

BMJ Open Follow-up rescreening uptake and persistent positive rates among women after positive cervical cancer screening results in Ethiopia: a longitudinal cross-sectional study

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ABSTRACT

Objective To assess cervical cancer screening positivity rates, follow-up rescreening uptake 1 year after treatment and persistent positivity among women with initial positive screening results in Ethiopia. The study also explored reasons for loss to follow-up and preferences for reminder strategies.

Design Longitudinal cross-sectional study.

Settings 10 primary healthcare facilities in Oromia and southern and central Ethiopia.

Participants From November 2022 to April 2024, 17 586 women screened for cervical cancer. Of these 768 (4.4%) had positive screening results, and 515 women treated at the primary level were included to assess follow-up rescreening uptake. An additional 139 women who did not return for follow-up were interviewed to identify reasons for non-uptake and reminder preferences.

Result Of the 515 women included in the analysis, 179 (34.8%, 95% CI: 30.6% to 38.8%) returned for follow-up rescreening. Among those re-screened, the persistent visual inspection with acetic acid (VIA) positivity rate was 16.1% (95% CI: 11.0% to 21.7%). Factors significantly associated with follow-up rescreening uptake included age over 40 (adjusted OR (AOR): 2.5; 95% CI: 1.34 to 5.00), urban residence (AOR: 1.7; 95% CI: 1.15 to 2.58), secondary or higher education (AOR: 2.0; 95% CI: 1.06 to 4.12) and HIV-positive status (AOR: 2.4; 95% CI: 1.27 to 4.87). Among the 139 women contacted, the main reasons for non-uptake were lack of time, forgetting appointments, visiting another facility and pregnancy. Regarding preferred reminders, 93% favoured text messages and all agreed to phone calls or home visits.

Conclusion One-third of women adhered to follow-up rescreening after a positive cervical cancer screening in Ethiopia, revealing a considerable gap since those women had a three times higher chance of being VIA positive compared with the first screening. Older age, urban residence, higher education and HIV-positive status were significantly linked to follow-up rescreening uptake. Addressing barriers such as time constraints and forgotten appointments through tailored reminder strategies is essential for improving the follow-up rescreening uptake.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study used prospective documentation to track follow-up rescreening uptake in real time.
- ⇒ Data were collected in primary healthcare settings, reflecting routine service delivery conditions.
- ⇒ Phone interviews were conducted with women who missed follow-up rescreening to explore reasons for non-uptake.
- ⇒ Some data were obtained retrospectively from patient records, which may be incomplete or inconsistently documented.
- ⇒ Self-reported responses may be affected by recall or reporting bias.

Contextualised interventions can strengthen rescreening for finding those women at very high risk for cervical lesions and strengthen cervical cancer prevention in Ethiopia.

Trial registration number NCT06515301.

INTRODUCTION

Cervical cancer is the fourth leading cause of cancer-related deaths, with over 350 000 deaths globally in 2022,¹ more than 90% of which occurred in low- and middle-income countries (LMICs).² East Africa has the highest age-specific mortality rate, at 28.6 per 100 000 women, followed by southern Africa at 20.6 and the lowest in western Asia at 2.3 per 100 000.² In Ethiopia, cervical cancer is the second most common cancer among women, with 8168 new cases and 5975 deaths estimated in 2022.¹ The age-specific mortality rate in Ethiopia was 16 per 100 000 women in 2020, far above the global target of 4 per 100 000 by 2030.³

Cervical cancer screening is a preventive strategy used to detect and treat precancerous

changes before progression to cancer. Common methods include cytology (Pap smear), Human papillomavirus (HPV) DNA testing and visual inspection with acetic acid (VIA). Although HPV DNA testing is the globally recommended method, Ethiopia continues to use VIA as the primary screening modality due to its low cost, rapid results and compatibility with a screen-and-treat approach suitable for LMICs. This approach offers same-day treatment to eligible women who screen positive, helping to reduce delays in care and minimise follow-up losses.

