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Cervical cancer screening practice and associated factors among female health care professionals in Ethiopia 2024: a systematic review and meta-analysis

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Abstract

Background Cervical cancer, ranking as the fourth most common gynecological cancer worldwide, claimed an estimated 570,000 lives and resulted in 311,000 new cases in 2018. This disease disproportionately affects those living in poverty and is more prevalent in countries with weak healthcare systems. Low and middle-income nations, particularly in Sub-Saharan Africa, face higher incidence and mortality rates due to limited access to vaccines, screening, and treatment. The world health organization recommends regular screening for women from age 25, setting a 90-70-90 target for low- and middle-income countries by 2030. Despite limited previous knowledge, the study aims to assess the pooled prevalence of cervical cancer screening practices and associated factors among female healthcare professionals in Ethiopia in 2024.

Objective The study aimed to synthesize the existing literature on cervical cancer screening practice and associated factors among female health workers in Ethiopia.

Methods Studies were searched through the search engine of Google Scholar, PubMed, and Cochrane Library. Searching was made using Keywords/ MeSH terms Cervical cancer; utilization; Preventive practice. Heterogeneity was assessed using the Cochran Q test and I2 statistics. A random-effects model with a 95% confidence interval was used for the pooled prevalence and odds ratio estimations.

Result Seven studies were included in this systematic review and meta-analysis. The overall pooled prevalence of cervical cancer screening practice among female health workers in Ethiopia was 18%. Work place(OR = 2.858;95% CI: 0.412, 5.305),knowledge(OR = 3.457; 95% CI: 2.314, 4.601), work experience(OR = 5.421; 95% CI:4.178,6.664),being diagnosed(OR = 10.787; 95% CI: 06.197,15.377) and ever cared of cervical cancer patient (OR = 2.93; 95% CI: 2.004, 3.856) were the pooled associated factors that are significantly associated with cervical cancer screening practice among female health care worker.

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Conclusion The implementation of preventive measures for cervical cancer screening was found to be suboptimal. Our findings underscore the importance of enhancing awareness among this demographic, which is crucial in mobilizing local communities. It is imperative to provide continuous education to female health workers regarding cervical cancer. The Ministry of Health should collaborate with various organizations to ensure the accessibility of cost-effective screening services in all healthcare facilities.

Keywords Cervical cancer, Female health care workers, Screening practice, Ethiopia

Background

Cervical cancer poses a significant public health challenge, ranking as the fourth most prevalent gynecological cancer worldwide. In the year 2018, approximately 570,000 cases and 311,000 fatalities were reported globally due to cervical cancer [1].

Cervical cancer shares similarities with neglected tropical diseases (NTDs) in that it disproportionately impacts economically disadvantaged populations. Both conditions can be effectively prevented through existing solutions, and they tend to be prevalent in regions with inadequate health policies [2].

Cervical cancer sees a notably higher incidence and mortality rate in low- and middle-income nations, where limited access to vaccines, screening, and treatment is a significant challenge. [3]. Cervical cancer has a severe impact on Sub-Saharan Africa, with 19 out of the top 20 countries worldwide reporting the highest cases in 2018 belonging to this region [4]. In Africa, Zambia held the top position, and Ethiopia secured the thirteenth spot for cervical cancer incidence [5] .

Cervical cancer ranks as the second most prevalent cancer type in Ethiopia, accounting for an estimated 7,445 new cases and 5,338 cancer-related deaths nationally [6].

The vaccination against Human Papillomavirus (HPV) and the implementation of screening have a considerable potential to eliminate cervical cancer in low- and middle-income countries [7].

The primary preventive measure against Human Papillomavirus (HPV) infection is the HPV vaccination. The services provided as part of the vaccination program include administering the vaccine to early adolescent girls, offering comprehensive sexual education, and supplying condoms for sexually active adolescents. Ethiopia initiated its HPV vaccination program in 2018 [5]. Screening serves as a secondary prevention approach, aiding in the early identification and treatment of precancerous cases before they advance to cervical cancer. However, without a connected treatment pathway, screening alone cannot be considered a comprehensive solution for preventing cervical cancer [8, 9]. Screening techniques encompass the Pap test, HPV DNA test, and visual inspection with acetic acid. The Pap test is employed to identify abnormal (cancerous) cells, while the HPV test distinguishes the specific strains of the virus

[10]. Collecting samples for the HPV DNA test is uncomplicated, but it requires significant resources. In contrast, visual inspection with acetic acid is a cost-effective screening method capable of identifying early cellular changes and more advanced stages of cervical pre-cancer [8, 9, 11].

The World Health Organization (WHO) advocates routine screening for women starting at the age of 25. The WHO has set a target of 90-70-90 for low- and middle-income countries by 2030, aiming to achieve 90% HPV vaccination for girls by the age of 15, screen 70% of women at the ages of 35 and 45, and treat 90% of women diagnosed with the diseases [3].

