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CORRELATES OF CERVICAL CANCER SCREENING UPTAKE AMONG WOMEN LIVING WITH HIV AT EMBU COUNTY REFERRAL HOSPITAL, KENYA

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E. W. Karanja, J. Muchiri and J. Museve

ABSTRACT

Background: Cervical cancer screening has been shown to reduce the time to disease detection and significantly improve overall management outcomes. This study aimed to assess factors influencing the uptake of cervical cancer screening among HIV-positive women seeking care at Embu County Referral Hospital, Kenya.

Methodology: The study used an analytical cross-sectional design with a mixed-methods approach. Systematic random sampling was employed. Chi-square tests guided bivariate analysis, and significant variables ($p \leq 0.05$) were modeled using binary logistic regression.

Results: The study evaluated 149 women, and of these (n=59,39.6%) had sought cervical cancer screening services. Study findings showed that participants with tertiary education were 16.3 times more likely to seek cervical cancer screening (OR = 16.3, 95% CI = 2.809–95.118, $p = 0.002$). Those knowledgeable about cervical cancer were 4.5 times more likely to utilize screening services (OR = 4.5, 95% CI = 1.091–5.532, $p = 0.001$). Multiparous women had similarly increased odds (OR = 4.5, 95% CI = 1.085–5.583, $p = 0.002$). The absence of a cervical cancer history significantly reduced screening uptake by 57% (OR = 0.43, 95% CI = 0.176–0.837, $p = 0.05$).

Conclusion: Uptake was significantly higher among women with tertiary education, knowledge about cervical cancer, and multiparity, while the absence of a cervical cancer history reduced the likelihood of screening. To improve uptake, health education campaigns, community outreach, and counseling programs should be strengthened, with a focus on raising awareness and targeting women with low risk perception or limited education.

INTRODUCTION

Women living with HIV (WLHIV) face a significantly higher risk of cervical cancer compared to the general population. In countries with limited resources, cervical cancer is the leading cause of death among women and ranks as one of the two most common cancers in women worldwide, following breast cancer¹. Globally, it's estimated that approximately 6% of all cervical cancer cases occur in WLHIV, with HIV contributing to nearly 5% of all cervical cancer cases². In sub-Saharan Africa, where the HIV burden is particularly high, about 85% of women diagnosed with cervical cancer are living with HIV, highlighting the critical need for targeted screening and prevention efforts in this region³.

Cervical cancer screening uptake in Africa remains critically low, contributing to the continent's high cervical cancer incidence and mortality rates⁴. A study analyzing Demographic and Health Survey data from 11 Sub-Saharan African countries found that only 10.29% of women aged 15–49 had undergone cervical cancer screening. Screening rates varied significantly among countries, with Namibia having the highest at 39.3% and Benin the lowest at 0.5%⁵. Cervical cancer remains a significant global health concern, with approximately 660,000 new cases and 350,000 deaths reported in 2022⁶. The highest incidence and mortality rates are observed in low- and middle-income countries, particularly in sub-Saharan Africa, Central America, and Southeast Asia. In 2019, global adherence to cervical cancer screening among women aged 20–69 was estimated at approximately 33.66%, with high-income countries (HICs) reporting a higher adherence rate of 75.66%, compared to 24.91% in low- and middle-income countries (LMICs)⁷.

Cervical cancer screening uptake among women living with HIV (WLHIV) in South Africa remains suboptimal, despite the heightened risk associated with HIV infection. A study conducted in the Ekurhuleni Health District South Africa found that only 32.9% of HIV-positive women attending primary healthcare clinics had documented cervical cancer screenings⁸. The median time from starting antiretroviral therapy (ART) to the first screening was approximately 43 weeks, indicating delays in initiating screening. Additionally, older age was associated with higher screening uptake, with women aged 35–44 years and over 45 years being more likely to be screened⁹. Compared to women without HIV infection, women with the virus are more likely to develop precancerous lesions, cervical cancer, and human papillomavirus infection⁹. The percentage of Kenyan women aged 18 to 69 who receive cancer screenings for cervical cancer is just 3.2%, despite the severity of the issue and the fact that it is easily avoidable¹⁰. Accordingly, routine cervical cancer screening is included in the National Guidelines for HIV Care for women who test positive for the virus. However, in developing countries, screening rates remain low. According to UN-WHO, only 3.2% of women (both HIV-positive and negative) between the ages of 18 and 69 have undergone cervical cancer screening in Kenya, while the rate is 70% in countries with advanced economies¹¹. Despite being preventable, cervical cancer remains the leading cause of cancer-related illnesses and fatalities among HIV-positive women in Kenya, with 4,802 cases and 2,451 deaths annually¹². By 2025, there will likely be a 55% increase in cervical cancer cases and a 36% increase in mortality from the disease if no action is taken⁷.