The success of cervical cancer screening depends largely on follow-up rescreening uptake after treatment for precancerous lesions,⁴ since persistent positive VIA results and untreated infections or abnormal cells increase the risk of cervical intraepithelial neoplasia recurrence and progression to cervical cancer.⁵ Nevertheless, in LMICs like Ethiopia, women often do not complete their follow-up visits or adhere to treatment guidelines.^{6–9} In low-income settings, the loss-to-follow-up rate ranged from 41% to 69%.^{7 8 10 11} Common barriers to follow-up rescreening uptake include lack of awareness or information about the need for continued care, forgetfulness regarding appointments, financial constraints, transportation difficulties and perceived absence of symptoms.⁸ Additionally, resource shortages, limited treatment facilities and socio-demographic and clinical factors such as low education, long distance to health facilities and HIV status further contribute to poor adherence.^{10 12} For instance, the recurrence of more advanced cervical precancerous lesions was 18% in Nigeria¹³ and 12% in Kenya after 12 months of follow-up.¹⁴ Despite recommendations for post-treatment follow-up,¹⁵ adherence remains low in developing countries.^{6 12 16} In Nigeria, 47.2% missed follow-up appointments, with poor education, distance over 10 km and lack of prior screening being predictors.¹⁷ Similarly, in Kenya, the loss-to-follow-up rate was 39%, women living with HIV (WLWH) were more likely to miss appointments,¹⁸ Cameroon had a 44.1% loss rate,¹⁹ while in Côte d'Ivoire, the adherence rate was only 23.1%, with HIV status being the main predictor of follow-up.²⁰

A small study (140 women with a VIA positive lesion and treatment received) including patients between 2011 and 2021 in Addis Ababa found follow-up adherence of 27.5% at 1 year and 7.4% at 2 years, with a recurrence rate of 15.7% after 15.5 months.⁶ A large study among 16 632 WLWH reported a 10% VIA positivity rate and that 48.9% did not return for follow-up. Specifically, several regions had higher non-return rates: 70.2% in Addis Ababa, 62.2% in Oromia and 61.4% in southern Ethiopia.⁹ A 2024 study with 13 800 women (43.6% known HIV positive) screened in health centres of Addis Ababa and hospitals in Oromia showed 5.9% VIA positivity rate and only 44.7% returned for follow-up, with a 10% recurrence rate for WLWH and 10.7% for women with negative or unknown HIV status.⁷ Another analysis within the same cohort of Addis Ababa and Oromia region reported that lack of information about follow-up, appointment forgetfulness and failure to see the need for follow-up were common barriers.⁸ These

studies focused on HIV-positive women with 72, 100 and 43.6% WLWH,^{6 7 9} limiting the generalisability of their findings to the broader population of women at risk for cervical cancer. Additionally, many lacked detailed data on follow-up rescreening uptake and recurrence at the primary healthcare level, particularly in rural settings where most women access care.^{7 8} Our study addresses these gaps by analysing a large cohort of women with a small proportion of WLWH, at multiple rural health centres and primary hospitals. Furthermore, by using a prospective questionnaire administered at first screening, this study enables a more thorough understanding of barriers to follow-up and adherence within decentralised, low-resource healthcare contexts. This approach provides critical baseline data to inform and tailor interventions aimed at improving follow-up adherence in Ethiopia's primary healthcare system. This study will serve as a baseline for our intervention study, the protocol for which is published at *BMJ Open*.²¹ The intervention is designed to improve follow-up adherence at the primary healthcare level in Ethiopia.

METHODS AND MATERIALS

Study settings, design and period

This study was conducted in peripheral cancer care settings in rural Ethiopia among 10 primary healthcare facilities. Eight health centres and two primary hospitals set in the South-West of Ethiopia's capital Addis Ababa were included. The facilities were the peripheral cancer care network of the Else Kröner-Center for Cancer Care Ethiopia and DINKNESH project, which have been implementing cervical cancer screening and treatment since 2020. Cervical cancer screening and treatment for pre-cervical cancer lesion using either cryotherapy or thermal ablation were available in all the facilities as part of a see and treat approach. All participating facilities used VIA as the primary screening method, following Ethiopia's national guidelines. Acetic acid (3–5%) was applied to the cervix, and trained providers inspected for acetowhite lesions to detect potential precancerous changes. Screening targeted women aged 30–49 in the general population and HIV-positive women starting at age 25. Women who tested VIA positive were assessed for eligibility and, if appropriate, received immediate ablative treatment (cryotherapy or thermal ablation) during the same visit. Those with lesions covering >75% or ineligible for ablation were referred for loop electrosurgical excision procedure (LEEP). This see-and-treat strategy is intended to minimise delays and reduce loss to follow-up. At the time of data collection, all included facilities were actively providing VIA-based cervical cancer screening and same-day treatment services.

