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Review Article

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Barriers to HPV vaccination and cervical cancer screening in developing countries

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ABSTRACT

Human papillomavirus (HPV) infection, a leading cause of cervical cancer in women, is a significant public health concern, especially in low- and middle-income countries (LMICs) where access to healthcare is limited. High HPV vaccination coverage is crucial for herd immunity against cervical cancer in LMICs. While developed countries have introduced a considerable amount of HPV vaccines (80%), the introduction in LMICs is low (41%) due to significant barriers that limit access to these essential health services in the region. This review identifies key obstacles and proposes targeted interventions to improve HPV vaccination uptake and cervical cancer screening in LMICs. This narrative review was carried out by searching various databases, such as PubMed, Scopus, Google Scholar, and Web of Science, as well as resources from health organizations like the World Health Organization (WHO), for articles on HPV vaccination and cervical cancer screening in LMICs, published between October 2005 and December 2024, using specific keywords. The review included English-language publications that met predefined criteria, facilitating secondary data analysis. Several barriers to HPV vaccination and cervical cancer screening services exist in LMICs, including limited healthcare infrastructure, insufficient health education, cultural and social norms, vaccine hesitancy, and inadequate governmental support. To address these challenges, recommended strategies include implementing sustainable financing, government subsidies, price negotiations with pharmaceutical companies, increasing healthcare facilities, fostering public-private partnerships, launching targeted awareness campaigns, engaging men in health education, and ensuring community involvement in decision-making processes. To achieve the WHO's goal of eradicating cervical cancer by 2030, addressing barriers to cervical cancer screening and HPV vaccination in LMICs is crucial for lowering the cervical cancer burden and enhancing women's health. Moreover, prioritizing equitable access to these essential services, especially for individuals in rural areas and those facing financial barriers, is necessary.

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The authors declare that they have no competing interests.

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BACKGROUND OF HUMAN PAPILLOMAVIRUS (HPV) VACCINATION AND CERVICAL CANCER SCREENING

Cervical cancer is a significant public health issue affecting many women globally, ranking as the fourth most common cancer.[1] Low- and middle-income countries (LMICs), including Ghana, India, Uganda, and Nigeria, with limited access to healthcare facilities, bear the brunt of this disease.[2] For instance, of 604,000 new cases and 342,000 deaths that were recorded worldwide in 2020,[1] LMICs alone accounted for about 90% of the global incidence and mortality of these cases.[3] To prevent and reduce the high burden of cervical cancer in LMICs, early detection of the disease via screening as well as vaccination against HPV is crucial. Moreover, early detection of cervical cancer is essential for efficient disease surveillance and the implementation of preventive initiatives.

Since the 1940s, cytology screening, known as 'Pap Smears,' has been the bedrock of cervical cancer prevention in high-income countries.[4] In addition to pap smear, other screening techniques for cervical cancer prevention include HPV DNA testing, as well as visual examination of the cervix using acetic acid or Lugol's iodine.[5] Besides cervical cancer screening, HPV vaccination is another vital preventive measure in reducing the incidence of cervical cancer. HPV vaccines have demonstrated a minimum effectiveness of 95% in preventing infection from the most cancer-causing strains of HPV. Moreover, when administered before sexual activity begins, they are 100% effective in preventing precancerous alterations in the cervix.[3,6,7]

The increasing adoption of the HPV vaccine and cervical cancer screening has made cervical cancer prevention feasible and has had a remarkable impact in reducing its incidence globally, especially in high-income countries with high vaccination and screening coverage rates.[8] However, several LMICs face significant challenges in implementing effective HPV vaccination and cervical cancer screening programs, thereby limiting the efficient implementation of population-based vaccination and screening programs in the region.[2]

HPV VACCINATION INITIATIVES IN LMICs

Several LMICs have successfully integrated HPV vaccination into their routine immunization programs, while others are in the process. Rwanda, for instance, was the first LMIC to launch a national vaccination program, achieving a high coverage rate of 93% of the target population through school-based vaccination and community outreach.[9] Bhutan and Uganda also implemented HPV vaccination campaigns, with high vaccination coverage rates of over 89% and 73.8%, respectively, targeting girls aged 13–18 via school-based and healthcare facility-based approaches.[10,11] As of June 2020, 55% (107 out of 194) of World Health Organization (WHO) member states were considered to have partially or entirely implemented the HPV vaccine nationally.[12]

Only 41% of LMICs have introduced HPV vaccines, in contrast to the approximately 80% of high-income countries (HICs) that have implemented these vaccines.[12] However, GAVI (officially Gavi, the Vaccine Alliance, a public-private partnership) has taken significant steps

to address the issue of global vaccine coverage by collaborating with vaccine manufacturers GSK and Merck to reduce the purchase cost of HPV vaccines Cervarix (bivalent) and Gardasil (quadrivalent) from over $100 in HICs to $5 in LMICs.[12] Since 2012, Gavi has supported 29 countries with HPV vaccines, including 20 African countries,[13] resulting in approximately 14.7 million girls receiving complete HPV vaccination through routine immunizations and multi-age cohort vaccinations. These efforts have significantly increased access to HPV vaccination in LMICs and reduced disparities in global vaccine coverage.

BARRIERS TO CERVICAL CANCER SCREENING AND HPV VACCINATION IN LMICs

Despite significant efforts to increase access to HPV vaccines and cervical cancer screening in LMICs, several barriers continue to hinder the uptake of these essential health services in the region. Hence, it is crucial to highlight the key barriers that impede cervical cancer screening and HPV vaccination in LMICs. The following are some significant hindrances to HPV vaccination and cervical cancer screening services in LMICs.