The annual cervical cancer mortality rates recorded at Embu Hospital were as follows: 28

deaths in 2019, 26 in 2018, 21 in 2017, and 15 in 2015¹³. Moreover, Embu County has been recognized as the Kenyan county with the highest relative risk of cervical cancer¹³. Given the low rate of cervical cancer screening among women, factors such as a lack of awareness about risk factors for cervical cancer and limited acceptance of the services are believed to negatively impact screening uptake. This study aimed to assess the factors influencing cervical cancer screening uptake among HIV-positive women seeking care at Embu County Referral Hospital, Kenya.

MATERIALS AND METHODS

Study design

This study employed an analytical cross-sectional design, using a mixed-methods approach to collect both quantitative and qualitative data. The aim was to explore sociodemographic, healthcare system, and knowledge-related factors influencing the uptake of cervical cancer screening services. This dual approach enabled a comprehensive analysis and ensured effective data triangulation.

Study area

Embu County, located in eastern Kenya, covers 2,818 square kilometers and has a population of over 600,000. Known for its fertile land, it is part of the larger Eastern Kenya region. Embu County Referral Hospital is the main public health facility, offering specialized services such as maternal and child health, emergency care, and outpatient services. It serves as a referral center for lower-level health facilities and plays a key role in providing healthcare, including care for women living with HIV.

Study population

The study population consisted of HIV-positive women receiving comprehensive care

services at Embu County Referral Hospital in Kenya.

Study entry

Inclusion. The study included HIV-positive women at Embu County Referral Hospital who had been on antiretroviral therapy (ARVs) for at least six months and provided written informed consent.

Exclusion criteria: Those who were critically ill.

Sample size determination.

Fisher's exact formula was used to determine the required sample size for this study. As a result, 149 study respondents were recruited to provide quantitative data, while three key informants contributed qualitative data.

Sampling technique

In this study, a combination of purposive, systematic, and simple random sampling methods was used for participant selection. Embu County Referral Hospital was selected purposively. To choose study respondents, both systematic and simple random sampling techniques were applied. Key informants were also selected purposively, with three key informant interviews conducted with a gynecologist, a nurse, and a clinician from the reproductive health department.

Data accrual

The data collection tools used in this study were researcher-developed. To collect quantitative data, a semi-structured questionnaire was employed, divided into four sections: Section A focused on the utilization of cervical cancer screening services; Section B captured sociodemographic characteristics; Section C covered health system factors; and Section D assessed knowledge-related influences on screening uptake. In addition, Knowledge was assessed using a Likert scale. Respondents who selected "agree" or "strongly agree" were categorized as knowledgeable, while those who selected

"disagree" or "strongly disagree" were classified as not knowledgeable. For qualitative data, an interview guide was used with key informants, and responses were recorded using an audio recorder to ensure accuracy and comprehensive documentation.

Statistical analysis

Quantitative data was analyzed using SPSS version 26.0, with descriptive statistics (frequencies and percentages) to summarize the data. A chi-square test assessed the relationship between independent and dependent variables, with statistical significance set at $p \leq 0.05$. Significant variables from the bivariate analysis were then analyzed using binary logistic regression to control for confounding effects. Qualitative data underwent thematic content analysis, with audio recordings transcribed into text and processed in Microsoft Word before being analyzed using NVivo version 11. Themes, sub-themes, and codes were generated. Thereafter, qualitative data was triangulated with the quantitative data.

Ethical considerations

The study received ethical approval from the Institutional Research Ethics and Review Committee (IREC) of Mount Kenya University (MKU), reference number 2458. The National Commission for Science, Technology, and Innovation (NACOSTI) authorized the research with permit number NACOSTI/P/24/32927. Formal approval for the study was also granted by the County Commissioner of Embu County and the County Department of Health Services (CDHS), along with additional approval from Embu County Referral Hospital. All participants provided written informed consent after being taken through the study and expressing understanding of the purpose

and procedures of the study. In addition, participation was entirely voluntary, and to ensure confidentiality, participants were identified using unique numbers rather than their names. Participants who did not consent to the study, however, received all other due services. All study data were securely archived in a password-protected electronic database. Access to these records is limited to the primary researcher, supervising academic team, and authorized personnel.