A longitudinal cross-sectional study was employed from November 2022 to April 2024 for this study. Data were collected from 14 April to 27 April 2024. This baseline observational study was conducted as part of a larger intervention trial. The full protocol is prospectively

registered on ClinicalTrials.gov (NCT06515301) and has also been published in *BMJ Open* (DOI: 10.1136/bmjopen-2024-091693).

Participants and sample size determination

A single population proportion formula was used to estimate the required sample size for the study. Proportion of 27.9% of follow-up adherence (referred to in this study as follow-up rescreening uptake) from a previous study in Addis Ababa, Ethiopia, published 2022⁶; 4% margin of error and 5% level of significance (95% CI), and a 6.5% non-response rate were applied. The required sample size for the study was calculated to be a minimum of 515.

Inclusion and exclusion criteria

Those women who were screened positive during initial cervical cancer screening (asymptomatic) and treated for positive cervical cancer screening result were appointed after 1 year and those with complete records at the health facilities were included in the study. Women with hysterectomies, diagnosed with other histological invasive cervical cancer, suspicious cervical cancer cases, pregnancy, those who previously screened and vaginal bleeding were excluded from the study.

Variables and measurement

Follow-up rescreening uptake was the dependent variable for this study. Whereas socio-demographic and clinical factors (age, residence, educational status, marital status and HIV status), reproductive history (number of children) and cervical cancer screening information's were independent variables. Age was categorised into three

groups: ≤ 30 , 31–39 and ≥ 40 , based on cervical cancer screening eligibility in Ethiopia.

Follow-up rescreening uptake

follow-up rescreening uptake was measured: re-screening (VIA) after 1 year (11–13 months after first screening). Women who returned within this time frame were categorised as having achieved follow-up rescreening uptake. Those who did not return were classified as 'lost to follow-up'.^{7 15}

Persistent VIA positive (recurrence rate)

Women who screened positive for cervical cancer screening during rescreening visits after being treated for pre-cervical cancer lesion previously.^{7 13}

Patient and public involvement

Patients, healthcare professionals and experts were engaged throughout the study, particularly during the design and data collection phases. The questionnaire was pretested with 10% of the sample size (n=51), enabling revisions for clarity and relevance. Feedback from experts and healthcare professionals in cervical cancer screening and treatment helped the tool modifications. Experienced data collectors were trained on study objectives, with local research assistants and supervisors ensuring data quality and consistency. Study findings will be disseminated to stakeholders through workshops, conferences and publications.

Data collection procedure, analysis and management

Quantitative data was collected prospectively since 2022 using a questionnaire built based on previous studies.^{6 7 17}

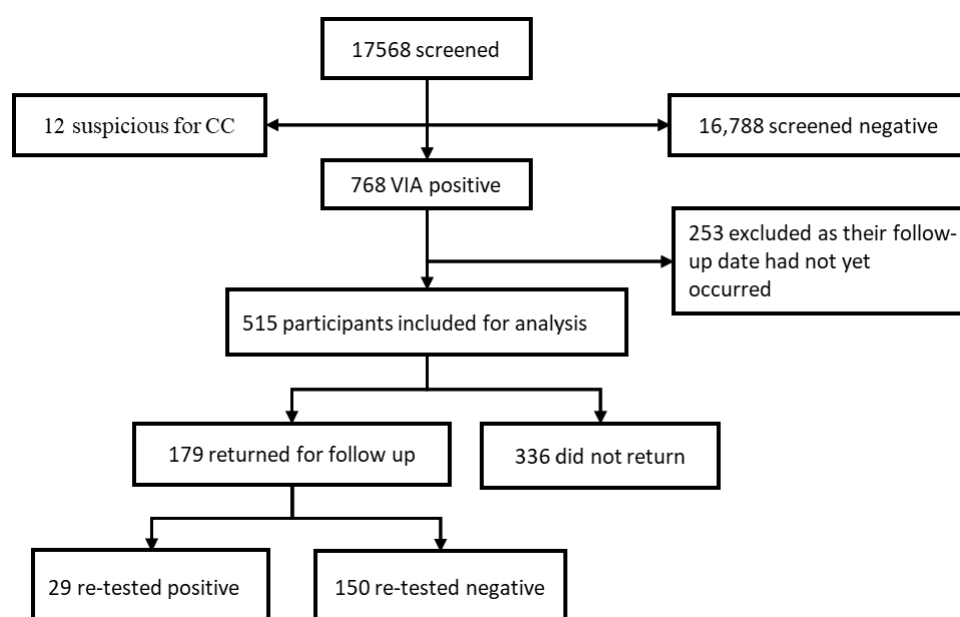


Figure 1 Flow chart of women screened using VIA, treated and included in follow-up re-screening uptake analysis. Of 17 568 women screened, 768 tested positive and were treated. 12 suspicious cervical cancer cases were referred for further diagnosis. Women whose follow-up period had not elapsed (n=253) were excluded, leaving 515 women included in follow-up re-screening uptake analysis. Of these, 179 returned for follow-up, with 29 persistent VIA-positive cases on rescreening. CC, cervical cancer; VIA, visual inspection with acetic acid.