Community-level barriers to cervical cancer screening and HPV vaccination

Limited knowledge about HPV, cervical cancer, and HPV vaccines is prevalent in many LMICs, contributing to low uptake of these health services. The widespread lack of awareness significantly hinders cervical cancer screening and vaccination efforts, leading to persistently high rates of cervical cancer in these regions. Studies in South Africa and Cameroon indicate that most women lack knowledge about HPV, its vaccine, and its association with cervical cancer.[14,15] Similarly, research in India reveals a significant gap in awareness and practices related to cervical cancer, highlighting a general absence of preventive healthcare measures.[16]

Insufficient knowledge regarding HPV and its association with cervical cancer may result in stigma and discrimination among community members. In many LMICs, women often experience discrimination and stigma from community members, including neighbors and religious groups, which can deter them from seeking healthcare services, including HPV vaccination and cervical cancer screening. In Kisumu, Kenya, for instance, community members hold discriminatory views that hinder women from accessing screening and treatment services, based on assumptions regarding their promiscuity, infidelity, or HIV status.[17]

Another significant barrier to cervical cancer screening and HPV vaccination in many LMICs is financial constraints, which contribute to low uptake of these essential health services. In LMICs, individuals—especially women—often perceive the cost as a significant obstacle due to high expenses associated with screening appointments, potential follow-up treatments, lost wages from taking time off work, laboratory testing fees, and transportation costs.[18] These financial barriers significantly affect women's uptake of HPV vaccination and adherence to cervical cancer screening, particularly among medically underserved groups who are financially vulnerable. This situation leads to disparities in cervical cancer incidence and mortality, including HPV-related diseases, which persist across various poverty levels, despite the availability of effective and affordable screening and vaccination services.[18,19] For instance, in India, women from lower socioeconomic backgrounds often struggle to access healthcare services, including HPV vaccination and cervical cancer screening, due to high out-of-pocket expenses.[20]

The shortage of healthcare practitioners represents a critical barrier to HPV vaccination and cervical cancer screening in LMICs. Many LMICs face a significant deficit of trained healthcare providers capable of delivering these essential services effectively. This lack of personnel limits the availability of screenings and vaccinations and undermines the overall healthcare quality in these countries, ultimately impacting public health outcomes. In Nigeria, for instance, the healthcare system grapples with a shortage of qualified professionals who can administer HPV vaccines and perform cervical cancer screenings—despite having a population exceeding 200 million, the country has fewer than 1,000 gynecologists and only about 100 oncologists.[21,22] This limited number of specialists reflects broader staffing shortages within the country's healthcare system, thereby posing a significant challenge to global efforts aimed at reducing infectious diseases, including cervical cancer rates, as well as HPV-related diseases. Several factors, such as inadequate training programs, limited resources, and high rates of healthcare worker migration to more developed countries for better pay, exacerbate this gap in trained personnel.[23] This leaves many women without access to vital preventive health services, such as HPV vaccines and cervical cancer screening facilities.

Additionally, the absence of skilled practitioners can lead to longer wait times and reduced patient confidence in the healthcare system. Women may be discouraged from seeking care if they perceive that the services available are not delivered by adequately trained staff or if they experience delays in receiving treatment. Moreover, this shortage could place an excessive strain on current healthcare providers, resulting in burnout and a decline in the quality of healthcare services.

Social barriers to HPV vaccination and cervical cancer screening

Cultural attitudes toward women's health significantly hinder access to cervical cancer screening and HPV vaccination in many countries, including LMICs. Discussions about sexual health in many LMICs are often stigmatized, leading to a reluctance among women to seek necessary medical care.[24] Many women view participation in cervical cancer screening and HPV vaccination as inappropriate or contrary to their cultural and religious beliefs. For instance, in some African communities, conservative values contribute to feelings of embarrassment regarding examinations that require exposing intimate areas of the body, especially when the healthcare provider is male.[25,26] This discomfort arises from the belief that exposing one's genitals is a violation of privacy and modesty.[25] Consequently, cultural and religious norms create substantial obstacles for women, making them hesitant to seek essential health services,[25] including cervical screening facilities and HPV vaccination, therefore posing a significant barrier to HPV vaccination and cervical cancer screening.

High rates of hesitancy towards vaccines and reluctance to access essential health services in several LMICs also pose a significant challenge to the uptake of HPV vaccines and cervical cancer screening.[27] This is primarily due to misconceptions surrounding the safety and efficacy of vaccines and cervical cancer screening, and distrust in the healthcare system and information.[27,28] The increasing prevalence of myths and misconceptions surrounding HPV disease, as well as its prevention in many LMICs, discourages people, especially women, from accessing healthcare facilities, including HPV vaccination and cervical cancer screening services. Religious and cultural beliefs often influence misconceptions surrounding immunization and screening. Several studies have shown a close interconnection between social, cultural, religious, and traditional barriers, yet the relationship between HPV vaccine acceptance and these beliefs among different populations remains complex.[29] While

some studies revealed that vaccine uptake is independent and not influenced by religious beliefs,[30-34] others provided opposing evidence, claiming that HPV vaccine acceptance is negatively influenced by misconceptions and objections fueled by religious beliefs.[35-42]

Fears about the vaccine causing infertility or being a form of population control, rumors about the vaccine causing diseases, or being experimental, which could be fueled by skepticism about modern medicine, are some of the misconceptions posing barriers to vaccine uptake in many LMICs.[43] In addition, worries that vaccines are unnatural and contain haram substances,[32,44] as well as the belief that the vaccine may encourage promiscuity and affect the acceptance of the HPV vaccine, are significant misconceptions that also limit HPV vaccination and cervical cancer screening in the region.[45] The variations in outcomes related to the acceptance of the HPV vaccine in many LMICs, which are influenced by various cultural and religious beliefs, demonstrate regional diversity. Hence, appreciating diversity is essential to comprehending particular religious dynamics and ensuring public health initiatives are attentive to cultural and religious differences.[29]

HPV vaccination and cervical cancer screening hesitancy in several LMICs are exacerbated by misinformation and anti-vaccination campaigns on social media platforms like Twitter, Facebook, and Instagram.[46] Many individuals, especially young people, are exposed to misleading claims about vaccine safety, efficacy, and necessity, which often deter them from seeking vaccination A study highlights the detrimental impact of social media on vaccination efforts, where misleading claims about vaccine safety, efficacy, and necessity can deter individuals from seeking vaccination.[46] Given the limited access to accurate health information and inadequate public health communication strategies in several LMICs, which amplify vaccine hesitancy, this issue is concerning and hinders efforts to combat vaccine-preventable diseases such as HPV.