RESULTS

This section provides the results of 149 participants evaluated, and the findings are as follows.

Social Demographic Characteristics

As shown in Table 1, in this study, (n=72,48.3%) of the subjects were between the ages of 28 and 37, while a small percentage (n=3,2%) were between the ages of 38 and 47. On formal education (n=69,46.3) had completed primary or elementary school, and (n=5,3.4%) of the participants had no formal education. Marital status; married were (n=87,58.4%) and widowed (n=8,5.4%).

Multiparity was documented in (n=98,65.8%) of the participants. Prior diagnosis of cervical cancer observed that (n=130,87.2%) stated they had no history of cervical cancer, while (n=19,12.8%) reported having a history of this cancer.

Formal employment data revealed (n=53,35.6%) as having employment, while (n=96,64.4%) were unemployed and were on subsistence jobs. Income results noted that (n=60,40.3%) of the respondents earned between 1,000 and 10,000 Ksh. The majority of the participants were Christians (n=147,98.7%) and Muslims (n=2,1.3%).

Table 1
Social Demographic Characteristics

Variables	Categories	Frequencies	%
Age	18-27	33	22.1
	28-37	72	48.3
	38-47	3	2
	48-57	27	18.1
	58-67	14	9.4
Education level	Tertiary	22	14.8
	Vocational	20	13.4
	Secondary	33	22.1
	Primary	69	46.3
	No formal education	5	3.4
Marital status	Single	33	22.1
	Married	87	58.4
	Separated	21	14.1
	Window	8	5.4
Cervical cancer history	Present	19	12.8
	Absent	130	87.2
Income level(Ksh)	1-10000	60	40.3
	10001-20000	32	21.5
	20001-30000	40	26.8
	>30001	17	11.4
Parity status	Nullparous	51	34.2
	Multiparous	98	65.8
Religion	Christians	147	98.7
	Muslims	2	1.3
Employment	Employed	53	35.6
	Unemployed	96	64.4

Cervical cancer screening uptake

Figure 1 provides the uptake of cervical cancer screening services, in which (n=90,60.4%) had

not sought cervical cancer screening services and (n=59,39.6%) had received cervical cancer screening services.

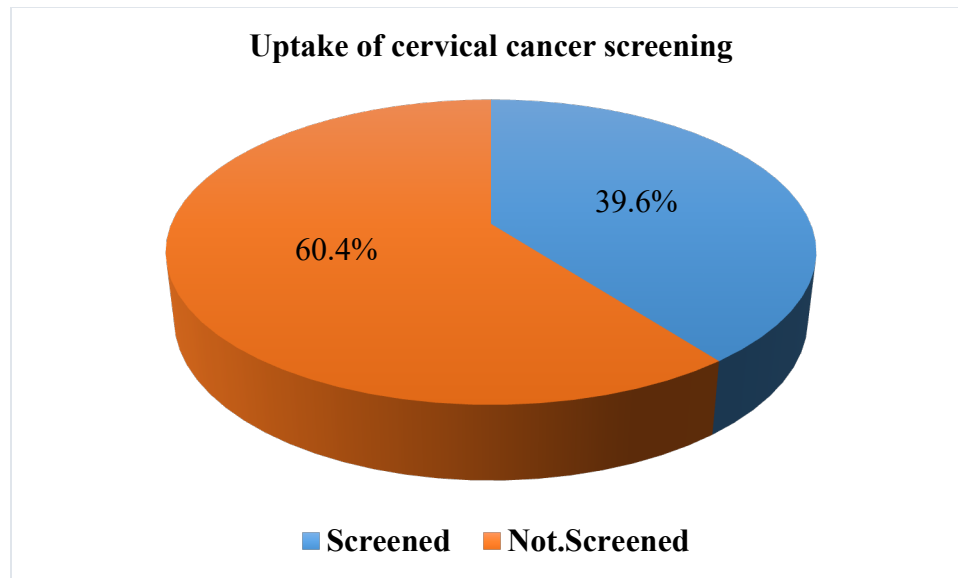


Figure 1: Uptake of cervical cancer screening.