The questionnaire had four parts (socio-demographic characteristics, reproductive history, risk factors and cervical cancer screening information). Data were analysed using SPSS V.25. To identify factors independently associated with follow-up adherence, bivariate logistic regression analyses were first conducted. Variables with a p value < 0.25 in bivariate analyses, as well as variables considered clinically relevant based on prior literature (including age group, residence, marital status, educational status, number of children and HIV status), were included in the multivariable logistic regression model. This strategy allowed control for potential confounding and assessment of the independent effect of each predictor on follow-up rescreening uptake. Multicollinearity among independent variables was evaluated using variance inflation factors ($VIF < 4$), ensuring model stability. Model fit was assessed with the Hosmer-Lemeshow goodness-of-fit test, with a p value > 0.05 indicating adequate fit. Adjusted OR (AOR) with corresponding 95% CIs and p values were reported, with statistical significance defined at $p < 0.05$.

RESULTS

In this study, 17 568 women were screened from November 2022 to April 2024. Among those screened, 768 (4.4%) tested positive in the VIA screening and received treatment through either cryotherapy or thermal ablation. There were 12 suspicious cervical cancer cases, all of

which were referred for further diagnosis and treatment to their respective referral centres. Nearly one-third of women with a VIA positive lesion were excluded because their follow-up time had not yet occurred during the data collection period. Only women whose follow-up period had passed (1 year for the general cohort and 6 months for WLWH) were included in the follow-up adherence analysis. Thus, 515 women were included in our study. Of these 515 women, 179 returned for their follow-up appointment and 29 were persistent positive during rescreening (figure 1).

Two-thirds of the participants (332; 63.8%) were between 31 and 39 years, with a mean age of 34.82 years (± 4.63). The majority were married (508; 96.4%), and more than half (296; 56.2%) resided in rural areas. 210 participants (39.5%) had no formal education, while 80 participants (15.2%) were WLWH (see table 1).

Cervical cancer screening and treatment information

All 515 women in the study tested positive for a cervical abnormality during screening, and all received same-day treatment using cryotherapy or thermal ablation.

Follow-up rescreening uptake and persistent positive rates

Of the 515 women scheduled for follow-up visits, 179 (34.8%, 95% CI: 30.6% to 38.8%) returned for rescreening at primary healthcare settings. Among those re-screened, 29 women (16.1%, 95% CI: 11.0% to 21.7%)

Table 1 Socio-demographic and reproductive characteristics of participants (n=515) in the study area 2024

Variables	Category	Total n (%)	HIV positive n (%)	HIV negative n (%)	Unknown HIV status n (%)
Age group	≤ 30	110 (21.4)	10 (9.1)	78 (70.9)	22 (20.0)
	31–39	325 (63.1)	44 (13.5)	215 (66.2)	66 (20.3)
	> 40	80 (15.5)	26 (32.5)	45 (56.2)	9 (11.3)
Residence	Rural	284 (55.1)	28 (9.9)	196 (69.0)	60 (21.1)
	Urban	231 (44.9)	52 (22.5)	142 (61.5)	37 (16.0)
Educational status	Illiterate	198 (38.4)	19 (9.6)	132 (66.7)	47 (23.7)
	Can read and write	75 (14.6)	22 (29.3)	48 (64.0)	5 (6.7)
	Elementary	189 (36.7)	28 (14.8)	126 (66.7)	35 (18.5)
	Secondary and above	53 (10.3)	11 (20.8)	32 (60.4)	10 (18.9)
Marital status	Others	18 (3.5)	4 (22.2)	10 (55.6)	4 (22.2)
	Married	497 (96.5)	76 (15.3)	328 (66.0)	93 (18.7)
STI	No	460 (89.3)	70 (15.2)	301 (65.4)	89 (19.3)
	Yes	55 (10.7)	10 (18.2)	37 (67.3)	8 (14.5)
Number of children	≤ 2 children	37 (7.2)	6 (16.2)	23 (62.2)	8 (21.6)
	3–4 children	305 (59.2)	46 (15.1)	197 (64.6)	62 (20.3)
	≥ 5 children	173 (33.6)	28 (16.2)	118 (68.2)	27 (15.6)
HIV status	Positive	86 (16.7)	(—)	(—)	(—)
	Negative	320 (62.1)	(—)	(—)	(—)
	Unknown	109 (21.2)	(—)	(—)	(—)

