

# Occupational Related Upper and Low Back Pain Among Working Population of Ethiopia: Systematic Review and Meta-Analysis

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## Systematic Review

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## Abstract

**Background:** Back pain such as low and upper back pains are among the most common disabling musculoskeletal conditions that can cause a major public health and socio-economic problems. Back pain is one of the leading causes of disability that reduces worker performance, well-being, and increase absence from work, which can cause an enormous economic burden. In developing countries, particularly in Ethiopia, there is no adequate evidence on the overall prevalence of occupational-related low and upper back pains and remain less prioritized and empirically unrepresented. Therefore, this study aimed to determine the prevalence of occupational-related low and upper back pains among the working population of Ethiopia.

**Methods:** This systematic review and meta-analysis considered studies conducted in Ethiopia, written in English language, and published from 2017-2020. Articles were searched from nine electronic databases (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. The quality assessment of the articles was performed using Joanna Briggs Institute Critical Appraisal tools to determine the relevance of the articles to the study. A random effects model was used to estimate the pooled prevalence, 95% confidence interval, and the degree of heterogeneity among the included studies. Sensitivity analyses were performed to identify the influence of outliers and to identify the sources of heterogeneity.

**Results:** Of the 1,114 studies identified from the included databases, 20 studies were included in the systematic review and meta-analysis. The pooled prevalence of occupational-related upper and low back pain in the previous year was 27.1% [95% CI: 18.4, 37.9] and 54.2% [95% CI: 48.2, 60.0], respectively. Based on a subgroup analysis by publication year, study population and countries where the studies are conducted, the prevalence of upper back pain was 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], respectively, while the prevalence of low back pain was 61.8% [95% CI: 58.9, 64.6], 52.8% [95% CI: 51.3, 54.3] and 55.2% [95% CI: 51.4, 59.0], respectively.

**Conclusions:** This systematic review and meta-analysis found that more than half of the included study participants experienced low back pain in the previous year, while more than one-fourth experienced upper back pain. Therefore, implementation of engineering and administrative controls, modifying individual factors, ergonomics, physical examinations and identifying risk factors can reduce back pains.

## Background

The global population is now living longer with consequences related to musculoskeletal conditions (1) that comprised the second highest global volume of years lived with disability (YLD) (1, 2). Approximately 1.71 billion people have musculoskeletal conditions worldwide (3). Among musculoskeletal conditions, back pain is a major cause of disability that reduces worker's performance, well-being and increase absence from work which can cause an enormous economic burden on individuals, families, communities, industry and governments (4-7). It affects the person's mental well-being and productivity, and consequently weakening the economy (5, 8, 9). It is among the most disabling musculoskeletal conditions (1, 10) that pose major threats to health by limiting physical and mental capacities and functional ability (1).

Workers involved in various occupational settings such as health care, driving, manufacturing, general labor, maintenance or repair and cleaning are at the highest risk of back pain (11). According to the European Working Conditions Survey (EWCS), 47 % workers experienced back pain in the past 12 months (12). According to the Health and Safety Executive (HSE), about 1.8 million working days were lost in 2016/17 because of back pain (13) and incurs billions of dollars in medical expenditures each year (14, 15).

Among back pains, low back pain is a work-related disease/injury and leads to a serious social problem, huge workers' compensation and a decline in productivity (9, 16) and drive up costs for workers, companies, and society in general (17, 18). It is still one of the persistent public health challenges around the world (19-21) and the most common type of musculoskeletal disorder (MSD) usually related to work and working conditions (13, 20, 22). It results in increasing demands for the utilization of healthcare services, causing temporary and permanent disability, and reduced quality of life (18, 23). For example, 568 million people experienced low back pain and it caused 64 million YLDs globally (24). Among back pains, low back pain is a work-related disease/injury and leads to a serious social problem, huge workers' compensation and a decline in productivity(16)

In developing countries, where there is poor awareness of ergonomic issues, lack of adequate training and problems are under-reported, occupational-related back pain have increased (25). In Ethiopia, many studies have been reported occupational-related upper and low

back pains in different occupational settings (15, 19, 20, 26-44). To our knowledge, there are limited studies conducted to determine and compare the prevalence of low and upper back pains in the work environments that is crucial to the health and safety issue and to promote the implementation of environmental, ergonomic and organizational interventions.

Thus, this systematic review and meta-analysis aimed to determine the prevalence of occupational-related low and upper back pains among the working population in Ethiopia. This study also provides detailed country-based information on the low and upper back pains, that contribute to the needs. Such figures can serve as the powerful tools to strengthen and integrate the control measures, to prevent low and upper back pains in the working environments.

## Methods

This study included articles that reported the prevalence of low back pain or/and upper back pain in the previous year. The study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol (45).

### *Eligibility criteria.*

#### *Inclusion Criteria*

- i. **Population:** The study reported the prevalence of low and/or upper back pain among the working above or equal to 18 years of age regardless of their occupation
- ii. **Study Design.** Cross-sectional studies
- iii. **Outcome.** Studies that provided quantitative outcomes (magnitude, frequency, proportion or prevalence) in the last 12 months
- iv. **Exposure:** In the work environment or work place
- v. **Study Area.** Studies conducted in Ethiopia
- vi. **Language.** Full-text articles published in the English language.
- vii. **Publication Issue.** Articles published from 2017 to 2020 were included in the study to provide current evidence on the prevalence of low and upper back pains.

