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

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Research article

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

Posted Date: February 24th, 2021

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

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

Author	Publication year	Study year	Sample size	Study design	Low back pain (%)	Upper back pain (%)	Population	Region	Reference
Tolera and Kabeto	2020	2018	368	Cross-sectional	55.7	NA	Beauty Salon Workers	Oromia	[47]
Regassa et al	2018	2015	301	Cross-sectional	67.8	15.3	Nurses	Oromia	[48]
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.

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Figures

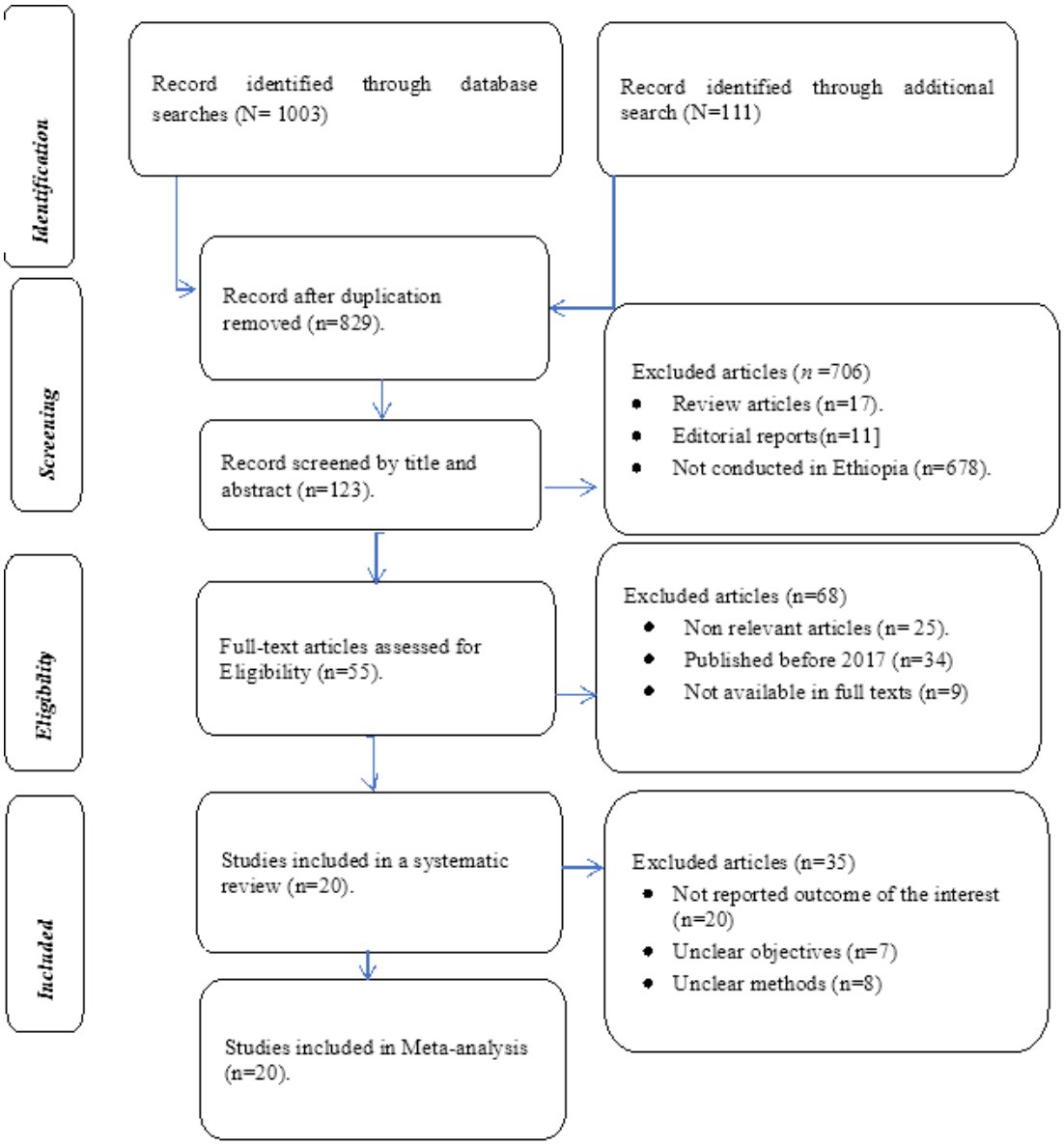

Figure 1

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

Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Tamene et al	0.104	0.076	0.141	-12.193	0.000
Kibret et al	0.336	0.308	0.415	-4.839	0.000
Hailu et al	0.158	0.126	0.196	-12.387	0.000
Henok and Bekele	0.604	0.557	0.650	4.241	0.000
Mekonnen et al (a)	0.388	0.342	0.436	-4.535	0.000
Lette, et al	0.157	0.125	0.196	-12.381	0.000
Mekonnen et al (b)	0.504	0.466	0.542	0.204	0.838
Melese et al	0.170	0.129	0.220	-9.678	0.000
Dagne et al	0.354	0.321	0.389	-7.904	0.000
Regassa et al	0.153	0.117	0.198	-10.688	0.000
Overall	0.271	0.184	0.379	-3.902	0.000

Heterogeneity (I Squared) = 98.029; P-Value <0.0001

Random effect model