Footnote: HIV status appears both as a participant characteristic (row) and as a grouping variable (columns). The em dash (—) indicates a non-applicable cell. Percentages for HIV subgroups are row-wise.

Table 2 Follow-up rescreening uptake and persistent positive rates by patient characteristics in the study area, 2024 (n=515)

Variables	Category	Total n=515 (%)	Follow-up rescreening		
			Not re-screened n=336 (65.2%)	Re-screened negative n=150 (83.9%)	Re-screened positive n=29 (16.1%)
Age group	≤30	110 (21.4)	77 (70.0)	23 (20.9)	10 (9.1)
	31–39	325 (63.1)	228 (70.2)	82 (25.2)	15 (4.6)
	>40	80 (15.5)	31 (38.8)	45 (56.2)	4 (5.0)
Residence	Rural	284 (55.1)	206 (72.5)	66 (23.2)	12 (4.2)
	Urban	231 (44.9)	130 (56.3)	84 (36.4)	17 (7.4)
Educational status	Illiterate	198 (38.4)	138 (69.7)	52 (26.3)	8 (4.0)
	Can read and write	75 (14.6)	51 (68.0)	21 (28.0)	3 (4.0)
	Elementary	189 (36.7)	121 (64.0)	55 (29.1)	13 (6.9)
	Secondary and above	53 (10.3)	26 (49.1)	22 (41.5)	5 (9.4)
Marital status	Others	18 (3.5)	12 (66.7)	5 (27.8)	1 (5.6)
	Married	497 (96.5)	324 (65.2)	145 (29.2)	28 (5.6)
STI	No	460 (89.3)	301 (65.4)	133 (28.9)	26 (5.7)
	Yes	55 (10.7)	35 (63.6)	17 (30.9)	3 (5.5)
HIV status	Positive	80 (15.5)	31 (38.8)	43 (53.8)	6 (7.5)
	Negative	338 (65.6)	241 (71.3)	80 (23.7)	17 (5.0)
	Unknown	97 (18.8)	64 (66.0)	27 (27.8)	6 (6.2)
Number of children	≤2 children	37 (7.2)	26 (70.3)	9 (24.3)	2 (5.4)
	3–4 children	305 (59.2)	196 (64.3)	93 (30.5)	16 (5.2)
	≥5 children	173 (33.6)	114 (65.9)	48 (27.7)	11 (6.4)

STI, sexually transmitted infection.

were found to have persistent VIA-positive lesions. When stratified by HIV status, persistence was observed in 6 of 49 HIV-positive women (12.2%), 17 of 97 HIV-negative women (17.5%) and 6 of 33 women with unknown HIV status (see [table 2](#)).

Barriers to follow-up rescreening uptake

Of the 336 women (65.2%) lost to follow-up, we collected data from 139 through phone calls and direct access. The main reasons for not attending follow-up visits were forgetting the appointment date (n=66; 47.5%) and lack of time (n=36; 25.9%), visiting another health facility and pregnancy ([table 3](#)).

Follow-up reminder preferences among study participants

Among women with available phones, we asked non-follow-up (n=139) and follow-up-adhered (n=55) participants regarding their willingness to receive appointment reminders via SMS, phone calls or home visits by health extension workers. Out of 194 women contacted, 181 (93.3%) preferred receiving reminder texts and all participants were open to receiving reminders via phone calls or home visits.

Factors associated with follow-up rescreening uptake

In the multivariable logistic regression analysis, socio-demographic variables such as age group, residence,

educational status and HIV status were associated with follow-up rescreening uptake ([table 4](#)). Women aged 40–49 were more likely to return for follow-up rescreening uptake than those aged less than 30 (AOR=2.5; 95% CI: 1.51 to 5.69). Those whose residential areas were in urban areas of the screening facilities were also more likely to rescreening uptake than those who reside in rural areas (AOR=1.7; 95% CI: 1.15 to 2.58). Women with secondary and above education were more likely to return for follow-up rescreening than those without education (AOR=2.0, 95% CI: 1.06 to 4.12). WLWH were more likely to return for follow-up rescreening uptake than women with unknown HIV status (AOR=2.3, 95% CI: 1.20 to 4.66).

