

# Work related injury and its disparity across selected occupations in Ethiopia: systematic review and meta-analysis

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## Research

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# Abstract

## Background

Globally, work related injury has been continued as a major public health problem. In Ethiopia there are few fragmented empirical studies particularly among workers of fast growing sectors and there is no a national representative study on work related injury. Therefore, this study aims to determine the magnitude of occupational injury and to identify its predictors among construction, textile and municipal solid waste management workers in Ethiopia.

## Objective

to determine magnitude of Work related injury and its disparity across selected occupations in Ethiopia

## Method:

Both published and unpublished articles conducted in Ethiopia on work related injury were searched between the periods 12 October, 2019 to 15 December, 2019. Random effect model was employed to estimate the overall magnitude of occupational injury and its predictors.

## Results

The overall magnitude of work related injury was 39.35% (95% CI: 27.40, 51.30%). Subgroup analysis revealed that there was slight disparity across occupations and regions. Drinking alcohol, smoking cigarette, khat chewing habit, work related stress, level of education and utilization of PPE were significantly associated with work related injury.

## Conclusion

This study found that more than 1 in 3 workers had at least one occupational injury at work. There was slight disparity across occupations and regions. It is strongly recommend that health education programs about the risk of substance use on occupational injury and apply strict occupational safety practices regulations should be strengthened.

# Background

Work-related injury and illness refers an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing condition(1). Furthermore an occupational injury is defined as any personal injury, disease or death resulting from an occupational accident; while an occupational disease is a disease contracted as a result of an exposure over a period of time to risk factors arising from work activity(2).

According to International Labour Organization (ILO) estimates globally 2.3 million people are surrendered to occupational injuries and illnesses. In addition, around 340 million occupational accidents and 160 million victims of work-related illnesses are occurred annually and over 6000 deaths every single day(3).

Despite magnitude and extent disparities, occupational injury and illness is the issue of both developed and developing nations. For instance, in Canada around 951 workers died due to work related causes in 2017(4).

Work related injury has been continued as a major public health problem and leads to devastating economic and health impact. According to World Health Organization (WHO) about 11% of the burden of disease is from work place related illnesses (5).

In Ethiopia there is high report of injuries from health facilities(6, 7). However, health facilities reports did not show how many cases of injuries were work places related and could not well address what factors were associated with those injuries and illness(7, 8). There are also few fragmented empirical studies on predictors or determinants of occupational injury and illness (9–11).

As to the knowledge of the authors of this study in Ethiopia there is no a national representative empirical study on the magnitude and determinants of occupational injury among municipal solid management workers, textile and construction industry workers.

Therefore this study aims to determine magnitude of work related injury and its disparity across selected occupations in Ethiopia. The results of this study may be helpful for decision and policy makers to have a nationwide insight and to take targeted corrective measures to promote health and safety and prevent non-fatal and fatal injuries and illnesses.

# Methods

## Identification and study selection

Through international data bases (MEDLINE/PubMed, Science Direct, Google scholar and Cochrane Library) and national digital library repositories (Addis Ababa University's digital library repository) were searched for potentially relevant published and unpublished research articles; between the periods 12 October, 2019 to 15 December, 2019. The key terms used for the searching articles were "Magnitude", "Epidemiology", "Prevalence", "occupational injury", "Work related injury", "work places injury", "Illness", "diseases", "Municipal Solid waste management", "Textile industry", "Garment", "Construction industry", "Workers" and "Ethiopia". Boolean operators "AND" and "OR" were used as connector. The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guideline was used to undertake this study(12).

## Eligibility criteria

The authors of this meta-analysis reviewed abstracts from initial search using well defined inclusion and exclusion criteria.

## Inclusion criteria

Both peer reviewed published and unpublished observational articles written in English language and conducted in Ethiopia which reports magnitude of work related injury among workers of municipal solid waste management, textile and construction industry were included.

## Exclusion criteria

Studies which were not fully accessed, difficult for data extraction and didn't report the outcome of interest were excluded.