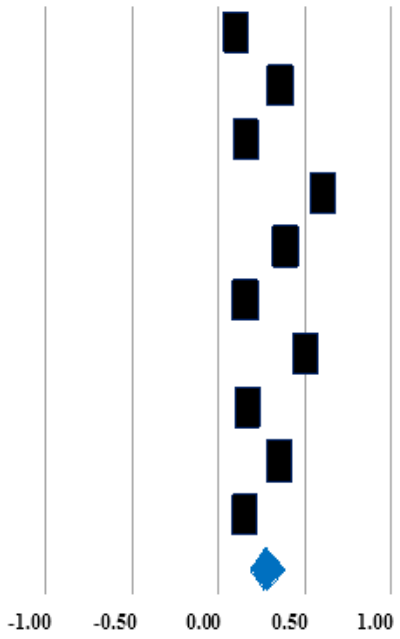

Figure 2

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

Group by Population	Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Industry workers	Hailu et al	0.158	0.126	0.196	-12.387	0.000
Industry workers		0.158	0.126	0.196	-12.387	0.000
Bank workers	Kibret et al	0.336	0.308	0.415	-4.839	0.000
Bank workers	Dagne et al	0.354	0.321	0.389	-7.904	0.000
Bank workers		0.346	0.327	0.385	-9.265	0.000
Barbers	Mekonnen et al(a)	0.388	0.342	0.436	-4.535	0.000
Barbers		0.388	0.342	0.436	-4.535	0.000
Cleaners	Melese et al	0.170	0.129	0.220	-9.678	0.000
Cleaners		0.170	0.129	0.220	-9.678	0.000
Construction workers	Lette, et al.	0.157	0.125	0.196	-12.381	0.000
Construction workers		0.157	0.125	0.196	-12.381	0.000
Hairdressers	Mekonnen et al(b)	0.504	0.466	0.542	0.204	0.838
Hairdressers		0.504	0.466	0.542	0.204	0.838
Nurses	Regassa et al	0.153	0.117	0.198	-10.688	0.000
Nurses		0.153	0.117	0.198	-10.688	0.000
Pedestrian BL women	Henok and Bekele	0.604	0.557	0.650	4.241	0.000
Pedestrian BL women		0.604	0.557	0.650	4.241	0.000
Vehicle Repair Workers	Tamene et al	0.104	0.076	0.141	-12.193	0.000
Vehicle Repair Workers		0.104	0.076	0.141	-12.193	0.000
Overall		0.347	0.331	0.362	-18.195	0.000

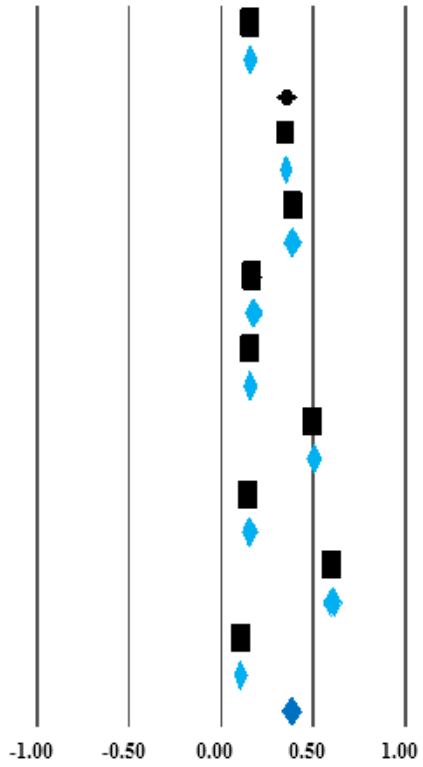

Figure 3

Key: BL: Back Loading Forest plot shows the subgroup analysis of the prevalence of occupational-related upper back pain in the previous one year based on the study population/occupation categories, 2020.

