

Single-Visit Approaches for Cervical Cancer Prevention in Low- and Middle-Income Countries: A Review of Effectiveness, Acceptability, and Implementation

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Abstract

Background: Cervical cancer remains one of the leading causes of cancer-related morbidity and mortality among women in low- and middle-income countries (LMICs), accounting for nearly 90% of global deaths. Although effective screening and treatment strategies exist, conventional multi-visit screening pathways are frequently associated with substantial loss to follow-up, delayed treatment, and poor programmatic effectiveness. Single-visit approaches (SVA), including screen-and-treat and see-and-treat strategies, have emerged as practical alternatives that simplify care pathways and improve treatment completion. **Objective:** To review the effectiveness, acceptability, implementation experiences, and future directions of single-visit approaches for cervical cancer prevention in LMICs. **Methods:** A narrative review of published literature, implementation studies, WHO guidance documents, clinical trials, conference presentations, and institutional experiences was conducted. Evidence related to VIA-based screening, HPV testing, thermal ablation, cryotherapy, same-day excisional treatment, and emerging technologies was examined. **Results:** Evidence from Africa, Asia, and Latin America demonstrates that single-visit approaches substantially reduce loss to follow-up and improve treatment completion. Studies from Ethiopia, Indonesia, Peru, South Africa, and India have shown high feasibility and acceptability. Thermal ablation has emerged as a particularly attractive treatment modality because of its portability, low maintenance requirements, and suitability for primary care settings. Task-sharing with nurses and midwives has further enhanced program scalability. Emerging innovations including HPV self-sampling, point-of-care HPV testing, and artificial intelligence-assisted visual evaluation, may further strengthen SVA implementation. **Conclusions:** Single-visit approaches represent an effective and woman-

centered strategy for cervical cancer prevention in resource-constrained settings. By reducing barriers to care and facilitating same-day treatment, these approaches can contribute substantially to achieving global cervical cancer elimination targets.

Keywords

Cervical Cancer Prevention, Screen-and-Treat, See-and-Treat, HPV Testing, Thermal Ablation, Low- and Middle-Income Countries, Women's Health

1. Introduction

Cervical cancer remains a major public health challenge despite being one of the most preventable malignancies affecting women worldwide. Persistent infection with oncogenic human papillomavirus (HPV) is recognized as the necessary cause of almost all cervical cancers. Advances in vaccination, screening, and treatment have led to dramatic reductions in disease burden in high-income countries; however, cervical cancer continues to disproportionately affect women in low- and middle-income countries (LMICs), where nearly 90% of deaths occur [1] [2].

The World Health Organization (WHO) has launched an ambitious global strategy to eliminate cervical cancer as a public health problem [3]. The strategy is built upon three pillars: HPV vaccination, screening, and treatment [3]. Despite these advances, many countries continue to struggle with the implementation of effective screening programs [4]. Conventional cervical cancer prevention pathways often require multiple visits involving screening, colposcopy, biopsy, treatment, and follow-up. Such pathways are difficult to sustain in settings where women face significant financial, geographic, and social barriers to healthcare access [4].

Loss to follow-up remains one of the greatest obstacles to successful cervical cancer prevention. In many LMICs, women may travel long distances to healthcare facilities, incur transportation expenses, lose daily wages, and require childcare arrangements to attend appointments. As a result, substantial numbers of women who screen positive never complete diagnostic evaluation or receive treatment.

Single-visit approaches (SVA) were developed to address these challenges by minimizing the number of healthcare encounters required for cervical cancer prevention. These approaches aim to provide screening, triage, and treatment during a single encounter whenever clinically appropriate. By reducing attrition and improving treatment completion, SVA has become an increasingly important component of cervical cancer prevention strategies in resource-constrained settings.

2. Methods

A narrative review of the literature was conducted using PubMed, Scopus, Google Scholar, WHO guidance documents, and major implementation reports published between 2000 and 2025. Search terms included “single visit approach,”

“screen-and-treat,” “see-and-treat,” “thermal ablation,” “cryotherapy,” “HPV testing,” “cervical cancer prevention,” “LMIC,” and “women’s health.”

