BMJ Open

Mapping evidence on the acceptability of human papillomavirus self-sampling for cervical cancer screening among women in sub-Saharan Africa: a scoping review

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To cite: Dzobo M, Dzinamarira T, Maluleke K, *et al*. Mapping evidence on the acceptability of human papillomavirus self-sampling for cervical cancer screening among women in sub-Saharan Africa: a scoping review. *BMJ Open* 2023;**13**:e062090. doi:10.1136/bmjopen-2022-062090

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2022-062090).

Received 28 February 2022
Accepted 12 April 2023

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ABSTRACT

Objectives The objective of this scoping review was to map evidence on the acceptability of self-sampling for human papillomavirus testing (HPVSS) for cervical cancer screening among women in the sub-Saharan Africa region.

Design Scoping review.

Methods Using Arksey and O'Malley's framework, we searched Scopus, PubMed, Medline Ovid, Cochrane and Web of Science databases for evidence on the acceptability of HPVSS among women aged 25 years and older published between January 2011 and July 2021. We included studies that reported evidence on the acceptability of HPVSS for cervical cancer screening. Review articles and protocols were excluded. We also searched for evidence from grey literature sources such as dissertations/theses, conference proceedings, websites of international organisations such as WHO and relevant government reports. Two reviewers independently performed the extraction using a pre-designed Excel spreadsheet and emerging themes were narratively summarised.

Results The initial search retrieved 1018 articles. Of these, 19 articles were eligible and included in the review. The following themes emerged from the included articles: acceptability of HPVSS; lack of self-efficacy to perform HPVSS, complications when performing HPVSS, preferences for provider sampling or assistance; setting of HPVSS; HPVSS by vulnerable populations.

Conclusion Evidence shows that HPVSS is highly acceptable for cervical cancer screening in sub-Saharan Africa. Further research exploring the acceptability of HPVSS among women residing in rural areas is required, as well as studies to determine women's preferences for HPVSS intervention including the preferred type of sampling devices. Knowledge on the acceptability and preferences for HPVSS is important in designing women-centred interventions that have the potential to increase screening coverage and participation in cervical cancer screening programmes.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ A scoping review approach was employed to synthesise literature and reveal gaps for future research and practice, two independent researchers were involved in the screening of articles and data extraction, and additionally the articles were appraised.
⇒ To improve transparency in the reporting of our findings, the scoping review followed the Preferred Reporting System for Systematic Reviews. All the included studies were critically appraised to improve the rigour of our study findings.
⇒ The scoping review may have missed some important studies since protocols and reviews were excluded as well as non-English literature. The cut-off on the dates of publication may have excluded some important studies.

INTRODUCTION

A large majority of cervical cancer (CC) cases (more than 95%) develop from persistent infection with high-risk human papillomavirus (hrHPV).[1] In 2020, CC was the fourth most frequently diagnosed cancer and the fourth leading cause of cancer death in women globally, with an estimated 604 000 new cases and 342 000 deaths worldwide.[2] The global burden of CC is unevenly distributed worldwide with women in sub-Saharan Africa (SSA) being disproportionately affected with higher incidence and mortality rates than in any other region of the world.[3]

The majority of CC screening programmes in SSA are opportunistic and based on the use of visual inspection with acetic acid (VIA). The use of VIA has not achieved the desired impact due to health system–related barriers such as the lack of trained providers and screening materials and equipment.[4] Poor access to healthcare, high stigma, low awareness of the benefits of early screening, longer waiting times, embarrassment, lack of privacy and the need for spousal permission are some of the reasons for women avoiding CC screening.[5] The use of HPV testing for CC screening has the potential to overcome some of the barriers to CC screening uptake

in low-to-middle-income countries (LMICs).[6] WHO advocates for the use of HPV testing for screening women 30 years or older where resources permit.[4] HPV tests can be performed on both clinician-collected and self-collected specimens.

