SPECIAL ARTICLE

The next quarter century of cervical cancer screening in Brazil: a perspective on the transition from cytology to HPV-DNA testing

Ricardo Ney Cobucci[1,2]
https://orcid.org/0000-0002-0184-2061

[1] Postgraduate Program in Applied Sciences for Women's Health. Federal University of Rio Grande do Norte (UFRN). Nilo Peçanha Av., 259. Petrópolis. Natal, RN, Brazil. Postal Code: 59.012-310. Email: ricardo.cobucci.737@ufrn.edu.br
[2] School of Medicine and the Graduate Program in Biotechnology at Potiguar University (UnP).

Abstract

Cervical cancer remains a significant public health challenge in Brazil, characterized by pronounced regional disparities in both incidence and mortality rates. For several decades, the country has predominantly relied on opportunistic cervical cytology (Pap smears) for cervical cancer screening. While cytology-based screening served as a cornerstone of preventive measures, its effectiveness has been hindered by limited coverage, opportunistic administration, and deficiencies in follow-up protocols. Brazil is now undergoing a transition towards primary HPV DNA testing, commencing at age 25, in accordance with international guidelines. This perspective article critically examines the potential implications of this transition for cervical cancer prevention over the next 25 years. Evidence suggests that HPV testing provides enhanced sensitivity, facilitates earlier detection of precancerous lesions, and enables the implementation of organized, population-based screening programs. However, challenges persist, including the risk of over-referral among younger women, existing health system inequalities, and the necessity for rigorous quality assurance and follow-up mechanisms. If successfully implemented, the new strategy could enable the detection of high-grade lesions up to a decade earlier, increase screening coverage, and reduce mortality rates, particularly in underserved regions. Nevertheless, the success of this initiative will depend on sustained financial investment, integration with vaccination efforts, and the assurance of equitable access to screening services.

Key words *Cervical cancer, HPV DNA test, Cytology, Screening, Brazil*

http://dx.doi.org/10.1590/1806-93042026OS100273-en

Introduction

Cervical cancer remains a major public health challenge in Brazil, ranking as the third most prevalent cancer among women and showing stark regional disparities.[1] Despite decades of implementation of cytology-based screening programs, mortality rates have not declined at the same rate as those observed in high-income countries.[2] Factors such as opportunistic screening practices, insufficient quality assurance measures, and inadequate follow-up of abnormal results have significantly undermined the effectiveness of these programs.[3]

In response to these challenges, the Brazilian Ministry of Health has revised its guidelines to gradually integrate HPV DNA testing as the primary screening method for women aged 25 to 64 years.[4] This paradigm shift - supported by global evidence of the superior sensitivity of HPV testing – reflects a modern approach to cervical cancer prevention.[5] The forthcoming 25 years will be decisive for consolidating this transition, evaluating its real-world impact, and addressing existing structural limitations within the health system.

From Cytology to HPV DNA Testing

Historically, cytology screening has contributed to a reduction in cervical cancer incidence in high-income settings; however, its effectiveness depends on the presence of organized, high-coverage screening systems.[6] In Brazil, the implementation of Pap testing has largely remained opportunistic, with coverage estimates stagnating at approximately 50% of the target population and marked disparities based on race, education, and geographic region.[3,7]

In contrast, HPV DNA testing has demonstrated superior sensitivity in identifying high-grade lesions (CIN2+ and CIN3+) compared to cytology.[5] A population-based demonstration study conducted in Brazil revealed that HPV testing identified a significantly greater number of high-grade lesions and early-stage cancers, particularly among women under 30 years of age, albeit with an associated increase in colposcopy referral rates.[8] Furthermore, a five-year program indicated that HPV-based screening detected cancers nearly a decade earlier than cytology, with a larger proportion of diagnoses made at stage I.[9]

International systematic reviews confirm that organized HPV-based screening programs can effectively reduce both incidence and mortality when implemented appropriately.[5,6] These findings provide robust support for Brazil's decision to transition to HPV DNA testing as the primary screening method.

Challenges and Risks in Transition

Despite its benefits, the implementation of HPV DNA testing in Brazil encounters several significant hurdles:

1. **Age of Initiation**: The World Health Organization (WHO) recommends initiating testing at age 30, while Brazil plans to begin at age 25.[4] Evidence indicates a higher prevalence of transient HPV infections within this younger demographic, which may lead to an increase in unnecessary colposcopies and potential overtreatment.[8] Balancing early detection with the avoidance clinical of harm is essential.
2. **Systemic Inequalities**: Screening uptake remains lower in the North and Northeast regions, where mortality rates are highest.[1] Without targeted strategies to address inequities in access and follow-up, HPV testing alone may fail to bridge regional disparities.
3. **Program Organization**: Brazil's current opportunistic screening model needs to transition to an organized, population-based approach that incorporates registries, recall systems, and quality monitoring.[3] The absence of active invitation and follow-up could perpetuate the limitations observed with cytology.
4. **Integration with Vaccination**: Since the introduction of HPV vaccination into the national immunization program in 2014, there has been a clear synergy between prevention pillars; however, vaccination coverage remains suboptimal.[1] The forthcoming decades must focus on integrating screening and vaccination strategies to expedite elimination goals.

