

Recent treatment outcomes of cervical intraepithelial neoplasia in south western Uganda: a six year retrospective study[☆]

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ABSTRACT

Background: There is limited real-world data on trends and distribution of treatment outcomes of cervical lesions in cervical cancer care settings in Uganda. We conducted this study to describe trends and the distribution of treatment outcomes for Cervical Intraepithelial Neoplasia (CIN) among women treated at Mbarara Regional Referral Hospital (MRRH), Southwestern Uganda.

Methods: We conducted a retrospective census of women treated for CIN at the cervical cancer clinic and gynecology ward of MRRH from January 2020 to July 2025. Data on age, district of residence, HIV status, HPV test results, treatment modality, year of treatment, and treatment outcomes were extracted from clinic registers and patient records and analyzed using Stata 17.

Results: We retrieved records of 184 women who had been treated for CIN, and their mean age was 43.3 (± 14.8). The majority (150/184, 81.5%) of CIN cases were documented as cured while the while 34/184 (18.5%) had persistent lesions. More than half of cases with persistent lesions also had unknown HIV status. Persistent CIN was mostly observed among women who were either positive with single HPV16 genotype (7/34, 20.6%) or HPV18/45 plus Other hrHPV genotypes (22/34, 64.7%).

Conclusion: An increasing trend in persistent cervical intraepithelial neoplasia was observed over the study period, particularly among women with unknown HIV status and those with HPV16 infection or mixed HPV18/45 and other high-risk HPV infections. These findings highlight the need to strengthen integration of cervical precancer care into HIV services, reinforce the screen-and-treat approach, and improve post-treatment follow-up and monitoring.

Abbreviations: CIN, Cervical Intraepithelial Neoplasia; HIV, Human Immunodeficiency Virus; HPV, Human Papilloma Virus; HrHPV, High Risk Human Papilloma Virus.; MRRH, Mbarara Regional Referral Hospital.; MUST, Mbarara University of Science and Technology; WHO, World Health Organisation.

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1. Introduction

Globally, cervical cancer cases and deaths are estimated to be 117,316 and 76,745, respectively (Sharma et al., 2022), with disproportionately high figures in low-income countries (Zhao et al., 2021). In the East Africa region, recent statistics indicate that incidence stands at 43/100,000 (Sankaranarayanan, 2014). Specific statistics for Uganda indicate cervical cancer as one of the most common cancers (Nakaganda et al., 2023), whose age-standardized incidence rate is 56.2/100,000 (WHO, 2018), and accounting for 1/10 of all gynecological admissions at Mbarara Regional Referral Hospital (MRRH) (Kajabwangu et al., 2024a). The reported prevalence of cervical intraepithelial lesions among communities served by MRRH is estimated to be 6% (Sseddyabane et al., 2024).

Uganda implements a test and treat approach (MoH, 2016), which calls for immediate treatment/management following a positive screening test, mainly Visual Inspection with Acetic acid (VIA) (Nakisige et al., 2017; WHO, 2006; Uganda MoH, 2018; WHO, 2014a; WHO, 2013; WHO, 2014b; WHO, 2011; World Health Organization, 2020). Treatment outcomes are usually assessed using indicators such as lesion clearance, recurrence or persistence. (Dareng et al., 2019; De Marco, 2013; De Vuyst et al., 2009). In many settings, including Uganda, premalignant cervical lesions are often underdiagnosed or detected late due to limited screening coverage, reducing opportunities for timely treatment and increasing the risk of progression to invasive disease. (Delam et al., 2020; Jacobs et al., 2000; Krüger-Kjær et al., 1998; Haversath et al., 2017; Houlihan et al., 2016; Hansen et al., 2020). Additional challenges, including treatment delays, interruptions, loss to follow-up, and multimorbidity with other disease conditions, further affect treatment outcomes (Delam et al., 2020; Kajabwangu et al., 2024b).

While trends and distribution of treatment outcomes for premalignant cervical lesions are well documented in high-income settings, evidence from resource-limited contexts is limited especially in Uganda. There is limited data on real-world treatment outcomes and factors influencing prognosis in routine care settings in Uganda. Understanding treatment outcomes in the Ugandan context is critical for improving clinical care and informing evidence-based cervical cancer control strategies. This study aimed to describe trends and distribution of treatment outcomes of premalignant cervical lesions outcomes among women treated at the cervical cancer clinic of MRRH. Findings from this study are expected to inform clinical practice, budgeting and resource allocation, and policy decisions aimed at improving overall cervical cancer care.