Group by Publication year	Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
2017	Henok and Bekele	0.604	0.557	0.650	4.241	0.000
2017		0.604	0.557	0.650	4.241	0.000
2018	Regassa et al	0.153	0.117	0.198	-10.688	0.000
2018		0.153	0.117	0.198	-10.688	0.000
2019	Mekonnen et al(a)	0.388	0.342	0.436	-4.535	0.000
2019	Lette, et al.	0.157	0.125	0.196	-12.381	0.000
2019		0.256	0.094	0.534	-1.739	0.082
2020	Tamene et al	0.104	0.076	0.141	-12.193	0.000
2020	Kibret et al	0.336	0.308	0.415	-4.839	0.000
2020	Hailu et al	0.158	0.126	0.196	-12.387	0.000
2020	Mekonnen et al(b)	0.504	0.466	0.542	0.204	0.838
2020	Melese et al	0.170	0.129	0.220	-9.678	0.000
2020	Dagne et al	0.354	0.321	0.389	-7.904	0.000
2020		0.253	0.155	0.384	-3.471	0.001
Overall		0.438	0.399	0.477	-3.081	0.002

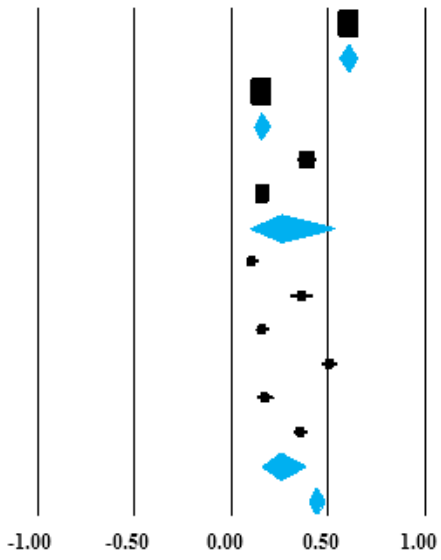

Figure 4

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

Group by Region	Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Addis Ababa	Dagne et al	0.354	0.321	0.389	-7.904	0.000
Addis Ababa		0.354	0.321	0.389	-7.904	0.000
Amhara	Mekonnen et al(a)	0.388	0.342	0.436	-4.535	0.000
Amhara		0.388	0.342	0.436	-4.535	0.000
Oromia	Hailu et al	0.158	0.126	0.196	-12.387	0.000
Oromia	Lette, et al.	0.157	0.125	0.196	-12.381	0.000
Oromia	Mekonnen et al (b)	0.504	0.466	0.542	0.204	0.838
Oromia	Regassa et al	0.153	0.117	0.198	-10.688	0.000
Oromia		0.221	0.092	0.445	-2.381	0.017
SNNP	Tamene et al	0.104	0.076	0.141	-12.193	0.000
SNNP	Henok and Bekele	0.604	0.557	0.650	4.241	0.000
SNNP		0.297	0.033	0.841	-0.669	0.503
Tigray	Kibret et al	0.336	0.308	0.415	-4.839	0.000
Tigray	Melese et al	0.170	0.129	0.220	-9.678	0.000
Tigray		0.255	0.113	0.479	-2.127	0.033
Overall		0.362	0.336	0.390	-9.459	0.000

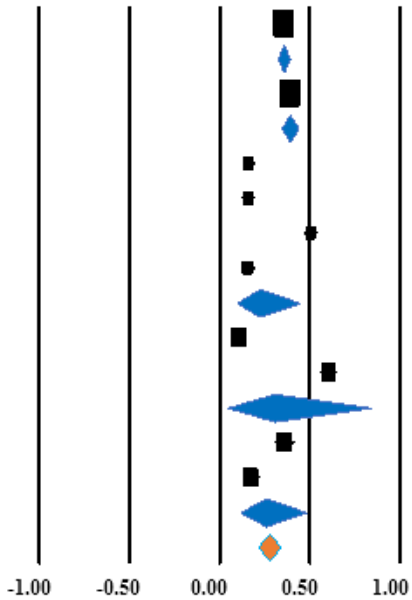

Figure 5

Keys: SNNP: Southern Nations, Nationalities, and Peoples Forest plot shows the subgroup analysis of pooled prevalence of occupational related upper back pain in the previous one year based on study region, 2020.

Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Tamene et al	0.628	0.576	0.677	4.694	0.000
Tafese et al	0.649	0.602	0.693	6.026	0.000
Kibret et al	0.404	0.351	0.460	-3.343	0.001
Hailu et al	0.359	0.314	0.407	-5.645	0.000
Wanamo et al	0.642	0.595	0.686	5.752	0.000
Fanta et al	0.384	0.347	0.423	-5.746	0.000
Henok and Bekele	0.673	0.627	0.716	6.956	0.000
Kebede et al	0.748	0.712	0.781	11.676	0.000
Yosef et al	0.650	0.602	0.695	5.905	0.000
Olana	0.582	0.544	0.619	4.194	0.000
Abebaw, et al	0.440	0.405	0.475	-3.324	0.001
Lette, et al.	0.255	0.215	0.299	-9.462	0.000
Mekonnen (a)	0.557	0.510	0.603	2.356	0.018
Mekonnen(b)	0.636	0.589	0.681	5.490	0.000
Mekonnen et al(b)	0.532	0.494	0.570	1.633	0.102
Melese et al	0.348	0.293	0.407	-4.859	0.000
Dagne et al	0.543	0.507	0.578	2.360	0.018
Tolera & Kabeto	0.557	0.506	0.607	2.182	0.029
Regassa et al	0.678	0.623	0.728	6.036	0.000
Overall	0.542	0.482	0.600	1.363	0.173

Heterogeneity (I Squared) = 96.78; P-Value <0.0001

Random effect model

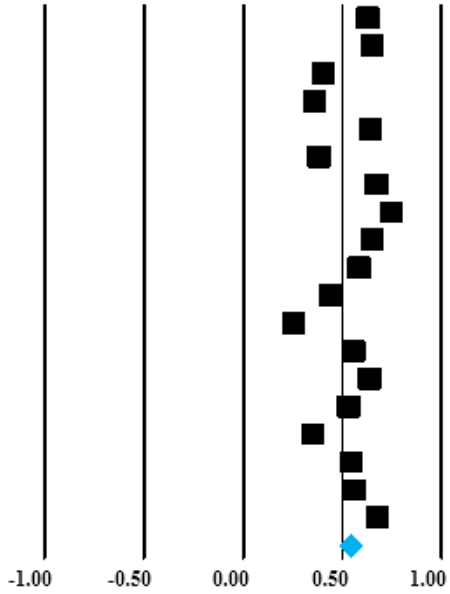

Figure 6

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

Group by Population	Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Bank workers	Kibret et al	0.404	0.351	0.460	-3.343	0.001
Bank workers	Dagne et al	0.543	0.507	0.578	2.360	0.018
Bank workers		0.475	0.343	0.610	-0.360	0.719
Barbers	Mekonnen (a)	0.557	0.510	0.603	2.356	0.018
Barbers		0.557	0.510	0.603	2.356	0.018
BS Workers	Tolera & Kabeto	0.557	0.506	0.607	2.182	0.029
BS Workers		0.557	0.506	0.607	2.182	0.029
Civil service workers	Fanta et al	0.384	0.347	0.423	-5.746	0.000
Civil service workers		0.384	0.347	0.423	-5.746	0.000
Cleaners	Melese et al	0.348	0.293	0.407	-4.859	0.000
Cleaners		0.348	0.293	0.407	-4.859	0.000
Construction workers	Lette, et al.	0.255	0.215	0.299	-9.462	0.000
Construction workers		0.255	0.215	0.299	-9.462	0.000
Hairdressers	Mekonnen et al(b)	0.532	0.494	0.570	1.633	0.102
Hairdressers		0.532	0.494	0.570	1.633	0.102
Industry workers	Tafese et al	0.649	0.602	0.693	6.026	0.000
Industry workers	Hailu et al	0.359	0.314	0.407	-5.645	0.000
Industry workers	Wanamo et al	0.642	0.595	0.686	5.752	0.000
Industry workers	Olana	0.582	0.544	0.619	4.194	0.000
Industry workers		0.559	0.432	0.679	0.911	0.363
Nurses	Mekonnen (b)	0.636	0.589	0.681	5.490	0.000
Nurses	Regassa et al	0.678	0.623	0.728	6.036	0.000
Nurses		0.654	0.612	0.694	6.911	0.000
Pedestrian BL women	Henok and Bekele	0.673	0.627	0.716	6.956	0.000
Pedestrian BL women		0.673	0.627	0.716	6.956	0.000
Teachers	Kebede et al	0.748	0.712	0.781	11.676	0.000
Teachers	Abebaw, et al	0.440	0.405	0.475	-3.324	0.001
Teachers		0.604	0.293	0.849	0.635	0.525
Drivers	Yosef et al	0.650	0.602	0.695	5.905	0.000
Drivers		0.650	0.602	0.695	5.905	0.000
Vehicle Repair Workers	Tamene et al	0.628	0.576	0.677	4.694	0.000
Vehicle Repair Workers		0.628	0.576	0.677	4.694	0.000
Overall		0.528	0.513	0.543	3.641	0.000

