220035.t002

33.3)] of the participants in our study indicated they had experienced pain in their hip/thigh body sites. This result was higher than the report in Nigeria (16.6%) [16]. The discrepancies could be due to differences in data collection methods, injury and illness management, and reporting procedures.

The result of the multivariable regression analysis demonstrated that age markedly contributed to the development of back and lower extremity disorders. This result was in agreement with the results of other studies [16,19,41]. The probable explanation for these similarities is

the fact that the biological/functional structures of the human body, particularly those related to supportive structures, like muscles, joints, nerves, ligaments, and tendons would tend to degenerate as age increases. This could be likely to induce the reduced structural functional capacities of the workers. Similar explanations have been provided by previous investigations [42,43]. The other possible reason could be the effect of aging or a cumulative effect of workload on the musculoskeletal systems through years of employment services. Improvements in modern human lifestyles would also be likely to increase workers' chance of extended stay in the employment world, resulting in the current domination of working workplaces for aging workers.

The current study identified that the length of employment/work experience is an important determinant of back pains and lower extremity disorders. This result was supported by other scholastic works [16–18,41]. The possible explanation might be the fact that employees with comparatively longer duration of employment are often victims of the effects of cumulative exposure to ergonomic and other workplace hazards. Another possible reason might be that workers with longer duration of employment might neglect the possible protection mechanisms of potential health and safety risk factors at their workplace, relying on the length of employment/workplace adaptation as a means of protection from adverse effects.

Alcohol consumption was found to be the other significant factor of back and lower extremity complaints. This result corroborates previous studies [16,17,30]. The plausible reason may be that alcohol drinking is one of the common health risk behaviors that might deteriorate the normal functional capacities and defense mechanisms of the body. A more possible explanation is that alcohol drinking might negatively influence the behavior of people, often prohibiting from exercising a healthy life-style, such as physical exercise.

The absence of health and safety training was the other significant factor for back and lower extremity conditions. The proximal association between safety training and LBP has rarely been studied. Workers' health and safety awareness and training could however, play a great role in hazard and risk prevention and control measures. A study in Ethiopia was concurred with this result [19]. Safety training is more likely to promote workplace cultures of safety. Training targeting healthy life-styles might also result in behavioral changes of employees leading them to enjoy physical exercises, which could in turn lead to a reduced probability of back pain disorders.

The multivariate analysis also revealed that working posture considerably contributed to the risk of developing back and lower extremity pains. This finding was consistent with those of other studies [16–18,28,43,44]. It could be explained that awkward postures, such as twisting and bending and static postures, like prolonged standing, might impose stress on specific body parts by exerting pressure on locomotive body structures, leading to physical and functional impairments. A static/inflexible nature of working position for an extended time might also enhance muscle stiffness.

The distinguishing nature of the current study is that it pioneered the exploration of the prevalence and work-related factors leading to back and lower extremity disorders that usually experienced by people engaged in the cutting and shaving industry in Ethiopia. The potential occupational-related factors contributing to the conditions were replicated and the government and other stakeholders could benefit from it for policy design and implementations. However, the self-report data collection method employed in this study might be a limitation, as recall bias and under reporting could be anticipated. The temporal relationships between work-related symptoms of back and lower extremity disorders and the hairdressing-job related factors should be treated with caution as the study used a cross-sectional design. The lack of job posture analysis that could help ascertain the degree to which awkward postures/bending and twisting /are determined is other limitation of this study. Moreover, it might be difficult to

generalize the findings, because the study dealt with only a specific segment of workforce. Therefore, future investigations with larger samples and multiple sectors with strong designs, such as longitudinal studies, are greatly suggested.

## Conclusions

Back and lower extremity musculoskeletal pain and disability were found to be prevalent among Ethiopian barbers and to be associated with age, alcohol use, safety training, work postures, and length of employment. We believe that programs for management of musculoskeletal disorders need to address these factors.