## Data extraction

Using a Microsoft Excel two authors (WG and MA) independently extracted all the necessary data .The data extraction format for the first outcome of interest (magnitude of work related injury) consists; name of the first author, region publication year, study design, sample size, response rate, cases, total, type of occupation, data collection period). For the second outcome of interest (predictors), the data extraction format was prepared for each most frequently reported predictors by the studies included in this met-analysis. These predictors includes educational status (below high school vs high school and above high school), using PPE (Yes vs No), Age (below 30 vs 30 and above 30), safety training (Yes vs No), khat chewing (Yes vs No), smoking cigarette (Yes vs No), drinking alcohol (Yes vs No), sleeping pattern (Normal vs Not Normal), concentration (Yes vs No),sex (Male vs Female), marital status (Married vs Not Married), working hours per day (8 and below 8 hrs. vs more than 8 hours) and job related stress (Yes vs No) .Variables in this meta-analysis were considered as a predictor because at least two or more studies reported them as a predictor.

## Outcome measurements and Quality assessment

This study has two main outcomes. The first outcome of interest was to determine the magnitude of work related injury. The second outcome of the study was to identify the predictors of work related injury. The magnitude was calculated by dividing the number of respondents having at least 1 occupational injury within 12 months prior to the data collection period of included studies to the total number of participants who have been included in the study (number of respondents) multiplied by 100. Regarding predictor variables, the authors of this study calculated the odds ratio from the primary studies using the two by two tables. To assess the methodological qualities of the included articles, a modified version of the Newcastle-Ottawa Scale adapted for cross-sectional studies was used(13). By taking the mean score of the two researchers, disagreements of their assessment results were resolved. Finally, articles assessed with a score of  $\geq 6$  out of 10 were considered as achieving high quality.

## Data processing and analysis

Microsoft Excel for data extraction and STATA Version 14.0 software were used for analysis. The characteristics of included original articles were described using a table and forest plot. Statistical tests like heterogeneity  $\chi^2$  test,  $I^2$  test and the p-values were done to check the presence of heterogeneity among the reported prevalence of included studies(14). Random effects meta-analysis model was used to estimate overall magnitude of work related injury. Univariate meta-regression model was conducted by taking the publication year and number of respondents. Potential publication bias was also assessed objectively by using Egger's correlation and Begg's regression intercept tests at 95% significant level respectively (15, 16). In addition, subgroup analysis was done based on region of studies and type of occupation.

# Results

## Search results

In the first step of our search, 695 articles were retrieved regarding magnitude and predictors of occupational injury among workers of municipal solid waste management, construction, and textile workers. Of these initial records, 294 articles were excluded due to duplication. From the remaining 401 articles, 307 articles were excluded after review of their titles and abstracts being assessed as non-relevant to this review. Therefore, 34 full text articles were accessed, and assessed for eligibility based on the pre-set criteria, which resulted in further exclusion of 17 articles primarily due to the study population and outcome of interest. Finally, 17 studies were eligible and included in the meta-analysis (fig: 1)

### Characteristics Of Original Articles

Table 1  
summarizes the characteristics of the 17 original articles included in this systematic review and meta-analysis.

Authors	Pub. Year	study region	study design	source	response rate	Sample	event	prevalence in %	Study year	occupation type
Berhanu et al(17)	2019	Amhara	cross-sectional	596	95%	566	221	39.00	2015	construction
Gebremeskel and Yimer (18)	2019	Amhara	cross-sectional	402	93.03%	374	122	32.60	2018	construction
Emiru et al(19)	2017	Addis Ababa	cross-sectional	548	94.50%	518	211	40.70	2016	MSWM
Eskezia et al(20)	2016	Amhara	cross-sectional	394	96.20%	379	130	34.30	2015	MSWM
Tolera(21)	2016	Addis Ababa	cross-sectional	100	82.70%	83	62	67.70	2014	construction
Tadesse and Israel(22)	2016	Addis Ababa	cross-sectional	544	92.60%	504	194	38.30	2015	construction
Gebremichael G, et al(9)	2015	SNNPR	cross-sectional	441	98.00%	433	136	31.40	2015	Textile Factory
Bogale et al(23)	2014	Addis Ababa	cross-sectional	895	97.90%	876	383	43.70	2012	MSWM
Gizaw Z. et al(11)	2014	Amhara	cross-sectional	482	100.00%	482	308	63.90	2012	MSWM
Deyyas and Tafese(24)	2014	Oromia	cross-sectional	422	87.70%	370	148	40.00	2012	Garment Industry
Serkalem S. et al(25)	2013	Amhara	cross-sectional	455	100%	455	168	36.90	2013	Textile Factory
Aderaw et al(26)	2011	Amhara	case control	456	100%	456	152	33.33	2009	Textile Factory
Lette et al (27)	2018	Oromia	cross-sectional	360	98.60%	355	147	41.40	2016	construction
Tafese et al(28)	2018	Amhara	cross-sectional	419	93.30%	391	180	45.80	2016	textile (self-employed)
Mersha et al(10)	2017	Addis Ababa	cross-sectional	809	99.63%	806	683	84.70	2015	construction
Hussen and Kumie(29)	Unpublished	Oromia	cross-sectional	401	100%	401	140	34.90	2016	construction
Shine and Kumie(30)	Unpublished	Addis Ababa	case control	576	100%	576	192	33.33	2013	construction

