Prevalence of Occupational Related Upper and Low Back Musculoskeletal Disorders in Ethiopia: Systematic Review and Meta-Analysis

Dechasa Adare Mengistu (Dechasa.Adare@haramaya.edu.et)
Haramaya University College of Health and Medical Sciences  https://orcid.org/0000-0002-0076-5586

Yohannes Mulugeta Demmu
Haramaya University College of Health and Medical Sciences

Research article

Keywords: Back pain, Low back pain, Musculoskeletal disorders, Occupational health, Upper back pain, Ethiopia.

DOI: https://doi.org/10.21203/rs.3.rs-257589/v1

License: ©  This work is licensed under a Creative Commons Attribution 4.0 International License.  Read Full License
Abstract

**Background**: Occupational related musculoskeletal disorders (MSDs) are a major public health problem and result in the growing demands of healthcare service utilization, causing temporary and permanent disability and reduced quality of life. In developing countries, particularly in Ethiopia, there is no adequate evidence on the overall prevalence of occupational-related MSDs and remains less prioritized and empirically unrepresented. Thus, this study aimed to determine the pooled prevalence of occupational-related musculoskeletal disorders, particularly low and upper back musculoskeletal disorders in Ethiopia.

**Methods**: This systematic review and meta-analysis considered studies conducted in Ethiopia, written in the English language, and published from 2017-2020. The articles were searched using the following electronic databases such as Web of Science, SCOPUS, PubMed, Google Scholar, CINAHL, Cochrane Library, African Index Medicus, African Journals Online database, and Science direct using a combination of Boolean logic operators, Medical Subject Headings, and main keywords. Quality assessment of the articles was done using the Joanna Briggs Institute Critical Appraisal tools to determine the relevance of articles to the study.

**Results**: The current study found the pooled prevalence of occupational-related upper back pain and low back pain in the previous one year was 27.1% [95% of CI: 18.4, 37.9%] and 54.2% [95% of CI: 48.2, 60.0%] respectively. However, the pooled prevalence of occupational-related upper back pain in the previous one year after subgroup analysis based on publication year, study population, and study area was 43.8% [95% of CI: 39.3, 47.7%], 34.7%[95% of CI: 33.1, 36.2%] and 36.2% [95% of CI: 33.6, 39.0%] respectively while the pooled prevalence of occupational-related low back pain in previous one year based on subgroup analysis by publication year, study population, and study area was 61.8% [95% of CI: 58.9, 64.6%], 52.8% [95% of CI: 51.3, 54.3%] and 55.2% [95% of CI: 51.4, 59.0%] respectively.

**Conclusion**: This systematic review and meta-analysis found that, more than half of the included study participants were experienced low back pain in the previous year, whereas more than one-fourth of the included participants were experienced upper back pain. Thus, applying occupational health and safety practices in the working environment plays an important role in reducing work-related MSDs and other occupational hazards.

1. **Background**

Musculoskeletal disorders (MSDs) are impairments of the body affecting various body parts such as muscles, tendons, ligaments, joints, nerves, bones, and blood circulation system [1, 2] and characterized by various symptoms such as pain, ache, and discomfort [3,4]. Workers involved in various occupational settings such as health care, driving, manufacturing, general labor, maintenance or repairing, and cleaning are at the highest risk of MSDs [5].

Occupational related MSDs are an important public health problem that affects the neck, shoulders, elbows, wrists, hands, upper back, low back, hips, knees, ankles, and feet [6–10]. Furthermore, occupational-related MSDs result in growing demands of healthcare service utilization, causing temporary and permanent disability, and reduced quality of life [11, 12].

Globally, occupational-related MSDs are among the most common leading causes of worker complaints [13]. According to the Global Burden of Disease report, 2016, musculoskeletal disorders were the leading cause of disability-adjusted life years [14] with a double burden of economic costs and healthcare needs as well as a major social problem [15]. Annually, more than 2.3 million people die from an occupational injury or related diseases [16, 17]. In developing countries where there is poor awareness of ergonomics issues, lack of adequate training, and problems are underreported, occupational-related MSDs have been increased [18].
Furthermore, health and safety procedures are often disregarded, and infrastructure and preventive measures are poor in developing countries [19]. In developing countries, occupational-related MSDs remain less prioritized and empirically unrepresented [20] and only five to ten percent of workers get access to basic occupational health services [21].

There are many studies conducted on occupational-related MSDs such as upper and low back pain in different occupational settings in Ethiopia [22, 23, 29–48]. However, no study that provides adequate evidence on the overall pooled prevalence of upper and low back MSDs that can be important for policymakers, the federal Ministry of Health, and for a better understanding of the current evidence on the prevalence of upper and low back MSDs in Ethiopia. Thus, this study aimed to determine the pooled prevalence of occupational-related upper and low back musculoskeletal disorders among the working population in Ethiopia.