The Ethiopian Federal Ministry of Health (FMOH) has implemented various prevention and treatment measures. These include integrating cervical cancer prevention and treatment services into other women's healthcare services like gynecology clinics, reproductive and child health clinics, and outpatient departments. Additionally, health extension workers (HEWs) and the health development army (HDA) have played a crucial role in encouraging the utilization of cervical cancer prevention services [12].Women's awareness and attitudes towards HPV vaccination and screening are fundamental. Unawareness and misconception were identified as important variables impacting screening utilization in a study conducted in Nigeria, as well as the adverse effect of poor knowledge on cervical cancer prevention [13].

Healthcare professionals serve as exemplars for their clients, possessing ample knowledge and a constructive demeanor in delivering care, potentially enhancing the acceptance of services by clients. They act as reservoirs of information regarding the origins, risk elements, and screening techniques for cervical cancer. Moreover, they have the capacity to educate and impact the screening conduct of their clients [14–17].

Limited information has been available in the past concerning the engagement of female healthcare workers in cervical cancer screening practices.

The purpose of this study was to assess the pooled prevalence of cervical cancer screening practice and associated factors of female health care professionals, in Ethiopia.

Methods

Study design and search strategy

A comprehensive systematic review and meta-analysis were conducted, encompassing both published and unpublished studies from January to December 2024. Extensive searches were carried out across major databases including Google Scholar, PubMed, Cochrane Library, as well as supplementary sources such as reaching out to experts and researchers for recent articles. Additionally, manual searches were performed to identify unpublished studies. The search utilized specific Keywords/MeSH terms related to cervical cancer screening, female health care, and "Ethiopia". Adherence to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines was strictly maintained throughout the review process.

Study selection and eligibility criteria

This systematic review focused on cross-sectional studies conducted in Ethiopia, specifically selecting primary studies and excluding review articles, conference abstracts, and editorials. The eligibility criteria centered on studies conducted between 2010 and 2023, assessing the prevalence of cervical cancer screening practices and associated factors among female healthcare workers. Study selection adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guideline. Two authors independently screened studies based on eligibility criteria, ensuring consistency through cross-checking. Any discrepancies between authors were resolved through discussion and consensus. The protocol for this review has been prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO) under the registration number CRD42024512758.

Data extraction process

A standardized data extraction format was established using Microsoft Excel to retrieve information from the chosen studies. This format included categories such as author details (name and publication year), study year, setting, design, sample size, study population, sampling procedures, data collection methods, and findings. Two authors independently conducted data extraction, and the extracted data were cross-checked for consistency. If any discrepancies arose, the articles were re-evaluated, and disagreements were resolved through verification and subsequent discussion.

Outcome of interest

The outcome variable for this systematic review and meta-analysis was cervical cancer screening practice among female health care workers.

Study quality and validity

The quality of studies was assessed using the Joanna Briggs Institute (JBI) critical appraisal checklist. Following the tool's protocol, reviewers (GL, EG) employed a blinded review approach to evaluate the quality of the original articles. Studies scoring 5 or more in JBI criteria were deemed to have good quality and were consequently included in the review. Any discrepancies in the quality assessment were resolved through consultation with the first author.

Statistical analysis and synthesis

The data extracted were input and analyzed using STATA version 17 statistical software. Cervical cancer screening practice variance in each article was computed using the binomial distribution formula, considering the frequency of the outcome and sample size. The random-effect model was employed to calculate the pooled odds ratio (OR) with a 95% confidence interval (CI) to identify factors associated with cervical cancer screening practices among female health care professionals in Ethiopia. Heterogeneity among studies was assessed using the Cochran Q test (P-value<0.10 considered significant) and I2 statistics (at least 50% considered significant).

Given the substantial variations in study findings, a random-effects model with a 95% CI was utilized for estimation. This model, known for its conservative nature, accounts for inherent heterogeneity in meta-analysis. Subgroup analysis was conducted based on sample size. To identify publication bias, funnel plot analysis, Egger weighted regression, and Begg rank correlation tests were employed, with a P-value<0.05 considered statistically significant. The results of the meta-analysis were visually presented using forest plots and tables.

Result

Characteristics of the studies

From various databases, a total of 6,400 published studies were identified through searching. Among these, 4,300 studies were eliminated due to duplication, and an additional 1,642 studies were excluded after reviewing titles and abstracts against the inclusion and exclusion criteria, as they did not align with the study's aim. The remaining 458 full articles underwent eligibility assessment. Ultimately, seven cross-sectional studies met the criteria and were included in the systematic review and meta-analysis (see Fig. 1).