## Supporting information

**S1 File. This is data set used in analysis.**
(XLSX)

## Acknowledgments

The author would like to extend deepest gratitude to the University of Gondar, College of Medicine and Health Sciences, Institute of Public Health for providing ethical clearance. The author is also very much thankful to all data collectors, supervisors, and all study participants.

## Author Contributions

**Conceptualization:** Tesfaye Hambisa Mekonnen.

**Formal analysis:** Tesfaye Hambisa Mekonnen.

**Funding acquisition:** Tesfaye Hambisa Mekonnen.

**Methodology:** Tesfaye Hambisa Mekonnen.

**Software:** Tesfaye Hambisa Mekonnen.

**Supervision:** Tesfaye Hambisa Mekonnen.

**Validation:** Tesfaye Hambisa Mekonnen.

**Writing – original draft:** Tesfaye Hambisa Mekonnen.

**Writing – review & editing:** Tesfaye Hambisa Mekonnen.

## References

1. Abia WA, Fomboh R, Ntungwe E, Abia EA, Serika WA, Ageh MT (2016) Assessment of occupational health hazards awareness and common practices amongst barbers and hairdressers in Cameroon. Journal of Public Health in Developing Countries 2: 94–101.
2. Collins RM, Janse Van Rensburg DC, Patricios JS (2011) Common work-related musculoskeletal strains and injuries. South African Family Practice 53: 240–246.
3. Singh V, Goyal N, Singh A, Bhatty SM, Deane A, Prakash JS (2015) Upper limb musculoskeletal disorders associated with computer usage in health-care professionals. International Journal of Medical Science and Public Health 4: 1615–1619.
4. Daka D (2017) Barbers knowledge and practice of biological hazards in relation to their occupation: A case of Hawassa Town, Southern Ethiopia. Journal of Public Health and Epidemiology 9: 219–225.
5. Mandiracioglu A, Kose S, Gozaydin A, Turken M, Kuzucu L (2009) Occupational health risks of barbers and coiffeurs in Izmir. Indian journal of occupational and environmental medicine 13: 92–96. https://doi.org/10.4103/0019-5278.55128 PMID: 20386627

