

Pharmacists' Role in HPV Vaccine Uptake Among Women: A Scoping Review of Interventions and Barriers

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Abstract: Human papillomavirus (HPV) is a leading cause of cervical cancer among women worldwide. Although HPV vaccination is proven to be safe and effective, global coverage remains suboptimal, with substantial disparities between high-income and lower-middle-income countries. Recent evidence indicates that HPV vaccine uptake in upper-middle-income countries is considerably higher than in lower-middle-income countries, reflecting persistent inequities in vaccine access. Pharmacists, as accessible and trusted healthcare professionals, have been increasingly recognized for their potential roles in supporting HPV vaccination through education, counseling, and vaccine administration. This scoping review, conducted in accordance with the PRISMA-ScR framework, aimed to explore how pharmacists influence HPV vaccine uptake among women by identifying their roles, assessing their impact on vaccination-related outcomes, and examining implementation challenges. A comprehensive search of PubMed and Scopus databases was performed. A total of 24 studies were included in this review. The majority of studies originated from high-income countries, particularly the United States, where pharmacists are authorized to provide immunization services. Nine studies reported pharmacist-led interventions such as public education, individualized counseling on the importance of vaccination for parents/caregivers, outreach messaging, and vaccine administration, which demonstrated improvements in awareness, vaccination intent, and HPV uptake. The remaining studies assessed pharmacists' knowledge, attitudes, readiness, and perceived barriers related to the provision of immunization services, including limited training, unclear legal authority, and workload constraints. Overall, this review underscores the important contribution of pharmacists in HPV vaccination delivery. When adequately supported by education, infrastructure, and policy, pharmacists can serve as key partners in expanding equitable access to HPV vaccination and advancing cervical cancer prevention.

Keywords: HPV vaccination, pharmacists, women's health, community pharmacy, vaccine uptake

Introduction

HPV is a small, non-enveloped virus with a circular double-stranded DNA genome of approximately 8 kilobases.¹ The genome is divided into three main regions: the early genes (E1, E2, E6, E7, etc.), which regulate viral replication and cell transformation; the late genes (L1 and L2), which encode structural proteins of the viral capsid; and the non-coding long control region (LCR), which governs transcriptional regulation and replication.² Among these, the E2 protein plays a pivotal role as the key regulator of viral replication and the expression of oncogenic proteins such as E6 and E7, making it a critical factor in HPV-associated carcinogenesis.³ HPV is one of the most prevalent sexually transmitted infections worldwide and is recognized as the leading cause of cervical cancer in women. Beyond cervical cancer, HPV is also implicated in the development of other malignancies, including anal, penile, and certain head and neck cancers.⁴ In 2022, nearly 94% of deaths due to cervical cancer occurred in low- and middle-income countries, where health services are less accessible and vaccination and screening remain limited.² Evidence from a recent systematic review demonstrates a substantial disparity in HPV vaccination uptake, with coverage rates average approximately 71.7% in upper-middle-income countries compared to only 46.4% in lower-middle-income settings.⁵ In May 2018, the WHO launched

the Cervical Cancer Elimination Initiative, and in August 2020, adopted a global strategy including the 90-70-90 targets by 2030, 90% of girls vaccinated by age 15, 70% of women screened by age 35 and 45, and 90% of women identified with precancer or invasive cancer receiving treatment all essential to eliminate cervical cancer as a public health problem.¹ Meeting these targets could avert over 74 million new cervical cancer cases globally and drastically reduce cancer mortality in women, particularly in underserved populations.

Despite the proven safety and over 90% efficacy of prophylactic HPV vaccines in preventing infections with HPV 16 and HPV 18 who are responsible for about 70% of cervical cancer cases, vaccine coverage remains below target in many regions. Women continue to bear this preventable cancer burden, especially in settings with poor awareness, healthcare access barriers, high cost, and vaccine hesitancy. Within this context, community pharmacists, trusted and accessible healthcare professionals could play a pivotal role in increasing HPV vaccine uptake among women and adolescent girls, especially in areas with limited primary care infrastructure. The scope of pharmacists' authority to provide vaccination services is shaped by regional and national health policies, which differ considerably across jurisdictions. In the United States, pharmacists' authority to administer the HPV vaccine varies substantially across states. Most states (80%) allow pharmacists to vaccinate adult women, whereas only 61% permit vaccination for adolescents aged 12 years, with authorization mechanisms ranging from physician–pharmacist collaborative protocols to independent practice.⁶ In France, extending prescribing and administration competencies to pharmacists led to projected improvements in vaccine coverage and economic and organizational benefits, supporting adolescent and adult access to HPV vaccination.⁷