The seven studies included assessing cervical cancer screening practice among female health care worker who exhibited high heterogeneity (Cochrane Q test $p=0.00$, I2 test (96.95%) which is indicative of to use of the random-effects model (Fig. 2). Even though the Begg rank correlation statistics ($p=0.0844$) indicated that there is no publication bias, the Egger weighted regression statistics
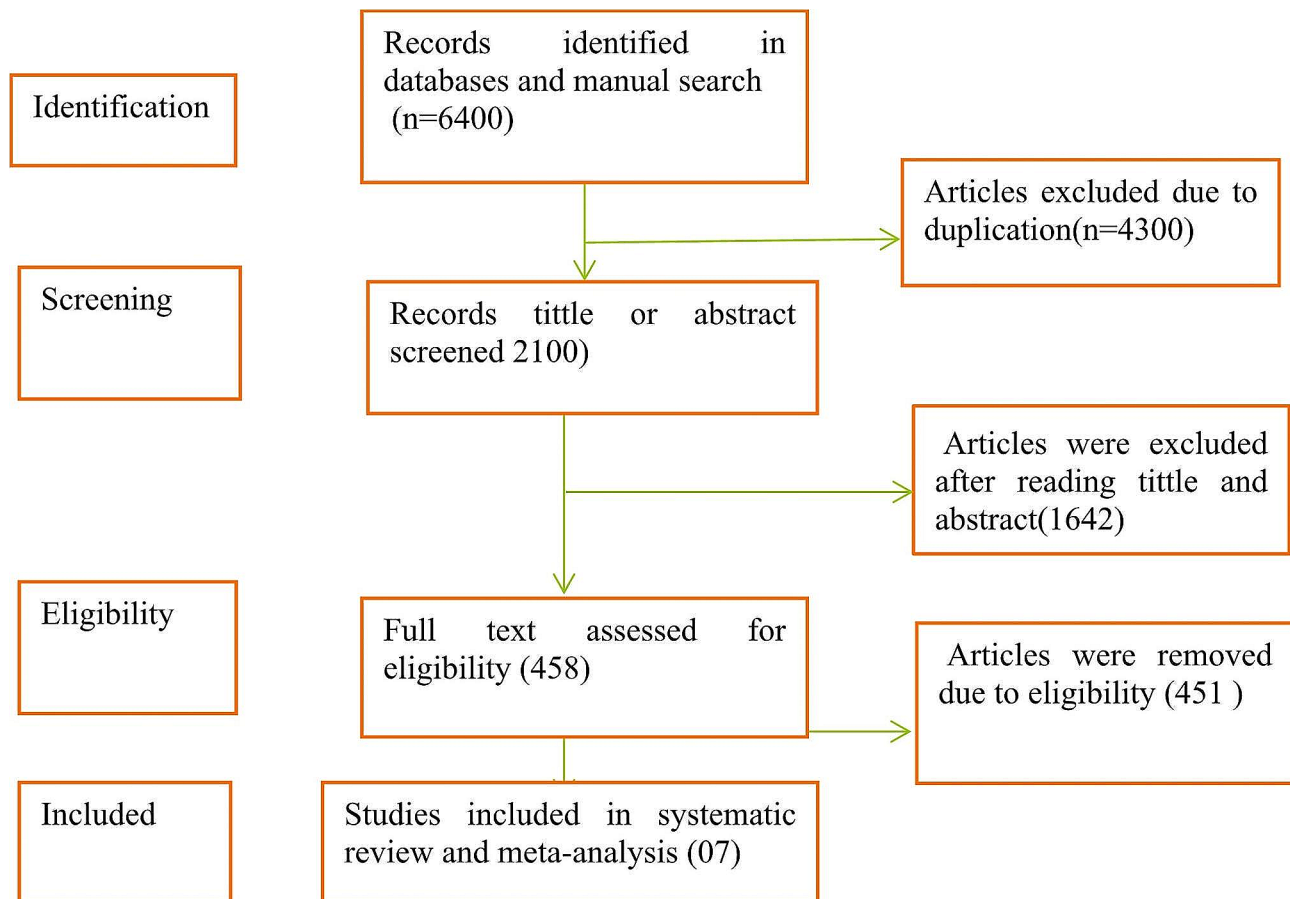
Fig. 1 PRISMA flow chart diagram describing selection of studies for systematic review and meta-analysis on cervical cancer practice and associated factors among female health care workers in Ethiopia (2010–2023)