Influence of socio-demographic factors on uptake of cervical cancer screening services

The chi-square test of independence was employed to establish the correlation between social demographic factors and the utilization of cervical cancer screening. The age of study participants ($\chi^2=13.683, df=4, p^*=0.008$), education level ($\chi^2=21.234, df=4, p^* < 0.000$), marital status ($\chi^2=11.739, df=3, p^*=0.008$), cervical cancer history ($\chi^2=10.579, df=1, p=0.001$), employment status ($\chi^2=7.862, df=1, p=0.005$), parity status ($\chi^2=8.37, df=1, p=0.004$) were found to be significantly correlated with the uptake of cervical cancer screening. Hence, these variables were imported for binary logistic regression analysis. While income level ($\chi^2=6.098, df=3, p=0.107$) and religion ($\chi^2=0.09, df=1, p^*=0.76$) did not exhibit a statistically noteworthy relationship with the uptake of cervical cancer screening.

As indicated in Table 2 below, compared to those without formal education, study subjects with a tertiary level of schooling were 16.3

times more likely to seek out CC screening services. Absence of a history of cervical cancer significantly reduced the odds of undergoing cervical cancer screening by 57%. Furthermore, compared to nulliparous women, multiparous women were 4.5 times more likely to seek cervical cancer screening uptake. These findings agreed with the qualitative findings where parity status emerged as a sub-theme, on socio-demographic factors influencing the uptake of CC screening.

In addition, one of the key informants narrated that;

“ Let me say, HIV-positive Prenatal, postpartum, and other healthcare-related services may result in increased interactions between women who have given birth and the healthcare system. Women may be encouraged to attend screening appointments and have more opportunities to talk about cancer of the cervix screening as a result of their increased interaction with healthcare providers.....” (KII 2, Nurse, 4/3/2024)

Table 2

Binary logistic regression analysis on social demographic factors

Variables	B	S.E.	Wald	df	Sig.	OR	95% C.I.	
							Lower	Upper
Education level			12.441	4	.014			
Tertiary	2.794	.899	9.667	1	.002	16.345	2.809	95.118
Vocational	2.008	.874	5.281	1	.242	1.449	.344	4.300
Secondary	2.308	.813	8.057	1	0.45	1.052	.323	9.470
Primary	.764	1.254	.371	1	.542	2.147	.184	5.052
No F.education						<i>Ref</i>		
Respondents age			7.533	4	.110			
18-27	1.247	.809	2.376	1	.123	3.481	.713	7.001
28-37	.980	.731	1.800	1	.180	2.665	.636	10.164
38-47	22.868	23.718	.000	1	.999	5.261	.153	4.552
48-57	-.316	.814	.151	1	.698	.729	.148	3.595
58-67						<i>Ref</i>		
History of C.C	-0.847	.669	3.701	1	.054	0.43	.176	0.837
Present						<i>ref</i>		
Parity status	1.504	.492	9.359	1	.002	4.5	1.085	5.583
Nulliparous						<i>ref</i>		
Employment status	.289	.530	.296	1	.586	1.335	.472	3.773
Unemployed						<i>Ref</i>		
Marital status			2.214	3	.137			
Single	.438	.294	1.634	1	.143	1.550	.870	2.760
Married	.860	.793	1.175	1	.278	2.36	.499	11.183
Separated	.894	.625	2.045	1	.113	3.5	.718	8.332
Window						<i>Ref</i>		

Influence of the level of knowledge on cervical cancer screening services uptake

The respondents who agreed and strongly agreed were deemed as knowledgeable, while study respondents who disagreed and strongly disagreed were deemed not knowledgeable. Knowledge of the services available for CC screening ($\chi^2=7.317, df=2, p=0.03$) and knowledge about cervical cancer ($\chi^2=13.626, df=2, p=0.001$) were found to be significantly correlated with the uptake of CC screening. Hence, these variables were imported for binary logistic regression analysis. Awareness of CC signs and symptoms ($\chi^2=1.004, df=2, p=0.61$) and

awareness of cervical cancer risk factors ($\chi^2=3.621, df=2, p=0.16$) did not exhibit a statistically significant relationship with the uptake of CC screening.