Self-sampling for HPV testing (HPVSS) is a process where a woman who wants to know whether she has hrHPV infection uses a kit to collect a cervicovaginal sample, which is then sent for analysis in a laboratory.[7] HPVSS has the potential to increase uptake of CC screening by reducing some of the personal barriers to screening.[8] Studies conducted in Zimbabwe[9] and Ethiopia[10] to compare the utility of self-collected versus clinician-collected specimens for hrHPV detection demonstrated good agreement between the two methods. In addition, HPVSS has been associated with increased participation of women who have not previously been screened and those who do not attend CC screening regularly in LMICs.[6]

HPVSS may be a promising strategy to overcome barriers that prevent women from participating in CC screening programmes in SSA. However, there is a paucity of recently published reviews synthesising research evidence on the acceptability of HPVSS for screening CC among women in SSA. The main objective of this study is to map evidence on the acceptability of HPVSS for CC screening among women in the SSA region between January 2011 and July 2021; we chose this period because WHO recommended HPV testing and there was an increase in the number of studies on HPV testing. In the current study, we included studies with women who are 25 years and older because HPV screening among women less than 25 years leads to overdiagnosis and overtreatment. However, targeting women aged 25 years and above has both screening benefits and reduced harms due to overtreatment.[11]

The current study refers to acceptability as the extent to which participants will be willing to collect their cervicovaginal specimens for HPV testing. The choice of a scoping review for this study was necessary to map current literature evidence on the acceptability of HPVSS as a primary screening method in SSA. It is anticipated that the results of this review will identify gaps in research and practice and help guide policymakers in designing HPVSS interventions that are acceptable to women in SSA to increase CC screening coverage and reduce the burden of CC in the region.

METHODS

We conducted a scoping review of published peer-reviewed and grey literature (literature non-formally published scholarly or substantive information) studies on the acceptability of HPVSS for screening CC among women in SSA. The published methodology was made available on 19 September 2021, and it can be accessed online (https://osf.io/ba8fc. A systematic scoping review protocol was published in *BMJ Open* journal under the title: Human papillomavirus self-sampling for cervical cancer screening among women in sub-Saharan Africa: a scoping review protocol.[12] This scoping review was conducted according to the methodological framework proposed by Arksey and O'Malley[13] and Levac *et al*.[14] According to Arksey and O'Malley's framework, a scoping review follows five stages: (1) identify the research question; (2) identify relevant studies; (3) select eligible studies; (4) charting the data; (5) collating, summarising and reporting the results. The results of the scoping review are presented in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) (online supplemental file 1).[15]

Table 1 PCC for determining the eligibility of the research question

Population	Women, 25 years and older residing in SSA
Concept	HPVSS programmes conducted between January 2011 and July 2021
Context	SSA

HPVSS, self-sampling for human papillomavirus testing; PCC, population, concept and context framework; SSA, sub-Saharan Africa.

Eligibility of the research question

Our scoping review research question is: what is known from existing literature on the acceptability of HPVSS for CC screening among women in SSA? To determine the eligibility of the research question for the scoping review, we used the population, concept and context (PCC) framework (table 1); the framework indicates that our study's population were women aged 25 years and older, while our concept was HPVSS and the context was SSA.

Identifying relevant studies

We conducted a comprehensive literature search of relevant articles from PubMed, Scopus, Medline Ovid, Cochrane and Web of Science electronic databases. We limited the dates of publication to January 2011 to July 2021. The first author developed the literature search in consultation with the University of Pretoria librarian (KK). We included studies (qualitative studies mixed methods, randomised trials, cross-sectional studies) that reported evidence on the acceptability of HPVSS for CC screening among women in SSA. Review articles (narrative, scoping, systematic, meta-analysis and meta-synthesis) and protocols were excluded. The database search terms included 'cervical cancer', 'human papillomavirus', 'self-sampling' and 'sub-Saharan Africa'. Boolean terms, AND and OR, were used to separate the keywords. Medical subject headings (MeSH) terms were also included in the keyword search. The search strategy was adapted to suit each database. In addition, we also searched the WHO library and university repositories for grey literature such as dissertations, theses and reports. We did not search for non-English literature. Following keyword search, eligible