Table 1 Characteristics of the five studies included in cervical cancer screening practice among female health care workers in Ethiopia in systematic review and meta-analysis
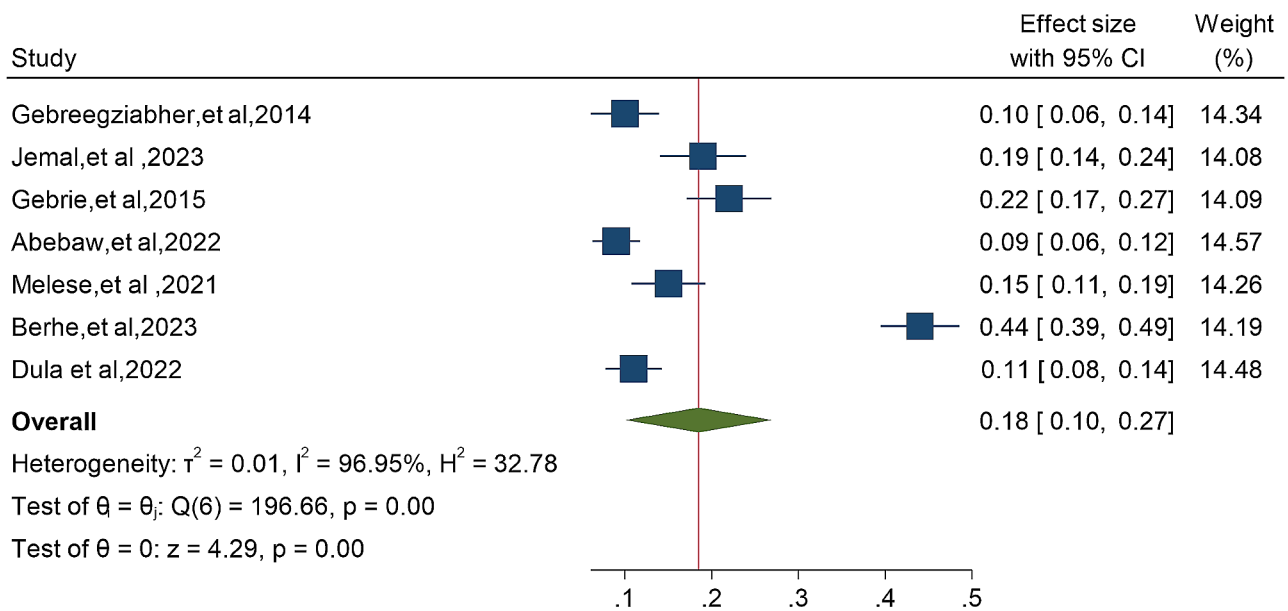
Author	Survey year	Place of the study	Study setting	Sample size	Sampling procedure	Screening practice(yes)	JBI score	Ref
Gebreegziabher, et al.	2014	Mekele	Facility based cross-sectional	225	Systematic random sampling	10%	8	[18]
Jemal, et al.	2023	Hosana	Facility based cross-sectional	241	simple random sampling	19.6%	9	[19]
Gebrie, et al.	2020	Addis abeba	Facility based cross-sectional	275	Systematic	22%	8	[20]
Abebaw, et al.	2022	East gojjam	Facility based	404	Systematic	9%	8	[21]
melese, et al.	2021	Bale zone	Facility based cross-sectional	266	Systematic	15%	7	[22]
Berhe, et al.	2023	Addis Abeba2	Facility based cross-sectional	460	Systematic random sampling	44%	9	[22]
dula et al.	2022	Hawasa	Facility based cross-sectional	367	simple random sampling	11%	8	[23]

of studies conducted on the cervical cancer screening practice ($P=0.0355$) show that there is evidence of publication bias. Visual inspection of the funnel plot reveals asymmetry, which is a potential indicator of publication bias in the data. (Fig. 3). To decrease the heterogeneity, subgroup analysis was performed based on sample size (fig.4). To treat publication bias we ran a nonparametric trim-and-fill analysis, however, no imputed studies were observed.

Prevalence of cervical cancer screening practice among female health care workers in Ethiopia

A total of seven studies were included in this systematic review and Meta-analysis to reveal the prevalence of cervical cancer screening practice among female health

Study	Effect size with 95% CI	Weight (%)
Gebreegziabher,et al,2014	0.10 [0.06, 0.14]	14.34
Jemal,et al ,2023	0.19 [0.14, 0.24]	14.08
Gebrie,et al,2015	0.22 [0.17, 0.27]	14.09
Abebaw,et al,2022	0.09 [0.06, 0.12]	14.57
Melese,et al ,2021	0.15 [0.11, 0.19]	14.26
Berhe,et al,2023	0.44 [0.39, 0.49]	14.19
Dula et al,2022	0.11 [0.08, 0.14]	14.48
Overall	0.18 [0.10, 0.27]	