As indicated in Table 3 below, Study participants who were knowledgeable of cancer of the cervix were 4.5 times more likely to use screening services for CC.

These findings agreed with the qualitative findings, where awareness of cancer of the cervix emerged as a sub-theme.

In addition, one of the key informants narrated that;

"Let me say many of the women are unaware that cervical cancer can be caught early and treated.

When we educate them about how screening can detect the disease before it becomes life-threatening, they become more willing to get screened....." (KII 1, Clinical officer,4/3/2024)

Table 3
Binary logistic regression table on knowledge factors

Variables	B	S.E.	Wald	df	Sig.	OR	95% C.I.	
							Lower	Upper
Cervical cancer screening services			5.522	2	.063			
Knowledgeable	.975	.436	5.011	1	.65	0.34	.161	2.886
Neutral	-.025	.464	.003	1	.371	.975	.393	2.422
Not knowledgeable						<i>Ref</i>		
Cervical cancer awareness			11.383	2	.003			
Knowledgeable	1.516	.449	11.376	1	.001	4.5	1.091	5.532
Neutral	1.159	.565	4.211	1	.160	.314	.104	1.249
Not knowledgeable						<i>Ref</i>		

Association between health facility factors and the uptake of cervical cancer screening

The association between health facility factors and the utilization of cervical cancer screening were as follows; Cervical cancer screening costs ($\chi^2=20.03, df=1, p<0.000$), Provision of health education and counseling ($\chi^2=25.947, df=1, p<0.000$), CC screening outreach programs presence ($\chi^2=10.655, df=1, p=0.001$), CC screening services presence ($\chi^2=6.967, df=1, p=0.008$) were found to be significantly correlated with the uptake of cervical cancer screening. Hence these variables were imported for binary logistic regression analysis. The presence of patient-friendly health services ($\chi^2=0.053, df=1, p=0.819$) did not exhibit a statistically significant relationship with the uptake of cervical cancer screening.

As indicated in Table 4 below, the presence of health education and counseling programs increased the odds of screening for cancer of the cervix by 3.4. In addition, Women who faced a cost for cervical cancer screening were

82% less likely to undergo screening compared to those who accessed the service for free. These results corroborated the qualitative findings, where cancer screening cost emerged as a sub-theme on health facility aspects influencing cervical cancer screening.

In addition, one of the key informants noted that;

" I would say the cost of screening may influence individuals' decision-making regarding whether to undergo screening and how frequently to do so. Some individuals may prioritize other expenses over screening tests if they perceive them as too costly, especially if they do not perceive themselves to be at high danger for cervical cancer..."(KII 2, Nurse, 4/3/2024)

The absence of cervical cancer (CC) screening outreach programs reduced the likelihood of screening by 74%. These findings aligned with the qualitative data, where outreach programs were identified as a sub-theme under health

facility factors influencing the utilization of CC screening.

In addition, one of the key informants noted that;

“ Allow me to say that outreach programs identify and address obstacles to screening, such as lack of responsiveness, fear or misconceptions about

screening tests, financial constraints, transportation issues, and distrust of the healthcare system. They provide information, support, and resources to help individuals overcome these barriers and make informed decisions about cancer of the cervix screening.....” (KII 4, CCC in charge(Gynecologist),4/3/2024)

Table 4

Results of binary logistic regression analysis on health facility factors

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.	
							Lower	Upper
Cervical cancer screening charges	-1.691	.422	16.099	1	.000	0.184	.081	0.721
Absent						Ref		
Outreach initiatives	-1.35	.418	5.787	1	.016	0.26	.161	0.83
Present						Ref		
Health education and counseling	1.209	.416	8.461	1	.004	3.4	1.483	7.567
Absent						Ref		
Cervical cancer screening services	1.217	.446	7.450	1	.12	3.379	.249	8.098
Absent						Ref		

DISCUSSION

This study carried out in a rural health care providing facility showed that the observations were not hugely different from larger studies and the results could be replicated elsewhere particularly in Kenya. Overall 39.6% of the study subjects had sought cancer of the cervix screening services and uptake therefore was low which should be of a public health concern. A study in Uganda had 44%¹⁴. Research carried out in Tanzania reported a higher utilization of cancer of the cervix screening of 50.2%¹⁵. While another study carried out in Ethiopia reported a lower(18.2%) prevalence of cancer of the cervix

screening utilization among HIV-positive women². The differences in the uptake could be linked to different settings, target populations in particular social, economic and demographic profiles.

