# Lessons learned from comparing self-collected vs. physician-collected vaginal swabs for diagnosing infections in resource-limited settings: a 24-year review

## *Lições aprendidas com a comparação de esfregaços vaginais autocoletados e colhidos por médicos para o diagnóstico de infecções em ambientes com recursos limitados: uma revisão de 24 anos*

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**ABSTRACT**

**Introduction:** Reproductive health is essential for women's overall well-being, yet vaginal infections like Bacterial Vaginosis (BV), Candidiasis, and Trichomoniasis are prevalent and can lead to severe complications if left untreated. In high-income countries, healthcare systems are generally equipped to handle these infections; however, in resource-limited settings, barriers such as geographic isolation, financial constraints, and social stigmas hinder access to effective care. Self-collected vaginal swabs present a promising alternative to traditional physician-collected samples, offering potential benefits in these underserved regions. **Objective:** This study aims to evaluate the feasibility, diagnostic accuracy, and community acceptance of self-collected vaginal swabs compared to physician-collected samples for diagnosing bacterial vaginosis, candidiasis, and trichomoniasis in resource-limited settings, and to explore strategies for the broader implementation of this approach to improve women's reproductive health. **Methods:** This narrative review synthesizes literature on the effectiveness, feasibility, and community acceptance of self-collected vaginal swabs compared to physician-collected samples for diagnosing BV, Candidiasis, and Trichomoniasis. A systematic search was conducted across PubMed, Google Scholar, and institutional repositories for studies from January 2000 to May 2024. The review encompasses various sections, including background on the significance of timely diagnosis, initiatives empowering women through self-collection, challenges and successes of these initiatives, and strategies for quality assurance and policy advocacy. **Results:** Self-collected vaginal swabs were found to be as accurate as physician-collected samples in diagnosing BV, Candidiasis, and Trichomoniasis. The method enhances accessibility and reduces stigma, showing potential for broader application in community health settings. **Conclusion:** Self-collected vaginal swabs represent a viable solution to reproductive health challenges in resource-limited settings. They offer comparable diagnostic accuracy, enhance accessibility, and can reduce cultural barriers to seeking care. Future efforts should focus on community education, technological innovations, and policy reforms to maximize the effectiveness and sustainability of this approach in improving global women's health.

**Keywords:** Diagnostic. Reproductive health. Women's health.

**RESUMO**

**Introdução:** A saúde reprodutiva é essencial para o bem-estar geral das mulheres, mas infecções vaginais, como vaginose bacteriana (VB), candidíase e tricomoníase, são prevalentes e podem levar a complicações graves, se não forem tratadas. Em países de alta renda, os sistemas de saúde geralmente estão equipados para lidar com essas infecções, no entanto, em ambientes com recursos limitados, barreiras, como isolamento geográfico, restrições financeiras e estigmas sociais, dificultam o acesso a cuidados eficazes. Os esfregaços vaginais autocoletados apresentam uma alternativa promissora às amostras tradicionais coletadas por médicos, oferecendo benefícios potenciais em regiões carentes. **Objetivos:** Este estudo tem como objetivo avaliar a viabilidade, a precisão do diagnóstico e a aceitação da comunidade de amostras vaginais coletadas pela própria mulher em comparação com amostras coletadas por médicos para o diagnóstico de vaginose bacteriana, candidíase e tricomoníase em ambientes com recursos limitados e explorar estratégias para ampliar essa abordagem a fim de melhorar a saúde reprodutiva das mulheres. **Métodos:** Esta revisão narrativa sintetiza a literatura sobre a eficácia, a viabilidade e a aceitação da comunidade de *swabs* vaginais autocoletados em comparação com amostras coletadas por médicos para o diagnóstico de VB, candidíase e tricomoníase. Uma busca sistemática foi conduzida no PubMed, Google Scholar e repositórios institucionais para estudos de janeiro de 2000 a maio de 2024. A revisão abrangeu várias seções, incluindo o histórico sobre a importância do diagnóstico oportuno, iniciativas que empoderam as mulheres por meio da autocoleta, desafios e sucessos dessas iniciativas e estratégias para garantia de qualidade e defesa de políticas. **Resultados:** Os esfregaços vaginais autocoletados foram tão precisos quanto as amostras coletadas pelo médico no diagnóstico de VB, candidíase e tricomoníase. O método melhora a acessibilidade e reduz o estigma, mostrando potencial para uma aplicação mais ampla em ambientes de saúde comunitários. **Conclusão:** Os esfregaços vaginais autocoletados representam uma solução viável para os desafios da saúde reprodutiva em cenários com recursos limitados. Eles oferecem precisão diagnóstica comparável à dos materiais obtidos por médicos, melhoram a acessibilidade e reduzem as barreiras culturais para a busca de cuidados. Os esforços futuros devem se concentrar na educação da comunidade, em inovações tecnológicas e reformas de políticas para maximizar a eficácia e a sustentabilidade dessa abordagem, visando à melhoria da saúde global das mulheres.