DISCUSSION

This study includes a large number of women from rural Ethiopia attending cervical cancer screening at eight health centres and two hospitals; one in eight women was living with HIV. The study serves as a baseline assessment of follow-up rescreening uptake for cervical cancer, with implications for a pragmatic randomised control trial intervention study, the protocol of which has been published at *BMJ Open*.²¹ We found that only one-third of women adhered to rescreening after positive cervical

Table 3 Reasons for loss to follow-up among participants (n=139). Data were collected using a structured questionnaire, participants selected only one primary reason

Variables	Category	Total n (%)	Barriers to follow-up rescreening uptake				
			Forgot the appointment	Lack of time	Visited another health facility	Pregnancy	Other reasons
Total		139 (100)	66 (47.5%)	36 (25.9%)	16 (11.5%)	13 (9.4%)	8 (5.8%)
Age group	≤30	35 (25.2)	17	6	2	6	4
	31–39	95 (68.3)	43	29	13	6	4
	>40	9 (6.5)	6	1	1	1	0
Residence	Rural	81 (58.3)	37	17	12	12	3
	Urban	58 (41.7)	29	19	4	1	5
Educational status	Illiterate	49 (35.3)	27	9	6	6	1
	Can read and write	21 (15.1)	8	7	2	3	1
	Elementary	53 (38.1)	24	15	5	4	5
	Secondary and above	16 (11.5)	7	5	3	0	1
Marital status	Others	6 (4.3)	2	0	1	2	1
	Married	133 (95.7)	64	36	15	11	7
HIV status	Positive	18 (12.9)	7	5	3	3	0
	Negative	95 (68.3)	48	22	10	8	7
	Unknown	26 (18.7)	11	9	3	2	3
STI status	No	124 (89.2)	61	31	14	13	5
	Yes	15 (10.8)	5	5	2	0	3
Number of children	≤2	11 (7.9)	4	2	4	1	0
	3–4	80 (57.6)	41	23	8	5	3
	≥5	48 (34.5)	21	11	4	7	5

*Other reasons include participants reporting 'didn't feel necessary', financial constraints or lack of partner support.

cancer screening, revealing a significant gap, with a persistent positive rate or recurrence rate of 16%. Significant factors associated with follow-up rescreening uptake included age over 40 year's old, urban residence, better educational status and WLWH.

The follow-up rescreening uptake level found in our study in rural Ethiopia is lower than a recent study conducted in urban Addis Ababa and among large hospitals of Oromia regions of Ethiopia in 2024, which reported about half of the women adhering to the follow-up appointment.⁷ With follow-up rescreening uptake below 50%, effective strategies are crucial to boost follow-up adherence rate. Re-screening data from 2011 to 2021 was lower than our results (27.5%) possibly due to activities in the early days of screening.⁶

Our findings are also lower than most in other LMICs.^{17–18} For instance, the follow-up adherence levels were reported as 52.8% in Nigeria,¹⁷ 55.9% in Cameroon¹⁹ and 61% in Kenya.¹⁸ The difference could be attributed to variations in settings and follow-up time points considered across the studies. Although the same VIA screening modality was used, the above-mentioned studies measured re-screening uptake within less than 1 year. For instance, in Cameroon, follow-up status was

assessed the day after the initial visit,¹⁷ and in Kenya, it was measured 3 months after the screening date.¹⁸ However, we measured re-screening uptake after 1 year in line with the national cervical cancer screening guidelines. Lower rescreening rates were reported in Côte d'Ivoire during the COVID-19 pandemic, which likely led women to skip their follow-up visit due to restrictions.²⁰

Another important finding was the recurrence rate, with 16.1% of re-screened participants testing positive at follow-up screening. This rate aligns with the findings from a study with patients from 2011 to 2021 in Addis Ababa 15.7%,⁶ 10% in Ethiopia in 2024,⁷ 12% in Kenya⁵ as well as 18% in Nigeria.¹³ These results underscore the need for robust follow-up mechanisms to ascertain treatment of those women at very high risk to develop cervical cancer.