Cervical screening, which entails pelvic examination and the possible combination with treatment for reproductive or sexually transmitted infection, has the propensity to suggest strong disapproval of a woman. It is for this reason that many women in LMICs face stigmatization and embarrassment whenever they engage in topics or attempt to access cervical cancer screening.[47] This stigma often emanates from their social network, acting as a barrier to screening and vaccine uptake,[48] as influences from friends and family may lead to misconceptions about the importance of screenings, create stigma, or discourage proactive health measures.

The substantial daily responsibilities faced by many women in LMICs serve as significant barriers to HPV vaccination and cervical cancer screening, preventing them from attending necessary appointments.[25] Studies indicate that family obligations often take precedence over health needs, leaving little time for women to seek cervical screening services.[47,49,50] Societal expectations for women to prioritize their family's well-being as primary caregivers lead to competing demands that overshadow their health needs.[50,51] Moreover, many women are burdened by household duties, which complicate visits to healthcare facilities, especially given the time-consuming nature of the screening process. For instance, some women reported that their busy schedules with household tasks hindered their participation in cervical cancer screening exercises.[49] Additionally, the lack of spousal support and household assistance has been recognized as a significant barrier to the uptake of the HPV vaccine and cervical cancer screening.[52]

Medical system-related barriers to HPV vaccination and cervical cancer screening

Over the years, medical system-related barriers have continued to hinder the widespread adoption of HPV vaccination and routine cervical screening in LMICs. Owing to these barriers, approximately 90% of cervical cancer cases and deaths worldwide occur in LMICs, with women from lower socioeconomic backgrounds bearing the weight of this burden.[53,54] One of the primary barriers is the limited access to healthcare facilities. While 63% of high-income nations screen all eligible women, the average rate in most LMICs is only 19%.[55] Similarly, these countries have limited national vaccination coverage for HPV, which reflects a stark disparity in healthcare access.[56] Interestingly, a study found that women from ethnic minority groups and those living in poorer areas have lower immunization rates, even in developed nations like England.[57]

Financial constraints are another obstacle affecting those living in countries without subsidized healthcare or effective national health insurance programs. The cost of HPV vaccines and screening tests, including HPV DNA tests and colposcopy, can be a significant financial burden.[58]

Moreover, due to a shortage of supply and the high upfront costs associated with purchasing the vaccine in bulk, several countries have yet to establish a nationwide HPV immunization program.[59] This is particularly true in low-income nations that are not eligible for support from Gavi.

Another barrier associated with the health system is that of the health provider. According to a recent survey involving 826 medical professionals, 47.34% have never evaluated a patient's HPV vaccination status, while 35.96% have never suggested the shot. Their justifications include insufficient time, a lack of screening resources and patient education materials, and the requirement for further training to carry out tasks linked to HPV vaccination.[60] Additionally, it has been reported that the absence of female healthcare personnel in certain facilities to administer the pap/colposcopy test causes discomfort or, in certain situations, even discourages patients from continuing their cervical cancer screening evaluation.[61]

Institutional barriers to HPV vaccination and cervical cancer screening

Unlike high-income countries like Australia, which has successfully implemented a comprehensive cervical cancer prevention program including a well-funded HPV vaccination initiative that began in 2007 and expanded to include boys,[62] many LMICs face significant governmental barriers. The lack of sufficient government support and commitment to implement comprehensive and sustainable HPV vaccination and cervical cancer screening programs in most LMICs represents a formidable barrier to achieving the WHO's goal of eliminating cervical cancer as a public health concern by 2030.[63] Many LMICs allocate inadequate budgets to healthcare, which can lead to shortages of essential supplies, such as vaccines and screening equipment. The low budgetary allocation and poor management in many LMICs present a significant obstacle to HPV vaccination and cervical cancer screening efforts in these countries.[64] For instance, the absence of a well-defined cervical cancer screening policy in Uganda has impeded practical prevention efforts.[65] Moreover, without adequate funding for public awareness campaigns, many women, especially those in rural and remote regions, remain uninformed about the importance of cervical cancer screening as well as vaccination.

The lack of efficient policy implementation in many LMICs also stands as a significant barrier to HPV vaccination and cervical cancer screening in the region. Even when policies promoting HPV vaccination and cervical cancer screening are in place, their implementation is often hampered by bureaucratic challenges and a lack of coordination among health agencies. For instance, in Malawi, despite having a national cervical cancer prevention strategy, significant challenges, including a shortage of service providers who receive inadequate supervision, a lack of essential equipment, frequent stock-outs of medical supplies, and insufficient funding, were reported in some health facilities managing the cervical cancer program at the district level. Moreover, many healthcare providers are unaware of the policies that govern their work and lack access to the necessary standards and guidelines for cervical cancer screening and treatment.[66] In some cases, national policies may not effectively translate into local practices in LMIC due to communication gaps and insufficient resource allocation.

Within healthcare settings in many countries, including in LMICs, stigma and discrimination occur, constituting a significant barrier to accessing healthcare facilities such as HPV vaccination and cervical cancer screening. Women seeking these vital services may encounter negative attitudes from healthcare providers, which can foster a reluctance to patronize healthcare services. According to D'Anna et al.[67] experiences of discrimination may deter women from returning for follow-up appointments or engaging with health services altogether. This stigma is particularly pronounced in traditional cultures where discussions surrounding sexual health are considered taboo. Consequently, individuals, especially women, may feel isolated and reluctant to seek information or support and access healthcare facilities regarding their health, undermining efforts to promote public health, including access to HPV vaccination and cervical cancer screening, which ultimately contributes to increased mortality and morbidity rates from cervical cancer and HPV-related diseases in the region.