2. Methods

This study included articles that reported the prevalence of low back pain or/and upper back pain musculoskeletal disorders in the previous one year. This study was conducted under the Preferred Reporting Items for the Systematic Reviews and Meta-Analysis (PRISMA) guidelines [24].

2.1 Eligibility Criteria.

The articles that met predetermined inclusion criteria were included in the systematic review and meta-analysis. A cross-sectional study design conducted in Ethiopia from 2017 to 2020 that provided quantitative outcomes (magnitude, frequency, or prevalence) of low and/or back musculoskeletal disorders in the last twelve months was included in this study. Furthermore, the study included full-text articles written in the English language and published in peer-reviewed journals from 2017 to 2020.

2.2 Information Sources and Search Strategy.

The searches were focused on keywords of the systematic review and meta-analysis through search strategies such as Web of Science, SCOPUS, PubMed, Google Scholar, CINAHL, Cochrane Library, African Index Medicus and African Journals Online databases and Science Direct. The articles were searched using a combination of Boolean logic operators (AND, OR, and NOT), Medical Subject Headings (MeSH), and major keywords.

The following is a search term, the authors (DA. Mengistu and YM. Demmu) used in the initial searching of articles: "Prevalence "OR "Magnitude" AND "Occupational-related" OR "Work-related" AND "Musculoskeletal" OR "Low back" OR "Upper back" AND "Disorders" OR "Disease" OR "Problems" OR "Pain" OR "Injury" AND "Working group" OR "Working population" OR "Workers" AND "Ethiopia". Furthermore, the manual searching was made to cover the search missed from the electronic databases.

Finally, all identified keywords and an index term were checked by the authors (DA. Mengistu and YM. Demmu) across the included electronic databases. The last search was done on 12 October 2020.

2.3 Study Selection

After searching, duplicated articles were removed using the ENDNOTE software version X5 (Thomson Reuters, USA). The authors (DA. Mengistu and YM. Demmu) screened the titles and abstracts of the identified articles by applying the predetermined inclusion and exclusion criteria. Finally, the systematic review included articles conducted in Ethiopia and published from 2017 to 2020 that reported the last one-year prevalence of occupational-related musculoskeletal disorders (low and upper back pain) in different occupational settings.

2.4 Data Extraction and Quality Assessment
The authors (DA. Mengistu and YM. Demmu) independently extracted the required data from the eligible articles. The relevant data required for the study under the following headings: author; publication year; sample sizes, study area/region; study design, and primary outcomes of interest were extracted using a Microsoft Excel, 2016 format.

The quality of each article was assessed to evaluate and to confirm the relevance of the articles to the study. The selected articles were subjected to a rigorous and independent appraisal using standardized critical appraisal tools, Joanna Briggs Institute (JBI) Critical Appraisal tools [25] to determine the quality and relevance of the articles. Then the score was taken across all studies and graded as high (85% and above score), moderate (60–85% score), and low (< 60% score) quality. Disagreements made between authors (DA. Mengistu and YM. Demmu) were solved by discussion after repeating the same procedure.

2.5 Data Analysis and Statistical Procedures.

The pooled prevalence of occupational-related low and upper back musculoskeletal disorders in the previous one year was done using Comprehensive Meta-Analysis (CMA) version 3.0 statistical software. The forest plot and random-effects model were used to determine the pooled prevalence of selected musculoskeletal disorders in the previous year.

The publication bias of included articles was evaluated using funnel plots and a P-value of less than 0.05 was considered as the evidence for publication bias. Furthermore, the subgroup analysis based on the publication year, occupation categories/population, and the study region was done to minimize the random variations between the point estimates of the included articles. Finally, the characteristics of the included articles were presented using texts, tables, and graphs.

2.6 Heterogeneity

Cochran's Q test (Q) and I Squared test ($I^2$ statistics) were used to evaluate the heterogeneity among the included articles. $I^2$ statistics is the proportion of the variation in the estimates of prevalence due to genuine variation in prevalence [26, 27]. The level of heterogeneity was divided into four categories; no heterogeneity (0%), low (25–50%), moderate (50–75%), and high (greater than 75%). [28]. Furthermore, subgroup analysis and meta-regression were used to determine the heterogeneity in the prevalence of MSDs based on the years of publication, occupation/study population, and study areas.