In contrast, in many low- and middle-income countries, pharmacists' roles remain largely confined to patient education and referral on HPV vaccine due to restrictive regulatory frameworks and insufficient healthcare infrastructure. Among South Asian countries, India has one of the highest burdens of cervical cancer, with an ASR of 18.7%, second only to the Maldives (24.5%), while Iran reports the lowest rate (2.33%). Despite the availability of HPV vaccines in India since 2008, uptake remains remarkably low. The challenges surrounding HPV vaccination implementation are multifactorial, encompassing socio-cultural norms, healthcare system limitations, and political considerations. The situation was further exacerbated in 2010 when media reports linked several deaths to HPV vaccination, leading to the suspension of two national vaccination programs and triggering widespread public concern about vaccine safety. Despite India's high disease burden, no formal regulatory framework currently authorizes pharmacists to administer HPV vaccines, largely due to persisting concerns similar to those observed in the rollout of other national immunization programs.⁸

This variation in regulatory scope is further reflected in evidence from LMICs. A recent systematic review by Yemeke et al identified 25 studies across 25 LMICs, revealing that pharmacists most commonly contributed to vaccine advocacy and education ($n = 15$ countries), with fewer reports of direct vaccine administration or storage in community pharmacies ($n = 8$ countries). Only a limited number of countries documented pharmacist training in immunization, access to vaccination records, or participation in adverse event reporting. Collectively, these findings highlight that although pharmacists in LMICs possess strong potential to enhance vaccine delivery, their involvement remains inconsistently implemented and underreported. Notably, the review encompassed various types of vaccines including influenza, hepatitis, and HPV, indicating that the limited integration of pharmacists into immunization programs reflects broader systemic and regulatory challenges, rather than issues specific to a single vaccine type. This underscores the urgent need for stronger regulatory frameworks and structured inclusion of pharmacists within national vaccination strategies.⁹

Qualitative research further supports this expansion: adults, mostly women aged 18–45, reported that convenience, trust, and knowledge of pharmacy-based vaccination influenced their willingness to receive HPV vaccines in pharmacies. However, barriers such as low awareness of pharmacists' expanded role, stigma, privacy concerns, and lack of follow-up reminders remain common.¹⁰ Additionally, pharmacists' own perceived barriers, including vaccine cost, reimbursement challenges, and their need for more education on HPV, have been reported in systematic reviews.¹¹ COVID-19 pandemic has profoundly affected global health systems, disrupting routine healthcare delivery, including preventive and reproductive health services. These disruptions have influenced vaccination programs, screening initiatives, and access to essential care in many countries. Histopathological reviews report extrapulmonary effects of SARS-CoV-2, including changes in reproductive tissues, which provides biological justification for considering the pandemic's indirect impact on HPV prevention efforts.¹²

Collectively, these studies underscore that community pharmacists are underutilized yet promising actors in cervical cancer prevention, particularly for women. However, to date, no comprehensive scoping review has mapped the breadth of evidence on pharmacist-led HPV vaccination initiatives targeting women's cervical cancer prevention globally. A scoping review approach was selected instead of a systematic review to comprehensively map diverse evidence and highlight existing knowledge gaps that warrant further investigation. A previous review by Le et al focused on pharmacists' roles in increasing uptake of vaccines such as influenza, pneumococcal, herpes zoster, and Tdap across various settings, but did not specifically address HPV vaccination.¹³ Oyedemi et al¹¹ examined pharmacists' barriers to HPV vaccination but did not explore their active roles in promoting uptake or intervention strategies, and the review was limited to six studies conducted in the US. These gaps highlight the need to explore pharmacists' roles in HPV vaccination programs across diverse contexts and their impact on vaccination cover.