Compared to those without formal education, respondents with a tertiary level of education were 16.3 times more likely to seek out cancer of the cervix screening services. A possible reason for this is that higher health literacy increases the odds that a person will comprehend the significance of cancer of the cervix screening and follow advised screening protocols. The research results were in line with those of two additional research

investigations conducted in Jordan and Côte d'Ivoire^{16,17}.

Further more the likelihood of obtaining cancer of the cervix screening services was lowered by 3.6 in the absence of a family history of the illness. A possible reason for this is that an individual's perceived risk for contracting cancer of the cervix may be increased if there is a family past of the illness. People may be encouraged to get screened more frequently and take proactive measures to keep an eye on their health as a result of this elevated perception of risk. The same results were also reported in the study done in Kenya where the absence of cancer of the cervix family history reduced the odds of CC screening¹⁸.

Compared to nulliparous women, multiparous women were 4.5 times more likely to seek cancer of the cervix screening uptake. HIV-positive women's patterns of healthcare utilization may be influenced by their parity status. A possible reason for this is that women who have given birth more than once may be more accustomed to the medical care system and are more likely to include cancer of the cervix screening in their regular medical services routines. The results of the present investigation were consistent with a Tanzanian study that found multiparous women were 2.5 times more likely than their counterparts to seek cancer of the cervix screening uptake¹⁹.

Study respondents who were knowledgeable about cancer of the cervix were 3.2 times more likely to seek CC screening services. Knowledgeable individuals are aware of the risk factors associated with CC, such as HPV infection, and early sexual activity. Understanding these risk factors may prompt individuals to recognize their susceptibility to the disease and the importance of regular screening, especially if they have one or more risk factors. Investigation results were in

harmony with those of an investigation carried out in Ethiopia where knowledge of CC increased the odds of CC screening²⁰. This was contrary to another investigation carried out in Nepal²¹.

The presence of CC screening cost reduced the odds of CC screening uptake by 5.4. This is that high screening charges may lead to individuals delaying or forgoing cancer of the cervix screening altogether, particularly if they perceive themselves to be low risk or if they prioritize immediate financial needs over preventive healthcare. This can result in missed opportunities for early detection of precancerous lesions or early-stage cervical cancer. Findings from this investigation were concurrent with those of an investigation carried out in Kenya where the presence of cervical cancer screening charges reduced the odds of CC screening²².

The absence of CC screening outreach programs reduced the odds of CC screening by 2.7. Thus, outreach programs bring cancer of the cervix screening services directly to the community through mobile clinics, community health centers, pop-up events, and partnerships with local healthcare providers. They offer free or low-cost screenings, making them accessible to individuals who may not otherwise have access to healthcare. Findings from this research agreed with those of an investigation carried out in LMIC where the presence of CC screening outreach programs was associated with CC screening²³. This was contrary to another study carried out in India²⁴.

Limitations of the study

A key limitation of the study is its cross-sectional design, which limits the ability to establish causality between identified factors and cervical cancer screening uptake. Additionally, the study was conducted in a single facility among women living with HIV,

which may limit the generalizability of the findings to other populations or settings. Social desirability bias may also have influenced participants' responses, especially on sensitive issues like health-seeking behavior.

CONCLUSION

The study showed that uptake of cervical cancer screening among women living with HIV was influenced by; multiparity, level of formal education attained and family history of the disease. Others were health system factors, availability of counseling and education programs, outreach programs and screening fees. The recommendations are to enhance; awareness and knowledge of cervical cancer, health education and counseling programs.

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Authors' Contributions

EW, JM, and JM participated in the entire research process. EW and JM participated in the data analysis process. HC and EW played a key role in drafting the manuscript. All authors read and approved the final manuscript.