Heterogeneity: $\tau^2 = 0.01$, $I^2 = 96.95\%$, $H^2 = 32.78$

Test of $\theta_i = \theta_j$: Q(6) = 196.66, p = 0.00

Test of $\theta = 0$: z = 4.29, p = 0.00

Random-effects DerSimonian–Laird model

Fig. 2 Forest plots of the seven studies on cervical cancer screening practice among female health care workers in Ethiopia, 2024
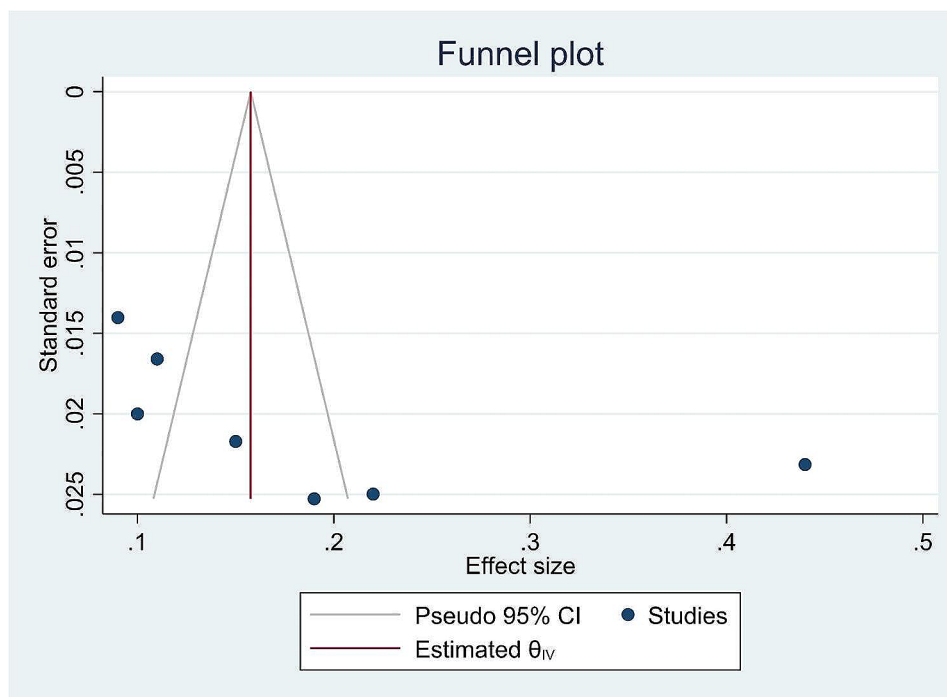

Fig. 3 A Funnel plot of studies conducted on female health care workers on cervical cancer screening practice in Ethiopia (2010–2023)

care workers in Ethiopia from 2010 to 2023. A study done in 2014 reported there was an 10% prevalence of cervical cancer screening practice among female health care workers in the Ethiopia, Tigray region in mekele, and a study conducted in 2020 in Ethiopia, Addis abeba was 22%.Whereas in a study conducted in 2021, the prevalence of cervical cancer screening practice among female health care workers was 15% in Ethiopia, bale zone.Another study conducted in 2022 in the Ethiopia Amhara region, East Gojjam, and sidama, region Hawasa documented the prevalence of cervical cancer screening practice among female health care workers was 9% and 11% respectively. similarly in 2023 in Ethiopia southern region, Hosana and Addisabeba documented the

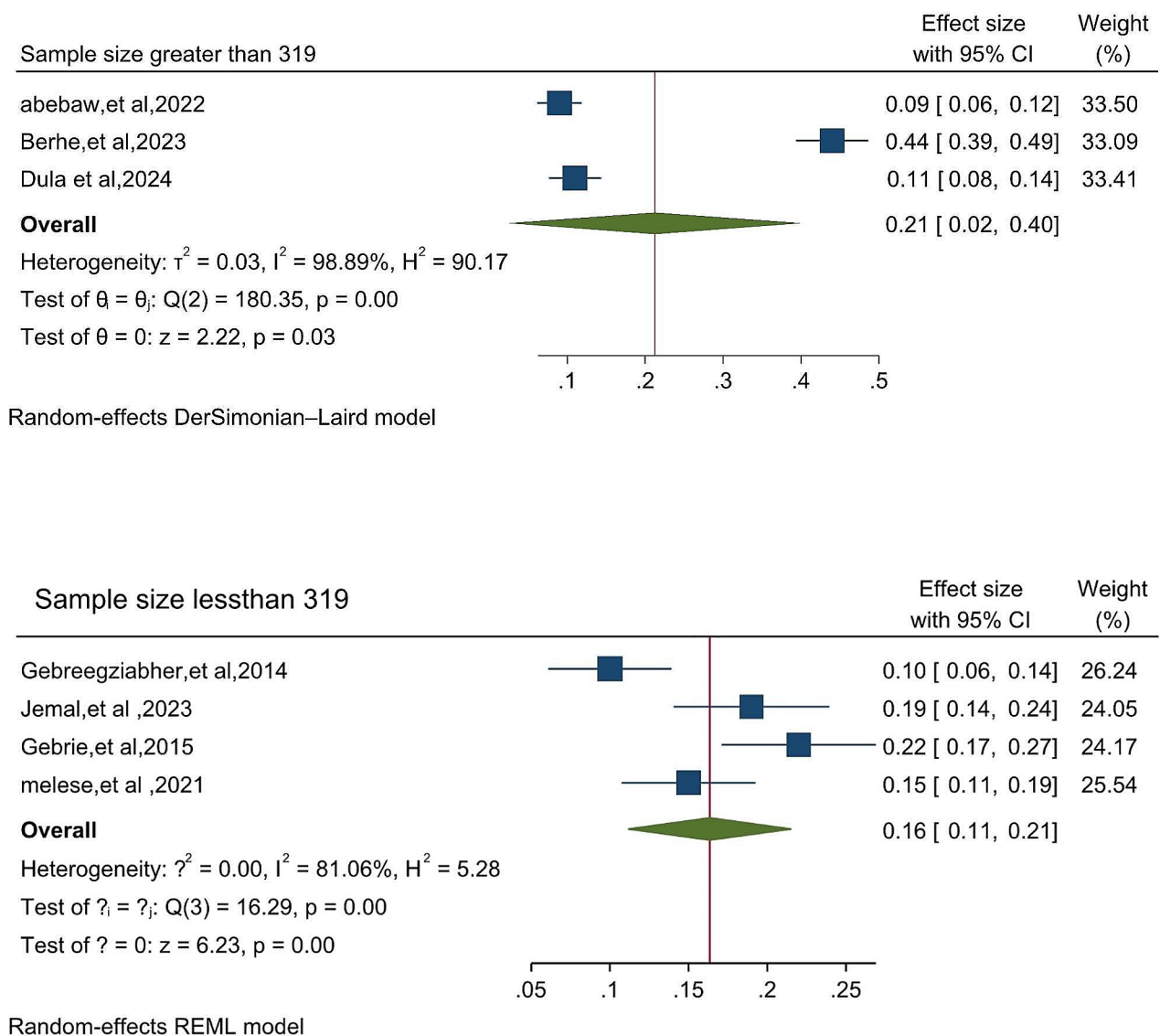Lakew *et al. BMC Cancer*   (2024) 24:986