3. Results

3.1 Study Selection

About 1114 articles, editorials, and reports were searched through electronic databases such as Web of Science, SCOPUS, PubMed, Google Scholar, CINAHL, Cochrane Library, African Index Medicus, African Journals Online databases and Science direct from 10 September to 12 October 2020. Following the searching of articles, 285 duplicated articles were excluded. Furthermore, 706 articles were excluded after initial screening, and 35 articles excluded after full-text articles were assessed for eligibility, of which 20 articles were included in the systematic review and meta-analysis (Fig. 1).

3.2 Characteristics of Included Articles

In this study, a total of 9,410 participants were included in 20 articles conducted in Ethiopia and published from 2017 to 2020 [29–48]: 9 (45.0%) articles [30, 32, 38, 39, 41, 43, 44, 47, 48] conducted in Oromia, three (15%) in Tigray [31, 36, 45], three (15%) in SNNP [29, 34, 35], three (15%) articles in Addis Ababa [33, 40, 46], two (10%) articles in Amhara regional state. All included studies were cross-sectional studies with a sample size ranging from 264 [45] to 771[40] study participants.
Among the included articles, 10 (50%) [30, 33, 34, 36, 37, 39, 40, 42, 43, 47] of the included articles were reported the prevalence of both low back pain and upper back pain, 9 (45%) articles [29, 31, 32, 35, 41, 44–46, 48] reported the prevalence of low back pain alone and 1 (5%) [38] reported the prevalence of upper back pain alone.

Furthermore, 8 (40%) included articles were published in 2020 [29, 31, 32, 34, 44–47], followed by studies published in 2019 [36–38, 41–43] that accounted 6 (30%) of the included articles. Based on JBI Critical Appraisal tool [25], all of the included articles had a low risk of bias. The occupational-related prevalence of low and upper back pain in the previous one year ranged from 25.5% [41] to 74.8% [36] and 10.4% [29] to 60.4% [35] respectively (Table 1).
Table 1: Overall characteristics of included articles in the systematic review and meta-analysis, 2020.

| Author            | Publication year | Study year | Sample size | Study design       | Low back pain (%) | Upper back pain (%) | Population          | Region     | Reference |
|-------------------|------------------|------------|-------------|--------------------|-------------------|---------------------|---------------------|------------|-----------|
| Tamene et al      | 2020             | 2019       | 344         | Cross-sectional    | 62.8              | 10.4                | Vehicle Repair Workers | SNNP       | [29]      |
| Tafese et al      | 2018             | 2015       | 422         | Cross-sectional    | 64.9              | NA                  | Industry workers     | Oromia     | [30]      |
| Kibret et al      | 2020             | 2018       | 307         | Cross-sectional    | 40.4              | 33.6                | Bank workers         | Tigray     | [31]      |
| Hailu et al       | 2020             | 2018       | 412         | Cross-sectional    | 35.9              | 15.8                | Industry workers     | Oromia     | [32]      |
| Wanamo et al      | 2017             | 2015       | 422         | Cross-sectional    | 64.2              | NA                  | Industry workers     | Addis Ababa | [33]      |
| Fanta et al       | 2020             | 2017       | 625         | Cross-sectional    | 38.4              | NA                  | Civil service workers | SNNP       | [34]      |
| Henok and Bekele  | 2017             | 2016       | 422         | Cross-sectional    | 67.3              | 60.4                | Pedestrian back-loading women | SNNP       | [35]      |
| Kebede et al      | 2019             | 2015       | 611         | Cross-sectional    | 74.8              | NA                  | Teachers             | Tigray     | [36]      |
| Yosef et al       | 2019             | 2018       | 400         | Cross-sectional    | 65.0              | NA                  | Truck Drivers        | Oromia     | [37]      |
| Mekonnen et al (a)| 2019             | 2018       | 417         | Cross-sectional    | NA                | 38.8                | Barbers              | Amhara     | [38]      |
| Olana             | 2018             | 2017       | 660         | Cross-sectional    | 58.2              | NA                  | Industry workers     | Oromia     | [39]      |
| Abebaw, et al     | 2018             | 2016       | 771         | Cross-sectional    | 44.0              | NA                  | Teachers             | Addis Ababa | [40]      |
| Lette, et al.     | 2019             | 2017       | 410         | Cross-sectional    | 25.5              | 15.7                | Construction workers | Oromia     | [41]      |
| Mekonnen (a)      | 2019             | 2017       | 429         | Cross-sectional    | 55.7              | NA                  | Barbers              | Amhara     | [42]      |
| Mekonnen (b)      | 2019             | 2017       | 418         | Cross-sectional    | 63.6              | NA                  | Nurses               | Oromia     | [43]      |
| Mekonnen et al (b)| 2020             | 2019       | 652         | Cross-sectional    | 53.2              | 50.4                | Hairdressers         | Oromia     | [44]      |
| Melese et al      | 2020             | 2019       | 264         | Cross-sectional    | 34.8              | 17.0                | Cleaners             | Tigray     | [45]      |
| Dagne et al       | 2020             | 2016–2017  | 755         | Cross-sectional    | 54.3              | 35.4                | Bank workers         | Addis Ababa | [46]      |