2. Materials and methods

2.1. Study site

The study was conducted at Mbarara Regional Referral Hospital (MRRH), a tertiary referral facility located in south western Uganda. MRRH serves a catchment population of about 6.3 million people across more than ten districts and also receives patients from neighbouring countries, including Rwanda, Burundi, Tanzania, and the eastern Democratic Republic of the Congo (2020 UBOS, 2020). The hospital provides comprehensive cancer care services, owing to the existence of a regional branch of the Uganda Cancer Institute and serves as the teaching hospital for Mbarara University of Science and Technology Medical School. This study specifically involved data from the hospital's main laboratory registers and databases, the cervical cancer clinic registers, and the gynecology ward registers, charts, and patients' files. HPV testing is carried out in the accredited main laboratory, while patients with suspicious cervical lesions are evaluated at the cervical cancer clinic and managed at the gynecology ward for clinical staging and treatment. MRRH offers specialized services and runs dedicated clinics for various medical conditions, including cervical cancer. The cervical

cancer clinic screens an average of 20 women per day, operates five days a week, and is the only clinic of its kind in south western Uganda. It is staffed by a gynecologic oncologist, gynecologists, residents of Obstetrics/Gynecology and nurses. Women access the cervical cancer clinic through self-referral or referral from lower-level health facilities within the hospital catchment area. Referred women commonly include those with positive screening results, abnormal cervical findings, or symptoms suggestive of cervical disease requiring further evaluation. HIV counselling and testing are routinely offered to women attending the cervical cancer clinic in accordance with national guidelines. Screening for cervical cancer is primarily performed using Visual inspection with acetic acid (VIA) and HPV testing. Cytology and histopathological examinations are undertaken selectively and only when clinically indicated, while women eligible for ablative therapy are managed according to the national screen-and-treat approach. The clinic follows a screen-and-treat approach in accordance with national guidelines. A positive screening test was defined as a positive VIA result, characterized by the presence of aceto-white changes on the cervix suggestive of a precancerous lesion. For HPV, a positive test was defined as presence of any of the high risk HPV genotypes. Women with lesions considered eligible for ablative treatment underwent same-day thermocoagulation. Thermocoagulation is an ablative treatment modality that uses heat to destroy abnormal cervical tissue and is routinely used for the treatment of eligible cervical precancerous lesions in low-resource settings. Women with precancerous lesions are followed up for 12 months, at which time, the primary test, VIA or HPV, is performed to determine treatment outcomes. If a woman turns up with a persistent lesion at 12 months, a colposcopy is done and a biopsy is collected to determine the exact grade of the lesion and depth of invasion, which eventually determines the next course of treatment according to local guidelines.

2.2. Study design and population

This was a retrospective, hospital-based study that analyzed treatment outcomes of patients who were treated for premalignant cervical lesions at Mbarara Regional Referral Hospital (MRRH) between January 2020 and July 2025. The study population included women who attended the cervical cancer clinic during this period. Only patient records with complete demographic information and documented treatment outcomes were included in the analysis.

2.3. Sample size determination

All eligible patient records within the study period were included, resulting in a census of available data for analysis. A formal sample size calculation was not required, as the study aimed to include all records meeting the inclusion criteria.

2.4. Study selection criteria

Records were included if they belonged to women aged 18 years and above who received care at MRRH between January 2020 and July 2025 and contained complete demographic data and documented treatment outcomes. Records were excluded if treatment outcomes were missing, if there were duplicate entries, or if they fell outside the defined study period.

2.5. Sampling procedure

A census approach was employed, whereby all eligible patient records during the study period were retrieved and analyzed.

2.6. Data collection

Relevant demographic information and treatment outcome data were systematically retrieved from the main hospital laboratory

database and registers, cervical cancer clinic registers, and gynecology ward registers and patients' files using a structured Microsoft Excel data extraction form. Variables collected included patient age, HPV genotypes, residence, HIV status, type of treatment received, and year of treatment. HIV status was abstracted from routine clinical records and clinic registers. Women without documented HIV test results were classified as having unknown HIV status. The data collection process was designed to capture trends and patterns in treatment outcomes over the study period across the different hospital units involved in cervical cancer care and management. Treatment outcomes were assessed 12 months after thermocoagulation using the test-of-cure modality documented in the clinical records. For VIA, cure was defined as absence of aceto-white lesions and persistence as the presence of aceto-white lesions suggestive of cervical precancer. For cases where cytology was used, cure was defined as absence of squamous intraepithelial lesions, while persistence was defined as the presence of low-grade or high-grade squamous intraepithelial lesions. When HPV testing was used, HPV negativity was considered evidence of successful treatment, whereas HPV positivity was interpreted as persistent high-risk HPV infection and not necessarily histologically confirmed persistent dysplasia (Luyten et al., 2009; Mbulawa et al., 2018; Peltzer and Pengpid, 2016). These definitions reflect the routine practice in screening for and treating cervical precancer at MRRH.