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Fig. 4 Sub-group analysis based on sample size on cervical cancer screening practice in female health workers in Ethiopia (2010–2023)

prevalence of cervical cancer screening practice among female health care workers was 19% and 44% respectively (Table 1).

The pooled prevalence of cervical cancer screening practice among female health care workers in Ethiopia was 18% (95%CI: 10- 27%) (Fig. 2).

Furthermore, subgroup analysis based on the sample size showed that the cervical cancer screening practice was significantly higher(21%) with sample size greater than 319 compared to the lowest prevalence (16%) with sample size less than 319 (Fig. 4).

Table 2 Meta-regressions of cervical cancer screening practice among female health care workers by sample size of included studies in Ethiopia (2010–2023)

Covariate	β (95% CI)	*p*-value
Sample size	-0.0.002612(− 0.4497354−0.4385714)	0.668

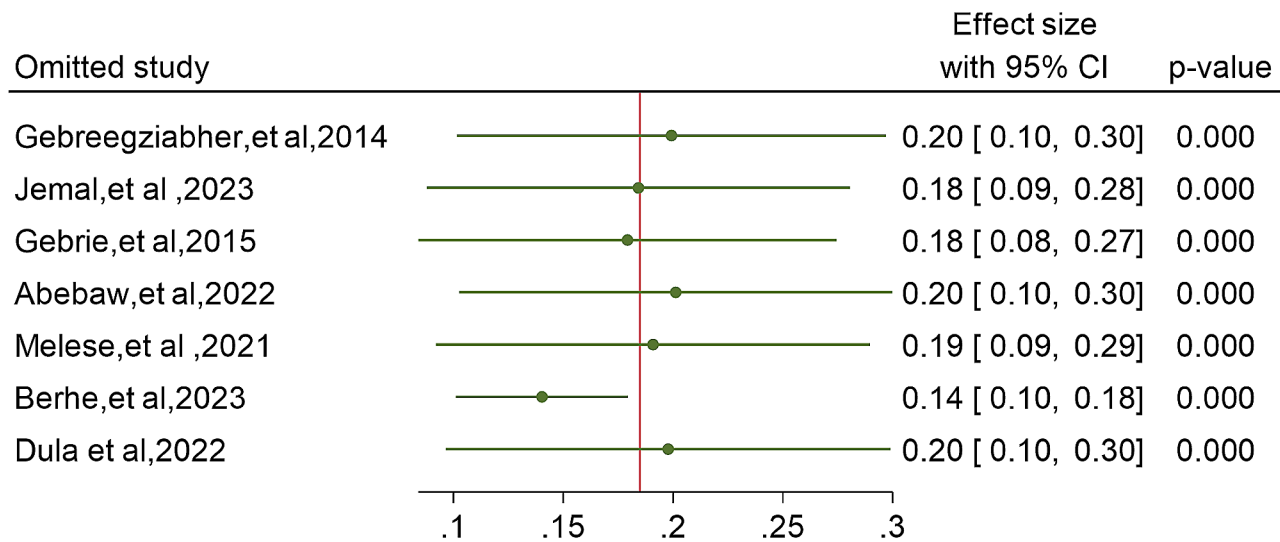## Meta-regression and sensitivity analysis
Meta-regression
Meta registration was conducted by considering the sample size as covariates using a random effect model. The result showed that no heterogeneity was observed by the place of study (*p*=0.991) (Table 2).