*Keys: NA: Not Applicable; SNNP: Southern Nations, Nationalities, and Peoples*
### 3.3 Prevalence of Musculoskeletal Disorders

The meta-analysis was conducted using the Comprehensive Meta-Analysis (CMA) Version 3 statistical package (software) to determine the pooled prevalence of occupational-related low back and upper back musculoskeletal disorders in Ethiopia.

#### 3.3.1 Prevalence of Upper Back Pain

##### 3.3.1.1 Overall Pooled Prevalence of Upper Back Pain

The pooled prevalence of occupational-related upper back pain in the previous one year was 27.1% with 95% CI of 18.4 to 37.9%; $I^2 = 98.029\%$ with $p$-value $< 0.001$ (Fig. 2).

##### 3.3.1.2 Subgroup Analysis of Prevalence of Upper Back Pain by Study Population

Based on the subgroup analysis of prevalence by the study population, the lowest prevalence [10.4% (95% CI: 7.6, 14.1%)] with a $p$-value $< 0.001$ of occupational-related upper back pain in the previous one year was reported among vehicle repair workers whereas the highest prevalence [60.4% (95% CI: 55.7, 65.0%)] with a $p$-value of $< 0.001$ was reported among pedestrian back-loading women.

Furthermore, after subgroup analysis was done based on the study population, the overall pooled prevalence of occupational-related upper back pain in the previous one year was 34.7% (95% CI: 33.1, 36.2% with $P$-value of $< 0.001$) (Fig. 3).

##### 3.3.1.3 Prevalence of Upper Back Pain by Publication Year

Based on a subgroup analysis of prevalence by year of publication, the lowest [15.3% (95% CI: 11.7%, 19.8%)] with a $p$-value of $< 0.001$ prevalence of occupational-related upper back pain in the previous one year was reported in the study published in 2018 whereas the highest prevalence [60.4%, (95% CI: 55.7, 65.0%) with a $p$-value of $< 0.001$] was observed in the study published in 2017.

After the subgroup analysis was done based on the year of publication, the overall pooled prevalence of occupational related upper back pain in the previous one year was 43.8 % with 95% CI: 39.9, 47.7%) and a $p$-value of $= 0.002$ (Fig. 4).

#### 3.3.1.4 Prevalence of Upper Back Pain by Study Areas (Region)
Based on the subgroup analysis by study region, the lowest pooled prevalence [22.1% (95% CI: 9.2%, 44.5%) with a p-value = 0.017] of occupational-related upper back pain in the previous one year was reported among the studies conducted in the Oromia regional state while the highest prevalence [38.8%, (95% CI: 34.2, 43.6%) with a p-value of < 0.001] was reported by the study conducted in Amhara regional state.

Furthermore, after the subgroup analysis was done based on the study region, the overall pooled prevalence of occupational-related upper back pain was 36.2 % with 95% CI: 33.6, 39.0%) and a p-value of < 0.001] (Fig. 5).

3.3.2 Prevalence of Occupational-Related Low Back Pain

3.3.2.1 Overall Prevalence of Low Back Pain

The pooled prevalence of occupational-related low back pain in the previous one year was 54.2% with 95% CI of 48.2, 60.0 with p-value of 0.173 and $I^2 = 96.78\%$ with a P-value < 0.001 (Fig. 6).

3.3.2.2 Prevalence of Low Back Pain Based on Study Population

Based on the subgroup analysis of prevalence by the study population, the lowest prevalence [25.5% (95% CI: 21.5, 29.9%) with a p-value < 0.001] of occupational-related low back pain in the previous one year was reported among construction workers whereas the highest prevalence [67.3% (95% CI: 62.7, 71.6%) with a p-value of < 0.001] was reported among pedestrian back-loading women.

Furthermore, after subgroup analysis was done based on study population or participants, the overall pooled prevalence of occupational-related low back pain in the previous one year was 52.8% (95% CI: 51.3, 54.3% with a P-value of < 0.001] (Fig. 7).