#### *Exclusion Criteria:*

Studies that did not report the prevalence of low or upper back pain in the previous year (12 months), case reports, case series, qualitative studies, review articles, surveillance data/reports, conference abstracts, personal opinions, articles written in non- English language, articles had high risk of bias, study not available in full texts and studies published before 2017 were excluded from the study.

#### *Information Sources and Search Strategy*

Articles were searched using electronic databases (Web of Science, SCOPUS, PubMed, Google Scholar, CINAHL, Cochrane Library, African Index Medicus, African Journals Online databases, and Science Direct) using a combination of Boolean logic operators (AND, OR, and NOT), Medical Subject Headings (MeSH), and major keywords.

The following is a search terms that the authors (DAM, AA and YMD) used in the initial search of the 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 search was made to address the articles not covered in the included electronic databases. The reference list of all selected articles was searched for more articles.

All identified keywords and index terms were checked by the authors (DAM, AA and YMD) across the included electronic databases. The last search was done on 12 October 2020.

#### *Study Selection*

After searching, duplicated articles were removed using the ENDNOTE software version X5 (Thomson Reuters, USA). The authors (DAM, AA and YMD) screened the articles based on the titles and abstracts of the identified articles by applying the inclusion and exclusion criteria. Finally, the systematic review and meta-analysis included articles conducted in Ethiopia and published from 2017 to 2020 that

reported the last year's prevalence of low and/or upper back pain in different occupational settings to provide current evidence on the prevalence of low and upper back pains.

### ***Data Extraction and Quality Assessment***

The authors (DAM, AA and YMD) extracted the data from the eligible articles independently. A predefined Microsoft Excel 2016 format was used to extract data from selected studies under the following headings: author, publication year, sample size, study participants, occupation, sex, data collection tool, study region, study design and primary outcomes of interest.

The quality of each article was evaluated to confirm the relevance of the articles to the study. The selected articles were subjected to a rigorous and independent evaluation using standardized critical appraisal tools (JBI Critical Appraisal tools) (46) to determine the quality and relevance of the articles. The score was taken across all studies and graded as high quality (85% and above score), moderate quality (60–85% score) and low quality (<60% score). Disagreement made between the authors (DAM, AA and YMD) was solved by discussion after repeating the same procedure.

### ***Data Analysis and Statistical Procedures.***

The pooled prevalence of occupational-related low and upper back pains in the previous year was performed 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 low and upper back pains in the previous year.

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

### ***Heterogeneity***

The Cochran's Q test (Q) and I Squared test ( $I^2$  statistics) were used to evaluate the heterogeneity between the included articles.  $I^2$  statistics is the proportion of the variation in the estimates of prevalence due to genuine variation in prevalence (47, 48). The level of heterogeneity was classified into four categories; no heterogeneity (0%), low (25– 50%), moderate (50–75%) and high heterogeneity (greater than 75%) (49). Subgroup analysis were performed to determine the heterogeneity in prevalence, based on the years of publication, occupation/study population, study areas and outcomes. Sensitivity analysis were performed to determine the differences in pooled effects by dropping the studies that were found to be influencing the summary estimates. A P-value of < 0.05 was considered as the evidence for publication bias.

## **Results**

### ***Study Selection***

A total of 1,114 articles were searched from the included electronic databases (Web of Science, SCOPUS, PubMed, Google Scholar, CINAHL, African Index Medicus, African Journals Online databases and Science direct) from 10 September 2020 to 12 October 2020. The search was carried out by the authors (DAM, YMD and AA) from the included electronic databases independently. Then, 285 duplicate articles were removed using the ENDNOTE software version X5 (Thomson Reuters, USA). A total of 706 articles were excluded after the initial screening based on title and abstract. Thirty-five articles were excluded after full-text articles were evaluated for eligibility, of which 20 articles were included in the systematic review and meta-analysis (Figure 1).

### ***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 (15, 19, 20, 28-44); nine (45.0%) articles (15, 19, 29, 31, 36, 38, 40, 43, 44) were conducted in Oromia, three (15%) in Tigray (20, 30, 41), three (15%) in SNNP (28, 33, 34), three (15%) articles in Addis Ababa (32, 37, 42) and two (10%) articles in Amhara region state (19, 35). The included studies were cross-sectional studies with a sample size ranging from 264 (41) to 771 (37) study participants.

Among the included articles, 10 (50%) (15, 19, 20, 29, 32, 33, 36, 37, 39) articles reported the prevalence of low back pain alone, 9(45%) (28, 30, 31, 34, 38, 40-42, 44) articles reported both low back pain and upper back pains and 1(5%) (35) article reported the

prevalence of upper back pain alone.

Furthermore, 8 (40%) articles published in 2020 (28, 30, 31, 33, 40-43), followed by studies published in 2019 (15, 19, 20, 35, 38, 40) that represented 6(30%) of the included articles. Based on JBI Critical Assessment tool (46), all included articles had a low risk of bias. Occupational-related prevalence of low and upper back pain in the previous year ranged from 25.5% (38) to 74.8% (20) and 10.4% (28) to 60.4% (34), respectively.