To explain differences in follow-up rescreening uptake, Andersen's Behavioural Model of Health Services Use provides a useful framework. The model identifies three key factors influencing service use: predisposing factors such as age and education; enabling factors like urban residence and access to healthcare; and need factors, including HIV status and perceived health risks. In our context, older and more educated women may better

Table 4 Multivariable logistic regression analysis to identify factors for rescreening uptake in Ethiopia 2024

Variable	Category	Follow-up rescreening		COR (95%)	AOR (95% CI)
		Not adhered	Adhered		
Age group	≤30	77	33	1	1
	31–39	228	97	0.9 (0.61 to 1.59)	0.9 (0.56 to 1.55)
	40–49	31	49	3.0 (2.01 to 6.76)	2.5 (1.51 to 5.69)*
Residence	Rural	206	78	1	1
	Urban	130	101	1.7 (1.19 to 2.48)	1.7 (1.15 to 2.58)*
Education	Illiterate	138	60	1	1
	Can read and write	51	24	1.0 (0.61 to 1.91)	0.8 (0.46 to 1.72)
	Elementary	121	68	1.2 (0.84 to 1.97)	1.1 (0.74 to 1.88)
	Secondary and above	26	27	2.4 (1.33 to 4.63)	2.0 (1.06 to 4.12)*
HIV status	Positive	31	49	3.0 (1.65 to 5.67)	2.3 (1.20 to 4.66)*
	Negative	241	97	0.7 (0.48 to 1.26)	0.7 (0.44 to 1.20)
	Unknown	64	33	1	1
Number of children	<2	26	11	1	1
	2–4	196	109	1.3 (0.62 to 2.76)	1.4 (0.66 to 3.25)
	>5	114	59	1.2 (0.56 to 2.64)	1.1 (0.51 to 2.71)

The bold values were used for emphasis but the asterisks are the primary indicators of significance.

*Significantly associated.

AOR, adjusted OR; COR, crude OR.

understand the importance of follow-up; urban residents often face fewer barriers to care; and HIV-positive women may perceive a higher need due to regular contact with health services. This framework helps clarify how these factors interact to shape follow-up behaviour. A 2023 study in southern Ethiopia²² applied the same model to maternal health services, reinforcing its relevance. Understanding these dynamics can guide the development of targeted interventions to improve follow-up rescreening uptake in rural settings.

Women's characteristics were significantly associated with follow-up re-screening uptake. Women aged over 40 were more likely to return for follow-up visits than those under 30. Previous studies have also identified age as an important predictor variable.⁷ The higher re-screening rate among older women might be due to their increased awareness and concern about health, including cervical cancer, which may stem from accumulated life experience and greater health-seeking behaviour. In contrast, younger women may face competing priorities such as family responsibilities, work or education, which could lead them to deprioritise the need for follow-up re-screening. In Ethiopia, cervical cancer screening is recommended for women aged 30–49,²³ so the higher rescreening uptake among older age group is encouraging. Nonetheless, the lower adherence observed among younger women highlights a gap that needs to be addressed. Tailored strategies such as personalised reminders and counselling by community health workers may be effective in reaching and motivating younger women, particularly in rural or underserved areas.

Urban residence was also associated with higher rescreening uptake compared with rural areas, a finding consistent with previous studies.⁸ This disparity may be due to better access to healthcare facilities, higher health literacy and greater exposure to health promotion activities in urban settings. In contrast, rural women often face multiple barriers, including long travel distances to health facilities, transportation costs, limited availability of health services and lower awareness about the importance of follow-up screening. Socio-cultural norms and reliance on traditional medicine may also play a role in delaying or avoiding formal healthcare. Given that over 85% of Ethiopians live in rural areas,²⁴ interventions must be tailored to these community needs. Community-based follow-up by health extension workers, combined with mobile health strategies such as SMS reminders in local languages, could help address the unique challenges rural women face and improve follow-up re-screening uptake.

Educational status emerged as a significant predictor of follow-up rescreening uptake: women with secondary education or higher were more likely to return for follow-up rescreening uptake than those without formal education, consistent with findings from Ethiopia⁷ and Nigeria in 2014.¹⁷ Women with a higher education may have increased awareness about the benefits of rescreening in preventing cervical cancer morbidity and mortality. Additionally, they may exhibit stronger health-seeking behaviours,²⁵ which further support their adherence to follow-up care. In contrast, women with a lower education, often residing in rural areas, face barriers such as low health literacy, limited awareness of cervical cancer

risks and reduced access to healthcare information. These findings serve as a baseline for our forthcoming intervention trial, which will use community-based mechanisms, particularly health extension workers, phone calls and text messaging to reach these underserved populations. By addressing these barriers through personalised education and reminders, we aim to improve follow-up rescreening uptake and reduce disparities in cervical cancer screening outcomes.