**Palavras-chave:** Diagnóstico. Saúde reprodutiva. Saúde da mulher.

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## INTRODUCTION

Reproductive health is a cornerstone of women's overall well-being, and is critical for ensuring a high quality of life. Timely diagnosis and effective treatment of vaginal infections, such as Bacterial Vaginosis (BV), Candidiasis, and Trichomoniasis, are essential for preventing complications and enhancing women's health[1]. Vaginal infections are among the most common health issues faced by women globally, with significant implications for their reproductive health and quality of life. BV, for example, is a condition caused

by an imbalance in the vaginal microbiota, leading to symptoms such as discharge, odor, and itching, and it can increase susceptibility to sexually transmitted infections (STIs) and preterm birth[2]. Candidiasis, often caused by an overgrowth of Candida species, presents with symptoms including itching, burning, and discharge, while Trichomoniasis, a parasitic infection, can cause discomfort and, if untreated, lead to adverse pregnancy outcomes and increase the risk of HIV transmission[3,4].

In high-income countries, access to healthcare services for the diagnosis and treatment of these infections is generally available, with well-established protocols and resources for managing reproductive health issues. However, in resource-limited settings, the scenario is markedly different. Women in these regions face numerous barriers to accessing adequate healthcare services, which exacerbates the burden of common vaginal infections and impedes their overall reproductive health[5]. These barriers include limited availability of healthcare facilities, a shortage of trained healthcare professionals, and financial constraints that prevent women from seeking medical care[6]. Furthermore, societal stigmas and lack of awareness about reproductive health issues can discourage women from seeking help or discussing their symptoms openly[7].

The challenges faced by women in low-resource settings underscore the need for innovative approaches to improve access to reproductive health services. Self-collected vaginal swabs represent one such potential solution. This method allows women to collect their own samples for diagnostic testing, which can be a viable alternative to traditional physician-collected samples, particularly in settings where healthcare access is limited[8]. Self-collection offers several advantages, including increased privacy, reduced stigma, and the potential for broader implementation in community health settings. By enabling women to perform sample collection in the comfort of their own homes, self-collected vaginal swabs could help overcome some of the logistical and social barriers associated with traditional diagnostic methods[9].

Recent studies have demonstrated that self-collected samples can be as effective as physician-collected samples for diagnosing various vaginal infections. For instance, research has shown that self-collected vaginal swabs can accurately detect BV, Candidiasis, and Trichomoniasis, with results comparable to those obtained through physician-collected samples[10,11]. This approach not only enhances accessibility but also aligns with efforts to decentralize healthcare services and empower women to take control of their reproductive health[12]. However, despite these promising findings, there are still challenges to be addressed, including ensuring the accuracy of self-collection methods, providing adequate training and support to women, and integrating these methods into existing healthcare systems[13].

Addressing these issues requires a multi-faceted approach that includes community engagement, capacity building, and policy advocacy. Community involvement is crucial for overcoming cultural barriers and ensuring that women are informed about the benefits of self-collection and how to use the kits effectively. Additionally, building the capacity of healthcare systems to support self-collection methods through training and quality assurance processes is essential for ensuring reliable diagnostic results[14]. Policy advocacy is also important for creating supportive environments for the implementation of self-collection methods and for integrating these innovations into national health programs[15]. This study aims to evaluate the feasibility, diagnostic accuracy, and community acceptance of self-collected vaginal swabs compared to physician-collected samples for diagnosing bacterial vaginosis, candidiasis, and trichomoniasis in resource-limited settings, and to explore strategies for the broader implementation of this approach in improving women's reproductive health.