3.3.2.3 Prevalence of Low Back Pain Based on Year of Publication

After a subgroup analysis was done based on the year of publication, the lowest pooled prevalence [46.9% (95% CI: 39.9, 54.0%)] of occupational-related low back pain in the previous one year was reported among studies published in 2020 whereas the highest pooled prevalence [65.7%, (95% CI: 62.5, 68.9%) with a p-value of < 0.001] was observed among studies published in 2017.

Furthermore, after the subgroup analysis was done based on the year of publication, the overall pooled prevalence of occupational-related low back pain in the previous one year was 61.8 % with 95% CI: 58.9, 64.6%) and a p-value < 0.001] (Fig. 8).

3.3.2.4 Prevalence of Low Back Pain by Study Areas (Region)

Based on the subgroup analysis of the pooled prevalence of occupational-related low back pain by study region, the lowest pooled prevalence [50.7% (95% CI: 25.0, 76.0%)] was reported among the studies conducted in Tigray regional state whereas the highest prevalence [56.3%, (95% CI: 37.1, 73.9%)] was reported among the studies conducted in Southern Nations, Nationalities, and Peoples.
Furthermore, after the subgroup analysis of the prevalence of low back pain was done by the study region, the overall pooled prevalence of occupational-related low back pain was 55.2 % with 95% CI: 51.4, 59.0%) and a p-value of a = 0.007 (Fig. 9).

3. Discussion

The current study was conducted to determine the pooled prevalence of occupational-related musculoskeletal disorders; lower back and upper back pain in the previous one year in Ethiopia based on previously (2017–2020) published articles. In this study, a total of 9,410 of the study participants regardless of their occupation categories, were included in 20 articles conducted in Ethiopia [29–48].

Musculoskeletal disorders are the leading causes of loss of productivity and employee absenteeism and affect the quality of life [49, 50]. The study found the prevalence of low back pain among various groups of the working population of Ethiopia ranged from 25.5–67.3% that was lower than the finding of another study conducted in Saudi Arabia and found the prevalence of lower back pain in different professional groups ranged from 64% and 89% [51].

Furthermore, the current found pooled prevalence of occupational-related low back pain accounted 54.2% [95% of CI: 48.2, 60.0%] that was relatively smaller than the pooled prevalence of low back pain in Africa accounted 57% [52]. The difference may be related to the scope of the study or variation in the implementation of occupational health safety practices or low awareness on occupation health issues.

The pooled prevalence of low back pain was increased to 61.8% [95% CI: 58.9, 64.6%] and 55.2% [95% CI: 51.4, 59.0%] after the subgroup analysis based on publication year and study area respectively. However, the prevalence of low back pain was decreased to 52.8% [95% CI: 51.3, 54.3%] based on the subgroup analysis by study participants/population.

There was variation in the prevalence of low back pain among different study populations or occupations. The variation may be due to the difference in an occupation or working environment or a difference in the implementation of occupational health and safety practices. For example, the current study found the prevalence of occupational-related low back pain among nurses in the previous last year accounted for 65.4% that was relatively consistent with work done in Saudi Arabia and Iran that found 65.0% and 61.2% prevalence of low back pain respectively [50, 53].

On the other hand, the current study found the pooled prevalence of occupational-related upper back pain in the previous one-year account 27.1% [95% CI of 18.4 to 37.9%]. However, the pooled prevalence of upper back pain was increased to 43.8% [95% CI: 39.3, 47.7%], 34.7% [95% CI: 33.1, 36.2%] and 36.2% [95% CI: 33.6, 39.0%] after sub-group analysis of the prevalence of upper back pain based on publication year, study participants, and study area respectively. The highest prevalence (60.4%) of work-related upper back pain was reported among pedestrian backloading women, followed by the prevalence (50.4%) reported among hairdressers, while the lowest prevalence (10.4%) was reported among vehicle repair workers. The variation may be related to the variation in activities or workload or working time or nature of the work or availability and implementation of occupational health safety services.

In general, the current study found that at least one out of four study participants experienced work-related upper back musculoskeletal disorders, whereas one out of two participants experienced work-related low back pain regardless of the occupation categories. Thus, the implementation of occupational health and safety practices such as engineering control, administrative control, and the use of personal protectives in the working environment plays an important role in reducing these problems [53, 54].
Limitations

There was an unequal distribution of the occupations among the included articles. On the other hand, the prevalence of MSDs in some regions of Ethiopia was not covered because of the lack of studies in those regions.

Conclusions

Occupational related musculoskeletal disorders continue to have a potential impact on worker's health, productivity, and quality of life worldwide. This systematic review and meta-analysis found that more than half of the included participants experienced low back pain at least once a time in the previous one year, whereas more than one-fourth of the included participants experienced upper back pain. Thus, applying occupational health and safety practices in the working environment plays an important role in reducing these problems.

