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Review Paper

Cervical cancer screening uptake in Sub-Saharan Africa: a systematic review and meta-analysis

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ABSTRACT

Objectives: The objective of this study is to estimate the pooled uptake of cervical cancer screening and identify its predictors in Sub-Saharan Africa.
Study design: Systematic review and meta-analysis.
Methods: We searched PubMed, EMBASE, CINAHL, African Journals OnLine, Web of Science and Scopus electronic databases from January 2000 to 2019. All observational studies published in the English language that reported cervical cancer uptake and/or predictors in Sub-Saharan Africa were initially screened. We assessed methodological quality using the Newcastle-Ottawa Scale. An inverse variance-weighted random-effects model meta-analysis was performed to estimate the pooled uptake and odds ratio (OR) of predictors with a 95% confidence interval (CI). The I^2 test statistic was used to check between-study heterogeneity, and the Egger's regression statistical test was used to check publication bias.
Results: We initially screened 3537 citations and subsequently 29 studies were selected for this review, which included a total of 36,374 women. The uptake of cervical cancer screening in Sub-Saharan Africa was 12.87% (95% CI: 10.20, 15.54; I^2 = 98.5%). A meta-analysis of seven studies showed that knowledge about cervical cancer increased screening uptake by nearly five times (OR: 4.81; 95% CI: 3.06, 7.54). Other predictors of cervical screening uptake include educational level, age, Human Immune deficiency Virus (HIV) status, contraceptive use, perceived susceptibility and awareness about screening locations.
Conclusions: Cervical screening uptake is low in Sub-Saharan Africa as a result of several factors. Health outreach and promotion programmes to target these identified predictors are required.

Introduction

Cervical cancer is a global public health challenge.[1] The primary cause of cervical precancer and cancer is persistent infection with one or more of the high-risk oncogenic types of human papillomavirus (HPV). HPV interferes with the normal functioning of cells, which results in distinct changes in the epithelial cells of the transformation zone of the cervix.[2] Cervical cancer is one of the very few types of cancers where a precancer stage lasts for many years before becoming invasive cancer, thus allowing ample opportunity for detection and treatment.[3] Cervical cancer is a malignancy for which effective screening is available. The screening seeks to identify precancerous cellular changes on the cervix that may become cervical cancer if they are not appropriately treated.[4]

Cervical cancer is the fourth most common cancer in women, with an estimated 530,000 new cases every year, representing 7.9% of all female cancers.[5] In 2015, approximately 90% of the 270,000

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deaths from cervical cancer occurred in low- and middle-income countries.[5] The mortality rate varies remarkably among different regions of the world, with rates ranging from <2 per 100,000 in Western Europe and New Zealand to 27.6 per 100,000 in Sub-Saharan Africa.[6]

Cervical cancer prevention and the impact of screening programmes on cervical cancer-related deaths have been given considerable attention in developed countries, in contrast to the minimal effort seen in most low- and middle-income nations.[7] Cervical cancer screening coverage is very limited in low- and middle-income countries, as shown by a study that reported coverage of cervical cancer screening in developing countries to be 19% (on average) compared with 63% (on average) in developed countries.[8] Data from the 2017 World Health Survey indicated that the coverage of cervical cancer screening was 10% in Sub-Saharan Africa.[9] Moreover, <1% of women in four West African countries had ever been screened for cervical cancer.[10]

Although cervical cancer screening is proven to reduce cervical cancer incidence, many factors influence screening uptake.[11] The rate of screening uptake has been shown to vary by knowledge about cervical cancer and screening services, in addition to other factors, such as individual perception, beliefs, attitudes and culture and partner attitude.[12] Several studies have suggested that many women, particularly those with low levels of knowledge about cervical cancer and screening, may not recognise the benefit of screening over the possible consequences of forgoing screening.[13–18]

Although it is very limited in scope, there are prevention, treatment and rehabilitation strategies for cervical cancer, such as risk assessment, screening and clinical interventions, in Sub-Saharan Africa. Nevertheless, these services are not being fully used because of structural and behavioural barriers.[19,20] To enhance cervical cancer screening and treatment efforts, it is necessary to identify the factors influencing screening uptake in eligible women and their prevalence. Therefore, in this meta-analytic review, we aimed to estimate the pooled uptake of cervical cancer screening uptake and identify its predictors among Sub-Saharan African women.