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REFERENCES

1. Gurara AM, Gizaw AB, Ayalew AK, Adem AK. Reproductive health service utilization and associated factors among adolescents at public school in Adama town east Shewa Ethiopia, 2018. *Nurs Pract Today* [Internet]. 2020 Jul 22 [cited 2022 Oct 5];7(4):275–85. Available from: <https://npt.tums.ac.ir/index.php/npt/article/view/869>
2. Dessalegn Mekonnen B. Cervical Cancer Screening Uptake and Associated Factors among HIV-Positive Women in Ethiopia: A Systematic Review and Meta-Analysis. *Adv Prev Med*

[Internet]. 2020 Aug 17 [cited 2025 Feb 1];2020:1–10. Available from:

<https://pubmed.ncbi.nlm.nih.gov/32879739/>

3. Shitu BF, Atnafu DD, Agumas Y. Public School Adolescents Had Increased Odds of Being Willing to Uptake HPV Vaccinations Owing to Sociodemographic and Healthcare Access Features in Bahir Dar City, Ethiopia. *Biomed Res Int* [Internet]. 2023 [cited 2024 Jun 20];2023. Available from: [/pmc/articles/PMC10115532/](https://pubmed.ncbi.nlm.nih.gov/32879739/)

4. McDonald AC, Tergas AI, Kuhn L, Denny L, Wright TC. Distribution of Human Papillomavirus Genotypes among HIV-Positive and HIV-Negative Women in Cape Town, South Africa. *Front Oncol* [Internet]. 2014 [cited 2025 Feb 1];4. Available from:

<https://pubmed.ncbi.nlm.nih.gov/24672770/>

5. Ayenew AA, Zewdu BF, Nigussie AA. Uptake of cervical cancer screening service and associated factors among age-eligible women in Ethiopia: systematic review and meta-analysis. *Infect Agent Cancer* [Internet]. 2020 Dec 1 [cited 2025 Feb 1];15(1). Available from: <https://pubmed.ncbi.nlm.nih.gov/33292388/>

6. Ndibazza C, Barugahare BJ. Factors Associated with the Uptake of Human Papilloma Virus Vaccine among Girls Aged 9-14 Years in Buikwe District, Central Uganda. *J Adv Med Med Res* [Internet]. 2024 Sep 14 [cited 2024 Nov 28];36(10):25–34. Available from: <https://journaljammr.com/index.php/JAMMR/article/view/5585>

7. Tiruneh GA, Dagnez EZ. Prevalence of HIV infection and associated factors among infants born to HIV-positive mothers in health institutions, northwest Ethiopia, 2021. *Womens Health (Lond Engl)* [Internet]. 2022 [cited 2025 Feb 1];18. Available from: <https://pubmed.ncbi.nlm.nih.gov/35946947/>

8. Singh M, Jha RP, Shri N, Bhattacharyya K, Patel P, Dhamnetiya D. Secular trends in incidence and mortality of cervical cancer in India and its states, 1990-2019: data from the Global Burden of Disease 2019 Study. *BMC Cancer*. 2022;22(1):1–12.

9. Sarah Maria N, Olwit C, Kaggwa MM, Nabirye RC, Ngabirano TD. Cervical cancer screening among HIV-positive women in urban Uganda: a cross sectional study. *BMC Womens*