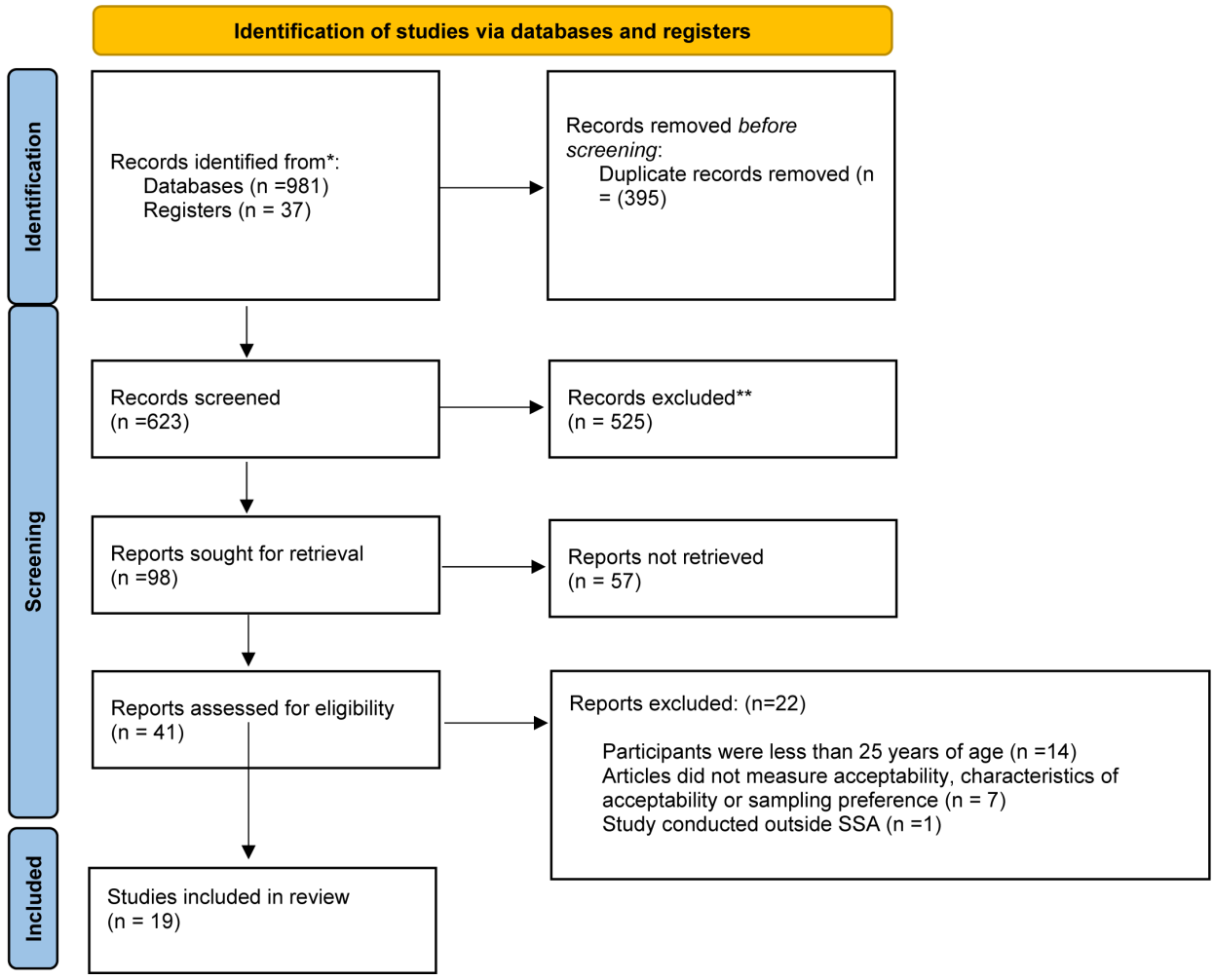

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of the study selection process. SSA, sub-Saharan Africa.

studies were exported to EndNote V.20 library for abstract and full article screening. The references of included articles were also searched and screened for relevant articles.