Methods

The protocol has been registered with PROSPERO, an international prospective register of systematic reviews,[21] under registration number CRD42017079375. This meta-analytic review is reported in compliance with the recommendation of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2015 statement.[22] The PRISMA Explanation and Elaboration document was followed and complemented by A Measurement Tool to Assess Systematic Reviews tool.[23] A PRISMA flow diagram[24] was used to illustrate the article screening and selection process (Fig. 1).

Literature search

PubMed, EMBASE, CINAHL, Web of Science, African Journals OnLine and Scopus electronic databases were explored to extract all available literature. Cross-references of included articles and grey literature were also searched. The search strategy (Table S1 in the supplementary material) was developed in consultation with medical information specialist and Peer Review of Electronic Search Strategies 2015 guideline statements.[25]

Eligibility criteria

Studies were included if they met the following inclusion criteria: (i) observational (i.e. cross-sectional, case-control, cohort) and (quasi) randomised controlled trial studies; (ii) conducted in Sub-Saharan Africa between January 2000 and December 2019; and (iii) published in the English language. Case reports, case series, expert opinions, qualitative studies, duplicated articles and studies with substantial incomplete data were excluded.

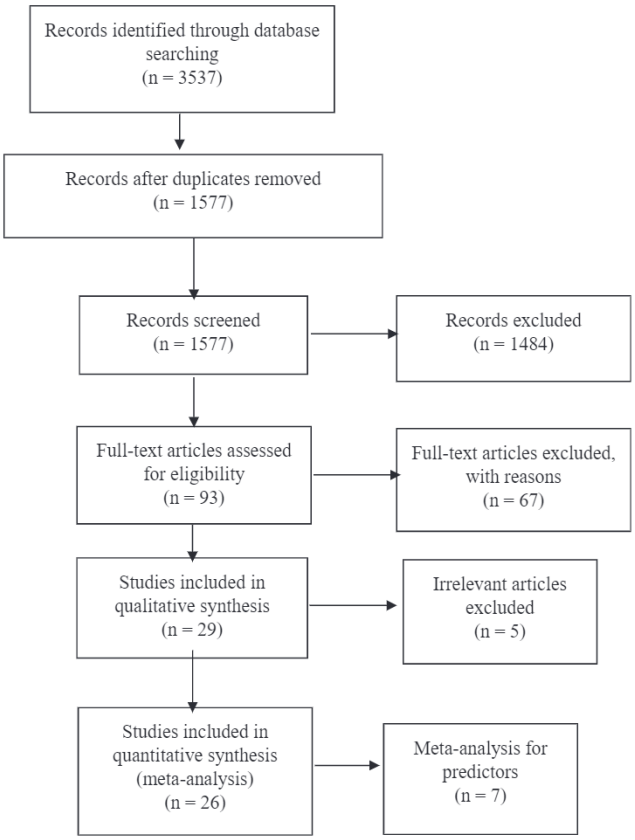

Fig. 1. PRISMA flow diagram for predictors of cervical cancer screening, January 2000 to January 2019. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

Study selection and data extraction

Initially, all identified articles were imported into Covidence.[26] After duplicate studies were excluded, two researchers (M.A.M. and N.B.Y.) identified articles by analysing the abstracts and titles for relevance to the proposed review topic. Agreement between the reviewers was made by consensus. Then, the full texts of the remaining articles were systematically reviewed for further eligibility. Finally, two reviewers (M.A.M. and N.B.Y.) extracted all relevant information, including first author, publication year, country, sample size, study design, prevalence,significant predictors and source of funding using an Excel spreadsheet. A disagreement between reviewers was solved through consensus.