- Health [Internet]. 2022;22(1):1–9. Available from: <https://doi.org/10.1186/s12905-022-01743-9>
10. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* [Internet]. 2018 Nov [cited 2025 Feb 1];68(6):394–424. Available from: <https://pubmed.ncbi.nlm.nih.gov/30207593/>
11. Assefa AA, Astawesegn FH, Eshetu B. Cervical cancer screening service utilization and associated factors among HIV positive women attending adult ART clinic in public health facilities, Hawassa town, Ethiopia: a cross-sectional study. *BMC Health Serv Res* [Internet]. 2019 Nov 19 [cited 2025 Feb 1];19(1). Available from: <https://pubmed.ncbi.nlm.nih.gov/31744548/>
12. Emru K, Abebaw TA, Abera A. Role of awareness on cervical cancer screening uptake among HIV positive women in Addis Ababa, Ethiopia: A cross-sectional study. <https://doi.org/10.1177/17455065211017041> [Internet]. 2021 Jun 6 [cited 2022 Nov 1];17. Available from: <https://journals.sagepub.com/doi/10.1177/17455065211017041?icid=int.sj-full-text.similar-articles.7>
13. Kuria Waitara J, Kerich G, Kihoro J, Korir A. Poisson-Gamma and Spatial-Temporal Models: with Application to Cervical Cancer in Kenya's Counties. *Am J Theor Appl Stat*. 2021;10(3):158.
14. Sarah Maria N, Olwit C, Kaggwa MM, Nabirye RC, Ngabirano TD. Cervical cancer screening among HIV-positive women in urban Uganda: a cross sectional study. *BMC Womens Health* [Internet]. 2022 Dec 1 [cited 2023 Jun 30];22(1):1–9. Available from: <https://bmcwomenshealth.biomedcentral.com/articles/10.1186/s12905-022-01743-9>
15. Mwantake MR, Kajoka HD, Kimondo FC, Amour C, Mboya IB. Factors associated with cervical cancer screening among women living with HIV in the Kilimanjaro region, northern Tanzania: A cross-sectional study. *Prev Med reports* [Internet]. 2022 Dec 1 [cited 2025 Feb 1];30. Available from: <https://pubmed.ncbi.nlm.nih.gov/36176589/>
16. Al-Amro SQ, Gharaibeh MK, Oweis AI. Factors Associated with Cervical Cancer Screening Uptake: Implications for the Health of Women in Jordan. *Infect Dis Obstet Gynecol* [Internet]. 2020 [cited 2025 Feb 1];2020. Available from: <https://pubmed.ncbi.nlm.nih.gov/32256030/>
17. Tchounga B, Boni SP, Koffi JJ, Horo AG, Tanon A, Messou E, et al. Cervical cancer screening uptake and correlates among HIV-infected women: a cross-sectional survey in Côte d'Ivoire, West Africa. *BMJ Open* [Internet]. 2019 Aug 1 [cited 2022 Nov 1];9(8). Available from: </pmc/articles/PMC6720463/>
18. Ngari DM, Nyamiaka MS, Mukami FM, Ngari DM, Nyamiaka MS, Mukami FM. Factors Affecting Cervical Cancer Screening among Women Below 25 Years in Kithare Area, Tharaka Nithi County, Kenya. *Open J Obstet Gynecol* [Internet]. 2021 May 8 [cited 2024 Mar 9];11(5):485–503. Available from: <http://www.scirp.org/journal/PaperInformation.aspx?PaperID=108967>
19. Hull1 R, Mbele M, Makhafola T, Hicks C, Wang SM, Reis RM, et al. Cervical cancer in low and middle-income countries (Review). *Oncol Lett* [Internet]. 2020 Sep 1 [cited 2023 Feb 8];20(3):2058–74. Available from: <http://www.spandidos-publications.com/10.3892/ol.2020.11754/abstract>
20. Kasa AS, Tesfaye TD, Temesgen WA. Knowledge, attitude and practice towards cervical cancer among women in Finote Selam city administration, West Gojjam Zone, Amhara Region, North West Ethiopia, 2017. *Afr Health Sci* [Internet]. 2018 Sep 1 [cited 2024 Mar 9];18(3):623. Available from: </pmc/articles/PMC6307012/>
21. Kumari S, Ojha N, Bista KD. Knowledge, Attitude, and Practice of Cervical Cancer Screening Among Women Attending a Gynecology Clinic at a Tertiary Level Hospital. *Int J Cancer Care Deliv* [Internet]. 2022 Mar 10 [cited 2024 Mar 9];2(1):2022. Available from: <https://doi.org/10.53876/001c.32581>
22. Kangethe JM, Monroe-Wis A, Muiruri PN, Komu JG, Mutai KK, Nzivo MM, et al. Utilisation of cervical cancer screening among women living with HIV at Kenya's national referral hospital. *South Afr J HIV Med* [Internet]. 2022 [cited 2023 Jun 29];23(1). Available from: </pmc/articles/PMC9082290/>
23. O'Donovan J, O'Donovan C, Nagraj S. The role of community health workers in cervical cancer

screening in low-income and middle-income countries: a systematic scoping review of the literature. *BMJ Glob Heal* [Internet]. 2019 May 1 [cited 2024 Sep 20];4(3):e001452. Available from: <https://gh.bmj.com/content/4/3/e001452>

24. Srinivas V, de Cortina SH, Nishimura H, Krupp K, Jayakrishna P, Ravi K, et al. Community-

based Mobile Cervical Cancer Screening Program in Rural India: Successes and Challenges for Implementation. *Asian Pac J Cancer Prev* [Internet]. 2021 May 1 [cited 2024 Mar 9];22(5):1393. Available from: [/pmc/articles/PMC8408397/](https://pubmed.ncbi.nlm.nih.gov/3408397/)