Peer-reviewed clinical trials, implementation studies, systematic reviews, WHO publications, and landmark cervical cancer prevention studies were included. Additional evidence was derived from conference presentations and institutional experiences from Safdarjung Hospital, New Delhi, which were relevant to emerging implementation strategies. Unpublished observations are presented separately and interpreted cautiously.

Inclusion: women who are cervical screen positive by HPV or VIA testing and symptomatic women with an unhealthy cervix

Exclusion: women who have cervical cancer or any history of treatment for cervical premalignant lesions.

Why women are lost in conventional screening programs

Traditional cervical cancer prevention programs require multiple clinic visits extending over weeks or months. Women typically undergo initial screening followed by colposcopy, biopsy, pathology review, treatment, and follow-up visits. Each step introduces opportunities for attrition.

Several barriers contribute to loss to follow-up:

- Transportation costs • Geographic inaccessibility • Loss of income • Childcare responsibilities • Social and cultural constraints • Fear of diagnosis and treatment • Fragmented healthcare systems

Studies have reported substantial loss to follow-up among screen-positive women in resource-limited settings [4] [5]. Consequently, many women with precancerous lesions never receive treatment despite successful detection.

From a women’s health perspective, reducing the number of required visits has important implications for healthcare access, autonomy, and equity. Single-visit approaches were specifically designed to address these barriers.

2.1. Single-Visit Approaches: Definitions and Models

Single-visit approaches (SVA) encompass a spectrum of cervical cancer prevention strategies designed to provide screening, diagnosis, and treatment during a single healthcare encounter. These approaches were developed to address the substantial loss to follow-up observed in conventional multi-visit screening programs and have become increasingly important in resource-constrained settings.

Table 1 includes studies evaluating Single-Visit Approaches for Cervical Cancer Prevention in LMICs.

Table 1. Major studies evaluating single-visit approaches for cervical cancer prevention in LMICs.

Author	Country	Study Design	Sample Size	Intervention	Key Findings
Denny <i>et al.</i> , 2005	South Africa	Randomized controlled trial	6555	HPV/VIA screen-and-treat	HPV-based treatment reduced CIN3 by 77%
Sankaranarayanan <i>et al.</i> , 2007	India	Cluster randomized trial	49,311	VIA screening	Significant reduction in cervical cancer mortality

Continued

Sankaranarayanan <i>et al.</i> , 2009	India	Cluster randomized trial	131,746	HPV screening	Reduced advanced cervical cancer and mortality
Shiferaw <i>et al.</i> , 2016	Ethiopia	Implementation study	16,632	VIA and cryotherapy	94.3% treatment completion
Prayitno <i>et al.</i> , 2012	Indonesia	Program evaluation	22,040	VIA screen-and-treat	Feasible large-scale implementation
Gilman <i>et al.</i> , 2024	Peru	Implementation study	Multiple facilities	HPV + thermal ablation	Improved completion of care
Gupta <i>et al.</i> , 2023	India	Prospective cohort	100	Thermal ablation	High acceptability and low pain scores

Screen-and-Treat

The screen-and-treat approach involves immediate treatment of women who screen positive without prior histopathological confirmation [5] [6]. Historically, visual inspection with acetic acid (VIA) has been the most widely used screening modality in such programs because results are available immediately. Women with positive VIA findings who meet eligibility criteria undergo same-day cryotherapy or thermal ablation [7].

More recently, HPV-based screen-and-treat strategies have emerged as the preferred model due to the superior sensitivity of HPV testing for detecting cervical precancer [8] [9]. Point-of-care HPV testing has further strengthened this approach by enabling same-day treatment decisions [9].

See-and-Treat

See-and-treat approaches incorporate colposcopic evaluation before treatment [10] [11]. Women with positive screening tests undergo colposcopy and receive immediate treatment if high-grade disease is suspected. This strategy reduces delays while providing greater diagnostic confidence than screen-and-treat models.