STRATEGIES TO OVERCOME BARRIERS

Overcoming the barriers mentioned earlier is crucial not only to facilitate HPV vaccine uptake and cervical cancer screening in LMICs but ultimately to reduce cervical cancer-associated mortality. Leveraging “Cervical Cancer Awareness Month,” healthcare providers and non-governmental organizations (NGOs) should spearhead awareness initiatives, possibly in collaboration with medical students as campaign volunteers, and by employing all media platforms and physical screening camps, active and educative awareness portraying the need and benefits of up taking HPV vaccines and cervical cancer screening should be effected with the involvement of lay health workers in fleshing out the intent of the awareness by following-up, encouraging and assisting women in obtaining screening. This was the combined intervention that aided increased screening rates among Vietnamese-American women.[68] Free vaccine and screening, follow-up calls, and assistance booking appointments for those who tested positive should also be employed as incentives.

Studies have shown that the fear of a positive screening test prevents people from getting screened, as it involves financial implications that bother many low and middle-income earners who consider that while screening is free, therapy is not.[69] Therefore, it is pertinent that the government and nonprofit organizations not only provide structures for financial aid but also strengthen and ensure the effective and smooth running of the existing ones. Alongside, the provision of affordable and easily accessible screening facilities should be

made available by the government, with the utilization of already existing clinics and the establishment of new ones in communities where necessary for awareness[70] as well as to drive and achieve the WHO global strategy- the "90–70–90 strategy" whose adoption proffer remedy to women's health and cancer globally,[71] with the capacity to significantly reduce cervical cancer mortality rate and save the lives of more than 62 million women over the next century in LMICs.[72]

SUCCESS STORIES IN DIFFERENT COUNTRIES

In recent years, there has been an increasing number of cervical cancer screening and HPV vaccination programs successfully carried out in different LMICs. This can largely be attributed to strategic efforts made by domestic and foreign organizations and even private individuals. For instance, to protect females under the age of 15, Rwanda became the first country in Africa to undertake a national HPV vaccination program in 2011.[9] With cervical cancer screening and HPV vaccination coverage reaching over 93% of girls aged 11 to 15, Rwanda has surpassed other nations, including first-world countries.[73]

On the other hand, Malawi has the highest cervical cancer mortality rate of 51.5 deaths per 100,000 per year and the second-highest age-standardized incidence rate of 67.9 per 100,000 per year.[74] Following a gradual ramping up of activities that started in the 1980s, the Malawian Ministry of Health-Reproductive Health Directorate developed a comprehensive cervical cancer screening program employing visual inspection with acetic acid and cryotherapy in 2004. Eighty percent of Malawi's eligible women could be screened as part of this program. Although there were some shortcomings in meeting the program's overall objectives, the percentage of women screened increased from 9.3% to 26.5%, showing nearly a threefold degree of effectiveness.[75]

Additionally, the Indian quadrivalent vaccine, Cervavac, developed by the Serum Institute of India in collaboration with the Department of Biotechnology, Government of India, has recently reached technical maturity and mass manufacturing capability. Launched on September 1, 2022, the government of India supports this vaccine and will be distributed through state health initiatives and subsequently through commercial companies and to other countries; it will be offered for a substantially reduced cost of between INR 200 and 400, i.e., approximately US $5.[76] This approach will promote vaccine accessibility, especially for economically disadvantaged citizens of the country.

FUTURE DIRECTIONS AND RECOMMENDATIONS

To achieve the WHO's ambitious goal of eradicating cervical cancer by 2030, which necessitates all nations attaining and maintaining an incidence rate of less than 4 cases per 100, 000 women,[77] intensified efforts towards enhancing HPV vaccine uptake, cervical cancer screening for early detection and treatment in LMICs is necessary. Therefore, addressing the impediments hindering individuals in LMICs from accessing these preventive measures is essential.

Policy-level intervention

Gleaning from the lessons of countries such as Rwanda, which have achieved high HPV vaccination and cervical cancer screening rates, governments in LMICs are urged to

ensure efficient and sustainable financing and advocacy for comprehensive cervical cancer preventive programs. Also, the involvement of multiple ministries, such as the Ministry of Education in the Technical Working Group, has been proven more effective in garnering support for increased vaccination and screening, especially in alternative settings such as schools and pharmacies.[78]

Government subsidies for HPV vaccines and cervical cancer screening centers in LMICs are crucial for improving access, particularly for individuals who cannot afford them.[79] Beyond subsidies, negotiating prices with pharmaceutical companies for HPV vaccines, cervical cancer screening equipment, and reagents, including implementing price regulations in LMICs can help lower costs and ensure affordability and access to these vital healthcare services.[80] Moreover, governments in LMICs should empower local pharmaceutical companies to manufacture essential drugs and vaccines,[81] including HPV vaccines and reagents for cervical cancer screening. Therefore, a supportive environment that includes financial incentives, regulatory assistance, and infrastructure development should be provided, allowing local pharmaceutical companies to thrive and compete effectively with pharmaceutical firms from high-income countries.

Healthcare system improvement

Healthcare facilities should be increased and strengthened to facilitate early detection and treatment of cervical cancer cases, especially for individuals in rural and hard-to-reach regions with limited healthcare services.

Health provider recommendation is considered a facilitator for HPV vaccination and cervical cancer screening, especially among parents with anti-vaccine sentiments. Thus, health providers should educate their patients and dispel their fears regarding the merits and risks associated with the HPV vaccination,[78] including cervical cancer screening. Studies have shown that women often seek their partners' consent before accessing cervical cancer screening facilities.[82] Therefore, men should also be included in the educational efforts,[83] as informing them about the crucial role of cervical cancer screening and HPV vaccination could increase the likelihood of their partners and children undergoing cervical cancer screening and receiving HPV vaccination. Additionally, it is also essential to desexualize the HPV vaccine. When promoted as an anti-cancer preventive measure and not a sexually transmitted disease, it may be possible to address negative attitudes among certain groups of people.[84]

Healthcare providers and policymakers can leverage social media to counter vaccine misinformation, promote informed decision-making, and increase vaccine confidence.[46] Hence, healthcare providers should be trained on effective social media strategies to address misinformation and provide accurate information about vaccines and other essential health services.