Abbreviations

CDC: Centers for Disease Control and Prevention; CMA: Comprehensive Meta-Analysis; JBI: Joanna Briggs Institute; MSDs: Musculoskeletal Disorders; PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analysis; SNNP: Southern Nations, Nationalities, and Peoples.

Declarations

Ethics Approval and Consent to Participate.

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Materials.

Almost all data are included in this study. However, additional data will be available from the corresponding author on reasonable request. PRISMA-P (Preferred Reporting Items for Systematic Review and Meta-Analysis) 2015 checklist is one of the recommended items to address in a systematic review and Meta-analysis.

Competing Interests.

The authors declare that they have no competing interests in this work.

Funding

This review did not receive any grants/funds

Authors’ Contributions

DA. Mengistu conceived the idea and had major roles in the data review, extraction, and analysis, writing, drafting, and editing of the manuscript. YM. Demmu has contributed to data extraction, analysis, and editing. Finally, the authors (DA. Mengistu, YM. Demmu) read and approved the final version of the manuscript to be published and agreed on all aspects of this work.

Acknowledgments
We would like to extend our deepest thanks to Haramaya University, Department of Environmental Health staff for providing their constructive support.

References

1. Roquelaure Y, Bodin J, Descatha A, Petit A. Musculoskeletal disorders: how to recognize them as occupational diseases. La Revue du praticien. 2018 Dec 1;68(10):1132-4.

2. da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: A systematic review of recent longitudinal studies. Am J Ind Med. 2010 Mar;53(3):285–323. doi:10.1002/ajim.20750.

3. Al-Hourani Z, Nazzal M, Khader Y, Almhdawi K, Bibars AR. Work-related musculoskeletal disorders among Jordanian dental technicians: Prevalence and associated factors. Work. 2017 Jan 1;56(4):617 – 23.

4. Bethge M. Work-Related Medical Rehabilitation. Rehabilitation (Stuttg). 2017 Feb;56(1):14–21.

5. European Agency for Safety and Health at Work. OSH infigures Work-Related Musculoskeletal Disorders in the EU European Risk Observatory Report,” European Agency for Safety and Health at Work, vol. 82, no. 6, p. 14, Bilbao, Spain, 2013.

6. Akrouf QAS, Crawford JO, Al Shatti AS. Musculoskeletal disorders among bank office workers in Kuwait. Eastern Mediterranean Health Journal. 2010;16(1):94–100.

7. Abledu JK, Abledu GK. Multiple logistic regression analysis of predictors of musculoskeletal disorders and disability among bank workers in Kumasi. Ghana J Ergonomics. 2012;2(111):2.

8. Stanley M, Rebecca DW, Kunaba I. Prevalence and patterns of work-related musculoskeletal disorders among bankers in maiduguri, northeast Nigeria. Occupational Medicine Health Affairs. 2014;2:1–6.

9. Kotwani SK, Sinha N, Panhale V. “Prevalence of musculoskeletal discomfort in bank employees,” International Journal of Innovative Research in Medical Science, vol. 4, no. 1, 2019.

10. Ruhul MD, Sarder M, Sumaiya ZE, et al. The prevalence of computer related musculoskeletal disorders among bankers of Dhaka city. Chattagram Maa-O-Shishu Hospital Medical College Journal. 2016;15(1):40–4.

11. Berberoğlu U, Tokuç B. Work-related musculoskeletal disorders at two textile factories in Edirne, Turkey. Balkan medical journal. 2013 Mar;30(1):23. https://doi.org/10.5152/balkanmedj.2012.069.

12. Huisstede BM, Bierma-Zeinstra SM, Koes BW, Verhaar JA. Incidence and prevalence of upper-extremity musculoskeletal disorders. A systematic appraisal of the literature. BMC musculoskeletal disorders. 2006 Dec 1;7(1):7. https://doi.org/10.1186/1471-2474-7-1.

13. Lima TM, Coelho DA. Prevention of musculoskeletal disorders (MSDs) in office work: a case study. Work. 2011;39(4):397–408.

14. Briggs AM, Woolf AD, Dreinhöfer K, Homb N, Hoy DG, Kopansky-Giles D, Åkesson K, March L. Reducing the global burden of musculoskeletal conditions. Bull World Health Organ. 2018;96(5):366–8.

15. Chang JH, Wu JD, Liu CY, et al. Prevalence of musculoskeletal disorders and ergonomic assessments of cleaners. Am J Ind Med. 2012;55(7):593–604. doi:10.1002/ajim.22064.