Quality assessment of included studies

Two reviewers (N.B.Y. and M.A.M.) assessed the quality of selected articles using the Newcastle-Ottawa Scale (NOS) for cross-sectional studies.[27] The tool has three domains: selection (maximum of five stars), comparability (maximum of five stars) and outcome (maximum of five stars). In this review, studies were ranked as 'very good' if they scored ≥5 stars, 'good' for 4 stars,

'satisfactory' for 3 stars and 'unsatisfactory' for 0–2 stars. Quality assessment and funding sources of the studies are available in the supplementary material (Table S2).

Data analyses

An inverse variance-weighted random-effects model meta-analysis was performed to estimate the pooled uptake and odds ratio (OR) of predictors with 95% confidence interval (CI). To maintain adequate power, the meta-analysis was only used if at least five studies were available on a particular outcome of interest. Jackknife sensitivity analysis using the leave-one-out method was used to assess the effect of individual studies on the pooled OR estimate, significance level of estimate and between-study heterogeneity. The Jackknife is a linear approximation of the bootstrap, which systematically removes each observation of a data set, calculating estimates and finding the average of the calculation. A study was excluded when the pooled OR estimate increased or decreased by 1 and if there were changes to the significance level after removing that particular study from the meta-analysis. Owing to a small number of studies available for some variables, the change in heterogeneity threshold was not considered as a primary criterion to detect and exclude the outlier study. A narrative synthesis was used to summarise evidence on predictors. Heterogeneity between studies was tested using the Cochran's Q test and the Higgins's I^2 test statistic. The risk of publication bias was checked by visualising funnel plots and Egger's regression statistical tests. STATA, version 11 (StataCorp, College Station, TX, USA, 2009), was used for statistical analysis. To examine the source of heterogeneity, subgroup analysis was carried out based on sample size, the geographic distribution of the studies and year of publication.

Results

Characteristics of the studies

A total of 3537 studies were retrieved through database and manual searching. After removing duplicates (1577), 93 full-text articles were assessed for further eligibility. Finally, 29 articles with 36,374 women were included in the meta-analysis and qualitative analyses. Only seven studies were included in the meta-analysis for knowledge and cervical cancer screening (Fig. 1).

This review included studies conducted in the following Sub-Saharan African countries: 1 in Ghana, 1 in Burkina Faso, 1 in Botswana, 6 in Nigeria, 7 in Ethiopia, 4 in Kenya, 2 in Uganda, 2 in Tanzania, 2 in Zimbabwe, 1 in Mozambique, 1 in Cameroon and 1 in South Africa. All of the included investigations were cross-sectional studies. In total, 28 studies had a 'very good' quality score (≥5 stars) and one study had 'good' quality score (4 stars) (Table 1).

Uptake of cervical cancer screening

The pooled uptake of cervical cancer screening in Sub-Saharan Africa was 12.87% (95% CI: 10.20, 15.54), and there was considerable heterogeneity ($I^2 = 98.5\%$). A random-effects model was used (Fig. 2), and subgroup analysis was conducted by region, sample size and year of publication. Based on the subgroup analysis, screening uptake ranged from 7.65% in the southern Sub-Saharan African countries to 14.13% in the eastern countries (refer to Fig. S1 in the supplementary material). By sample size, 13.83% of women were screened in a sample size group of <800, while 11.34% were screened in studies with sample sizes >800 (Figure S2). In addition, 13.5% of women were screened among studies published after 2015 (Figure S3). Sensitivity analysis was performed; no significant change was noted in the overall OR. There was publication bias, as evidenced by Egger's test P=0.048.