2.7. Data analysis

Data were entered into Microsoft Excel version 17 and exported to STATA version 17 for analysis. Descriptive statistics were used to summarize the distribution and patterns of treatment outcomes over the study period and across patient demographics. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations for normally distributed data or medians and interquartile ranges for skewed data. Trends in treatment outcomes over time were assessed descriptively and visualized using bar charts and pie charts. Distribution of treatment outcomes across demographic characteristics was compared using Fischer's exact-tests, chi-square tests or independent t-tests. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Participant demographics

A total of 184 women's records were reviewed for this study, with a mean age of 43.3 (± 14.8) years. Approximately one-quarter (50/184, 27.2%) of participants were aged 18–30 years, and a similar proportion (50/184, 27.2%) resided in Mbarara. The most common HPV genotypes detected were HPV16 (25/184, 13.6%) and HPV18/45 (27/184, 14.7%). Overall, 30.4% (56/184) of participants had unknown HIV status. All participants were treated with thermocoagulation (Table 1).

3.2. Treatment outcomes for cervical intraepithelial neoplasia

The majority (150/184, 81.5%) of CIN cases had been documented as cured while the rest (34/184, 18.5%) had been documented to have persisted. (Fig. 1).

3.3. Distribution of treatment outcomes across demographics

Mean age did not significantly differ across treatment outcome categories, with women with cured lesions slightly older (43.4 ± 14.7) than those with persisted lesions (42.9 ± 15.6). Close to a third (11/34, 32.4%) of all women with persisted lesions were aged 18–30 years. Treatment outcomes of cervical intraepithelial neoplasia (CIN) differed significantly across HIV status with more than half (18/34, 52.9%) of all persistent lesions being reported among women with unknown HIV

Table 1
Participant demographics (N = 184).

Variable	Category	Frequency	Proportion
AGE		43.3 (14.8)	
Age group	18–30	50	27.2
	31–40	37	20.1
	41–50	45	24.5
	51–60	22	12.0
	61–78	30	16.3
District	Isingiro	35	19.0
	Bushenyi	22	12.0
	Ibanda	9	4.9
	Mbarara	50	27.2
	Kiruhura	10	5.4
	Sheema	4	2.2
	Others	54	29.3
HPV results	HPV16	25	13.6
	HPV16 + HPV18/45	4	2.2
	HPV16 + HPV18/45 + Other hrHPV	0	0
	HPV16 + Other hrHPV	1	0.5
	HPV18/45	27	14.7
	HPV18/45 + Other hrHPV	5	2.7
	Negative	114	62
	Other hrHPV	8	4.3
HIV status	Negative	92	50
	Positive	36	19.6
	Unknown	56	30.4
Year of treatment	2020	8	4.3
	2021	29	15.8
	2022	18	9.8
	2023	58	31.5
	2024	29	15.8
	2025	42	22.8
Treatment modality	Thermocoagulation	184	100

Age was captured as a continuous variable and presented as mean (standard deviation).

status followed by HIV-negative women (10/34, 29.4%) (Table 2).

3.4. Trends of treatment outcomes by year

The number of cured CIN cases as well those that persisted fluctuated over time but showed an overall upward trend. Across all years, CIN cases with favorable outcomes (cured) consistently constituted the largest proportion, with a noticeable peak in 2023. The number of persistent CIN cases also increased gradually and peaked in 2023. (Fig. 2).

3.5. Distribution of CIN treatment outcomes across HPV test results

With regards to HPV results, persisted CIN was mostly observed among women who were either positive with single HPV16 genotype (7/34, 20.6%) or HPV18/45 + Other hrHPV genotypes (22/34, 64.7%). (Fig. 3).