Community-based interventions

As cost and financing continue to be a barrier, public-private partnerships are encouraged to provide cervical cancer screening facilities and vaccinations for target populations, especially girls and boys between the ages of 9–13. While co-payment seems a viable option, considering the high health expenditure and competing health services, provisions should be made for the strata of people who cannot afford the vaccines and screening facilities, especially in poor communities and government-owned schools.[85] This will ensure equitable access to these essential services, encompassing individuals who cannot afford them.

Furthermore, making the HPV vaccination a school requirement in secondary schools can help increase the number of vaccinated children aged 9–13. Countries such as Scotland and Australia have experienced declines in vaccine-related infections by implementing targeted school-based vaccination programs.[78]

Moreover, the involvement of local community members, including women, in the decision-making processes related to HPV vaccination and cervical cancer screening is crucial to enhance the uptake of these vital health services.[86]

Partnerships between governments in LMICs and key stakeholders—including religious leaders, community leaders, donors, and NGOs—are essential for improving access to HPV vaccines and cervical cancer screening.[81] Through this collaboration, research funding on HPV prevalence and vaccine effectiveness can be increased, culturally sensitive awareness campaigns can be developed, healthcare providers can be trained, and affordable access to vaccines and screening services can be guaranteed in several LMICs.

Local and international collaborations are encouraged through data collection, management, and sharing regarding HPV vaccination and cervical cancer screening rates, guiding targeted interventions among high-risk populations.[87]

REFERENCES

1. World Health Organization (WHO). Cervical cancer. https://www.who.int/news-room/fact-sheets/detail/cervical-cancer. Updated 2023. Accessed September 12, 2023.
2. Gupta R, Gupta S, Mehrotra R, Sodhani P. Cervical cancer screening in resource-constrained countries: current status and future directions. *Asian Pac J Cancer Prev* 2017.18(6):1461-7. PUBMED | CROSSREF
3. Sankaranarayanan R, Anorlu R, Sangwa-Lugoma G, Denny LA. Infrastructure requirements for human papillomavirus vaccination and cervical cancer screening in sub-Saharan Africa. *Vaccine* 2013;31 Suppl 5:F47-52. PUBMED | CROSSREF
4. Finocchario-Kessler S, Wexler C, Maloba M, Mabachi N, Ndikum-Moffor F, Bukusi E. Cervical cancer prevention and treatment research in Africa: a systematic review from a public health perspective. *BMC Womens Health* 2016;16(1):29. PUBMED | CROSSREF
5. Banerjee D, Mittal S, Mandal R, Basu P. Screening technologies for cervical cancer: Overview. *Cytojournal* 2022;19:23. PUBMED | CROSSREF
6. John-Akinola YO, Ndikom CM, Oluwasanu MM, Adebisi T, Odukoya O. Cervical cancer and human papillomavirus vaccine knowledge, utilisation, prevention educational interventions and policy response in Nigeria: a scoping review. *Cancer Control* 2022;29:10732748221130180. PUBMED | CROSSREF
7. LaMontagne DS, Bloem PJN, Brotherton JML, Gallagher KE, Badiane O, Ndiaye C. Progress in HPV vaccination in low- and lower-middle-income countries. *Int J Gynaecol Obstet* 2017;138 Suppl 1:7-14. PUBMED | CROSSREF
8. Bonanni P, Bechini A, Donato R, Capei R, Sacco C, Levi M, et al. Human papilloma virus vaccination: impact and recommendations across the world. *Ther Adv Vaccines* 2015;3(1):3-12. PUBMED | CROSSREF
9. Binagwaho A, Wagner CM, Gatera M, Karema C, Nutt CT, Ngabo F. Achieving high coverage in Rwanda's national human papillomavirus vaccination programme. *Bull World Health Organ* 2012;90(8):623-8. PUBMED | CROSSREF
10. Dorji T, Tshomo U, Phuntsho S, Tamang TD, Tshokey T, Baussano I, et al. Introduction of a national HPV vaccination program into Bhutan. *Vaccine* 2015;33(31):3726-30. PUBMED | CROSSREF
11. Malande OO, Munube D, Afaayo RN, Annet K, Bodo B, Bakainaga A, et al. Barriers to effective uptake and provision of immunization in a rural district in Uganda. *PLoS One* 2019;14(2):e0212270. PUBMED | CROSSREF
12. Bruni L, Saura-Lázaro A, Montoliu A, Brotons M, Alemany L, Diallo MS, et al. HPV vaccination introduction worldwide and WHO and UNICEF estimates of national HPV immunization coverage 2010-2019. *Prev Med* 2021;144:106399. PUBMED | CROSSREF