Methods

This scoping review was conducted to explore and map existing literature regarding the roles and interventions of pharmacists in HPV vaccination programs. This review was conducted in accordance with the Joanna Briggs Institute (JBI) methodological framework for scoping reviews.¹⁴ A scoping review design was chosen to allow a broader mapping of heterogeneous evidence and to identify knowledge gaps for future research. The reporting process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) to ensure methodological transparency and reproducibility.¹⁵ The research question was developed using the Population–Concept–Context (PCC) framework, formulated as follows: How do pharmacists influence HPV vaccine uptake among women across different healthcare settings, and what roles, outcomes, perspectives, readiness, and implementation challenges have been reported in the existing literature? In this framework, the Population (P) included women and relevant decision-makers such as parents or guardians, although the review focused on women, some included studies involved parents or mixed populations, as these groups influence women's vaccination decisions; the Concept (C) focused on pharmacists' roles, interventions, and their perspectives, readiness, and challenges toward HPV vaccine administration and service delivery; and the Context (C) encompassed global healthcare settings, including both high-income and low- and middle-income countries.

The literature search was performed using the PubMed and Scopus database to identify relevant articles published up to 2025. The search strategy using PubMed included a combination of keywords such as (“Papillomavirus Vaccines”[MeSH Terms] OR “HPV vaccination”[tiab] OR “HPV vaccine”[tiab] OR “human papillomavirus vaccine”[tiab]) AND (“Pharmacists”[MeSH Terms] OR “pharmacist”[tiab] OR “pharmacists”[tiab] OR “pharmacy”[tiab] OR “community pharmacy”[tiab] OR “community pharmacist”[tiab]) to refine the results. The search strategy using Scopus included a combination of keywords such as TITLE-ABS-KEY (“Papillomavirus Vaccines” OR “HPV vaccination” OR “HPV vaccine” OR “human papillomavirus vaccine” OR “Pharmacists” OR “pharmacist” OR “pharmacists” OR “pharmacy” OR “community pharmacy” OR “community pharmacist”). Studies were considered eligible if they (1) involving pharmacists or pharmacy-based settings in any role related to HPV vaccination, (2) evaluated pharmacists' interventions such as education, training, or promotional programs, (3) assess pharmacists' perspectives, readiness, and challenges toward HPV vaccine administration and service delivery, and (4) Eligible studies included those assessing pharmacists' roles as educators, counselors, or vaccinators related to HPV vaccination among women, adolescents, or parents/guardians. Studies were excluded if they (1) did not involve pharmacists or pharmacy settings, (2) focused on pharmacy students, (3) addressed vaccines other than HPV, (4) non-English publications, and (5) conference abstracts without full-text availability, literature/systematic reviews, and editorials were also excluded. The literature search was conducted by W.N.I and A.N.H. AN.H. independently screened titles and abstracts against the eligibility criteria and subsequently assessed the full texts of studies meeting the inclusion standards. To ensure consistency and methodological rigor, the screening process and inclusion decisions were discussed and verified with W.N.I. Data extraction was performed by the primary reviewer A.N.H. and cross-checked by W.N.I to ensure accuracy and reliability.

Results

Literature Search and Study Characteristics

A comprehensive electronic search was performed across two databases, PubMed and Scopus. From PubMed, a total of 104 records were identified. After title and abstract screening, 60 records were excluded for not meeting the inclusion criteria, leaving 44 full-text articles for detailed assessment. Of these, 27 articles were excluded due to irrelevant context or conceptual focus, resulting in 18 studies that met the inclusion criteria. From Scopus, 596 records were retrieved. Following screening, 571 were excluded, leaving 25 potentially relevant articles. Among these, 13 overlapped with studies already identified in PubMed. Consequently, 12 unique full-text articles were reviewed, of which 6 were included and 6 were excluded after full-text evaluation. In addition, one study was identified through citation searching, bringing the total number of included studies to 25. The search and selection process is detailed in [Figure 1](#). The included studies, as outlined in [Table 1](#), exhibit considerable heterogeneity in both study design and geographical distribution. Most studies were conducted in the United States and predominantly employed cross-sectional designs, with fewer studies adopting retrospective cross-sectional, quasi-experimental, prospective pre-post intervention, or qualitative approaches.