Sex of the study participants specified in 18 (90%) articles (15, 19, 20, 28-31, 33-37, 39-44); 4906 (57.2%) males and 3672 (42.8%) females. Nordic Musculoskeletal Questionnaire was used for data collection in 18 (90%) studies (15, 19, 20, 28-37, 39-43) (Table 1).

### **Prevalence of Occupational-Related Upper and Low Back Pain**

Meta-analysis was performed using Comprehensive Meta-Analysis (CMA) Version 3 statistical package (software) to determine pooled prevalence of occupational related low and upper back pain in Ethiopia.

### **Prevalence of Occupational-Related Upper Back Pain**

The pooled prevalence of occupational-related upper back pain in the previous year was 27.1% (95% CI: 18.4, 37.9%) (Figure 2). After a subgroup analysis was performed based on occupation, the pooled prevalence of upper back pain in the previous year was 34.7% (95% CI: 33.1, 36.2%). The lowest prevalence [10.4% (95% CI 7.6, 14.1%)] was reported among vehicle repair workers, while the highest prevalence [60.4% (95% CI 55.7, 65.0%)] was reported among pedestrian back-loading women (Supplementary file I; Figure 1).

After the subgroup analysis was performed based on the publication year, the pooled prevalence of occupational-related upper back pain in the previous year was 43.8 % [95% CI 39.9, 47.7%]. The lowest prevalence [15.3% (95% CI: 11.7, 19.8%)] was reported in the study published in 2018, while the highest prevalence [60.4% (95% CI: 55.7, 65.0%)] observed among the study published in 2017 (Supplementary file I; Figure 2).

Furthermore, based on the study region, the pooled prevalence of upper back pain was 36.2 % (95% CI: 33.6, 39.0%). The lowest prevalence [22.1% (95% CI: 9.2, 44.5%)] was reported among the studies conducted in the Oromia regional state, while the highest prevalence [38.8% (95% CI: 34.2, 43.6%)] was reported by the study conducted in Amhara regional state (Supplementary file I; Figure 3).

### **Prevalence of Occupational-Related Low Back Pain**

The pooled prevalence of occupational-related low back pain in the previous year was 54.2% (95% CI: 48.2, 60.0) (Figure 3). Based on the subgroup analysis by occupation, the pooled prevalence of low back pain in the previous year was 52.8% (95% CI: 51.3, 54.3%). The lowest prevalence [25.5% (95% CI: 21.5, 29.9%)] was reported among construction workers, while the highest prevalence [67.3% (95% CI: 62.7, 71.6%)] was reported among pedestrian back-loading women (Supplementary File I; Figure 4).

After subgroup analysis was performed based on the publication year, the pooled prevalence of low back pain was 61.8 % (95% CI: 58.9, 64.6%). The lowest pooled prevalence [46.9% (95% CI: 39.9, 54.0%)] was reported among studies published in 2020, while the highest prevalence [65.7%, (95% CI: 62.5, 68.9%)] was reported among the studies published in 2017 (Supplementary file I; Figure 5).

Furthermore, after the subgroup analysis was performed by study region, the pooled prevalence of low back pain was 55.2 % (95% CI: 51.4, 59.0%). The lowest pooled prevalence [50.7% (95% CI: 25.0, 76.0%)] was reported among the studies conducted in Tigray regional state, while the highest prevalence [56.3% (95% CI: 37.1, 73.9%)] was reported among the studies conducted *in Southern Nations, Nationalities, and Peoples* (Supplementary File I; Figure 6).

The result of sensitivity analysis indicated that there is no significant difference between the pooled prevalence, before and after sensitivity analysis. There is no significant difference between the overall pooled prevalence of upper and low back pain before and after sensitivity analyses (Table 2).

### **Subgroup Analysis based on the Outcome**

After subgroup analysis was performed based on the outcomes, the pooled prevalence of occupational-related upper and low back pain in the previous year was 54.2% [95% CI: 48.2 to 60.0%] and 31.0% [95% CI: 21.6 to 42.3%], respectively (Figure 4).

### **Publication bias**

In this meta-analysis, publication biases were visualized using funnel plots. Publication bias was examined using Begg and Egger tests and was determined as  $p = 0.8065$  and  $p = 0.8367$ , respectively for low back pain, and  $p = 0.9287$  and  $p = 0.9994$ , respectively for upper back pain. These results indicated that the probability of publication bias was not statistically significant (Figure 5 and Figure 6).

## Discussion

The current study was conducted to determine the pooled prevalence of occupational-related low and upper back pains in Ethiopia (2017-2020). In this study, a total of 9,410 study participants, regardless of their occupation categories were included in the selected 20 articles (15, 19, 20, 28-44). Back pain such as low and upper back pains are the leading causes of loss of productivity and absenteeism of employees and affect the quality of life (50, 51). The current study found that the prevalence of low back pain among Ethiopian working population ranged from 25.5 to 67.3%, which was lower than the finding of another study conducted in Saudi Arabia reported the prevalence of low back pain in different professional groups ranged from 64 to 89% (52).