6. Health and Safety Executive (2018. Available at: http://www.hse.gov.uk/statistics/causdis/musculoskeletal/msd.pdf. Accessed 23 October 2018) Work-related Musculoskeletal Disorders (WRMSDs) Statistics in Great Britain 2017.
7. Lugay CIP, Matias AC (2015) Predictive models of work-related musculoskeletal disorders (WMSD) s among sewing machine operators in the garments industry. Asia Pacific Journal of Multidisciplinary Research 3: 56–63.
8. Berberoğlu U, Tokuç B (2013) Work-related musculoskeletal disorders at two textile factories in Edirne, Turkey. Balkan medical journal 30: 23–27. https://doi.org/10.5152/balkanmedj.2012.069 PMID: 25207064
9. Ryu E, Ye B, Yi Y, Kim J (2014) Risk factors of musculoskeletal symptoms in university hospital nurses. Annals of occupational and environmental medicine 26: 1–8. https://doi.org/10.1186/2052-4374-26-1
10. Huisstede BM, Bierma-Zeinstra SM, Koes BW, Verhaar JA (2006) Incidence and prevalence of upper-extremity musculoskeletal disorders. A systematic appraisal of the literature. BMC musculoskeletal disorders 7: 1–7. https://doi.org/10.1186/1471-2474-7-1
11. Fredriksson K, Alfredsson L, Köster M, Thorbjörnsson CB, Toomingas A, Torgén M, et al. (1999) Risk factors for neck and upper limb disorders: results from 24 years of follow up. Occupational and environmental medicine 56: 59–66. https://doi.org/10.1136/oem.56.1.59 PMID: 10341748
12. Health and Safety Excutive (2018. Availbale at: http://www.hse.gov.uk/statistics/causdis/msd.pdf. Accessed on 7 December 2018) Work related musculoskeletal disorders statistics (WRMSDs) in Great Britain, 2018.
13. Rathi M, Oza PA, Palekar T, Gazbare P, Khandare S (2017) Effect of Ergonomic Advice on Upper Extremity Work Related Musculoskeletal Disorders in House-Keepers. International Journal Of Scientific Research And Education 5: 6419–6424.
14. Arokoski JP, Nevala-Puranen N, Danner R, Halonen M, Tikkanen R (1998) Occupationally oriented medical rehabilitation and hairdressers' work techniques–A one-and-a-half-year follow-up. International Journal of Occupational Safety and Ergonomics 4: 43–56. https://doi.org/10.1080/10803548.1998.11076378 PMID: 10602606
15. Rezaeian T, Motiallah T, Ghanbari N, Moghimi F, Pirouzi S (2015) The prevalence of foot structural deformities in female hairdressers working in Shiraz. Pysical Treatments 5: 73–81.
16. Aweto HA, Tella BA, Johnson OY (2015) Prevalence of work-related musculoskeletal disorders among hairdressers. International journal of occupational medicine and environmental health 28: 545–555. https://doi.org/10.13075/ijomeh.1896.00291 PMID: 26190730
17. Mussi G, Gouveia N (2008) Prevalence of work-related musculoskeletal disorders in Brazilian hairdressers. Occupational medicine 58: 367–369. https://doi.org/10.1093/occmed/kqn047 PMID: 18467336
18. Tsigonia A, Tanagra D, Linos A, Merekoulias G, Alexopoulos EC (2009) Musculoskeletal disorders among cosmetologists. International journal of environmental research and public health 6: 2967–2979. https://doi.org/10.3390/ijerph6122967 PMID: 20049238
19. Rezaeian T, Piroozi S, Ghanbari N, Moghimi F, Motiallah T (2015) The Prevalence of Leg Pain among Female Hairdressers: A Case Study in Shiraz in 2010. Physical Treatments-Specific Physical Therapy Journal 5: 33–40.
20. Health and Safety Executive (Availbale at: http://www.hse.gov.uk/statistics/causdis/musculoskeletal/msd.pdf. Accessed on 24 October 2018) Work-related Musculoskeletal Disorders (WRMSDs) Statistics in Great Britain 2017. 1–22.
21. SeyyedAli MN, Ramazan M (2012) Evaluation of upper limb musculoskeletal loads due to posture, repetition, and force by rapid upper limb assessment in a textile factory. Health Scope 2012: 18–24.
22. Wang P-C, Rempel D, Harrison R, Chan J, Ritz B (2007) Work-organizational and personal factors associated with upper body musculoskeletal disorders among sewing machine operators. Occupational and environmental medicine 10: 1–8.
23. Pelissier C, Fontana L, Fort E, Agard JP, Couprie F, Delaygue B, et al. (2014) Occupational risk factors for upper-limb and neck musculoskeletal disorder among health-care staff in nursing homes for the elderly in France. Industrial health 52: 334–346. https://doi.org/10.2486/indhealth.2013-0223 PMID: 24807124
24. Rodrigues EV, Gomes ARS, Tanhoffer AIP, Leite N (2014) Effects of exercise on pain of musculoskeletal disorders: a systematic review. Acta ortopedica brasileira 22: 334–338. https://doi.org/10.1590/1413-78522014220601004 PMID: 25538482
25. Tinubu BM, Mbada CE, Oyeyemi AL, Fabunmi AA (2010) Work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria: a cross-sectional survey. BMC Musculoskeletal disorders 11: 1–8. https://doi.org/10.1186/1471-2474-11-1