Sensitivity analysis
Sensitivity analysis was conducted by using the leave-one-out method to assess the effect of any individual

Omitted study	Effect size with 95% CI	p-value
Gebreegziabher,et al,2014	0.20 [0.10, 0.30]	0.000
Jemal,et al ,2023	0.18 [0.09, 0.28]	0.000
Gebrie,et al,2015	0.18 [0.08, 0.27]	0.000
Abebaw,et al,2022	0.20 [0.10, 0.30]	0.000
Melese,et al ,2021	0.19 [0.09, 0.29]	0.000
Berhe,et al,2023	0.14 [0.10, 0.18]	0.000
Dula et al,2022	0.20 [0.10, 0.30]	0.000

Random-effects DerSimonian–Laird model

Fig. 5 Leave-one-out sensitivity analysis of cervical cancer screening practice among female health care workers in Ethiopia (2010–2023)

study on the overall pooled cervical cancer screening practice among female health care workers. The result showed that the point estimated prevalence obtained when each study is left out from analysis was inside the confidence interval of the pooled prevalence. Therefore, none of the included studies affected the overall pooled estimate as shown below (Fig. 5).

Factors associated with cervical cancer screening practice among female health care workers in Ethiopia (2010–2023)
Work place, knowledge, work experience, being diagnosed and ever cared of cervical cancer patient were the pooled associated factors that are significantly associated with cervical cancer screening practice among female health care worker.

Female health workers who had worked in gynecology unit (OR=2.858; 95% CI: 0.412, 5.305) had 2.8 times more likely odds of cervical cancer screening practice compared to their respective counterparts. Female health workers who had knowledge about cervical cancer screening (OR=3.457; 95% CI: 2.314, 4.601) had 3.45 times more likely odds of cervical cancer screening practice compared to their respective counterparts. Female health workers who had greater than 7 years and above work experience (OR=5.421; 95% CI:4.178, 6.664) had 5.4 times more likely odds of cervical cancer screening practice compared to their respective counterparts.

Female health workers who were being diagnosed for cervical cancer (OR=10.787; 95% CI: 06.197, 15.377) had 10 times more likely odds of cervical cancer screening practice compared those who are not diagnosed.

The meta-analysis also showed that female health workers who cared cervical cancer patients were

Table 3 The pooled odds ratios of factors associated with cervical cancer screening practice among female health care workers in Ethiopia from (2010–2023)

Factor Variables	Odds Ratio (95% CI) (Random effect model)	I 2(%)	*P*-value
Work place	2.858(0.412–5.305)	92	**0.0220**
Knowledge	3.457(2.314–4.601)	73.79	**0.0000**
Age	0.141(-0.785-1.068)	0.000	0.07647
Work experience	5.421 (4.178–6.664)	54.35	**0.0000**
Being diagnosed	10.787(6.197–15.377)	98.11	**0.0000**
Ever cared	2.93(2.004–3.856)	77.99	**0.0000**

significantly associated with cervical cancer screening practice. Female health workers who cared cervical cancer patients (OR=2.93; 95% CI: 2.004, 3.856) had 2.93 times more likely odds of cervical cancer screening practice compared those who are not cared other patients (Table 3).

Discussion
This systemic review and meta-analysis synthesized evidence on the cervical cancer screening practice and associated in female health care workers in Ethiopia, 2024. The study further revealed that factors like work place, knowledge, work experience, and being diagnosed for cervical cancer and ever cared cervical cancer patient were significantly associated with the utilization of cervical cancer screening services.

The prevalence of cervical cancer screening among female healthcare workers in Ethiopia was determined to be 18%, aligning with similar studies conducted in Ethiopia (22%), Nigeria (20.6%), Baghdadi (18.8%), Chennai Corporation (18.4%), Tanzania (15.4%), and Dar Salaam, Tanzania (21%) [20, 24–28]. The observed consistency

may be attributed to similarities in the present socio-demographic status and sample size. Nevertheless, the prevalence found in this study was lower when compared to research conducted in Saudi Arabia (26.2%), Uganda (75%), Cameroon(41%),andIbadan, Nigeria(34.6%) [29–32].This variation could be attributed to the timing of the implementation of cervical cancer screening practices and disparities in the extent of healthcare service coverage across countries. Additionally, the results of this study surpass those reported in Sidama zone, Southern Ethiopia (11.4%), Arba Minch town, Southern Ethiopia (9.6%), Mekelle town, Northern Ethiopia (10.7%), Uttar Pradesh, India (10%), Korea (13%), South-eastern Nigeria (7.2%), rural India (7%), and Sokoto, Nigeria (10%) [18, 23, 33–38]. The lack of consistency could be attributed to variations in time and differences in the study environment. Moreover, the predominant participants in our study were urban-dwelling female health workers, potentially contributing to the noted divergence. This is lower than WHO recommendation in which should be at least 70% to effectively reduce the incidence and mortality associated with cervical cancer. These could include factors such as limited awareness, access to screening facilities, socio-economic disparities, cultural beliefs, and health infrastructure challenge. The other reason may include busy work schedules, perceived invulnerability, or stigma associated with the screening process. This implies that Healthcare workers serve as role models and influencers in their communities. If they are not adequately screened, it may contribute to a lack of awareness and uptake among the general population.