HIV status of women was a strong predictor variable explaining the follow-up rescreening uptake. In this study, HIV-positive women were more likely to return for follow-up rescreening than women with unknown HIV status. Our findings contrast with studies from Addis Ababa, Ethiopia, where HIV-negative women were more likely to adhere to follow-up appointments,⁶ and Kenya, where HIV-positive women were more likely to default from follow-up.¹⁷ However, our finding is in line with findings in Côte d'Ivoire²⁰ and Cameroon,¹⁹ where HIV-positive women showed higher follow-up adherence. The increased adherence among HIV-positive women may be attributed to their frequent interactions with healthcare workers, which helps them remember their appointments due to ongoing consultations. As a high-risk group for cervical cancer, HIV-positive women often receive counselling and support for follow-up appointments. Their regular visits to HIV clinics for HIV management provide further opportunities, enhancing adherence to follow-up rescreening.

Interestingly, the known increased risk of cervical disease persistence in HIV-positive women was not clearly reflected in our findings. In fact, HIV-positive women in this study showed a slightly lower persistence rate compared with HIV-negative women. This unexpected outcome could be due to the more structured follow-up and integrated care provided to HIV-positive women in Ethiopia, which may lead to earlier detection and more timely treatment. Additionally, women with unknown HIV status had the highest proportion of persistent cases, possibly reflecting undiagnosed or undisclosed HIV infections. Given the small sample sizes in some subgroups, this observation should be interpreted cautiously.

Our finding that half of the women who were lost to follow-up stated forgetting the appointment to be the main reason underscores the importance and potential role of reminder systems in enhancing follow-up re-screening uptake. In particular, mobile text message-based (SMS) and phone call-based reminder systems could be crucial, as they have proven effective in similar studies conducted in Tanzania.²⁶ This study serves as a foundation for our pragmatic randomised control trial, which will contribute to strategies aimed at improving follow-up rescreening uptake, thereby contributing to the achievement of the WHO cervical cancer elimination target by 2030.¹⁵ The upcoming intervention trial within the same study setting will use both phone call and SMS text message reminder systems to assess their effectiveness in improving follow-up rescreening uptake.

This study highlights critical gaps in cervical cancer follow-up rescreening uptake in rural Ethiopia, emphasising

the urgent need for feasible, context-specific interventions. The identification of key demographic and clinical predictors enables targeted strategies to improve rescreening uptake, especially among younger, less educated and rural women who are currently underserved. Our findings strongly support the implementation of reminder systems such as phone calls and SMS messaging as a practical, scalable solution to address forgetfulness, the most common barrier identified. The planned pragmatic randomised control trial will provide essential evidence on the effectiveness of these approaches within Ethiopia's primary healthcare context. By improving follow-up rescreening uptake, such interventions have the potential to enhance early detection and treatment of cervical cancer, ultimately contributing to the WHO's goal of cervical cancer elimination by 2030. These results should inform national cervical cancer programmes and encourage the integration of mHealth tools and community-based support mechanisms in LMICs.

Strengths and limitations

This is, to the best of our knowledge, the study including the largest cohort of women receiving cervical cancer screening service in Ethiopia and the only study primarily set in the primary healthcare level (health centres). Another strength was the use of prospective documentation to monitor follow-up rescreening status, enabling real-time tracking of women's adherence with follow-up visits. Some participant data were collected retrospectively through chart reviews, which could introduce bias. However, we mitigated this limitation by incorporating primary data using primary source via phone call and direct access. Part of the data is based on subjective patient information and should thus be interpreted carefully. Nonetheless, this study serves as a baseline for our forthcoming pragmatic randomised intervention trial.

CONCLUSION

Only one-third of women adhered to follow-up rescreening after a positive cervical cancer screening at primary healthcare facilities in Ethiopia, and half of those not rescreened stated forgetting the rescreening, revealing a significant gap. Factors such as older age, urban residence, higher education and HIV-positive status were significantly associated with follow-up rescreening uptake. The positivity rate was three times higher compared with the initial screening—showing the vulnerability of women initially screened positive and the necessity of rescreening utilisation. This highlights the need for interventions using reminder strategies for re-screening and tailored approaches for high-risk groups and hard-to-reach areas.

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