Predictors of cervical cancer screening

A study in Ghana and one in Ethiopia both showed that lack of formal education was significantly associated with low utilisation of cervical cancer screening services.[28,35] On the other hand, three studies[30,37,41] revealed that being HIV positive was a significant predictor for utilisation of the screening service. Awareness of place of screening also increased screening uptake in Kenya and Sudan.[37,45] An increase in cervical cancer screening was noted as age increases.[48] Tefera and Mitiku[34] reported a higher proportion of screened mothers aged 25–49 years. Similarly, Three studies[30,33,41] reported higher utilisation of the screening services with increasing age .

Negative attitudes, perceived susceptibility and perceived barriers have also been shown to reduce the likelihood of cervical cancer screening uptake.[41,42,55] Indeed, a positive attitude increased service utilisation in Ethiopia.[48] Akinyemiju et al.[44] in Nigeria reported that women were more likely to be screened if the provider was also female. On the contrary, not preferring gender of physician increased screening among Ethiopian women.[55] Two studies in Ethiopia reported that counselling about screening was associated with uptake of the service.[48,55] Abnormal vaginal bleeding,[28] heard about HPV and oral contraceptive use,[29] health insurance and condom use,[33] lack of awareness about the seriousness of cervical cancer,[36] fear of a bad result after screening,[37] multiple sexual partners and sexually transmitted diseases[41,48] and screening services provided at government health institutions[45] were also significantly associated with cervical cancer screening uptake (Table 1).

A meta-analysis of seven studies[29,30,33,34,39,41,55] revealed that knowledge about cervical cancer screening was significantly associated with cervical cancer screening (OR: 4.81; 95% CI: 3.07, 7.51). There was moderate heterogeneity ($I^2 = 47.8\%$); hence, a random effect model was used (Fig. 3). The Egger's test showed that no publication bias existed ($P = 0.44$).

Discussion

In this systematic review and meta-analysis, the overall uptake of cervical cancer screening was pooled from 26 studies in Sub-Saharan Africa and significant predictors of cervical cancer screening were identified. Knowledge about cervical cancer screening increased uptake of the service by nearly five times. In addition, educational level, age, HIV status, contraceptive use, perceived susceptibility and awareness about screening locations were predictors of cervical screening in Sub-Saharan Africa. The findings of this review revealed evidence to improve policies and practices aimed at addressing the utilisation of cervical cancer screening services across the region.

The pooled prevalence of cervical cancer screening in Sub-Saharan Africa was 12.12% (95% CI: 9.48, 14.76) in the present review. This rate is lower than that reported in studies of Chinese-Canadian and Malaysian women, which were 57%[56] and 48.9%,[57] respectively. Similarly, this rate is lower than that found in women with limited primary education in Indonesia (33–60%), Malaysia (23%) and Thailand (67.6%) but higher than that in women with limited primary education in the Philippines (7.7%) and Vietnam (4.9%).[58] However, these figures should be interpreted cautiously, as they are based on 2000–2001 World Health Organization estimates and may be out of date. Previous literature suggests that the lower uptake of screening in Sub-Saharan Africa may be due to overcrowding and overburden of healthcare

Table 1
Characteristics of the included studies from Sub-Saharan Africa, January 2000 to January 2019.