Study selection

The lead investigator screened titles using the eligibility criteria as a guide. Eligible articles were exported to EndNote V.20 library where duplicates were identified and removed. MD and (KM) then independently screened the abstracts to identify studies for full-text screening with guidance from the eligibility criteria for this study. Following the abstract screening, two authors (MD and KM) reviewed full texts for eligibility using a pretested screening instrument. Discrepancies in screening decisions between reviewers were resolved through discussion and consensus; when necessary, a third reviewer (ZJ) was consulted. The findings of the study were reported according to the PRISMA-ScR. The level of agreement between the two reviewers was calculated using the Kappa statistic (online supplemental file 2).

Eligibility criteria

Inclusion criteria

Articles were included if they met this study's inclusion criteria:

1. Studies presenting evidence that was published between January 2011 and July 2021.
2. Studies presenting evidence on women aged 25 years and older in SSA.
3. Studies presenting evidence on the acceptability of HPVSS for CC screening in SSA.

The aforementioned inclusion criteria were applied to both published and grey literature.

Exclusion criteria

Articles were excluded if they were

1. Studies published between January 2011 and July 2021.
2. Studies presenting evidence on women younger than 25 years and studies conducted outside SSA
3. Studies that did not present evidence on HPVSS
4. Review articles and protocols

Quality appraisal

To determine the quality of the selected studies, a Mixed Methods Appraisal Tool (MMAT) V.2018 was adopted

and piloted by the two independent reviewers.[16] The tool permits to appraise the methodological quality of five categories to studies: (1) qualitative research; (2) randomised controlled trials; (3) non-randomised studies; (4) quantitative descriptive studies; (5) mixed-methods studies.[16] Once the scores for each study were calculated as a percentage, they were given a specific rank. Studies equal to or below 50% were ranked as low quality, those between 51% and 75% were deemed average quality, and those ranging from 76% to 100% were given a high-quality score.

Charting the data

We developed a data charting form with variables related to the research question (population, concept and context). The data charting form was piloted by two independent reviewers using the first 10 included articles, necessary changes were made after agreement by the two reviewers and the tool was updated accordingly. We extracted the following data: first author and year of publication, location (country), aim(s) or main objective(s), sample description, study setting, sampling device used, study design, sample description, percentage acceptability and main outcomes.

Collating and reporting of the results

We thematically analysed the data extracted from the included articles. The themes were narratively summarised. The following themes emerged from the included studies: acceptability of HPVSS; lack of self-efficacy to perform HPVSS, complications when performing HPVSS, preferences for provider sampling or assistance; setting of HPVSS; HPVSS by vulnerable populations.

Ethical considerations

This scoping review relied on a synthesis of the existing literature, and therefore, ethical approval was not required.

Patient and public involvement

Patients and the public were not involved in this review.

RESULTS

Screening results

The electronic databases and searches from other sources identified 981 and 37 articles, respectively. These were exported to EndNote V.20 library. The search results retrieved from each database are displayed in online supplemental file 3.

After duplicates were removed, a total of 623 records remained. Titles and abstracts of these remaining records were screened and eliminated based on the exclusion criteria (figure 1). Forty-one articles that remained after abstract screening were reviewed for eligibility. Twenty-two articles were excluded at the full article screening stage.[17–38] Of the 22 excluded, 14 were conducted on participants less than 25 years old,[17 21–23 25–27 29 30 32–34 36 37]