Furthermore, the current study found the pooled prevalence of occupational-related low back pain accounted for 54.2% [95% CI: 48.2, 60.0%] that was relatively lower than the finding of another study conducted in Africa, reported 57% pooled prevalence of low back pain (53). The difference may be related to the scope of the study or variation in the implementation of engineering and administrative control measures, low awareness about occupational related hazards and physical exercise.

The pooled prevalence of low back pain increased to 61.8% [95% CI: 58.9, 64.6%] and 55.2% [95% CI: 58.4, 59.0%] after the subgroup analysis were performed based on publication year and study area, respectively. However, the prevalence of low back pain decreased to 52.8% [95% CI: 51.3, 54.3%], after subgroup analysis was performed based on the study participants/occupation. 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 occupation or working environments or difference in implementation of control measures and safety practices. For example, the current study found the prevalence of low back pain among nurses accounted for 65.4%, which was relatively consistent with the work done in Saudi Arabia and Iran that found a prevalence of low back pain accounted for 65.0% and 61.2%, respectively (51, 54).

On the other hand, the current study found the aggregated prevalence of occupational-related upper back pain in the previous one-year accounted for 27.1% [95% CI: 18.4, 37.9%]. However, after subgroup analysis were conducted based on publication year, study participants and study area, 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%], respectively. The highest prevalence of work-related upper back pain (60.4%) was reported among pedestrian back-loading women, followed by the prevalence reported among hairdressers (50.4%). The lowest prevalence (10.4%) was reported among vehicle repair workers. The variation may be related to the variation in activities, workload, nature of the work, and physical exercise.

In general, the current study found that at least one out of four study participants experienced work-related upper back pain, while one out of two participants experienced low back pain regardless of occupation categories. Back pain can be reduced by implementing primary and secondary interventions such as engineering and administrative controls and programs designed to modify individual factors (employee exercise)"(55). Similarly, the effect of musculoskeletal disorders such as low back pain may be reduced by considering proper observation of the principles of ergonomics in the workplace, identifying risk factors and then trying to fix them (54) and performing physical examinations (54) or physical exercise with education or alone (56-59).

### *Limitations*

There was an unequal distribution of occupations among the included articles. On the other hand, the prevalence of low and upper back pain in some regions of Ethiopia was not covered due to the lack of studies in those regions.

## Conclusion

Occupational related low and upper back pains continue to have a potential impact on worker health, productivity and quality of life worldwide. This study found that more than half of the included participants experienced low back pain, at least once in the previous year, while more than one-fourth experienced upper back pain. Therefore, implementation of adequate control measures such as, engineering and administrative controls, programs designating, principles of ergonomics and physical exercise can reduce low and upper back pains.

## List Of Abbreviations

CDC: Centers for Disease Control and Prevention; CMA: Comprehensive Meta-Analysis; EWCS: European Working Conditions Survey; HSE: Health and Safety Executive; JBI: Joanna Briggs Institute; MSDs: Musculoskeletal Disorders; PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analysis; *SNNP: Southern Nations, Nationalities, and Peoples*; *YLD: Years Lived with Disability*.

## 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 upon reasonable request. The PRISMA-P 2015 checklist (Preferred Reporting Items for Systematic Review and Meta-Analysis) 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.

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### *Authors' Contributions*

DAM conceived the idea and played an important role in the review, extraction and analysis of data, writing, drafting, and editing of the manuscript. AA and YMD contributed to data extraction, analysis, and editing. Finally, the authors (DAM, AA, and YMD) read and approved the final version of the manuscript to be published and agreed on all aspects of this work.

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## Tables

Publication year	Study year	Sample size	Study design	Low back pain (%)	Upper back pain (%)	Population	Study participants (gender)		Data collection tool	Region	Reference	
							Male	Female				
	2020	2019	344	Cross-sectional	62.8	10.4	Vehicle Repair Workers	340	4	NMQ	SNNP	(28)
t	2018	2015	422	Cross-sectional	64.9	NA	Industry workers	52	370	NMQ	Oromia	(29)
t	2020	2018	307	Cross-sectional	40.4	33.6	Bank workers	198	109	NMQ	Tigray	(30)
l	2020	2018	412	Cross-sectional	35.9	15.8	Industry workers	257	155	NMQ and Oswestry back pain disability index	Oromia	(31)
	2017	2015	422	Cross-sectional	64.2	NA	Industry workers	Not specified		NMQ	Addis Ababa	(32)
t	2020	2017	625	Cross-sectional	38.4	NA	Civil service workers	408	217	NMQ	SNNP	(33)
	2017	2016	422	Cross-sectional	67.3	60.4	Pedestrian back-loading women		422	NMQ	SNNP	(34)
t	2019	2015	611	Cross-sectional	74.8	NA	Teachers	280	331	NMQ	Tigray	(20)
t	2019	2018	400	Cross-sectional	65.0	NA	Truck Drivers	400		NMQ	Oromia	(15)
a	2019	2018	417	Cross-sectional	NA	38.8	Barbers	362	55	NMQ	Amhara	(35)
	2018	2017	660	Cross-sectional	58.2	NA	Industry workers	449	211	NMQ	Oromia	(36)
	2018	2016	771	Cross-sectional	44.0	NA	Teachers	393	378	NMQ	Addis Ababa	(37)
t	2019	2017	410	Cross-sectional	25.5	15.7	Construction workers	Not specified	...	Derived from published literatures	Oromia	(38)
a	2019	2017	429	Cross-sectional	55.7	NA	Barbers	373	56	NMQ	Amhara	(39)
a	2019	2017	418	Cross-sectional	63.6	NA	Nurses	185	233	NMQ	Oromia	(19)
a	2020	2019	652	Cross-sectional	53.2	50.4	Hairdressers	358	294	NMQ	Oromia	(40)
t	2020	2019	264	Cross-sectional	34.8	17.0	Cleaners		264	NMQ	Tigray	(41)
t	2020	2016-2017	755	Cross-sectional	54.3	35.4	Bank workers	372	383	NMQ	Addis Ababa	(42)
	2020	2018	368	Cross-sectional	55.7	NA	Beauty Salon Workers	320	48	NMQ	Oromia	(43)
	2018	2015	301	Cross-sectional	67.8	15.3	Nurses	159	142	DMQ	Oromia	(44)