## METHODS

This study adopts a narrative review methodology to synthesize existing literature and initiatives related to the self-collection of vaginal swabs for diagnosing common vaginal infections, including Bacterial Vaginosis (BV), Candidiasis, and Trichomoniasis, with the aim of evaluating the effectiveness, feasibility, and acceptability of self-collected samples compared to traditional physician-collected samples. A systematic search strategy is employed across key databases such as PubMed, Google Scholar, and relevant institutional repositories using a range of keywords and Medical Subject Headings (MeSH) terms including "self-collected vaginal swabs," "Bacterial Vaginosis," "Candidiasis," "Trichomoniasis," "diagnostic accuracy," "women's health," and "resource-limited settings." This search is designed to capture both qualitative and quantitative studies, pilot projects, and program evaluations. The review is structured into several sections: Introduction, which provides background information on the significance of diagnosing vaginal infections and the challenges in resource-limited settings; Initiatives Empowering Women, which looks at various programs and pilot projects using self-collected vaginal swabs; Challenges and Successes, which discusses the barriers and achievements associated with self-collection initiatives; Feasibility and Acceptance, which focuses on the acceptance and practical application of self-collected samples versus physician-collected samples; and Quality Assurance and Follow-Up, which analyzes strategies for maintaining quality and ensuring effective follow-up in self-collection programs. The literature search spans from January 2000 to May 2024, and the review process, including data extraction, analysis, and synthesis, is conducted from October 2023 to May 2024. Inclusion criteria focus on studies and initiatives that address the use of self-collected vaginal swabs for diagnosing BV, Candidiasis, and Trichomoniasis, specifically in resource-limited settings, and include both qualitative and quantitative research in addition to relevant grey literature, reports, and conference abstracts. Exclusion criteria eliminate studies not directly related to the self-collection of vaginal swabs, or those that do not focus on the specified infections, as well as initiatives lacking methodological details or those conducted in high-income settings with different healthcare contexts, unless they provide essential foundational knowledge. Relevant data are extracted systematically from the studies considered, including information on study design, participant characteristics, intervention details, outcomes, and key findings. Narrative synthesis techniques are employed to analyze the data, identifying themes, patterns, challenges, and successes across initiatives. Comparative analyses are conducted where applicable, particularly evaluating the diagnostic accuracy and acceptability of self-collected swabs versus physician-collected samples, and quality assessment tools are used to evaluate the methodological rigor of the studies based on sample size, design, bias, and generalizability.

The findings are synthesized and presented in a structured format to highlight key insights, lessons learned, and recommendations for future initiatives aimed at improving women's health through the innovative approach of self-collection of vaginal swabs.

# RESULTS AND DISCUSSION

## Challenges in resource-limited settings

In resource-limited settings, several key challenges impact women's access to healthcare and the diagnosis of vaginal infections. Limited Access to Healthcare is a major barrier due to geographic remoteness, financial constraints, and inadequate infrastructure, which collectively delay or restrict access to diagnostic services and timely intervention for infections such as bacterial vaginosis (BV), candidiasis, and trichomoniasis[16,17]. Stigma and Cultural Barriers further complicate these issues, as societal norms and taboos surrounding reproductive health create hesitation among women to seek medical attention, which can delay diagnosis and exacerbate the impact of these infections[18,19]. Additionally, the Shortage of Trained Healthcare Professionals aggravates the problem, as the lack of skilled personnel in rural areas leads to longer wait times and reduced accessibility to diagnostic services[20]. Finally, Infrastructure and Laboratory Constraints hinder the timely processing of samples due to inadequate facilities and resources, which delays the diagnostic pipeline and impacts the initiation of appropriate treatments[21].

## Empowering women through self-collected vaginal swabs

Self-collected vaginal swabs offer a promising solution to these challenges. Promoting Accessibility is a key advantage, as women can collect samples at home, overcoming geographical and transportation barriers that often limit access to healthcare facilities[22]. By allowing women to engage in the diagnostic process privately, self-collection helps overcome Stigma, encouraging women to prioritize their health without societal judgment[23,24]. The Community Engagement and Education initiatives are crucial for the success of self-collection programs, as they address myths and misconceptions and foster a supportive environment for the adoption of this method[25]. Furthermore, Capacity Building through the training of local volunteers and health workers enhances the effectiveness of self-collection programs, ensuring accurate and reliable sample collection and expanding the reach of healthcare services[26] **(Table 1)**[27].