13. Gavi, The Vaccine Alliance. Immunisation partners outline ambitious plan to protect millions of girls in lower- and middle-income countries against cervical cancer. https://www.gavi.org/news/media-room/immunisation-partners-outlin. Updated 2023. Accessed September 9, 2023.
14. Ramathuba DU, Ngambi D. Knowledge and attitudes of women towards human papilloma virus and HPV vaccine in Thulamela municipality of Vhembe district in Limpopo province, South Africa. *Afr J Reprod Health* 2018;22(3):111-9. PUBMED | CROSSREF
15. Tagne SR, Tchakounte CK, Sidje LM, Ferrand J, Kamdje AH. Primary and secondary prevention of cervical cancer at two district health centres in the West region of Cameroon. *Int J Cancer Clin Res.* 2020;7:136. CROSSREF
16. Vora K, Saiyed S, Joshi R, Natesan S. Community level barriers for cervical cancer screening in marginalized population. *Int J Reprod Contracept Obstet Gynecol* 2020;9(12):5006-11. CROSSREF
17. Ginjupalli R, Mundaden R, Choi Y, Herfel E, Oketch SY, Watt MH, et al. Developing a framework to describe stigma related to cervical cancer and HPV in western Kenya. *BMC Womens Health* 2022;22(1):39. PUBMED | CROSSREF
18. Biddell CB, Spees LP, Smith JS, Brewer NT, Des Marais AC, Sanusi BO, et al. Perceived financial barriers to cervical cancer screening and associated cost burden among low-income, under-screened women. *J Womens Health (Larchmt)* 2021;30(9):1243-52. PUBMED | CROSSREF
19. Omohwovo EJ. Prioritizing equitable access to human papillomavirus (HPV) vaccination for MSM in Africa: addressing disparities in disease prevention and control. *J Med Virol* 2023;95(5):e28795. PUBMED | CROSSREF
20. Sriram S, Albadrani M. Impoverishing effects of out-of-pocket healthcare expenditures in India. *J Family Med Prim Care* 2022;11(11):7120-8. PUBMED | CROSSREF
21. Eguzo K, Camazine B. Beyond limitations: practical strategies for improving cancer care in Nigeria. *Asian Pac J Cancer Prev* 2013;14(5):3363-8. PUBMED | CROSSREF
22. Agboghoroma CO, Gharoro EP. Coverage and distribution of obstetricians and gynecologists in Nigeria. *Int J Gynaecol Obstet* 2015;129(1):50-3. PUBMED | CROSSREF
23. Toyin-Thomas P, Ikhurionan P, Omoyibo EE, Iwegim C, Ukueku AO, Okpere J, et al. Drivers of health workers' migration, intention to migrate and non-migration from low/middle-income countries, 1970-2022: a systematic review. *BMJ Glob Health* 2023;8(5):e012338. PUBMED | CROSSREF
24. Ebu NI, Mupepi SC, Siakwa MP, Sampselle CM. Knowledge, practice, and barriers toward cervical cancer screening in Elmina, Southern Ghana. *Int J Womens Health* 2014;7:31-9. PUBMED | CROSSREF
25. Mantula F, Toefy Y, Sewram V. Barriers to cervical cancer screening in Africa: a systematic review. *BMC Public Health* 2024;24(1):525. PUBMED | CROSSREF
26. Mwaka AD, Wabinga HR, Mayanja-Kizza H. Mind the gaps: a qualitative study of perceptions of healthcare professionals on challenges and proposed remedies for cervical cancer help-seeking in post conflict northern Uganda. *BMC Fam Pract* 2013;14(1):193. PUBMED | CROSSREF
27. Wilson R. HPV vaccine acceptance in West Africa: a systematic literature review. *Vaccine* 2021;39(37):5277-84. PUBMED | CROSSREF
28. Poirier B, Sethi S, Garvey G, Hedges J, Canfell K, Smith M, et al. HPV vaccine: uptake and understanding among global Indigenous communities - a qualitative systematic review. *BMC Public Health* 2021;21(1):2062. PUBMED | CROSSREF
29. Kisa S, Kisa A. Religious beliefs and practices toward HPV vaccine acceptance in Islamic countries: a scoping review. *PLoS One* 2024;19(8):e0309597. PUBMED | CROSSREF
30. Ling WY, Razali SM, Ren CK, Omar SZ. Does the success of a school-based HPV vaccine programme depend on teachers' knowledge and religion? -- a survey in a multicultural society. *Asian Pac J Cancer Prev* 2012;13(9):4651-4. PUBMED | CROSSREF
31. Audu BM, Bukar M, Ibrahim AI, Swende TZ. Awareness and perception of human papilloma virus vaccine among healthcare professionals in Nigeria. *J Obstet Gynaecol* 2014;34(8):714-7. PUBMED | CROSSREF
32. Khatiwada M, Kartasasmita C, Mediani HS, Delprat C, Van Hal G, Dochez C. Knowledge, attitude and acceptability of the human papilloma virus vaccine and vaccination among university students in Indonesia. *Front Public Health* 2021;9:616456. PUBMED | CROSSREF
33. Al Shdefat S, Al Awar S, Osman N, Khair H, Sallam G, Elbiss H. Health care system view of human papilloma virus (HPV) vaccine acceptability by Emirati men. *Comput Math Methods Med* 2022;2022(1):8294058. PUBMED | CROSSREF
34. Odongo Ojok I, Ogwal JB, Wwesige B, Bongomin F, Akello F. Factors associated with the human papillomavirus vaccine coverage in Gulu district, Uganda. *Adolesc Health Med Ther* 2023;14:87-96. PUBMED | CROSSREF

35. Mouallif M, Bowyer HL, Festali S, Albert A, Filali-Zegzouti Y, Guenin S, et al. Cervical cancer and HPV: awareness and vaccine acceptability among parents in Morocco. *Vaccine* 2014;32(3):409-16. PUBMED | CROSSREF

36. Darraj AI, Arishy AM, Alshamakhi AH, Osaysi NA, Jaafari SM, Sumayli SA, et al. Human papillomavirus knowledge and vaccine acceptability in Jazan province, Saudi Arabia. *Vaccines (Basel)* 2022;10(8):1337. PUBMED | CROSSREF

37. Abdelaliem SM, Kuaia AM, Hadadi AA, Alhujayri AK, Al Anazi AA, Hajar AA, et al. Knowledge and attitudes toward human papillomavirus and vaccination: a survey among nursing students in Saudi Arabia. *Healthcare (Basel)* 2023;11(12):1766. PUBMED | CROSSREF

38. Frianto D, Setiawan D, Diantini A, Suwantika AA. Parental acceptance of human papillomavirus (HPV) vaccination in districts with high prevalence of cervical cancer in West Java, Indonesia. *Patient Prefer Adherence* 2022;16:2709-20. PUBMED | CROSSREF

39. Rabiu I, Yahuza Z. Knowledge and attitude towards human papilloma virus infection, vaccines, and cervical cancer prevention among school students in Kano, Nigeria. *Adv Virol* 2023;2023(1):2803420. PUBMED | CROSSREF