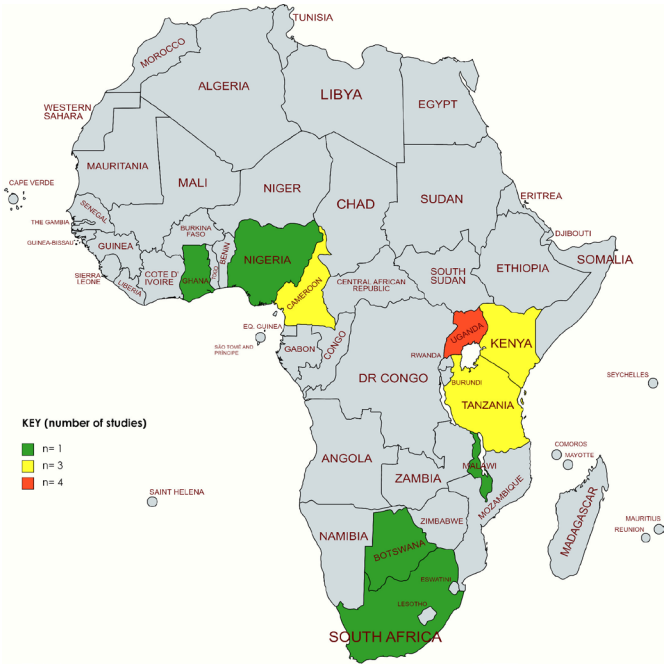

Figure 2 Distribution of sub-Saharan Africa countries represented in the included studies.

7 studies[18–20 24 28 31 38] did not measure acceptability, characteristics of acceptability or sampling preference and 1 study was conducted outside SSA.[35] The 19 remaining studies[39–57] were incorporated into the final analysis. After full-text screening, there was a substantial agreement of 85.37% versus 50.27% expected by chance (Kappa statistics=0.7057, p<0.05). In addition, McNemar's χ^2 statistics suggested no significant differences in the proportions of yes/no answers by the reviewers (p>0.05).

Characteristics of included studies

The scoping review included 19 studies including 8149 female participants, individual study sample sizes ranged from 21 to 1902. Characteristics of the included studies are presented in online supplemental file 4. The included studies were published between 2011 and 2021. Nine African countries were represented in the included studies. Four studies were conducted in Uganda; Kenya, Tanzania and Cameroon had 3 included studies each; South Africa, Malawi, Botswana, Ghana and Nigeria each had a single included study (figure 2). A total of 15 studies employed a quantitative approach: 12 cross-sectional studies,[41 43 45 46 48–51 53–56] 2 randomised control trials[39 47] and 1 case–control study.[44] One study used a mixed-methods approach.[40] The quantitative studies examined a wide range of end-users, including previously screened women, and vulnerable subpopulations such as women living with HIV (WLHIV)[48 53] and female sex workers.[50] Three studies used a qualitative research design,[42 52 57] specifically in-depth interviews, to explore acceptability and women's preferences related to HPVSS. Women performed HPVSS in all the studies except in four studies where knowledge, awareness and willingness to participate in HPVSS were assessed.[39 41 49 52]

Quality assessment of included studies

Nineteen studies underwent methodological quality assessment using the 2018 version of the MMAT tool[16] (online supplemental file 5). Thirteen studies scored 100%,[42–44 46–52 55–57] 4 studies scored 80%[39 40 53 54] and 2 studies[41 45] scored 60%.

Main findings

The following themes emerged from the included articles: acceptability of HPVSS; lack of self-efficacy to perform HPVSS, complications when performing HPVSS, preferences for provider sampling or assistance; setting of HPVSS; HPVSS by vulnerable populations.

Acceptability of HPVSS

Evidence on the acceptability of HPVSS was presented in all 19 studies.[39–57] The proportion of participants who found HPVSS acceptable ranged from 32% in a study by Manguro *et al*[50] to over 99% in a study by Mahande *et al*.[51] The ease and comfort of performing HPVSS was reported in[40 42 44 46 50 53 55–57] and participants confirmed that the availability of written instructions and diagrams made it easy to perform HPVSS.[55] The acceptability of HPVSS was also due to participants feeling less embarrassed and feeling less pain when compared with provider-sampling,[40 42 55 56] and three studies[42 45 57] included evidence from women indicating that HPVSS was a more private practice or that it would help ensure confidentiality. Four studies[39 45 46 51] included evidence from women who expressed willingness to perform HPVSS for future screening or recommended it to family members or friends.