**Table 1** provides a comparative overview of self-collected versus physician-collected samples for diagnosing vaginal infections, highlighting the advantages of self-collected samples in terms of accessibility, stigma reduction, and community engagement, while also noting the need for robust quality assurance measures and policy advocacy for widespread adoption[27].

## Community engagement and education

Community-based educational programs are essential for the successful implementation of self-collected vaginal swabs. These programs are vital for raising awareness about the importance of self-collection and addressing misconceptions about reproductive health[28]. By engaging communities and educating women, these initiatives foster acceptance of self-collected samples and encourage proactive health management[29].

## Capacity building

The training of community health workers and local volunteers to assist in the self-collection of samples is crucial to address the shortage of trained professionals in resource-limited settings. This approach ensures that the self-collection process is conducted accurately and reliably, thereby expanding the reach of reproductive healthcare services and promoting sustainable practices[30] **(Table 2)**.

**Table 2** summarizes studies focusing on self-collected vaginal swabs versus physician-collected samples, demonstrating the effectiveness of self-collection methods in terms of acceptance, diagnostic accuracy, and community involvement[31-36].

## Lessons learned

The evidence suggests that Acceptance and Feasibility of self-collected vaginal swabs are high, with positive attitudes from women and a feasible implementation strategy in resource-limited settings[37]. Comparative studies show that the Diagnostic Accuracy of self-collected samples is comparable to traditional methods, which supports their use as a reliable diagnostic tool[38]. Community Involvement

**Table 1. Comparative overview of self-collected vs. physician-collected samples for vaginal infection diagnosis[27].**

| Aspect | Self-collected vaginal swabs | Physician-collected samples |
|---|---|---|
| Accessibility | Convenient and accessible at home. | Requires a visit to a healthcare facility. |
| Stigma reduction | Empowers women to take an active role in their health. | May be associated with societal stigmas and discomfort. |
| Community engagement | Community-based education programs are crucial. | Relies on healthcare professionals for engagement. |
| Capacity building | Training local volunteers and health workers needed. | Healthcare professionals conduct sample collection. |
| Acceptance and feasibility | Generally accepted; feasible for widespread adoption. | Accepted but may involve logistical challenges. |
| Diagnostic accuracy | Comparable results in diagnostic accuracy. | Traditional method with established diagnostic accuracy. |
| Quality assurance | Requires robust measures during sample collection. | Quality assured through established healthcare systems. |
| Technological innovations | Potential for integration with point-of-care devices. | Limited integration of advanced technologies. |
| Policy advocacy | Advocacy for policy changes for routine use. | Traditional policies may need adjustment for acceptance. |

**Table 2. Studies on empowering women's health through self-collected vs. physician-collected samples for diagnosing vaginal infections in resource-limited settings.**

| Study title | Focus of study | Key findings |
|---|---|---|
| Pilot study: acceptance and feasibility | Evaluation of the acceptance and feasibility of self-collected vaginal swabs in resource-limited settings. | Encouraging results indicating general acceptance and feasibility for widespread adoption. |
| Comparative diagnostic accuracy | Comparative analysis of diagnostic accuracy between self-collected and physician-collected samples. | Comparable diagnostic accuracy, reinforcing the reliability of self-collected samples. |
| Community involvement initiatives | Lessons from community involvement initiatives in the planning and implementation of self-collection programs. | Emphasis on the importance of community engagement, tailoring initiatives to meet specific needs and cultural contexts. |
| Quality assurance measures | Examination of quality assurance measures during the entire process of self-collected sample collection. | Implementation of standardized protocols and guidelines for robust quality assurance to ensure accuracy and integrity of results. |
| Technological innovations | Exploration of technological innovations, including point-of-care testing devices, for enhanced efficiency and speed of diagnosis. | Integration of point-of-care devices as a practical solution to overcome infrastructure limitations. |
| Policy advocacy for routine use | Advocacy for policy changes to recognize and support the integration of self-collected samples into routine reproductive health services. | Emphasis on evidence-based effectiveness and the need for policy adjustments at regional, national, and international levels. |

is crucial for the success of these programs, as it ensures that initiatives are tailored to the specific needs and cultural contexts of the communities[39].