Key: NMQ: Nordic Musculoskeletal Questionnaire; DMQ: Dutch musculoskeletal questionnaire

Table 2: The pooled prevalence of upper and lower back pain after sensitivity analysis

Outcome	Variable	Prevalence (%)	95%CI	I <sup>2</sup>	P value
Lower back pain	After excluding lower outcome	55.7	50.2, 61.1%	96.048	<0.001
	After excluding small sample size and small prevalence	56.9	51.5, 62.2%	95.867	0.012
Upper back pain	By removing lower outcome	28.1	18.9, 39.7%	98.104	<0.001
	Removing small sample size and small prevalence	29.4	20.3, 40.5%	97.897	<0.001

## Figures

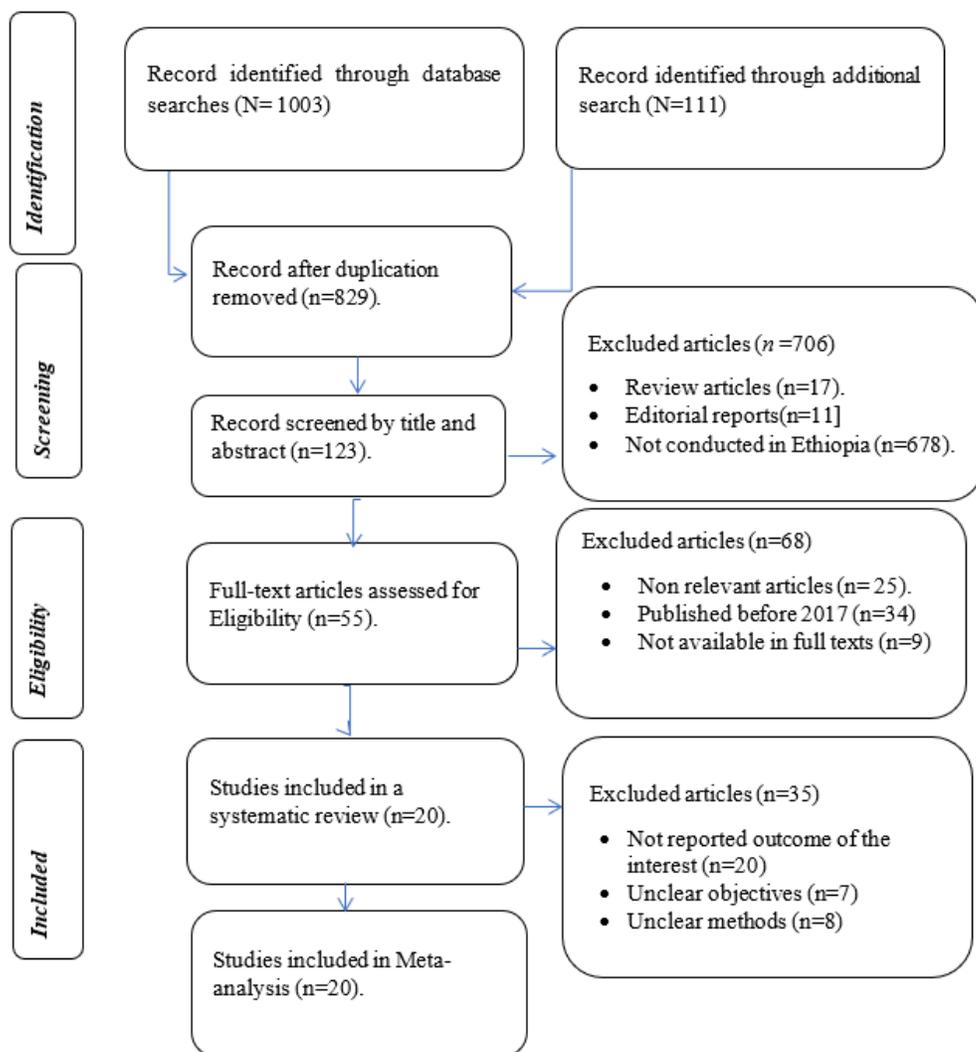
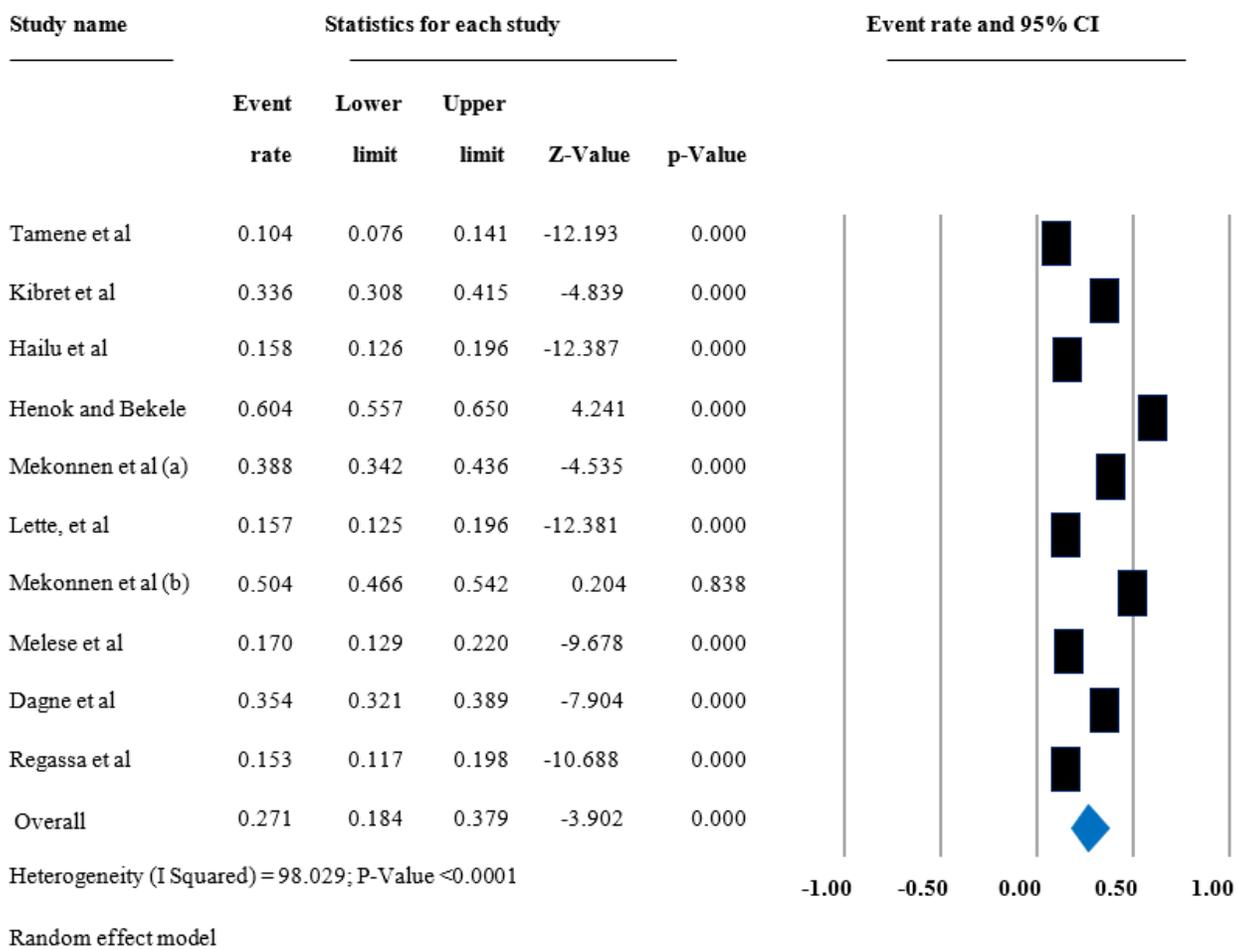