Lack of self-efficacy to perform HPVSS

The lack of self-efficacy is a theme that was recurrent in eight studies.[41 46 49 50 52 54 56 57] It highlighted the lack of women's confidence, motivation or intention to perform HPVSS. The lack of confidence to perform HPVSS caused some participants to doubt the validity of the HPV result derived from the specimen they collected; instead, they trusted the health provider to collect a specimen properly that would give valid HPV results.[50 52 56 57] In a cross-sectional study by Mremi *et al*,[46] some participants were not motivated to self-sample due to the fear of hurting themselves during self-sampling. A randomised control trial by Sossauer *et al* to assess the impact of an educational intervention on women's confidence to perform HPVSS revealed insignificant difference between the control group that received standard information and interventional group that received culture specific instructions on performing HPVSS.[39] The evidence of women's inability to correctly perform self-sampling was also revealed in a randomised control trial conducted in Nigeria by Modibbo *et al*. In this study, all specimens from the control arm of clinician-collected specimens had good DNA quality for HPV genotyping and five specimens from the self-collection arm had inadequate DNA material for HPV genotyping.[47] The evidence from the included studies shows that the lack of confidence to self-sample by women in SSA is a major barrier to HPVSS.

Complications when performing HPVSS

Four studies[46 51 53 57] reported on the difficulties that participants experienced when performing HPVSS. Three of the studies[46 51 57] reported incidents of pain, bleeding and irritation during or just after performing HPVSS among the participants. In two of the studies,[53 57] the participants faced challenges in holding the sampling devices and properly inserting them into their vagina; this was despite the availability of written and oral instructions on how to perform HPVSS. The evidence from the included studies revealed challenges that women experienced when they performed HPVSS using the provided sampling devices.

Preferences for provider sampling or assistance

A total of seven studies[40 42 50 52 53 56 57] reported evidence on participants who preferred provider sampling or a speculum examination for future screening compared with HPVSS or preferred the presence of a health provider to assist them when performing HPVSS. Evidence on preferences for provider speculum examination over HPVSS was reported in four studies[40 50 53 56]; the lack of confidence to self-sample among participants and increased trust in the health provider to collect a sample properly were cited as the reasons for the preference for a provider collected sample. Saidu *et al*[40] reported that participants also believed that the provider was in a position to identify other abnormalities within their genital areas during sample collection, which would help them to get medical attention. Three studies[42 52 57] reported evidence on women who, despite their acceptability of HPVSS, preferred to have the presence of a health provider to assist during self-collection. Bakiewicz *et al*[57] reported that participants felt less confident collecting the sample correctly and needed a health provider to assure them when performing HPVSS. The included studies revealed that the majority of women prefer to have their specimens collected by a health provider or to be assisted when performing HPVSS.

Setting for HPVSS

Six studies presented evidence on participants' preference for the setting of HPVSS, in five of the studies[41 45 47 49 52] women preferred to perform HPVSS at home or in the community, and in one study participants preferred to perform HPVSS at a health facility.[40] Two studies[45 52] reported that women preferred to perform HPVSS at home or in the community because it brings convenience when compared with walking or travelling long distances to a health facility especially in remote parts of the country. Another study by Mitchell *et al*[49] further demonstrates that participants were willing to self-sample if a health worker would drop a self-sampling kit at their workplace or their places of residence. A community-based randomised control trial by Modibbo *et al*[47] to compare CC screening uptake between women

in the hospital-collection and self-collection arms demonstrated that uptake of CC screening was high among participants in the self-collection arm because they conveniently dropped their samples at designated points in the communities they lived. Although women cited the convenience of sampling at home, a study conducted in South Africa[40] revealed that the majority of participants preferred hospital-based sampling citing lack of privacy at home, and fears of contamination or drying of the sample; there was also a concern that they would not be able to return the sample to the health facility after collecting due to travelling costs. Evidence from the included studies revealed the various venue options for performing self-sampling for the different and diverse communities in SSA.