## Overcoming challenges

Quality Assurance measures are essential for the success of self-collection programs, requiring standardized protocols, regular training, and stringent quality control to maintain accuracy and reliability. Technological Innovations, such as point-of-care testing devices, offer solutions to infrastructure limitations and enhance the efficiency of diagnostic processes. Policy Advocacy is necessary to support the integration of self-collected samples into routine healthcare practices through evidence-based guidelines and policy adjustments[40].

## Health education

Addressing the Lack of Knowledge and Healthcare-Seeking Behavior is crucial for preventive measures and early diagnosis of vaginal infections. Educational initiatives that promote proactive health management and address cultural barriers are essential for encouraging timely medical consultations and reducing the transmission of infections[41] **(Figure 1)**[42].

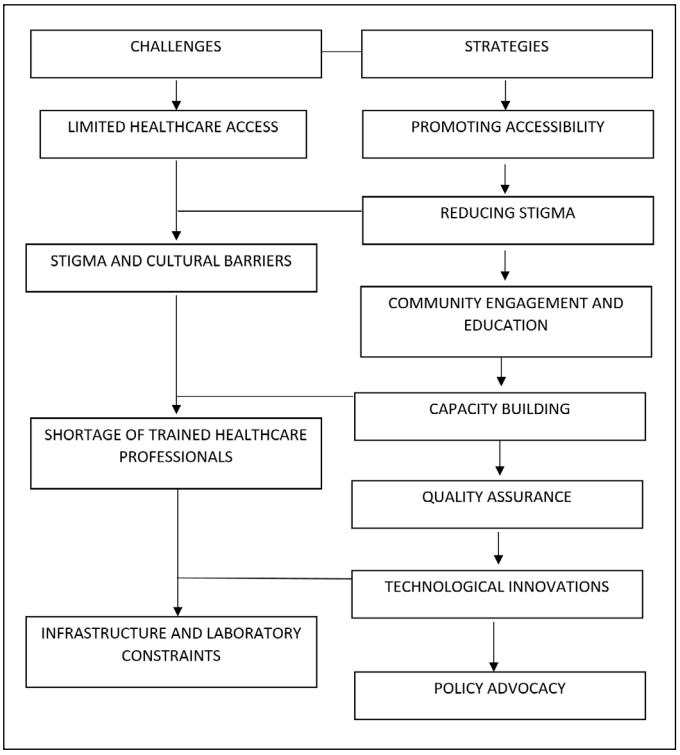


**Figure 1. Challenges and strategies flowchart for implementing self-collected vaginal swabs in resource-limited settings[42].**

## Strategies for follow-up engagement and timely treatment

Effective follow-up strategies, such as Short Message Service (SMS) reminders and telemedicine, are critical for maintaining engagement after positive diagnoses and ensuring timely treatment to prevent severe complications and reduce the societal and economic burden of advanced infections[43].

## Strengths

The study's Strengths include its comprehensive exploration of reproductive health challenges and the evaluation of self-collected vaginal swabs as a diagnostic method. The focus on community engagement, education, and capacity building supports a sustainable approach to improving reproductive health in resource-limited settings.

## Limitations

However, the study also faces Limitations such as generalizability to different cultural contexts, potential methodological constraints, and the need for continuous monitoring of long-term impacts. Future research should address these limitations to enhance the effectiveness and sustainability of self-collection programs.

# CONCLUSION

Empowering women through the use of self-collected vaginal swabs presents a groundbreaking opportunity to address major challenges in reproductive healthcare within resource-limited settings. Our findings reveal that self-collected swabs are not only a viable and effective diagnostic tool but also a catalyst for overcoming barriers related to healthcare access, cultural stigmas, and healthcare professional shortages. By demonstrating comparable diagnostic accuracy, fostering community engagement, and advocating for policy changes, this approach paves the way for a more inclusive and sustainable model of reproductive health care. Ongoing research and strategic actions to enhance community support, integrate technological advancements, and influence health policies will be crucial in realizing the full potential of this innovative diagnostic method for improving women's health on a global scale.

## Approval by the Human Research Ethics Committee

No ethical review is required for a narrative review

## Participation of each author

AL: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Validation. NK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation. RB: Investigation, Resources, Supervision, Validation. RS: Investigation, Resources, Validation. KM: Investigation, Resources, Validation. AG: Investigation, Resources, Validation.

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