40. Winarto H, Habiburrahman M, Dorothea M, Wijaya A, Nuryanto KH, Kusuma F, et al. Knowledge, attitudes, and practices among Indonesian urban communities regarding HPV infection, cervical cancer, and HPV vaccination. *PLoS One* 2022;17(5):e0266139. PUBMED | CROSSREF

41. Awan UA, Naeem W, Khattak AA, Mahmood T, Kamran S, Khan S, et al. An exploratory study of knowledge, attitudes, and practices toward HPV associated anal cancer among Pakistani population. *Front Oncol* 2023;13:1257401. PUBMED | CROSSREF

42. Wilson RJ, Leigh L, Bah H, Larson HJ, Clarke E. HPV vaccination acceptance and perceptions related to fertility and population control in the Gambia: an anthropological analysis. *Vaccine* 2023;41(24):3647-54. PUBMED | CROSSREF

43. Turiho AK, Okello ES, Muhwezi WW, Katahoire AR. Perceptions of human papillomavirus vaccination of adolescent schoolgirls in western Uganda and their implications for acceptability of HPV vaccination: a qualitative study. *BMC Res Notes* 2017;10(1):431. PUBMED | CROSSREF

44. Bean SJ, Catania JA. Immunology beliefs as a factor in vaccine opposition among complementary and alternative medical providers. *SAGE Open Med* 2018;6:2050312118807625. PUBMED | CROSSREF

45. Jradi H, Bawazir A. Knowledge, attitudes, and practices among Saudi women regarding cervical cancer, human papillomavirus (HPV) and corresponding vaccine. *Vaccine* 2019;37(3):530-7. PUBMED | CROSSREF

46. Rodrigues F, Ziade N, Jatuworapruk K, Caballero-Uribe CV, Khursheed T, Gupta L. The impact of social media on vaccination: a narrative review. *J Korean Med Sci* 2023;38(40):e326. PUBMED | CROSSREF

47. Fort VK, Makin MS, Siegler AJ, Ault K, Rochat R. Barriers to cervical cancer screening in Mulanje, Malawi: a qualitative study. *Patient Prefer Adherence* 2011;5:125-31. PUBMED | CROSSREF

48. Williams M, Kuffour G, Ekuadzi E, Yeboah M, ElDuah M, Tuffour P. Assessment of psychological barriers to cervical cancer screening among women in Kumasi, Ghana using a mixed methods approach. *Afr Health Sci* 2013;13(4):1054-61. PUBMED | CROSSREF

49. Ngugi CW, Boga H, Muigai AW, Wanzala P, Mbithi JN. Factors affecting uptake of cervical cancer early detection measures among women in Thika, Kenya. *Health Care Women Int* 2012;33(7):595-613. PUBMED | CROSSREF

50. Tarwireyi F. Perceptions and barriers to cervical cancer screening in a rural district of Mutoko, Mashonaland East Province, Zimbabwe. *Cent Afr J Med* 2005;51(11-12):120-2. PUBMED

51. Ndikom CM, Ofi BA. Awareness, perception and factors affecting utilization of cervical cancer screening services among women in Ibadan, Nigeria: a qualitative study. *Reprod Health* 2012;9(1):11. PUBMED | CROSSREF

52. Lim JN, Ojo AA. Barriers to utilisation of cervical cancer screening in Sub Sahara Africa: a systematic review. *Eur J Cancer Care (Engl)* 2017;26(1):e12444. PUBMED | CROSSREF

53. World Health Organization (WHO). Cervical cancer. https://www.who.int/news-room/fact-sheets/detail/cervical-cancer. Accessed September 13, 2024.

54. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2021;71(3):209-49. PUBMED | CROSSREF

55. Gakidou E, Nordhagen S, Obermeyer Z. Coverage of cervical cancer screening in 57 countries: low average levels and large inequalities. *PLoS Med* 2008;5(6):e132. PUBMED | CROSSREF

56. Dattani S, Samborska V, Roser M. HPV vaccination: how the world can eliminate cervical cancer. Our World in Data. https://ourworldindata.org/hpv-vaccination-world-can-eliminate-cervical-cancer. Updated October 29, 2024. Accessed February 17, 2025.

57. Falcaro M, Soldan K, Ndlela B, Sasieni P. Effect of the HPV vaccination programme on incidence of cervical cancer and grade 3 cervical intraepithelial neoplasia by socioeconomic deprivation in England: population based observational study. *BMJ* 2024;385:e077341. PUBMED | CROSSREF

58. Talabi O, Gilbert H, Fawzi MCS, Anorlu R, Randall T. Examining barriers and facilitators of HPV vaccination in Nigeria, in the context of an innovative delivery model: a mixed-methods study. *BMJ Public Health* 2023;1(1):e000003. PUBMED | CROSSREF

59. World Health Organization (WHO). *Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem*. Geneva, Switzerland: WHO; 2020.

60. Chido-Amajuoyi OG, Osaghae I, Onyeaka HK, Shete S. Barriers to the assessment and recommendation of HPV vaccination among healthcare providers in Texas. *Vaccine X* 2024;18:100471. PUBMED | CROSSREF

61. Ogundipe L, Ojo T, Oluwadare T, Olayemi E, Oluwafemi F, Oni O, et al. Cervical cancer screening and vaccination: knowledge, awareness, and attitude of female staff in a Nigerian University. *BMC Womens Health* 2023;23(1):218. PUBMED | CROSSREF

62. Swift C, Dey A, Rashid H, Clark K, Manocha R, Brotherton J, et al. Stakeholder perspectives of Australia's national HPV vaccination program. *Vaccines (Basel)* 2022;10(11):1976. PUBMED | CROSSREF

63. World Health Organization (WHO). Cervical Cancer Elimination Initiative. https://www.who.int/initiatives/cervical-cancer-elimination-initiative. Accessed November 23, 2024.