Although concerns regarding overtreatment remain, several studies have demonstrated acceptable overtreatment rates when careful patient selection and standardized colposcopic assessment are employed [10] [11].

Emerging One-Screen Models

Advances in technology are transforming cervical cancer prevention. Emerging models combine:

- HPV self-sampling
- Point-of-care HPV testing
- Automated visual evaluation (AVE)
- HPV-Automated Visual Evaluation (PAVE)
- Same-day thermal ablation

These innovations may allow effective cervical cancer prevention to be delivered through a single interaction with the healthcare system [12].

2.2. Evidence Supporting Single-Visit Approaches**Evidence from South Africa**

One of the most influential studies evaluating screen-and-treat strategies was

conducted by Denny and colleagues in South Africa [13]. In this randomized controlled trial involving 6555 women, HPV-based screen-and-treat substantially reduced the prevalence of high-grade cervical lesions compared with delayed evaluation. VIA-based treatment also reduced disease burden, although to a lesser extent.

This landmark trial established proof-of-concept that immediate treatment following screening could effectively reduce cervical precancer.

Evidence from India

India has played a pivotal role in the development of evidence supporting single-visit approaches. Studies led by Sankaranarayanan and colleagues demonstrated the effectiveness of VIA- and HPV-based screening programs [14] [15].

A cluster-randomized trial conducted in rural India showed a significant reduction in cervical cancer mortality among women offered VIA screening and treatment compared with unscreened populations [14]. These findings remain among the strongest demonstrations of the population-level impact of cervical cancer screening in LMICs.

Subsequent studies evaluated single-visit implementation models and demonstrated that VIA, colposcopy, biopsy, and immediate treatment could be integrated into a streamlined pathway [10] [16].

Institutional experiences from tertiary care centers have further demonstrated the feasibility of same-day treatment pathways utilizing Swede score-guided management and thermal ablation. Emerging conference data suggest that integration of risk stratification tools may further improve treatment efficiency while minimizing overtreatment.

Evidence from Ethiopia

The Addis Tesfa project represents one of the most successful examples of SVA implementation among women living with HIV [17]. More than 16,000 women were counselled regarding cervical cancer prevention, and over 99% accepted screening.

Among screen-positive women, treatment completion exceeded 94%, highlighting the effectiveness of same-day treatment pathways in minimizing loss to follow-up. The Ethiopian experience also demonstrated the feasibility of nurse-led service delivery and integration of cervical cancer prevention into existing HIV care infrastructure [17].

Evidence from Indonesia

Indonesia has implemented one of the largest VIA-based single-visit programs. In a cross-sectional evaluation, 22,040 women completed screening, and 92.7% had never previously been screened [18].

The program demonstrated that large-scale implementation of VIA, biopsy, and same-day cryotherapy was feasible in a low-resource setting [18].

Evidence from Peru

Implementation work in the Peruvian Amazon introduced HPV testing, including self-sampling, followed by visual assessment and portable thermal ablation at the primary-care level across 17 facilities [19].

Within six months, screening rates increased and approximately 70% of HPV-positive women reached a completion-of-care endpoint, compared with about 30% before implementation [19].

2.3. Women's Acceptability of Same-Day Treatment

Acceptability is a critical determinant of successful cervical cancer prevention programs. Evidence from multiple countries suggests that women generally prefer simplified care pathways that minimize the need for repeated clinic visits [20] [21].

Table 2 states the benefits of same day single visit treatment.

Table 2. Benefits of single-visit approaches for women.

Benefit	Potential Impact
Same-day treatment	Reduced loss to follow-up
Fewer healthcare visits	Reduced transportation costs
Less time away from work	Improved participation
Immediate results	Reduced anxiety
Reduced indirect expenses	Greater equity
Community-based services	Improved rural access
Nurse-led implementation	Expanded coverage
Faster treatment completion	Earlier disease control

Thermal ablation or LLETZ may be provided on the same day when the lesion is eligible, appropriate infrastructure is available, and trained providers are present. Suspected invasive disease or lesions unsuitable for ablation require referral for diagnostic evaluation and excisional management [7] [11].