Among the included studies, nine specifically examined pharmacist-led interventions related to HPV vaccination ([Table 2](#)). While the included studies consistently indicate that pharmacist-led interventions enhance HPV vaccine awareness, willingness, and in some cases uptake, the strength of evidence varied substantially across study designs. Quasi-experimental and randomized controlled trials ($n=33$)¹⁷ demonstrated measurable improvements in vaccination rates following multifaceted interventions, including EHR messaging and pharmacist-administered vaccination, providing the strongest empirical support within the current evidence base. However, these studies were often limited by small sample sizes and localized implementation. Prospective pre-post and descriptive studies primarily assessed changes in knowledge and intention to vaccinate, offering valuable indications of short-term educational effects but lacking the methodological controls necessary to establish causality. Cross-sectional and qualitative studies contributed important contextual information on pharmacists' readiness, perceived barriers, and public attitudes, although their inferential capacity was limited. Mixed-methods research combined quantitative outcomes with qualitative perspectives, enhancing interpretive depth but constrained by heterogeneity in study design and scale. Overall, the evidence derived from diverse methodologies underscores that pharmacist involvement in HPV vaccination has shown positive trends across different contexts, yet the degree of causal inference and generalizability differs according to study design and rigor.

The remaining 19 studies explored pharmacists' perspectives, readiness, and perceived barriers to HPV vaccine provision ([Table 3](#)). Evidence from cross-sectional studies conducted in multiple countries, including the United States, France, Italy, and Jordan, primarily revealed limited readiness and persistent knowledge gaps among pharmacists, alongside barriers such as parental hesitancy and lack of educational materials. These studies provided broad but descriptive data and did not establish causal relationships. In contrast, qualitative and semi-structured studies offered more in-depth insights into contextual challenges, including logistical limitations, consent procedures, and stigma associated with HPV vaccination, particularly in rural and resource-limited settings. A double-blind randomized controlled trial in Japan²⁶ provided stronger evidence of causality, showing that educational interventions increased pharmacists' willingness to recommend the HPV vaccine; however, motivation declined over time without continued reinforcement. Mixed-methods and secondary analyses complemented these findings by identifying broader system-level constraints, such as inadequate demand, absence of electronic reminder systems, and low patient engagement. Collectively, these studies varied in methodological rigor, with experimental and mixed-methods designs offering stronger evidence of impact, while cross-sectional and qualitative studies contributed valuable contextual understanding. Notably, evidence from Jordan,²⁷ representing a low- and middle-income country, underscored informational and structural barriers that limit the implementation of pharmacist-led HPV vaccination initiatives.

Effectiveness of Pharmacist-Led Interventions in Enhancing HPV Vaccination Uptake

Nine studies were included to evaluate the roles and interventions of pharmacists in promoting HPV vaccination across different settings and countries. The majority of studies employed prospective or quasi-experimental designs and were conducted predominantly in the United States, with one study each from Serbia and Puerto Rico. Interventions