In this study to estimate the pooled magnitude of work related injury a total of 8025 workers from MSWM, construction and textile industry were involved. Concerning geographical distribution of the studies, the 17 studies were obtained from the four regions of the country: six studies from Addis Ababa(10, 19, 21–23, 30), three from Oromia(24, 27, 29), seven (7) from Amhara(11, 17, 18, 20, 25, 26, 28), and one from Southern Nations, Nationalities and Peoples' Region (SNNPR)(29). The highest prevalence of occupational injury and illness (84.7%) was reported in Addis Ababa(10) whereas the lowest prevalence (31.4%) was reported from a study done in Arba Minch (SNNPR)(9). In addition, the original studies included in the meta-analysis had a response rate ranging from 83–100% and almost all the studies had good response rate

having a response rate of above 80%. Regarding the publication condition of the studies, two of the 17 studies were unpublished(29, 30), and 15 of the studies were published in reputable journals. Finally, the quality score of the studies ranges from 6–9 out of 10 points.

## Meta-analysis

As shown in the forest plot, the result of the 17 included studies revealed that the pooled magnitude of occupational injury was 43.59% (95% CI: 34.48, 52.70%) (Fig: 2). There was high heterogeneity across the studies which was shown by  $I^2$  statistic ( $I^2 = 98.7$ ,  $p$  value = 0.000). As a result, a random effect model was employed to estimate pooled magnitude of work related injury. In addition, a univariate meta-regression model to identify the possible sources of heterogeneity, by considering factors like data collection year, number of studies per region and sample size, but none of these variables was found to be statistically significant. Eggers' test revealed the presence of statistically significant publication bias ( $p = 0.019$ ). Therefore, trim and fill analysis was also done to adjust the final pooled estimate.

## Subgroup Analysis

Subgroup analysis was performed based on the regions where the studies were conducted and type of occupations. Accordingly, the highest regional pooled prevalence after trim and fill analysis was reported in studies done in Addis Ababa with a prevalence of 45.82% (95% CI: 21.39, 70.25) followed by Amhara region, 40.89% (95% CI: 32.44, 49.34) and lowest was from SNNPR region 31.40% (95% CI: 27.03, 35.77). With regard to occupation type, the prevalence of occupational injury and illness was slightly higher in studies done among construction workers, 41.80% (95% CI: 19.34, 64.27) as compared to textile 37.44% (95% CI: 32.48, 42.40) and MSWM workers 45.68% (95%CI: 34.00, 57.36).

## Predictors of occupational injury among textile, MSWM and construction workers

In this meta-analysis; the pooled odds of occupational injury among workers having drinking alcohol, cigarette smoking and chewing khat habit was 1.75, 2.15, and 2.03 times more than those who have not drinking alcohol, cigarette smoking and chewing khat habit 1.75 (95% CI: 1.03, 2.99); 2.15 (95%CI: 1.32, 3.50); and 2.03 (95% CI: 1.44, 2.86) respectively. Those workers who complete at least secondary education were 49% less likely to be injured or got ill (0.51(95%CI: 0.30, 0.89)) as a result of their occupation than those workers who did not complete high school education. Furthermore, those who having job-related stress was 3.85 times more likely to be injured and got ill (3.85 (95%CI: 2.66, 5.59)). Lastly the pooled odds of work related injury among those workers using PPE was 52% less than those who did not use PPE at work place (0.48 (95%CI: 0.36, 0.65)). To calculate the pooled odds ratio of alcohol drinking habit (9, 11, 17, 18, 26, 28, 30, 31), cigarette smoking habit(18, 24, 26, 30, 31), khat chewing habit(9, 22, 26–28, 30, 31), work related stress(9, 20, 26, 29, 30), level of education(9, 11, 18, 24, 26, 30, 31), and use of PPE(9, 11, 18, 19, 22, 26, 27, 29–31) reports of a minimum of 5 to 10 studies were included.