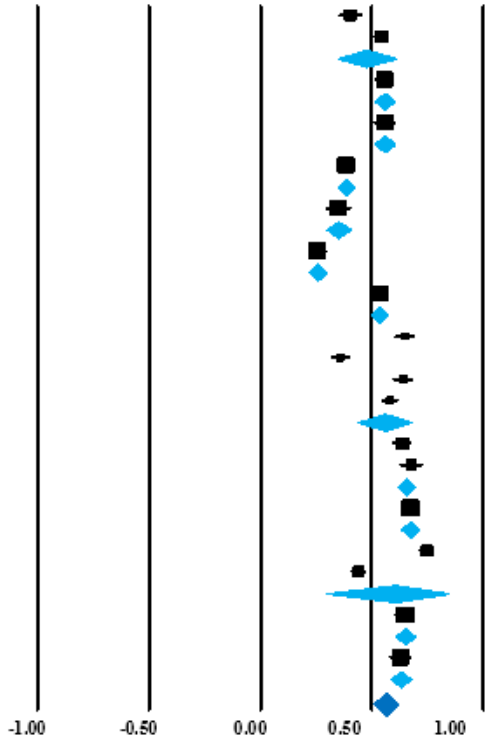

Figure 7

Key; BL: Back Loading; BS: Beauty Salon Forest plot shows the subgroup analysis of pooled prevalence of occupational related low back pain in the previous one year based on the study population, 2020.

Group by Publication year	Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
2017	Wanamo et al	0.642	0.595	0.686	5.752	0.000
2017	Henok and Bekele	0.673	0.627	0.716	6.956	0.000
2017		0.657	0.625	0.689	8.976	0.000
2018	Tafese et al	0.649	0.602	0.693	6.026	0.000
2018	Olana	0.582	0.544	0.619	4.194	0.000
2018	Abebaw, et al	0.440	0.405	0.475	-3.324	0.001
2018	Regassa et al	0.678	0.623	0.728	6.036	0.000
2018		0.588	0.477	0.691	1.564	0.118
2019	Kebede et al	0.748	0.712	0.781	11.676	0.000
2019	Yosef et al	0.650	0.602	0.695	5.905	0.000
2019	Lette, et al.	0.255	0.215	0.299	-9.462	0.000
2019	Mekonnen (a)	0.557	0.510	0.603	2.356	0.018
2019	Mekonnen(b)	0.636	0.589	0.681	5.490	0.000
2019		0.571	0.403	0.724	0.825	0.409
2020	Tamene et al	0.628	0.576	0.677	4.694	0.000
2020	Kibret et al	0.404	0.351	0.460	-3.343	0.001
2020	Hailu et al	0.359	0.314	0.407	-5.645	0.000
2020	Fanta et al	0.384	0.347	0.423	-5.746	0.000
2020	Mekonnen et al(b)	0.532	0.494	0.570	1.633	0.102
2020	Melese et al	0.348	0.293	0.407	-4.859	0.000
2020	Dagne et al	0.543	0.507	0.578	2.360	0.018
2020	Tolera and Kabeto	0.557	0.506	0.607	2.182	0.029
2020		0.469	0.399	0.540	-0.856	0.392
Overall		0.618	0.589	0.646	7.803	0.000