The likelihood of utilizing cervical cancer screening services was elevated in female health workers with a solid understanding of cervical cancer screening compared to those with limited knowledge. This aligns with findings from a comparable study conducted in Arba Minch town, Southern Ethiopia, and Nigeria [33, 39–41]. Due to their well-founded knowledge of cervical cancer, female health workers seize the opportunity to enhance early detection, thereby enhancing their chances of survival.

Female health workers who had worked in gynecology unit had 2.8 times more likely odds of cervical cancer screening practice compared to their respective counterpart's. The factors contributing to this connection are likely diverse and could encompass heightened awareness, knowledge, and availability of screening services among health workers within gynecology units.

Female health workers who were being diagnosed for cervical cancer had 10 times more likely odds of cervical cancer screening practice compared those who are not diagnosed this is consistent with a study conducted in India [42]. The most significant immediate progress in decreasing the incidence and mortality of cervical cancer in Ethiopia can be achieved by enhancing screening accessibility for women who are presently not screened or undergo screening less frequently, irrespective of the type of test employed. Female health workers who cared cervical cancer patients had 2.93 times more likely odds of cervical cancer screening practice compared those who are not cared other patients. This consistent with systematic review done in Uganda [43] and Addis Ababa [16]. Female health workers who had greater than 7 years and above work experience had 5.4 times more likely odds of cervical cancer screening practice compared to their respective counterparts. This prompts a more in-depth inquiry into the mechanisms underpinning the noted association, and it could provide insights for tailored interventions aimed at enhancing cervical cancer screening practices among less experienced health workers.

Implications of the study
This study was conducted to determine the overall pooled prevalence and associated factors of cervical cancer screening practice in female health care workers in Ethiopia in order to provide evidence for policy makers and stakeholders to design and implement evidence-based interventions to combat cervical cancer related morbidity and associated mortality in female health workers in Ethiopia.

Strength and limitations of the study
Thorough searches employing various search methods (both manual and electronic) were undertaken; encompassing both published and unpublished articles. To mitigate bias, two authors independently extracted data utilizing a predetermined tool, and quality assessment was carried out. Dealing with high heterogeneity involved conducting subgroup analyses and employing the random-effects model for calculating pooled prevalence and odds ratio. The potential biases from factors such as inaccurate selection of study participants, limited sample size in some studies, constraints in data collection and analysis, and selective reporting of results in the included studies could impact the findings of the meta-analysis. As the original studies included in this review were of a cross-sectional design, the estimates could be influenced by confounding variables. The presence of unexplored confounders might contribute to the variability in the prevalence of cervical cancer screening practices observed across the reviewed studies.

Conclusion
This study identified a low prevalence of cervical cancer screening among female healthcare workers in Ethiopia, highlighting the need for improvement. Factors associated with increased screening rates included knowledge

of the disease, work experience, personal history of the disease, and having cared for cervical cancer patients.

Recommendation
It is essential for female health workers to consistently receive education on cervical cancer, enabling them to continue effectively in their role of early detection, thereby reducing the morbidity and mortality linked to invasive cervical cancer. The Ministry of Health should collaborate with other organizations to ensure affordable screening services are accessible to the public across various healthcare settings.

Abbreviations
FMOH	Federal Ministry of Health
HAD	Health and development army
HEW	Health extension workers
HPV	Human papilloma virus
HPV DNA	Human papilloma virus deoxyribonucleic acid
JBI	Joanna Briggs Institute
NTD	Neglected tropical diseases
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
PROSPERO	Prospective Register of Systematic Reviews
WHO	World health organization

Author contributions
GL, EKB, GAA, KS, EG, ANY, AYB, AGB and SKB search and extract the articles . EGD, EKB and GAA check the quality of the articles, GL, EKB, GAA, KS, EG, ANY, AYB, AGB, and SKB search and extract the articles,.GL, EKB, and GAA do the analysis part and write the result, LG, EKB, GAA, KS, EG, and ANY, review the manuscript. LG and EKB revised the manuscript. Finally, all authors gave approval of the version to be published; agreed on the journal to which the article had been submitted; and agreed to be accountable for all aspects of the work.

Data availability
All data included in systematic review and Meta-analysis are available in the main manuscript.

Declarations

Ethics approval and consent to participate
This section is not applicable because this study is a systematic review and Meta-analysis.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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