## Discussion

In this study the overall pooled magnitude of work related injury among workers of selected occupations was 39.35% (95% CI: 27.40, 51.30). This prevalence is higher than the reports of previous meta-analysis done in Ethiopia which was particularly on needle stick injury among health professionals 28.8% (95%CI: 23.0, 34.5)(32) and studies done in Malaysia which was reported as 5.4% (33). However it was lower than the which was reported at 57%(34) and the results of this meta-analysis (current) was comparable with reports of a meta-analysis done on Prevalence of needle stick and sharps injuries in healthcare workers of Iranian hospitals which was 42.5% (95% CI 37–48)(35).

The subgroup analysis of this study revealed that the magnitude of work related injury was significantly varied across regions. The highest prevalence of occupational injury was observed in Addis Ababa with a prevalence of 45.82% (95% CI: 21.39, 70.25) followed by Amhara region, 40.89% (95% CI: 32.44, 49.34) and lowest was from SNNPR region 31.40% (95% CI: 27.03, 35.77). The possible justifications for this variation could be due to socio-cultural differences across the regions. The other possible reason for the higher prevalence of occupational injury in Addis Ababa could be in the fact that Addis Ababa (the capital) is the center of both politics and economy as a result there is high expansion of textile, construction and solid waste management activities. In spite of the emphasis given to expansion of these sectors, occupational and safety practice among workers and concerned bodies emphasis give to occupational safety may be minimal. With regard to type of occupation, the magnitude of work related injury was slightly higher in those studies done among MSWM workers 45.68% (95%CI: 34.00, 57.36). This difference may be due to MSWM sector is more risky than the rest in that the occupation is linked with wastes and it worsen by poor handling of wastes at home level.

The predictors of work related injury was identified based on the reports of included empirical primary studies. Hence in this study, drinking alcohol, and smoking cigarette and khat chewing habit and having work related stress were found to be predictors of work related injury. In addition, in this study chance of occupational injury was significantly lower among those workers who were using PPE at work places compared to their counterparts. This finding is consistent with studies conducted in sub-Saharan Africa which was reporting not using PPE (OR 1.91, 95% CI 1.10–3.32) exposed nurses to injury(34). This could be explained by the fact that using protective devices highly reduces chance of injury occurrence.

The magnitude of occupational injury was highly associated with workers level of education. Those workers who complete high school education had lower risk of injury at workplaces. This finding is in line with different studies carried out so far. The possible reason for the association may be, as anyone becomes more educated he/she is become aware of occupational health and safety issues. Furthermore, in this meta-analysis it was observed that those workers who had drinking alcohol, smoking cigarette and chewing khat habit and having work related stress had higher work related injury as compared to their counterparts. This finding is supported by previous studies conducted so far (32, 34, 35). The possible explanation could be because of a worker's substance use habit and work related stress reduces his/her concentration at work and use of PPE habit during work.

## Limitations Of The Study

Majority of the studies included in this review were cross-sectional in nature as a result; the outcome variable might be affected by other confounding variables. Therefore, this factor could affect the estimated report. In addition this meta-analysis was considering only English articles or reports. Lastly, this meta-analysis represented only studies reported from four larger regions of Ethiopia. Even though these regions covers majority of the country geographically, population and economic activity, still the rest regions may be under-represented.

## Conclusions And Recommendations

The study found that magnitude of work related injury among workers of textile, construction and MSWM was quite common. Drinking alcohol, smoking cigarette chewing khat practice, having work related stress, level education and utilization of PPE were found to be predictors of work related injury. Hence, it is strongly recommend that concerned stakeholders should launch health education programs about the risk of substance use on occupational injury and apply strict occupational safety practices regulations at such rapidly growing sectors.

## Abbreviations

MSWM Municipal Solid Waste Management

NOS Newcastle-Ottawa Scale

OR Odds Ratio

PPE Personal Protective Equipment

PRISMA Preferred Reported Items Systematic review and Meta-Analysis

SNNPR Southern Nations Nationalities Peoples Region

WHO World Health Organization

## Declarations

### Ethics approval and consent to participate:

Not applicable.

### Consent for publication:

Not applicable.

### Availability data and materials:

Data will be available from the corresponding author upon reasonable request.

### Competing interests:

The authors declare that they have no competing interests.

### Funding:

No funding was obtained for this study.