Study	Publication year	Country	Sample size	Screened women	Predictors	Quality score (stars)
Adanu et al.[28]	2010	Ghana	3183	25	Lack of formal education Abnormal vaginal bleeding	7
Sawadogo et al.[29]	2014	Burkina Faso	840	93	Heard about cervical cancer Knowledge about transmission mode Heard about human papillomavirus Oral contraceptive use	8
Mingo et al.[30]	2012	Botswana	376	271	Age 31–84 y Being HIV positive Heard about cervical cancer	7
Dim et al.[31]	2009	Nigeria	912	82	Not reported	5
Chigbu et al.[32]	2011	Nigeria	3712	389	Not reported	6
Cunningham et al.[33]	2015	Tanzania	575	35	Condom use Age 40–49 y, age >50 y Health insurance Knowledge about cervical cancer	7
Tefera and Mitiku[34]	2016	Ethiopia	634	68	Age 25–35 y, age 35–49 y Knowledge about cervical cancer	8
Aweke et al.[35]	2017	Ethiopia	595	58	Lack of formal education Primary education Secondary education	8
Morema et al.[36]	2014	Kenya	424	74	Lack of awareness about seriousness of disease	8
Orango'o et al.[37]	2016	Kenya	2505	273	Being HIV positive Fear of bad result Know place of screening	8
Tiruneh et al.[38]	2017	Kenya	9016	1750	Not reported	8
Lyimo and Beran.[39]	2012	Kenya	354	80	Knowledge about cervical cancer	8
Twinomujuni et al.[40]	2015	Tanzania	416	29	Not reported	8
Bayu et al.[41]	2016	Ethiopia	1286	235	Age 30–39 y Multiple sexual partners Sexually transmitted diseases Being HIV positive Knowledge about cervical cancer Perceived susceptibility and barriers	8
Idowu A et al.[42]	2016	Uganda	338	27	Negative attitude	8
Akanbi OA et al[43]	2015	Nigeria	737	110	Not reported	5
Akinyemiju et al.[44]	2015	Nigeria	1236	274	Female provider	8
Ahmed et al.[70]	2016	South Africa	500	79	Not reported	6
Ndejjo et al.[45]	2016	Uganda	845	43	Getting reproductive care at government facility Know place of screening Ease of getting reproductive service	8
Mupepi SC et al.[46]	2011	Zimbabwe	700	63	Knowledge of screening	8
Nwankwo et al.[47]	2011	Nigeria	845	36	Not reported	7
Bante et al.[48]	2019	Ethiopia	517	108	Age Counselling Positive attitude Visited health facility STIs	8
Brandão et al.[49]	2018	Mozambique	3177	96	Not reported	9
Donatus et al.[50]	2019	Cameroon	253	110	Not reported	4
Gebregziabher et al.[51]	2019	Ethiopia	344	59	Sexual experience Marital status Place of birth Year of study	7
Getachew et al.[52]	2019	Ethiopia	520	130	Not reported	8
Ifemelumma et al.[53]	2019	Nigeria	388	80	Not reported	6
Makurirofa et al.[54]	2019	Zimbabwe	409	15	Not reported	7
Nigussie et al.[55]	2019	Ethiopia	737	114	Government employee Know someone screened History of gynaecologic exam Gender of physician Counselling Knowledge Perceived susceptibility	8

STIs, Sexually Transmitted Infections.

providers at tertiary facilities.[59] Although cervical screening services are being offered, free of charge, in many African countries, out-of-pocket payment and fear of hidden charges were reported as barriers for utilisation of the service in some countries.[60] In addition, access to screening services, social support and other cultural and contextual factors might decrease utilisation of screening in Sub-Saharan Africa. As national screening campaigns have been promoted in recent years, the results from older studies might affect the pooled estimate of the present review. A root cause analysis in low-income countries reported that competing incentives among groups with shared interests in the service, suboptimal working conditions and lack of cervical cancer