HPVSS by vulnerable populations

Three studies presented evidence of the acceptability of HPVSS among WLHIV[48 53] and female sex workers.[50] The acceptability of HPVSS ranged from 32% in Manguro *et al*[50] to 98% in Mitchell *et al*.[48] The reported low acceptability was due to women's low self-efficacy to self-sample and increased trust in the health providers' ability to collect an accurate sample for HPV testing.[50 53] In a study by Mitchell *et al*,[48] the majority of WLHIV did not think it was necessary to be screened for CC (98.8%). Similarly, the perceived risk of HPV was low (8.3%), while 44% of WLHIV were unsure if they were at risk. In a study conducted in Kenya[50] among 199 female sex workers, 63 (32%) reported a preference for HPVSS compared with 136 (68%) who reported a preference for provider sampling. In this study, participants preferred the self-collection Evalyn 'dry' brush to the Viba brush stored in liquid media.

DISCUSSION

This scoping review mapped evidence on the acceptability of HPVSS for CC screening in SSA. Evidence from the scoping review revealed the following themes: the acceptability of HPVSS among women including WLHIV, lack of self-efficacy to perform HPVSS, complications when performing HPVSS, preferences for clinician sampling and setting for HPVSS. The WHO identifies self-sampling as a safe and easy approach to reaching women that otherwise would not participate in a clinician-based screening programme.[58] The increased participation of women in CC screening provides opportunities for meeting the WHO 2030 targets of getting 70% of eligible women screened by a highly sensitive screening tool to achieve the global target of eliminating CC by the end of the century.[59]

Overall, HPVSS is an acceptable cervical cancer screening option for many women in SSA, including WLHIV and female sex workers. Among the reasons for women's acceptability of HPVSS was the ease of use, the privacy and convenienec of performing sampling at home, the lack of pain and lack of embarassment when compared with standard cervical cancer screening with a clinician. Our findings are consistent with a previous systematic review and meta-analysis in 2016 by Nelson *et al*[60] which evaluated acceptability and preferences for HPVSS over clinician sampling among women from 24 countries across North America, South America, Europe, Africa and Asia; the study revealed high acceptability of HPVSS by the majority of participants. HPVSS is a good strategy for reaching key populations such as female sex workers who may face challenges such as stigma in accessing traditional screening methods provided by clinicians. Additional research on their preferences such sampling venue, sampling devices and results notification methods will be important as opposed to using a one-size-fits-all approach.

A major concern noted across many studies was the lack of confidence to perform self-sampling among many women. Women generally believed in the capabilities of the clinician or health provider to correctly collect a specimen and they would trust the result of a specimen collected by a clinician. Similar to our findings, a scoping review conducted by Styffe *et al* in Canada reported the lack of self-efficacy as a major concern and a barrier to successful programme implementation of CC screening programmes based on HPVSS.[61] The general lack of self-efficacy by women stands to derail anticipated benefits of rolling out HPVSS to overcome barriers that prevent women from participating in screening programmes. There is a need for extensive education of women and provision of educational material that are culture specific and easy for women to comprehend to improve their confidence in performing HPVSS.[62]

Our study findings indicated that the majority of women would either prefer performing HPVSS at the health facility or at home with the assistance or the presence of a health provider. The lack of self-efficacy to perform HPVSS was the major reason behind their preferences; this undelines the importance of educating the women including the health providers on the benefits and convenience of performing HPVSS even at their homes. In contrast to our findings, a randomised control trial conducted by Arrossi *et al*[63] demonstrated that Argentinian women who were offered the opportunity to self-collect a sample at home through community health workers were four times as likely to be screened for CC than women who were not offered the option to self-sample. Considering women preferences for HPVSS is important in the design of a new intervention as it affects the acceptability. This study revealed the limited literature evidence on the preferred devices for HPVSS . There is a need to conduct more studies that allow women to choose between different sampling devices to promote confidence and ensure a positive experience after self-sampling.