Opportunities for the Next 25 Years

If successfully scaled, HPV testing presents several transformative opportunities:

- **Earlier Detection**: Research indicates that HPV testing can identify high-grade lesions and early-stage cancers nearly a decade earlier than cytology, potentially leading to a significant reduction in mortality through timely intervention.[9]
- **Extended Screening Intervals**: Negative HPV tests provide higher negative predictive value than cytology, permitting the safe extension of screening intervals to five years.[4,10] This approach could enhance program efficiency and lower costs.[10]

- **Potential for Self-Sampling**: HPV testing is compatible with self-collection, which may enhance participation among underserved women and diminish inequalities.[5]
- **Cost-effectiveness**: Although initial costs may be higher, organized HPV testing could ultimately prove cost-effective by decreasing unnecessary procedures and late-stage cancer treatments.[9]
- **Pathway to Elimination**: Integrating vaccination, HPV testing, and improved treatment aligns with the WHO's strategic goal of eliminating cervical cancer as a public health issue.[5] By meeting these targets, Brazil could serve as a model for cervical cancer control in Latin America.

The next 25 years will be a decisive phase for implementation, adaptation, and evaluation. The most significant reductions in mortality will hinge on integrating the new technology within a truly organized, equitable, and population-wide program. This necessitates active outreach to the millions of never-screened women, particularly those in vulnerable, low-income, and remote populations that bear the highest burden of disease. Overcoming the regional disparities that have historically hindered Brazil's health system must be the cornerstone of this national strategy.

Critical Outlook

The transition to HPV DNA testing represents a historic opportunity; however, its success will rely more on health system preparedness than on the technology itself. Evidence from Europe illustrates that organized programs – rather than opportunistic screening – are essential for effective mortality reduction.[6]

Brazil must therefore invest in:

- Developing national registries for systematic screening and follow-up,
- Ensuring equitable access in vulnerable regions,
- Training professionals in HPV-based clinical algorithms, and
- Establishing seamless pathways between screening, diagnosis, and treatment.

Over the next 25 years, failure to overcome these structural barriers may result in only modest improvements. Conversely, a successfully implemented, organized program could bring Brazil within the reach of the cervical cancer elimination threshold.

Conclusion

Brazil's transition from cytology to HPV DNA testing represents a pivotal shift in the prevention of cervical cancer. Through the implementation of organized and equitable screening programs, the nation is poised to shift from a high-burden scenario toward the elimination of the disease.

However, persistent systemic inequalities, risks associated with early initiation, and challenges related to program organization remain substantial obstacles. If HPV testing is seamlessly integrated with vaccination efforts and equity is prioritized, the next 25 years could witness a marked reduction in cervical cancer incidence, establishing Brazil as a benchmark for other middle-income countries.

Authors' contribution

The author conceived the article and declared no conflict of interest.

Data availability

The entire data set supporting the results of this study has been published in the article itself.

References

1. Ferrari YAC, Jesus CVF, Batista JFC, Silva BEB, Cavalcante AB, Lima CA. Secular trend of cervical cancer mortality in Brazil and regions. Ciên Saúde Colet. 2025; 30 (3): e09962023.
2. Claro IB, Lima LD, Almeida PF. Cervical cancer guidelines, prevention and screening strategies: experiences from Brazil and Chile. Ciên Saúde Colet. 2021; 26 (10): 4497-510.
3. Azevedo e Silva G, Alcantara LLM, Tomazelli JG, Ribeiro CM, Girianelli VR, Santos EC, et al. Evaluation of cervical cancer control actions in Brazil and its regions. Cad Saúde Pública. 2022; 38 (7): e00041722.
4. Zeferino LC, Bragança JB, Vale DBA, Zanine RM, Melo YLMF, Primo WQS, et al. Guidelines for HPV-DNA testing for cervical cancer screening in Brazil. Rev Bras Ginecol Obstet. 2018; 40 (6): 360-8.
5. Koliopoulos G, Nyaga VN, Santesso N, Bryant A, Martin-Hirsch PPL, Mustafa RA, et al. Cytology versus HPV testing for cervical cancer screening in the general population. Cochrane Database Syst Rev. 2017; 8: CD008587.
6. Jansen EEL, Zielonke N, Gini A, Anttila A, Segnan N, Vokó Z, et al. Effect of organised cervical cancer screening on cervical cancer mortality in Europe: a systematic review. Eur J Cancer. 2020; 127: 207-23.

7. Vieira YP, Viero VSF, Vargas BL, Nunes GO, Machado KP, Neves RG, et al. Trends and inequalities in self-reported cervical cancer screening in Brazilian capitals, 2011–2020. Cad Saúde Pública. 2022; 38 (9): e00272921.

8. Teixeira JC, Vale DB, Discacciati MG, Campos CS, Bragança JF, Zeferino LC. Cervical cancer screening with DNA-HPV testing and precancerous lesions detection: a Brazilian demonstration study. Rev Bras Ginecol Obstet. 2023; 45 (1): 21-30.

9. Teixeira JC, Vale DB, Campos CS, Polegatto I, Bragança JF, Discacciati MG, et al. Transition from opportunistic cytological to organized screening program with DNA-HPV testing detected cancers 10 years in advance. Sci Rep. 2024; 14: 20761.

10. Carvalho CF, Teixeira JC, Bragança JF, Derchain S, Zeferino LC, Vale DB. Cervical cancer screening with HPV testing: updates on the recommendation. Rev Bras Ginecol Obstet. 2022; 44 (3): 264-71.

Received on August 19, 2025
Final version presented on October 15, 2025
Approved on October 20, 2025

Invited by Editor-in-Chief: Lygia Vanderlei