4. Discussion

This study provides important longitudinal evidence on treatment outcomes of cervical intraepithelial neoplasia in south-western Uganda over a six-year period. Three key findings stand out. First, CIN was more prevalent among younger women and occurred more frequently in later

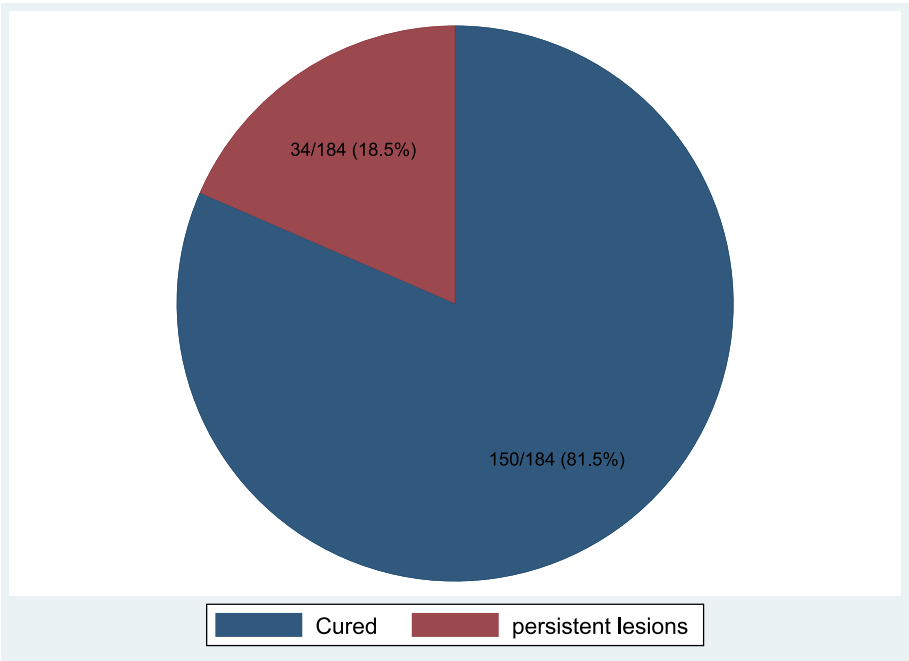


Fig. 1. Treatment outcomes of CIN cases.

Table 2
Distribution of demographic characteristics across treatment outcomes.

Variable	Category	Treatment outcomes		Test	P-value
		Cured N = 150	Persisted N = 34		
Age		43.4 (14.7)	42.9 (15.6)	Ind. t-test	0.86
Age group	18–30	39 (26.0%)	11 (32.4%)	Chi-square	0.31
	31–40	31 (20.7%)	6 (17.6%)		
	41–50	40 (26.7%)	5 (14.7%)		
	51–60	15 (10.0%)	7 (20.6%)		
	61–78	25 (16.7%)	5 (14.7%)		
District of residence	Isingiro	30 (20.0%)	5 (14.7%)	Fisher's exact	0.52
	Bushenyi	18 (12.0%)	4 (11.8%)		
	Ibanda	7 (4.7%)	2 (5.9%)		
	Mbarara	39 (26.0%)	11 (32.4%)		
	kiruhura	10 (6.7%)	0 (0.0%)		
	Sheema	3 (2.0%)	1 (2.9%)		
HIV status	Others	43 (28.7%)	11 (32.4%)	Chi-square	0.005
	Negative	82 (54.7%)	10 (29.4%)		
	Positive	30 (20.0%)	6 (17.6%)		
	Unknown	38 (25.3%)	18 (52.9%)		

Age was captured as a continuous variable and presented as mean (standard deviation).

years of the study. Second, while about one quarter of women had documented evidence of cure after treatment, a strikingly high proportion had persistent cervical intraepithelial neoplasia. Third, persistent cervical intraepithelial neoplasia was more common among women with either a single HPV16 genotype or a mixed infection with HPV18/45 plus Other hrHPV genotypes.

The age distribution observed in this study aligns closely with the established natural history of cervical carcinogenesis. CIN was more frequent among younger women, reflecting the long latency between initial HPV infection and progression to malignancy (Schiffman et al., 2016). Similar age patterns have been reported in population-based and hospital-based studies in Uganda and the wider East African region, where CIN is typically diagnosed in women aged younger than 45 years and (Kajabwangu et al., 2024a; Pilleron et al., 2019). The temporal increase in CIN diagnoses in the later years of the study likely reflects improvements in screening coverage and increased uptake of HPV testing and screen-and-treat approaches, rather than a rise in disease incidence. This trend is consistent with national efforts in Uganda to decentralize cervical cancer screening and expand access to preventive services at lower-level health facilities.