16. ILO. The prevention of occupational diseases Geneva: International Labour office; 2013.

17. ILO. Global trends on occupational accidents and diseases. World day for safety and health at work. 2015:1–2.

18. Abraha TH, Demoz AT, Moges HG, Ahmmed AN. Predictors of back disorder among Almeda textile factory workers, North Ethiopia. BMC research notes. 2018 Dec 1;11(1):304. https://doi.org/10.1186/s13104-018-3440-4.

19. Lucchini RG, London L. Global occupational health: current challenges and the need for urgent action. Annals Global Health. 2014;80(4):251–6.
20. Woolf AD, Brooks P, Åkesson K, Mody GM. Prevention of musculoskeletal conditions in the developing world. Best Pract Res Clin Rheumatol. 2008;22(4):759–72.

21. Hogstedt C, Pieris B: Occupational Safety and Health in Developing Countries. Review of strategies, case studies and a bibliography. 2000. Available at: https://pdfs.semanticscholar.org/ce5e/7a0fe556f67e5e5da0867fcbb2e36298a1b7.pdf. Accessed on 10 August 2019.

22. Kebede Deyyas W, Tafese A. 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;2014.

23. Wami SD, Dessie A, Chercos DH. The impact of work-related risk factors on the development of neck and upper limb pain among low wage hotel housekeepers in Gondar town, Northwest Ethiopia: institution-based cross-sectional study. Environmental health and preventive medicine. 2019 Dec 1;24(1):27.

24. Group PRISMA-P, Moher D, Shamseer L, et al., “Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement,” Systematic Reviews, vol. 4, no. 1, 2015.

25. The Joanna Briggs Institute. Critical appraisal tools for use in the JBI systematic reviews checklist for prevalence studies: The University of Adelaide. Available from: https://joannabriggs.org/sites/default/files/2019-05/JBICriticalAppraisalChecklist_for_Prevalence_Studies2017_0.pdf.

26. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. Stat Med. 2002;21(11):1539–58.

27. Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. JAMA. 2000;283(15):2008–12.

28. Ades AE, Lu GHJ. The interpretation of random-effects metaanalysis in decision models. Med Decis Mak. 2005;25:646–54.

29. Tamene A, Mulugeta H, Ashenafi T, Thygerson SM. Musculoskeletal Disorders and Associated Factors among Vehicle Repair Workers in Hawassa City, Southern Ethiopia. Journal of Environmental and Public Health. 2020 May 7;2020. https://doi.org/10.1155/2020/9472357.

30. Tafese A, Kebede G, Shibru A, Benti T. Work-related Low Back Pain among Garment Industry Workers in Eastern Oromia Region, Ethiopia, ijoh.tums.ac.ir. IJOH. 2018;10:1–6.

31. Kasaw Kibret A, Fisseha Gebremeskel B, Embaye Gezae K, Solomon Tsegay G. Work-Related Musculoskeletal Disorders and Associated Factors Among Bankers in Ethiopia, 2018. Pain Research and Management. 2020 Sep 8;2020., https://doi.org/10.1155/2020/8735169.

32. Getahun WHailuM, Mohammed A, Nurahmed N. Zemachu Ashuro Shemus Kedir, Ansha Nega, Yared Mamushet. Assessment of back pain and disability status among automotive industry workers, in Ethiopia. Int J Sci Rep. 2020 Aug;6(8):301–309. DOI: http://dx.doi.org/10.18203/issn.2454-2156.IntJSciRep20203113.

33. Wanamo ME, Abaya SW, Aschalew AB. Prevalence and risk factors for low back pain (LBP) among taxi drivers in Addis Ababa, Ethiopia: a community based cross-sectional study. Ethiopian Journal of Health Development. 2017;31(4):244–50.

34. Fanta M, Alagaw A, Kejela G, Tunje A. Low back pain and associated factors among civil service sectors office workers in Southern Ethiopia. International Journal of Occupational Safety Health. 2020 Jul;5(1):53–63. 10(

35. Henok A, Bekele T. Prevalence of musculoskeletal pain and factors associated with kyphosis among pedestrian back-loading women in selected towns of Bench Maji zone, Southwest Ethiopia. Ethiopian Journal of Health Development. 2017;31(2):103–9.

36. Kebede A, Abebe SM, Woldie H, Yenit MK. Low Back Pain and Associated Factors among Primary School Teachers in Mekele City, North Ethiopia: A Cross-Sectional Study. Occupational therapy international. 2019 Jul 8;2019. https://doi.org/10.1155/2019/3862946.
37. Yosef T, Belachew A, Tefera Y. Magnitude and contributing factors of low back pain among long distance truck drivers at Modjo dry port, Ethiopia: a cross-sectional study. Journal of environmental and public health. 2019 Sep 22;2019. https://doi.org/10.1155/2019/6793090.