Reported benefits include:

- Reduced travel requirements
- Lower out-of-pocket expenditures
- Less time away from work
- Reduced anxiety associated with waiting for results
- Increased confidence in treatment completion

Studies evaluating thermal ablation have consistently demonstrated high patient satisfaction despite commonly reported transient pain, discharge, or bleeding [20] [21].

Published Indian experience has similarly demonstrated high levels of patient acceptance, low pain scores, and few complications after thermal ablation [22].

HPV self-sampling may further expand access among under-screened women and is generally valued for privacy, convenience, and comfort [23].

Thermal Ablation: Expanding Access to Treatment

Thermal ablation has emerged as one of the most important innovations in cervical cancer prevention over the past decade.

Unlike cryotherapy, thermal ablation does not require refrigerant gas and can be delivered using portable devices. This makes it particularly suitable for outreach services, rural health facilities, and primary care settings [11] [24].

The World Health Organization endorsed thermal ablation as a treatment option for cervical precancer in 2019 [11].

Evidence indicates that thermal ablation has treatment success broadly comparable to cryotherapy while offering operational advantages, and it can be performed by appropriately trained non-physician providers [11] [24].

Published work from India has demonstrated excellent patient acceptability, low pain scores, and minimal complications [22].

As countries expand HPV-based screening, thermal ablation is likely to become increasingly important because of its simplicity and scalability.

Limitations of these approaches: Screen-and-treat may cause overtreatment when treatment is provided without histopathological confirmation or when screening specificity is limited. Potential harms include pain, bleeding, discharge, infection, and cervical stenosis; eligibility assessment is essential, and excisional treatment may have reproductive implications. Programs therefore require trained providers, appropriate treatment and referral facilities, follow-up, and quality assurance [7] [11] [20].

2.4. Task-Sharing and Nurse-Led Programs

Workforce shortages remain a major challenge for cervical cancer prevention in LMICs. Many countries have insufficient numbers of gynecologists, colposcopists, and pathologists to support conventional screening programs.

Task-sharing has emerged as an effective strategy for addressing these limitations.

Nurses and midwives have successfully performed:

- VIA screening
- HPV sample collection
- Cryotherapy
- Thermal ablation
- Patient counselling
- Follow-up coordination

Implementation experience and guidance support task-sharing of screening and ablative treatment with appropriately trained nurses, midwives, and other non-physician providers [11] [17] [24].

Task-sharing offers several advantages:

- Improved geographic coverage
- Lower program costs
- Enhanced sustainability
- Greater integration into primary healthcare

Successful implementation requires standardized training, ongoing mentorship, and quality assurance systems.

3. Implementation Challenges and Solutions

Despite their advantages, SVA programs face several implementation challenges.

Table 3 includes the barriers and facilitators to implementation.

Table 3. Barriers and facilitators to implementation.

Facilitators	Barriers
Community awareness campaigns	Limited awareness
Task-sharing with nurses	Workforce shortages
Portable thermal ablation devices	Equipment procurement challenges
Point-of-care HPV testing	Laboratory limitations
Mobile outreach clinics	Geographic barriers
Government commitment	Funding constraints
Digital tracking systems	Weak health information systems
Integration into primary care	Competing health priorities

Equipment and Infrastructure

Availability and maintenance of treatment equipment remain important barriers. Cryotherapy programs may be affected by interruptions in gas supply, whereas thermal ablation devices require procurement and maintenance systems.

Workforce Constraints

Training and retention of skilled providers can be challenging, particularly in rural areas.

Community Awareness

Many women remain unaware of cervical cancer prevention services. Misconceptions regarding screening and treatment continue to limit participation.

Data Systems

Effective monitoring and evaluation require reliable information systems capable of tracking screening outcomes and treatment completion.

Potential Solutions

Strategies associated with successful implementation include:

- Community engagement initiatives
- Mobile outreach services
- Task-sharing models
- Integration into primary healthcare
- Digital health platforms
- Government commitment and financing

4. Future Directions

The future of cervical cancer prevention is likely to be shaped by innovations that further simplify care pathways.