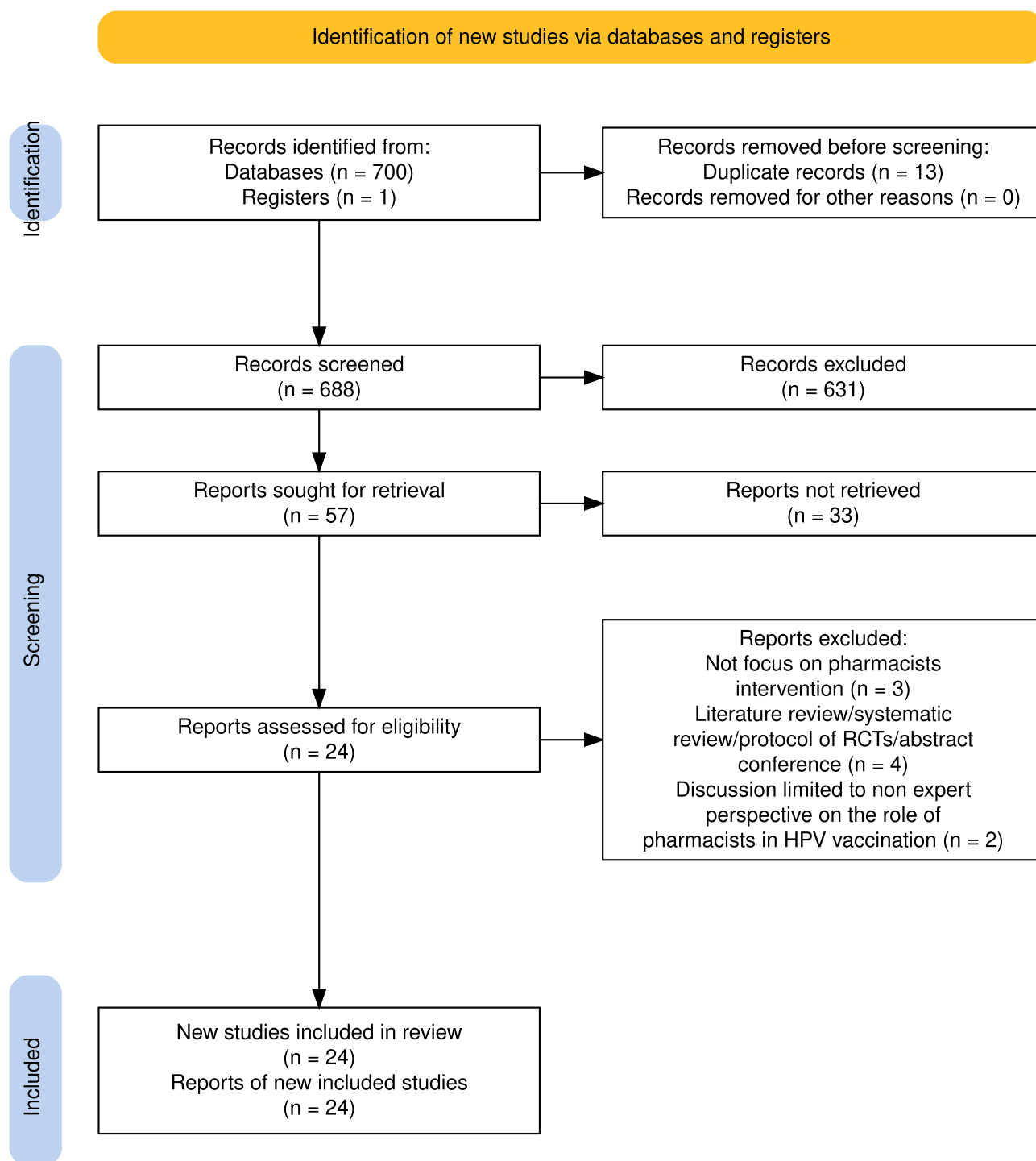


Figure 1 PRISMA 2020 Flow Diagram. The flow diagram was developed following the PRISMA-ScR guideline.¹⁶

implemented by pharmacists varied in approach, including group education sessions, individualized counseling, follow-up communication, outreach messaging via EHR, and direct administration of the vaccine.

All included studies demonstrated a positive impact of pharmacist-led initiatives in improving awareness, vaccination intent, and vaccine uptake. For instance, one study ($n = 24,327$ subjects were educated during the program's implementation)¹⁸ reported that pharmacy-based counseling significantly increased parents' willingness to vaccinate their children, with female participants exhibiting higher levels of HPV-related knowledge. Similarly, another study ($n = 33$ parents/guardians attended an

Table 1 Overview of the Included Studies

Characteristic	Type	Frequency	Percentage
Geographical Location	USA	16	66.68%
	Serbia	1	4.16%
	France	2	8.34%
	Japan	2	8.34%
	Italy	1	4.16%
	Jordan	1	4.16%
	Puerto Rico	1	4.16%
	Total	24	100%
Study Design	Cross-sectional	11	45.83%
	Retrospective cross-sectional	1	4.16%
	Descriptive prospective	2	8.34%
	Quasi-experimental	1	4.16%
	Prospective pre-post intervention	1	4.16%
	Mixed-method (retrospective+prospective)	1	4.16%
	Mixed-method (quantitative+qualitative)	1	4.16%
	Quasi-experimental time-series	1	4.16%
	Randomized control trial	2	8.34%
	Qualitative	3	12.5%
	Total	24	100%

Table 2 Role of Pharmacist in HPV Vaccination (n=9)

Reference	Country	Study Design	Pharmacist Intervention	Outcomes
[18]	Serbia	Retrospective cross-sectional	Education and counseling	42.3% of parents were willing to vaccinate their children after pharmacy-based counseling; female participants showed higher knowledge levels.
[19]	Puerto Rico	Descriptive prospective	Phone calls, messaging, and individual counseling	Only 4 out of 200 participants received the vaccine; major barriers included time, transport, and low patient engagement.
[20]	United States	Quasi-experimental	Provider education and direct EHR messaging	First-dose vaccination rates in 9–10-year-olds increased from 0.5% to 12.8% post-intervention; direct messaging significantly boosted uptake.
[21]	United States	Prospective pre-post intervention	Group education sessions	Intent to vaccinate increased from 35% to 44%; awareness of pharmacy-based vaccination rose from 32% to 100%.
[22]	United States	Mixed-method (retrospective + prospective)	Education, follow-up, and vaccination administration	48.3% of participants completed the three-dose series; significant knowledge gaps about HPV transmission and vaccine timing were observed.