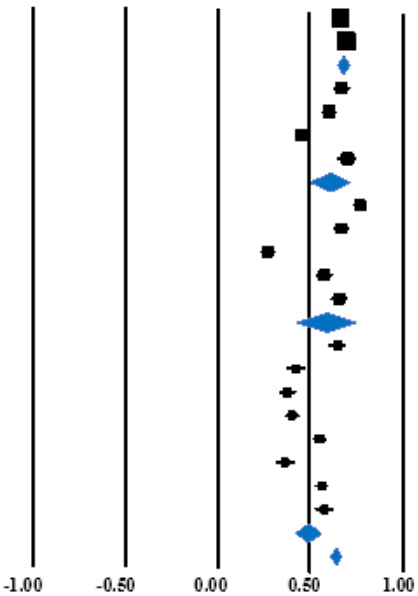

Figure 8

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

Group by Region	Study name	Event rate	Lower limit	Upper limit	Z-Value	p-Value
Addis Ababa	Wanamo et al	0.642	0.595	0.686	5.752	0.000
Addis Ababa	Abebaw, et al	0.440	0.405	0.475	-3.324	0.001
Addis Ababa	Dagne et al	0.543	0.507	0.578	2.360	0.018
Addis Ababa		0.542	0.432	0.647	0.746	0.456
Amhara	Mekonnen(a)	0.557	0.510	0.603	2.356	0.018
Amhara		0.557	0.510	0.603	2.356	0.018
Oromia	Tafese et al	0.649	0.602	0.693	6.026	0.000
Oromia	Hailu et al	0.359	0.314	0.407	-5.645	0.000
Oromia	Yosef et al	0.650	0.602	0.695	5.905	0.000
Oromia	Olana	0.582	0.544	0.619	4.194	0.000
Oromia	Lette, et al.	0.255	0.215	0.299	-9.462	0.000
Oromia	Mekonnen(b)	0.636	0.589	0.681	5.490	0.000
Oromia	Mekonnen et al(b)	0.532	0.494	0.570	1.633	0.102
Oromia	Tolera and Kabeto	0.557	0.506	0.607	2.182	0.029
Oromia	Regassa et al	0.678	0.623	0.728	6.036	0.000
Oromia		0.544	0.453	0.631	0.948	0.343
SNNP	Tamene et al	0.628	0.576	0.677	4.694	0.000
SNNP	Fanta et al	0.384	0.347	0.423	-5.746	0.000
SNNP	Henok and Bekele	0.673	0.627	0.716	6.956	0.000
SNNP		0.563	0.371	0.739	0.639	0.523
Tigray	Kibret et al	0.404	0.351	0.460	-3.343	0.001
Tigray	Kebede et al	0.748	0.712	0.781	11.676	0.000
Tigray	Melese et al	0.348	0.293	0.407	-4.859	0.000
Tigray		0.507	0.250	0.760	0.046	0.964
Overall		0.552	0.514	0.590	2.681	0.007

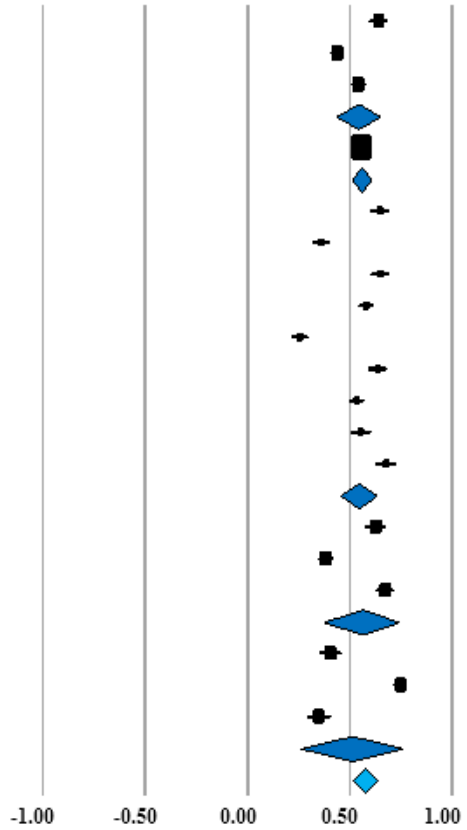

Figure 9

Keys: SNNP: Southern Nations, Nationalities, and Peoples Forest plot shows the subgroup analysis of pooled prevalence of occupational related low back pain in the previous one year based on study region,2020.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- PRISMAP2015checklistlowandupperback202011.docx