HPV Self-Sampling

Self-sampling allows women to collect their own specimens, increasing privacy

and convenience while reducing dependence on pelvic examinations; systematic reviews show that it can increase screening uptake [23] [25].

Point-of-Care HPV Testing

Rapid HPV testing enables same-day clinical decision-making and facilitates immediate triage and treatment [9] [19].

Artificial Intelligence-Assisted Visual Evaluation

Automated visual evaluation systems use machine-learning algorithms to assess cervical images and support risk-based triage; prospective validation in diverse, resource-limited settings is ongoing [12].

The PAVE strategy combines self-sampled HPV testing, extended genotyping, automated visual evaluation, and treatment with thermal ablation or excision, with effectiveness and implementation outcomes under evaluation [12].

Table 4 compares the various treatment modalities used in single visit approaches.

Table 4. Comparison of treatment modalities used in single-visit programs.

Characteristic	Cryotherapy	Thermal Ablation	LLETZ/LEEP
Histology available	No	No	Yes
Requires gas	Yes	No	No
Portable	Moderate	Excellent	Limited
Electricity required	No	Battery operated	Yes
Suitable for primary care	Yes	Yes	Limited
Cost of maintenance	Moderate	Low	High
Training requirements	Moderate	Moderate	High
WHO recommended	Yes	Yes	Yes

Table 5 includes the emerging technologies for cervical cancer prevention.

Table 5. Emerging technologies supporting single-visit cervical cancer prevention.

Innovation	Potential Benefit
HPV self-sampling	Increased screening uptake
Point-of-care HPV testing	Same-day results
Thermal ablation	Decentralized treatment
Artificial intelligence-assisted visual evaluation	Improved triage accuracy
Digital cervicography	Remote expert support
Mobile health applications	Improved follow-up
Electronic registries	Better program monitoring

One-Dose Vaccination and One-Lifetime Screening

Recent evidence supporting single-dose HPV vaccination has generated interest in simplified elimination strategies. Mathematical modelling across India, Ni-

geria, Uganda, and Viet Nam suggests that one-dose vaccination could avert a large proportion of the cervical cancers prevented by two-dose schedules, even under pessimistic assumptions [26].

5. Conclusions

Single-visit approaches represent one of the most promising strategies for expanding cervical cancer prevention services in low- and middle-income countries. By reducing the number of required healthcare encounters, these approaches address many of the financial, geographic, and social barriers that limit participation in conventional screening programs.

Evidence from India, South Africa, Ethiopia, Indonesia, Peru, and other LMICs demonstrates that SVA can improve treatment completion, reduce loss to follow-up, and expand access to preventive care. Thermal ablation, HPV testing, self-sampling, and artificial intelligence-assisted triage are further enhancing the feasibility and effectiveness of these approaches.

As countries work toward achieving WHO cervical cancer elimination targets, investment in woman-centered, accessible, and scalable prevention strategies will be essential. Single-visit approaches provide a practical framework for delivering equitable cervical cancer prevention services and have the potential to substantially reduce the global burden of cervical cancer among women.

Table 6 includes the Indian studies supporting single visit modalities.

Table 6. Indian experience and emerging evidence.

Source	Intervention	Findings	Evidence Type
Gupta S, Shamsunder S, Chadha S	Thermal ablation	High acceptability and low pain scores	Peer-reviewed publication
Shamsunder <i>et al.</i>	Swede Score-guided management	High concordance with histology	Conference presentation
Safdarjung Hospital experience	Single-visit treatment pathway	Improved treatment completion	Institutional data
FOGSI Gynecologic Oncology Committee initiatives	Awareness and implementation activities	Increased provider engagement	Programmatic experience

Author Contribution

Saritha Shamsunder: Conceptualization, Supervision, and Writing: review & editing and finalization. Nishtha Arora: Investigation, Data curation, and Writing: review & editing.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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