Strengths and limitations

The use of a scoping review to map evidence allowed the incorporation of different study designs, and the use

of a transparent and reproducible methods to identify, chart, analyse and appraise the articles.[13] The strength of this scoping review is that a comprehensive literature search in relevant electronic databases was conducted. To increase the rigour of our study, we critically appraised the included studies; in addition, we used the PRISMA tool to improve transparency in the reporting of our findings. The findings from this review should be viewed in light of its limitations. We did not include review articles and non-English literature, and therefore we may have missed important literature evidence on the acceptability of HPVSS among women in SSA. Despite this, our search was comprehensive and ensured a thorough review of existing literature to answer our research question. Another limitation of this study was that the study population were women who were attending a health facility and therefore have relatively good health-seeking behaviour . It would be beneficial to reach out to never-screened women who may share valuable insights for non-participation in CC screening.

Recommendations for future practice

This study revealed the lack of self-efficacy to self-sample among women; future CC screening programmes using HPVSS should incorporate adequate educational material and health providers' support to increase women's confidence and assure them of the validity of an HPV result from a self-sampled specimen. Considering the burden of HIV/HPV co-infection in SSA and the risk of progression to CC, policymakers need to integrate HPVSS at HIV care facilities to increase coverage of screening; this also has advantages of leveraging on existing facilities such as laboratories and human resources. Policymakers and programme managers need to have facilities that allow for a screen and treat approach to reduce loss to follow-up and promote linkage to care for women who screen positive for HPV. Mobile treatment facilities have been used successfully in a screen-and-treat approach in resource-constrained settings.[45]

Recommendations for future research

The review findings demonstrate the potential of HPVSS to increase the participation of women in CC screening programmes and increase opportunities for reaching under-screened and never-screened women in SSA where the burden of CC is highest.[6] It is already known that the majority of women are highly accepting of HPVSS; however, there is limited literature evidence on the acceptability of HPVSS among women in rural areas. There is a need to conduct more qualitative research among women, particularly under-screened populations such as rural women and key populations such as female sex workers to determine their preferences for an HPVSS intervention. This will allow the design of future interventions that are tailored to the end users and that address their preferences. Follow-up and linkage to care is reportedly a major challenge of many cervical cancer screening programmes; further research on the impact of HPVSS cervical cancer screening on follow-up and linkage to care are warranted and will help future implementation of HPVSS in SSA. We also recommend research on the perspectives of health workers and policymakers on HPVSS so that all stakeholders' input is considered in the design of an HPVSS intervention to ensure its success.

CONCLUSION

This scoping review presents evidence on the acceptability of HPVSS for CC screening among women in SSA. The acceptability of HPVSS for CC screening in this study provides opportunities for expanding screening services and reaching under-screened and never-screened women in SSA. However, this review highlights the paucity of literature evidence on the use and acceptability of HPVSS among women residing in rural and remote areas and women's preferences for HPVSS. This review also highlights the importance of providing culture-specific and culture-sensitive educational information and materials to women and health providers on cervical cancer and self-sampling to increase their confidence and trust in the validity of the results obtained from a self-sampled specimen.

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Acknowledgements We would like to thank Mr Elliot Mbunge for his help with the construction of the geographical map and the University of Pretoria, School of Health Systems and Public Health for supporting the development of the study.

Contributors Conceptualisation: MD, TD and TPM-T. Developing and conducting the search strategy: KK. Screening: MD, KM and ZJ. Writing—original draft: MD. Writing—reviewing and editing: TPM-T and TD. Supervision: TD and TPM-T. All authors have read and agreed to the published version of the manuscript. MD is the guarantor responsible for the conduct of the study and its overall content.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information. Data sharing not applicable as no data sets were generated and/or analysed for this study. All data underlying the results are available as part of the article and no additional source data are required.

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