38. Mekonnen TH, Abere G, Olkeba SW. Risk factors associated with upper extremity musculoskeletal disorders among barbers in Gondar town, Northwest Ethiopia, 2018: a Cross-sectional study. Pain Research and Management. 2019 Apr 3;2019. https://doi.org/10.1155/2019/6984719.

39. Olana AT. Occupational Risk Factors of Low Back Pain among Ammunition Engineering Industry in West Shoa Zone, Ethiopia, 2017. Journal of Medicine Physiology Biophysics. 2018;45:31–6.

40. Abebaw TA, Weldegebriel MK, Gebremichael B, Abaerei AA. 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. 2018;1:6. DOI: 10.26717/ BJSTR.2018.10.001886.

41. Lette A, Hussen A, Kumbi M, Nuriye S, Lamore Y. Musculoskeletal Pain and Associated Factors among Building Construction Workers in Southeastern Ethiopia. Ergonomics Int J. 2019;3(5):000214.

42. Mekonnen TH. 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. 2019 Jul 22;14(7):e0220035. https://doi.org/10.1371/journal.

43. Mekonnen TH. Work-related factors associated with low back pain among nurse professionals in east and west Wollega zones, Western Ethiopia, 2017: a cross-sectional study. Pain and therapy. 2019 Dec 1;8(2):239 – 47. https://doi.org/10.1007/s40122-019-0129-x.

44. Mekonnen TH, Kekeba GG, Azanaw J, Kabito GG. Prevalence and healthcare seeking practice of work-related musculoskeletal disorders among informal sectors of hairdressers in Ethiopia, 2019: findings from a cross-sectional study. BMC Public Health. 2020 Dec;20:1–0. https://doi.org/10.1186/s12889-020-08888-y.

45. Melese H, Gebreyesus T, Alamer A, Berhe A. Prevalence and associated factors of musculoskeletal disorders among cleaners working at Mekelle University, Ethiopia. Journal of Pain Research. 2020;13:2239–46.

46. Dagne D, Abebe SM, Getachew A. Work-related musculoskeletal disorders and associated factors among bank workers in Addis Ababa, Ethiopia: a cross-sectional study. Environ Health Prev Med. 2020 Dec;25(1):1–8. https://doi.org/10.1186/s12199-020-00866-5.

47. Tolera ST, Kabeto SK. Occupational-Related Musculoskeletal Disorders and Associated Factors among Beauty Salon Workers, Adama Town, South-Eastern Ethiopia, 2018. J Ergonomics. 2020;9:257. doi:10.35248/2165-7556.20.9.257.

48. Regassa TM, Lema TB, Garmomsa GN. Work Related Musculoskeletal Disorders and Associated Factors among Nurses Working in Jimma Zone Public Hospitals, South West Ethiopia. Occup Med Health Aff. 2018;6:279. DOI:10.4172/2329-6879.1000279.

49. Stewart WF, Ricci JA, Chee E, Morganstein D, Lipton R. Lost productive time and cost due to common pain conditions in the US workforce. JAMA. 2003;290(18):2443–54.

50. Al Amer HS. Low back pain prevalence and risk factors among health workers in Saudi Arabia: A systematic review and meta-analysis. J Occup Health. 2020;62:e12155. https://doi.org/10.1002/1348-9585.12155.

51. Aldera MA, Alexander CM, McGregor AH. Prevalence and Incidence of Low Back Pain in the Kingdom of Saudi Arabia: A Systematic Review. Journal of Epidemiology and Global Health. 2020. Vo l.10 (4); December (2020), pp.269–275DOI: https://doi.org/10.2991/jegh.k.200417.001.

52. Morris LD, Daniels KJ, Ganguli B, Louw QA. An update on the prevalence of low back pain in Africa: a systematic review and meta-analyses. BMC Musculoskeletal Disorders. 2018 Dec 1;19(1):196. https://doi.org/10.1186/s12891-018-2075-x.
53. Azizpour Y, Delpisheh A, Montazeri Z, Sayehmiri K. Prevalence of low back pain in Iranian nurses: a systematic review and meta-analysis. BMC nursing. 2017 Dec 1;16(1):50. DOI 10.1186/s12912-017-0243-1.

54. CDC. work place health promotion, Work-Related Musculoskeletal Disorders & Ergonomics. https://www.cdc.gov/workplacehealthpromotion/health-strategies/musculoskeletal-disorders/index.html. Last accessed on December, 16, 2020.