Women with CIN were more likely to harbor single high-risk HPV infections, particularly HPV16 and mixed infections of HPV18/45. This finding mirrors previous molecular epidemiological studies demonstrating a high prevalence of multiple HPV infections among women with advanced cervical disease (Clifford et al., 2017). Notably, single infection with HPV16 as well as multiple infection with HPV18/45 showed a closer connection with persistent CIN. This supports robust evidence that HPV16 and HPV18 are the most oncogenic genotypes, with the greatest propensity for persistence, treatment failure, and progression to high-grade disease (Koshiol et al., 2008). The strong association between HPV16/18 combinations and lesion persistence further reinforces the importance of achieving high HPV vaccination coverage as a long-term strategy to reduce cervical cancer incidence and treatment burden.

All cured and persistent cases of CIN were treated with thermocoagulation. The low proportion of persistent lesions following thermocoagulation is consistent with evidence from randomized trials and programmatic studies in low-resource settings showing high efficacy of ablative therapy for eligible CIN lesions, with cure rates exceeding

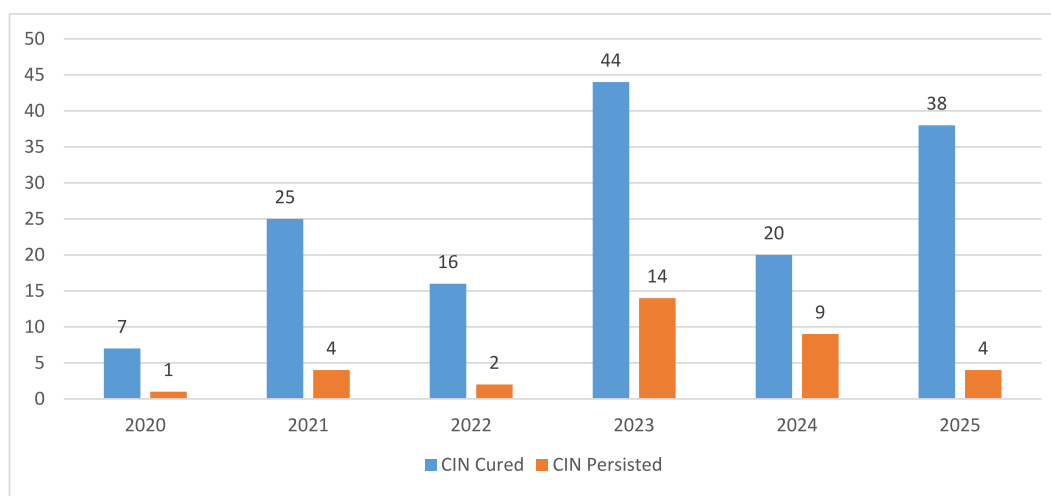


Fig. 2. CIN treatment outcome trends across years.

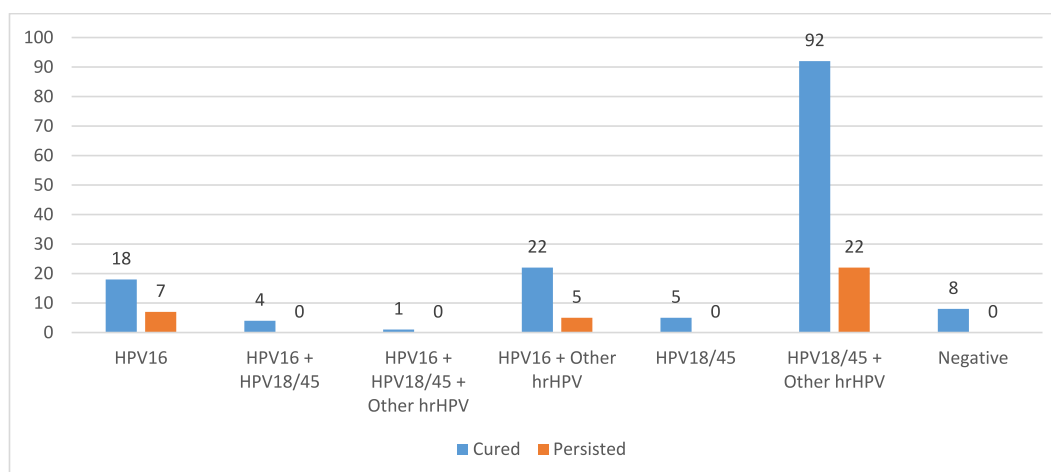


Fig. 3. Distribution of CIN treatment outcome trends across HPV test results.