26. Naz H, Kwatra S, Ojha P (2015) Prevalence of musculoskeletal disorders among handloom weavers of Uttarakhand: An ergonomic study. Journal of Applied and Natural Science 7: 102–105.
27. Moodley R, Naidoo S (2015) The prevalence of musculoskeletal disorders among dentists in KwaZulu-Natal. South African Dental Journal 70: 98–103.
28. Kaushik A, Patra P, HOD P, Dolphin P (2014) Upper extremity and neck disability in male hairdressers with concurrent changes in pinch strength: an observational study. age 4: 46–52.
29. Phedy P, Gatam L (2016) Prevalence and Associated Factors of Musculoskeletal Disorders among Young Dentists in Indonesia. Malaysian orthopaedic journal 10: 1–5.
30. Skillgate E, Vingård E, Josephson M, Holm LW, Alfredsson L (2009) Is smoking and alcohol consumption associated with long-term sick leave due to unspecific back or neck pain among employees in the public sector? Results of a three-year follow-up cohort study. Journal of rehabilitation medicine 41: 550–556. https://doi.org/10.2340/16501977-0370 PMID: 19543666
31. Kebede Deyyas W, Tafese A (2014) Environmental and organizational factors associated with elbow/forearm and hand/wrist disorder among sewing machine operators of garment industry in Ethiopia. Journal of environmental and public health 2014: 1–9.
32. Alshagga MA, Nimer AR, Yan LP, Ibrahim IAA, Al-Ghamdi SS, Al-Dubai SAR (2013) Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian Medical College. BMC research notes 6: 1–7. https://doi.org/10.1186/1756-0500-6-1
33. Tafese A, Nega A, Kifle M, Kebede W (2014) Predictors of occupational exposure to neck and shoulder musculoskeletal disorders among sewing machine operators of garment industries in Ethiopia. Science Journal of Public Health 2: 577–583.
34. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. (1987) Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Applied ergonomics 18: 233–237. PMID: 15676628
35. Solis-Soto MT, Schön A, Solis-Soto A, Parra M, Radon K (2017) Prevalence of musculoskeletal disorders among school teachers from urban and rural areas in Chuquisaca, Bolivia: a cross-sectional study. BMC musculoskeletal disorders 18: 1–7. https://doi.org/10.1186/s12891-016-1361-8
36. Abebaw T, Weldegebriel MK, Gebremichael B, Abaerei AA (2018) Prevalence and Associated Factors of Low Back Pain Among Teachers Working at Governmental Primary Schools in Addis Ababa, Ethiopia: A Cross Sectional Study. Biomedical Journal of Scientific and Technical Research 10: 1–6.
37. Macdonald S, MacIntyre P (1997) The generic job satisfaction scale: Scale development and its correlates. Employee Assistance Quarterly 13: 1–16.
38. Shukla A, Srivastava R (2016) Development of short questionnaire to measure an extended set of role expectation conflict, coworker support and work-life balance: The new job stress scale. Cogent Business & Management 3: 1–19.
39. Von Korff M, Ormel J, Keefe FJ, Dworkin SF (1992) Grading the severity of chronic pain. Pain 50: 133–149. PMID: 1408309
40. Bradshaw L, Harris-Roberts J, Bowen J, Rahman S, Fishwick D (2011) Self-reported work-related symptoms in hairdressers. Occupational medicine 61: 328–334. https://doi.org/10.1093/occmed/kqr089 PMID: 21831817
41. Emmanuel NM, Ezhilarasu P, Bheemarao AB (2015) Low Back Pain among Nurses in a Tertiary Hospital, South India. Journal of Osteoporosis and Physical Activity 3: 1–3.
42. Okunribido OO, Wynn T, Lewis D (2011) Are older workers at greater risk of musculoskeletal disorders in the workplace than young workers?–A literature review. Occupational Ergonomics 10: 53–68.
43. Health and Safety Executive (2010. Available at: http://www.hse.gov.uk/research/rrpdf/rr799.pdf. Accessed on 24 October 2018) Ageing and work-related musculoskeletal disorders:A review of the recent literature.
44. Erick PN, Smith DR (2011) A systematic review of musculoskeletal disorders among school teachers. BMC Musculoskelet Disord 12: 1–11. https://doi.org/10.1186/1471-2474-12-1