Figure 1

Study selection process of included articles for a systematic review and meta-analysis, 2020.



**Figure 2**

Forest plot shows the pooled prevalence of occupational-related upper back pain in the previous year in Ethiopia, 2020.

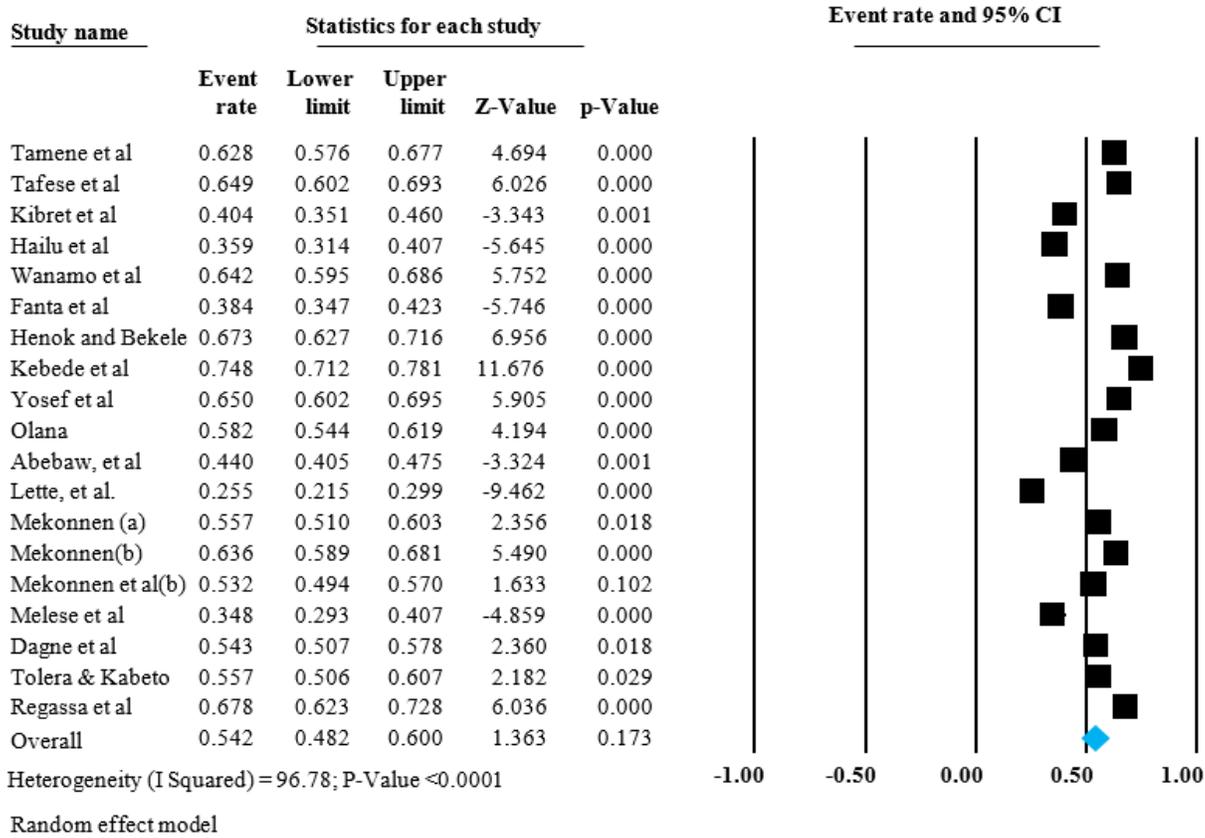


Figure 3

Forest plot shows the pooled prevalence of occupational-related low back pain in the previous year in Ethiopia, 2020.

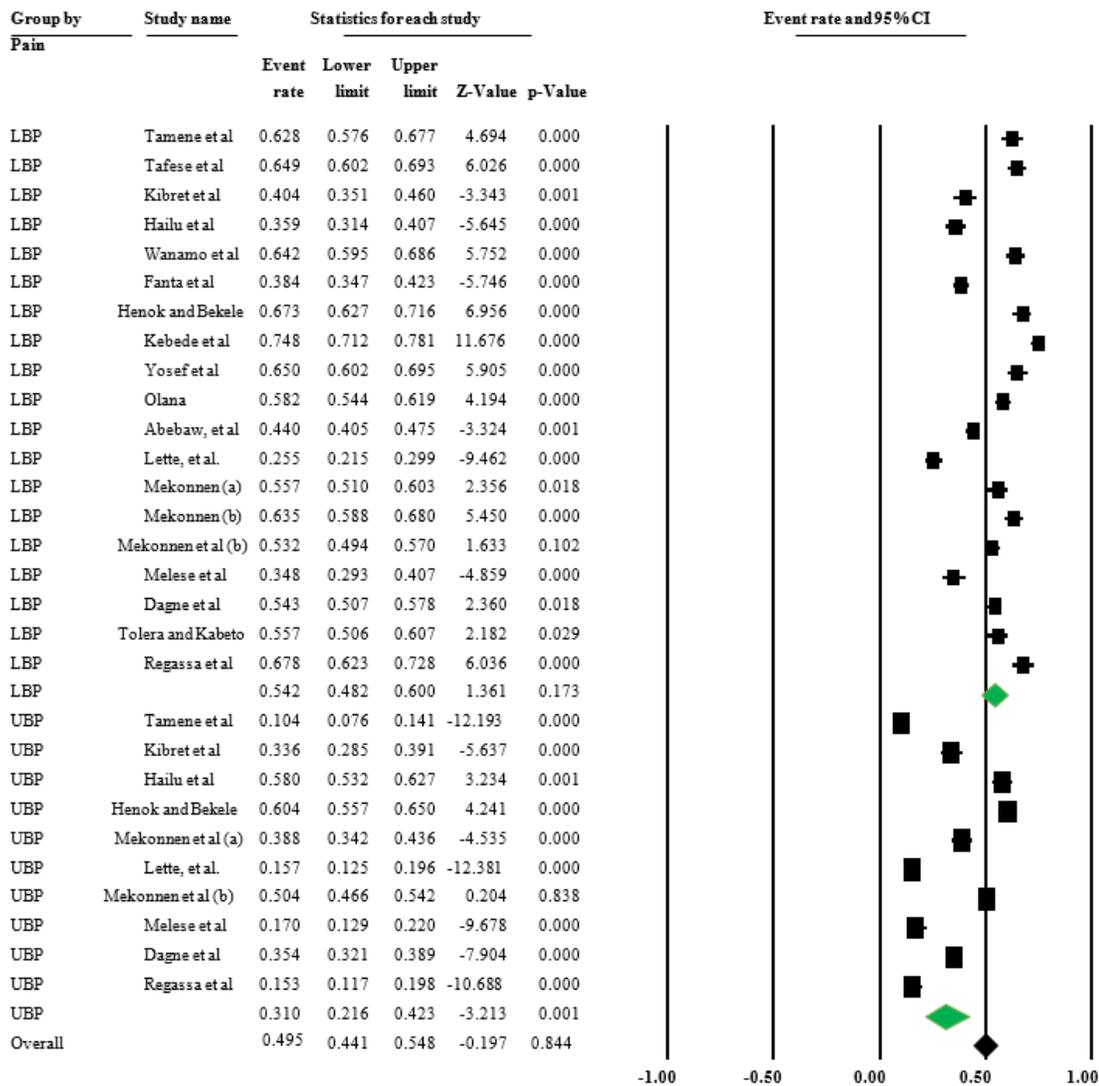


Figure 4

Forest plot shows the subgroup analysis of pooled prevalence of occupational related upper and low back pain in the previous year based on the outcome, 2020.