### Authors' contribution:

The first author WG involved in Conception of research protocol and developed the protocol, in addition he involved in study design, selection of study, literature review, data extraction, data analysis, interpretation and drafting the manuscript. MA involved in selection of study, data analysis, reviewing and editing the manuscript, data extraction and quality assessment. DS, MAA, and MM were involved in data analysis, reviewing and editing the manuscript. All authors have read and approved final draft of the manuscript.

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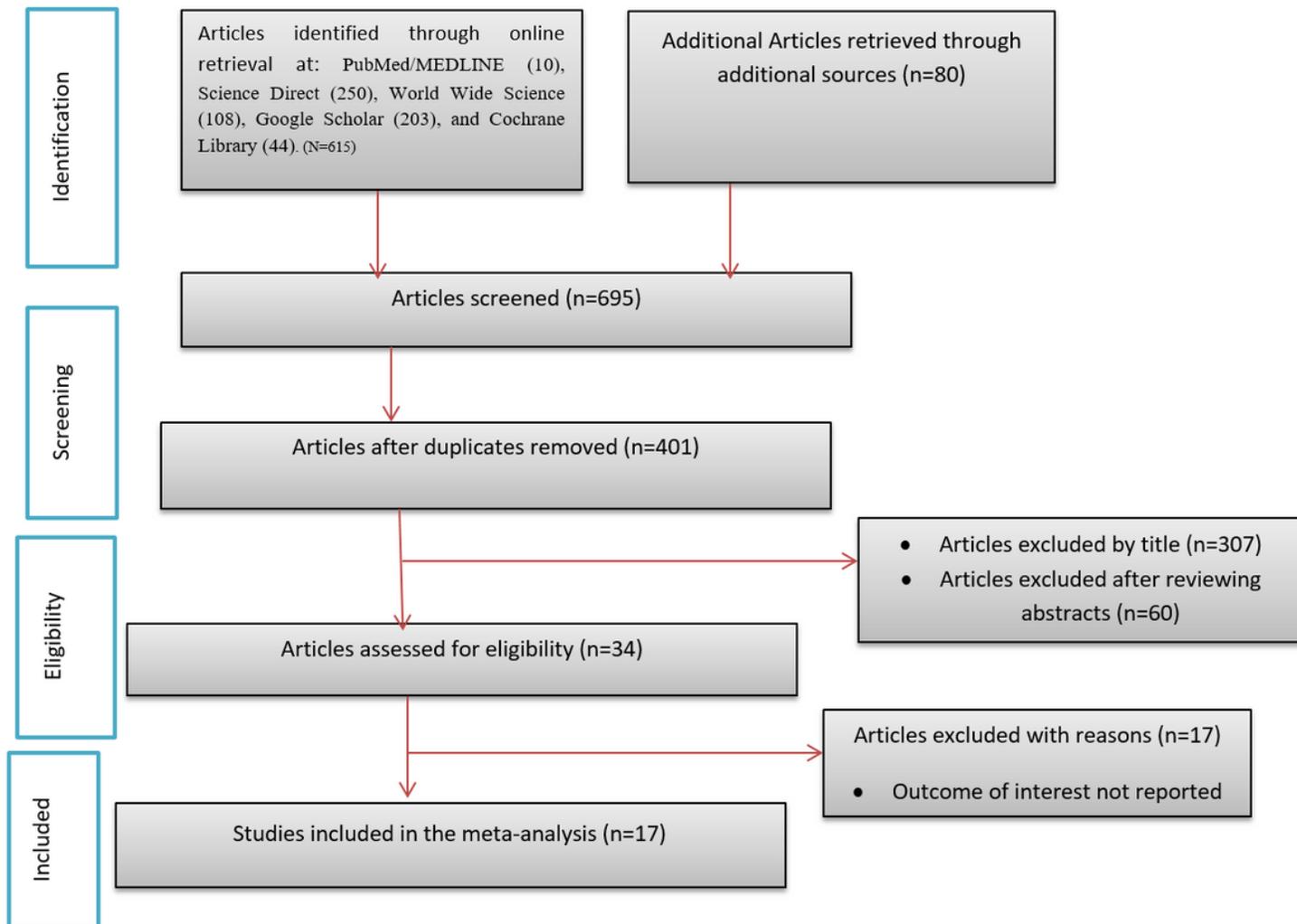
We would like to thank all authors of studies included in this systematic review and meta-analysis.