64. Rujumba J, Akugizibwe M, Basta NE, Banura C. Why don't adolescent girls in a rural Uganda district initiate or complete routine 2-dose HPV vaccine series: Perspectives of adolescent girls, their caregivers, healthcare workers, community health workers and teachers. *PLoS One* 2021;16(6):e0253735. PUBMED | CROSSREF

65. Obol JH, Harrison R, Lin S, Obwolo MJ, Richmond R. Perceptions of key informants on the provision of cervical cancer prevention and control programme in Uganda: implication for cervical cancer policy. *BMC Public Health* 2020;20(1):1396. PUBMED | CROSSREF

66. Maseko FC, Chirwa ML, Muula AS. Health systems challenges in cervical cancer prevention program in Malawi. *Glob Health Action* 2015;8(1):26282. PUBMED | CROSSREF

67. D'Anna LH, Hansen M, Mull B, Canjura C, Lee E, Sumstine S. Social discrimination and health care: a multidimensional framework of experiences among a low-income multiethnic sample. *Soc Work Public Health* 2018;33(3):187-201. PUBMED | CROSSREF

68. Mock J, McPhee SJ, Nguyen T, Wong C, Doan H, Lai KQ, et al. Effective lay health worker outreach and media-based education for promoting cervical cancer screening among Vietnamese American women. *Am J Public Health* 2007;97(9):1693-700. PUBMED | CROSSREF

69. Yang H, Li SP, Chen Q, Morgan C. Barriers to cervical cancer screening among rural women in eastern China: a qualitative study. *BMJ Open* 2019;9(3):e026413. PUBMED | CROSSREF

70. Zafar R, Burney A. Overcoming barriers to cervical cancer screening in a developing country like Pakistan. *J Pak Med Assoc* 2022;72(9):1896-7. PUBMED | CROSSREF

71. Torode J, Kithaka B, Chowdhury R, Simelela N, Cruz JL, Tsu VD. National action towards a world free of cervical cancer for all women. *Prev Med* 2021;144:106313. PUBMED | CROSSREF

72. Canfell K, Kim JJ, Brisson M, Keane A, Simms KT, Caruana M, et al. Mortality impact of achieving WHO cervical cancer elimination targets: a comparative modelling analysis in 78 low-income and lower-middle-income countries. *Lancet* 2020;395(10224):591-603. PUBMED | CROSSREF

73. Black E, Richmond R. Prevention of cervical cancer in Sub-Saharan Africa: the advantages and challenges of HPV vaccination. *Vaccines (Basel)* 2018;6(3):61. PUBMED | CROSSREF

74. Cubie HA, Campbell C. Cervical cancer screening - the challenges of complete pathways of care in low-income countries: focus on Malawi. *Womens Health (Lond Engl)* 2020;16:1745506520914804. PUBMED | CROSSREF

75. Beddoe AM. Elimination of cervical cancer: challenges for developing countries. *Ecancermedicalscience* 2019;13:975. PUBMED | CROSSREF

76. Ahuja M, Sharma P, Sarkar A. Universal cervical cancer immunization: India ready for a quantum leap. *J Midlife Health* 2022;13(3):260-2. PUBMED | CROSSREF

77. World Health Organization (WHO). Cervical Cancer Elimination Initiative. https://www.who.int/initiatives/cervical-cancer-elimination-initiative. Accessed March 22, 2024.

78. Attia AC, Wolf J, Núñez AE. On surmounting the barriers to HPV vaccination: we can do better. *Ann Med* 2018;50(3):209-25. PUBMED | CROSSREF

79. Wang H, Jiang Y, Wang Q, Lai Y, Holloway A. The status and challenges of HPV vaccine programme in China: an exploration of the related policy obstacles. *BMJ Glob Health* 2023;8(8):e012554. PUBMED | CROSSREF

80. You T, Zhao X, Pan C, Gao M, Hu S, Liu Y, et al. Informing HPV vaccine pricing for government-funded vaccination in mainland China: a modelling study. *Lancet Reg Health West Pac* 2024;52:101209. PUBMED | CROSSREF

81. Ravinetto R, Henriquez R, Srinivas PN, Bradley H, Coetzee R, Ochoa TJ, et al. Shaping the future of global access to safe, effective, appropriate and quality health products. *BMJ Glob Health* 2024;9(1):e014425. PUBMED | CROSSREF

82. Olubodun T, Balogun MR, Odeyemi AK, Odukoya OO, Ogunyemi AO, Kanma-Okafor OJ, et al. Barriers and recommendations for a cervical cancer screening program among women in low-resource settings in Lagos Nigeria: a qualitative study. *BMC Public Health* 2022;22(1):1906. PUBMED | CROSSREF

83. de Fouw M, Stroeken Y, Niwagaba B, Musheshe M, Tusiime J, Sadayo I, et al. Involving men in cervical cancer prevention; a qualitative enquiry into male perspectives on screening and HPV vaccination in Mid-Western Uganda. *PLoS One* 2023;18(1):e0280052. PUBMED | CROSSREF

84. Roy S, Shankar A. HPV vaccination of girl child in India: Intervention for primary Prevention of cervical cancer. *Asian Pac J Cancer Prev* 2018;19(9):2357-8. PUBMED | CROSSREF

85. Umeh IB, Nduka SO, Ekwunife OI. Mothers' willingness to pay for HPV vaccines in Anambra state, Nigeria: a cross sectional contingent valuation study. *Cost Eff Resour Alloc* 2016;14(1):8. PUBMED | CROSSREF

86. Kpokiri EE, Wapmuk AE, Obiezu-Umeh C, Nwaozuru U, Gbaja-Biamila T, Obionu I, et al. A designathon to co-create HPV screening and vaccination approaches for mothers and daughters in Nigeria: findings from a community-led participatory event. *BMC Infect Dis* 2024;24(1):606. PUBMED | CROSSREF

87. Bruni L, Albero G, Serrano B, et al. *Human Papillomavirus and Related Diseases in Nigeria, Summary Report (10 December 2018)*. Seattle, WA, USA: ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre); 2018.