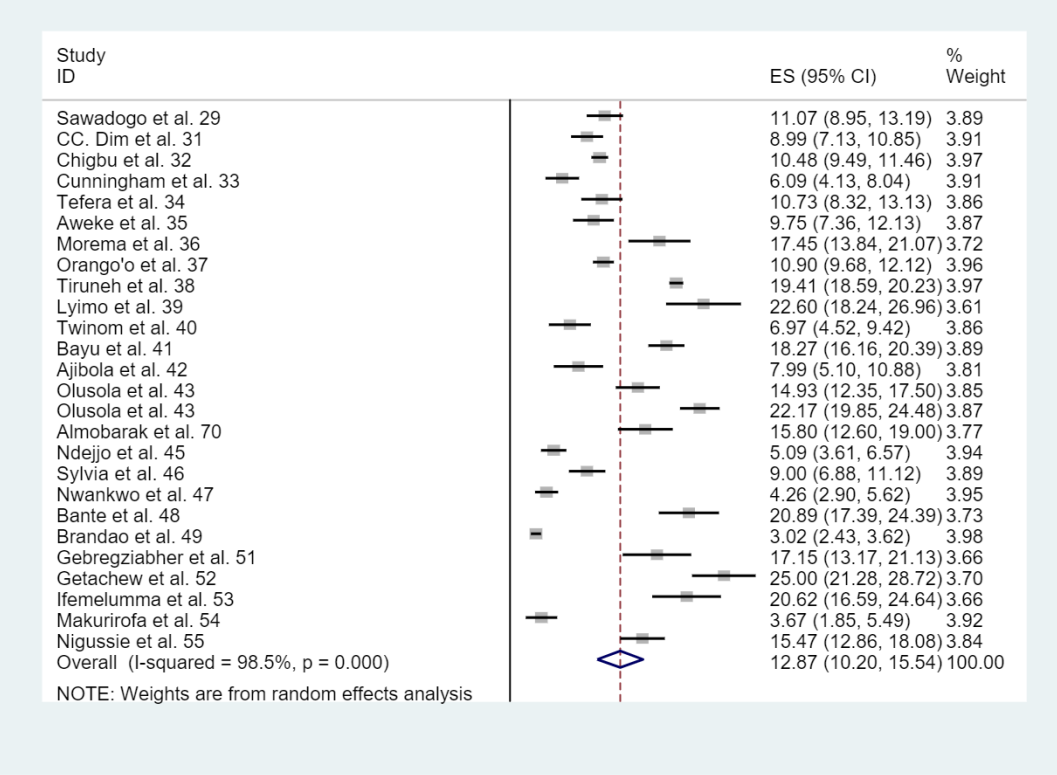

Fig. 2. Forest plot of pooled prevalence of cervical cancer screening in Sub-Saharan Africa, January 2000 to January 2019. CI, confidence interval; ES, effect size.

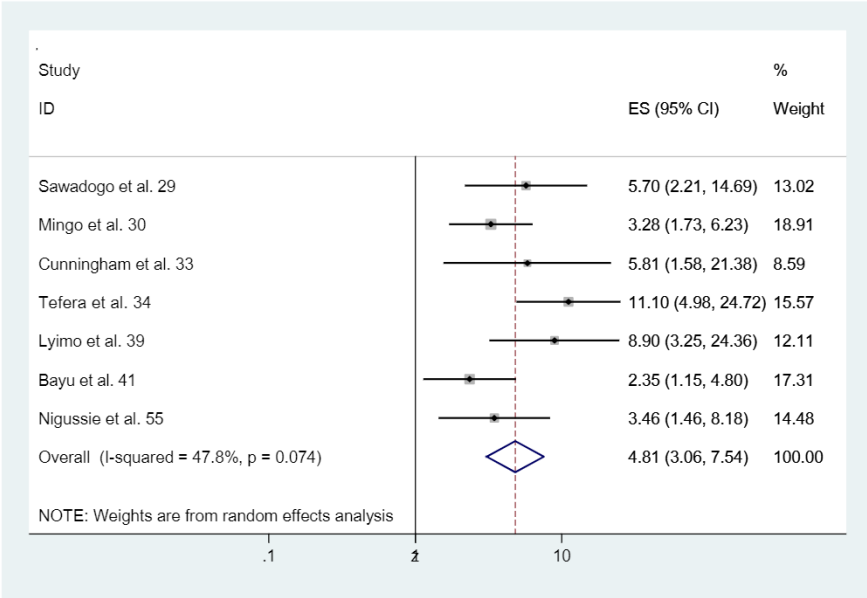

Fig. 3. Forest plot for knowledge about cervical cancer screening and uptake of service in Sub-Saharan Africa from January 2000 to January 2019. CI, confidence interval; ES, effect size.

prevention support in the political structures of the countries were identified as obstacles for successful cervical screening.[61] Another study, a Cochrane review of randomised trials, confirmed that invitations (e.g. appointments, letters, phone calls, verbal recommendations, prompts and follow-up letters) to women who were eligible for screening increased uptake of the service.[62] A systematic review in low- and middle-income countries revealed that telephone reminders or messages led to increasing cervical screening uptake.[63] Scaling up of screening services to all primary and secondary healthcare facilities and the use of trained medical staff may be important to increase uptake. Lower utilisation of screening services in Sub-Saharan Africa may also signal that political commitment is needed to improve cervical cancer prevention efforts.