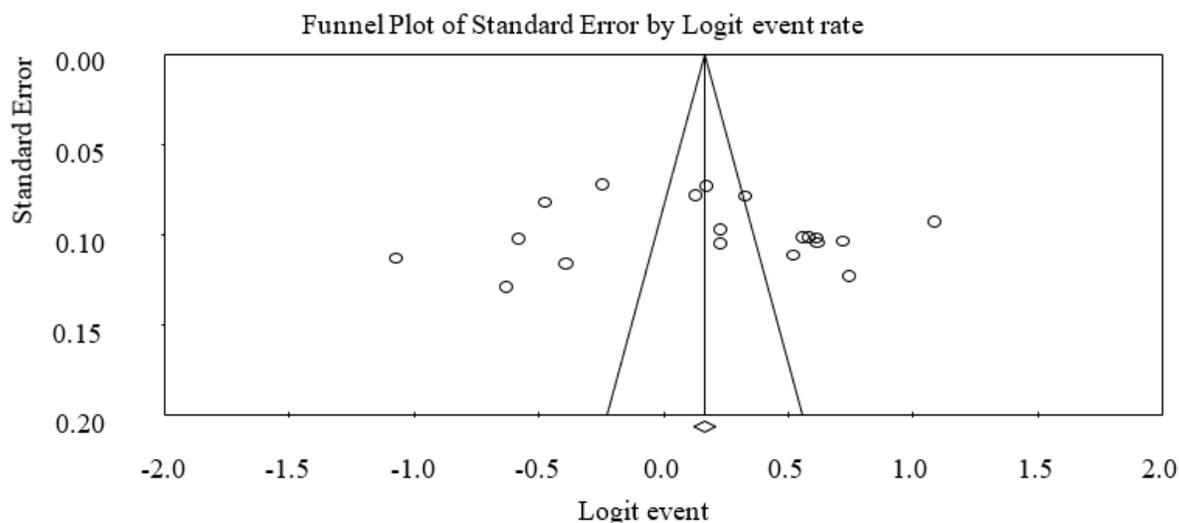


Figure 5

The funnel plot of the prevalence of occupational related low back pain, showing level of publication bias.

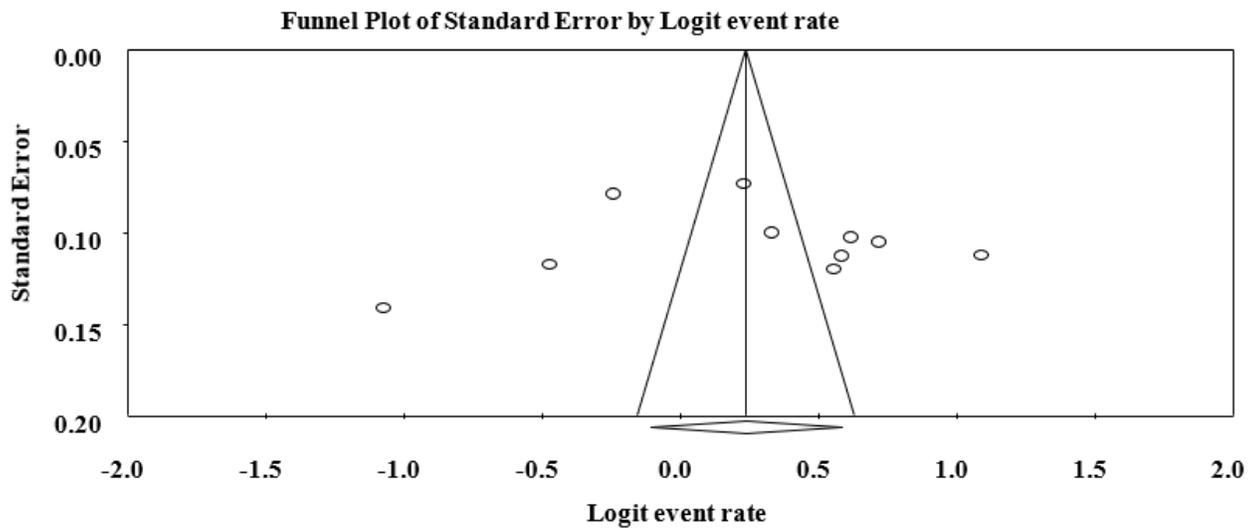


Figure 6

The funnel plot of the prevalence of occupational related upper back pain, showing level of publication bias.

## Supplementary Files

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- [Supplementaryfile.docx](#)