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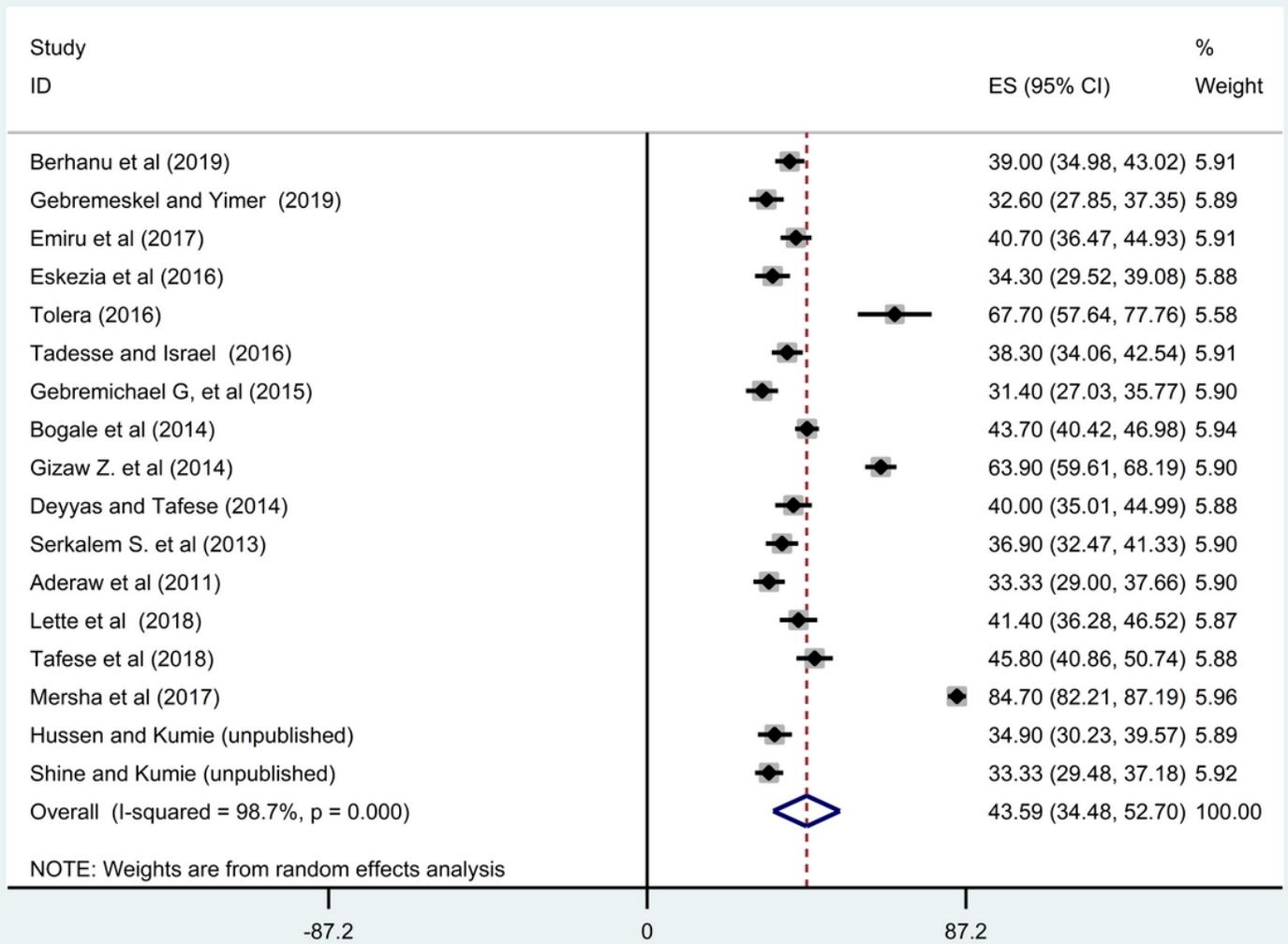
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## Figures



**Figure 1**  
 Flow chart describing the selection of studies for the systematic review and meta-analysis of prevalence and predictors of occupational injury among workers of MSWM, Construction and textile industry in Ethiopia, 2019 (identified screened, eligible and included studies).



**Figure 2**

Forest plot of the pooled prevalence of occupational injury and illness among workers of MSWM, construction and textile industry in Ethiopia before trim and fill analysis, 2019.