The current systematic review revealed that lack of formal education and inadequate awareness about the seriousness of cervical cancer were associated with low utilisation of cervical cancer screening. This finding is consistent with a study in India that reported a higher incidence of cervical lesions among illiterate women due to their late presentation to health facilities.[59] Community mobilisation, including the use of village health promotors, may be important to increase uptake of screening services. In India, rural cancer registries and campaigns were found to be useful in detecting cervical cancer at the village level.[64] Moreover, the current review noted a higher utilisation of screening among older women, which is consistent with a study conducted in Malaysia.[57] This might be due to the fact that older women tend to seek treatment for their age- or hormone-related complaints. In the Netherlands, women aged 40–50 years who felt a high personal moral obligation had the highest likelihood of screening uptake.[65]

Women in the current review were more likely to have cervical cancer screening when the provider was female. Similarly, a study in Canada revealed that cervical cancer screening was associated with culturally sensitive healthcare services.[56] Together, these findings may imply the need for culturally appropriate care and outreach. Moreover, the current review showed that women tend to underuse the screening service owing to fear of bad results. Evidence shows that there are potential harms of screening, including anxiety related to positive results.[66] The present review also identified negative attitudes, perceived susceptibility and perceived barriers as significant factors for screening uptake. As women's beliefs may contribute to lower uptake of screening,[65] intervention strategies should focus on beliefs and attitudes about cervical cancer.

In the current review, women who knew about cervical cancer are nearly five times more likely to use cervical cancer screening than those who did not. Studies have shown that awareness about cervical cancer screening is a priority in resource-limited countries.[59] Similarly, general knowledge about cervical screening tests was associated with cervical cancer screening uptake among Chinese-Canadian women.[56] In addition, the current finding is in line with a study conducted in Malaysia[57] and systematic reviews in low- and middle-income countries.[67,68] Awareness about screening services might change the attitude of women to use the service. The role of community healthcare workers in educating the local population and raising awareness[69] needs to be highlighted and made a priority.

We registered our protocol prospectively, and reporting was based on established guidelines. We included all women who reported cervical cancer screening, regardless of screening modalities.

As a limitation, this finding might be prone to risk of bias due to the substantial heterogeneity of studies included from different locations. In addition, differences in cervical screening modalities across the included studies might influence the results of this review. In this review, only English language articles were included. Moreover, differences in how knowledge about cervical cancer was assessed in the included studies might affect the pooled estimates.

Conclusions

Cervical cancer screening uptake is low in Sub-Saharan Africa. Knowledge about cervical cancer was significantly associated with screening uptake. In addition, education level, age, awareness about screening locations, HIV status, attitude, provider gender, having heard about HPV, oral contraceptive use, health insurance, condom use, fear of a bad result, lack of awareness about the seriousness of the disease, multiple sexual partners, sexually transmitted diseases, counselling and receiving screening at public institutions were all important predictors of cervical cancer screening uptake in the region. Community-based education that is tailored to local culture, literacy level and pervasive attitudes is recommended to improve the uptake of cervical screening.

Author statements

Ethical approval

Not required. This article is based on published articles.

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Competing interests

None declared.

Author contributions

N.B.Y. and M.A..M. conducted the search and data extraction. N.B.Y., K.S. and M.T. wrote the first draft of the manuscript. N.B.Y., B.A. and H.K.M. conducted the statistical analyses. S.G., N.T.S. and T.D.H. contributed to data interpretation and the final editing of the manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2021.04.014.

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