85–90% (Naud et al., 2016; Liu et al., 2024).

More than half of CIN cases with persistent lesion had an unknown HIV status. However, this finding should be interpreted cautiously, given the extent of missing data. On the other hand, substantial evidence indicates that women living with HIV have higher rates of HPV persistence, recurrent CIN, and progression despite treatment, due to immune suppression (Liu et al., 2018). The relatively small number of persistent lesions in this cohort may have limited the power to fully demonstrate these associations.

Geographic disparities were evident, with residents of Mbarara city having a higher rate of persistent lesions. This may reflect inequities in access to follow-up services, differences in health-seeking behavior, overall poor adherence to treatment schedules (Kajabwangu et al., 2024a; Kajabwangu et al., 2024c; Owokuhaisa et al., 2024; Kajabwangu et al., 2023). Sub-national disparities in cervical cancer prevention and treatment services have been documented in Uganda, underscoring the need for geographically targeted health system interventions (Ndejjo et al., 2016; Bingi et al., 2018).

A major strength of this study was its ability to consider data over a six-year period, including all women who underwent screening and treatment for cervical intraepithelial neoplasia. The provided prevalence, distribution, and trends of treatment outcomes reflect a real-life picture and are easily extrapolatable to other populations, especially in low-resource settings. However, being entirely descriptive, this study

is limited by the inability to provide statistical associations between several variables and treatment outcomes. Also, this being a retrospective review of hospital records, we do not present data on many demographic and clinical characteristics; hence, we cannot make any inferences about treatment outcomes based on these characteristics. Because of total absence of patient follow up mechanisms, there were several patients that were lost to follow up and this resulted in a lot of incomplete patient records. For this reason, we did not capture any data after 12 months. Therefore, we could hardly tell if any women with persistent lesions developed cancer, which would have added more information to this study. This study represents increased reliance on VIA despite its drawbacks, inadequate documentation and other difficulties healthcare workers face especially in resource-constrained environments, where it is nearly impossible to implement standard protocols.

5. Conclusion

There is an overall increasing trend for persistent cervical intraepithelial neoplasia throughout the study period, especially among women with unknown HIV status and those with a single HPV16 infection as well as those mixed infection with HPV18/45 and other hrHPV genotypes. There is an urgent need for locally developed and customized health system interventions, to strengthen the integration of cervical cancer care into routine HIV care, strengthen the screen and

treat approach, and also improve monitoring of patients during treatment periods. Improved monitoring would facilitate early detection and management of persistent cervical lesions and thus improving the overall cervical cancer care.

6. Policy implications

The current trends and distribution of treatment outcomes for cervical lesions, especially the persistent lesions, indicate the need for early detection of such lesions by implementing active follow-up of patients in order to achieve the World Health Organization targets.

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CRediT authorship contribution statement

Frank Ssedyabane: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Rogers Kajabwangu:** Writing – review & editing, Validation, Methodology, Investigation, Formal analysis, Data curation. **Hope Mudondo:** Writing – review & editing, Validation, Methodology, Investigation, Formal analysis, Data curation. **Deusdedit Tusubira:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Funding acquisition, Data curation, Conceptualization. **Joy Muhumuza:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Funding acquisition, Data curation. **Alexcer Namuli:** Writing – review & editing, Supervision, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Geoffrey Mwesigwa:** Writing – review & editing, Supervision, Resources, Methodology, Data curation, Conceptualization. **Charles Nkubi Bagenda:** Writing – review & editing, Visualization, Supervision, Methodology, Investigation, Formal analysis, Data curation. **Cesar M. Castro:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Hakho Lee:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Investigation, Funding acquisition, Data curation, Conceptualization. **Thomas C. Randall:** Writing – review & editing, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Joseph Ngonzi:** Writing – review & editing, Validation, Supervision, Resources, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Consent for publication

Not applicable.

Ethical considerations

The Mbarara University of Science and Technology Research Ethics Committee reviewed and approved this study (MUST-2025-334). Owing to the nature of the study, the need for informed consent was waived. We also obtained administrative clearance from the director Mbarara Regional Referral Hospital and all methods involved in this study followed relevant guidelines and regulations.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

All data is available from the corresponding author, only upon reasonable request.

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