(Continued)

Table 2 (Continued).

Reference	Country	Study Design	Pharmacist Intervention	Outcomes
[23]	United States	Quasi-experimental time-series	Multimodal education	No vaccines were dispensed during the control period; 10 participants received HPV vaccines post-intervention, mostly influenced by pharmacist recommendations.
[17]	United States	Randomized Controlled Trial	Administered HPV vaccine	Among the intervention group, 3 of 8 participants completed vaccination with community pharmacists; several expressed positive attitudes toward pharmacist-administered vaccination.
[24]	United States	Qualitative	Administered and promoted HPV vaccine	Only one pharmacist reported offering the HPV vaccine; others expressed willingness to educate or refer patients.
[25]	United States	Mixed methods (quantitative + qualitative)	Administered HPV vaccine, parent education, and coordination with primary care clinics.	Across five US states, only 16 HPV vaccine doses were administered (13 to adolescents, 3 to young adults).

Table 3 Pharmacists' Readiness, Perceptions, and Barriers in HPV Vaccination Practice (N=19)

Reference	Country	Study Design	Reported Barriers	Readiness to Promote HPV Vaccination
[28]	United States	Cross-sectional	Limited pharmacist knowledge, understaffing, lack of parental awareness, and materials	Low readiness; pharmacists expressed the need for more training
[29]	United States	Qualitative	Parental consent, vaccine stigma, and dose tracking challenges	Moderate readiness; pharmacists felt comfortable administering
[30]	United States	Semistructured qualitative	Financial constraints, regulatory barriers, and vaccine bulk-purchasing requirements	Not reported
[31]	United States	Cross-sectional	Time, lack of reimbursement, and insufficient incentives	High readiness when regulations are clearly defined
[32]	France	Cross-sectional	Historical concerns about adverse events	Readiness not assessed
[33]	Italy	Cross-sectional	Lack of knowledge and experience	Low readiness, positive attitudes, but need more training
[34]	United States	Cross-sectional	Low patient demand, cost, vaccine expiration, and low parental awareness	Low readiness; training needed to improve self-confidence
[35]	United States	Cross-sectional	Parental consent, stigma, absence of reminder systems	Not reported
[26]	Japan	Double-blind RCT	Decline in motivation 28 days post-education	The educational intervention improved pharmacists' willingness
[36]	France	Cross-sectional	Lack of time, need for training, digital alerts, and educational materials	High readiness; promotional practice is limited in reality
[37]	United States	Prospective descriptive	Knowledge gaps among healthcare providers	Low readiness; few participants supported vaccination
[30]	United States	Cross-sectional	Low demand, insufficient parental education, and consent	Low readiness; did not recommend HPV vaccination
[18]	Serbia	Cross-sectional	Lack of parental consent and awareness	High readiness after receiving adequate training and resources

(Continued)

Table 3 (Continued).

Reference	Country	Study Design	Reported Barriers	Readiness to Promote HPV Vaccination
[27]	Jordan	Cross-sectional	Lack of parental knowledge, insufficient educational materials for parents, and inadequate pharmacists knowledge	Not reported
[17]	United State	Randomized Controlled Trial	Inadequate insurance coverage for pharmacist - administered vaccines and limited HPV vaccine availability	Not reported
[38]	Japan	Cross-sectional	There are knowledge gaps depending on sex, age, and experience, misinformation from media coverage, and lack of national recommendation continuity	Low readiness; pharmacists had not received training or opportunities to participate directly in HPV vaccination programs
[39]	United States	Qualitative	Lack of parental awareness and education	Moderate readiness; partnership between primary care clinics and community pharmacies is considered a promising strategy to enhance HPV vaccination rates.
[24]	United States	Qualitative	Personal barriers such as limited information and lack of time and staff,	Low readiness; Only one pharmacist had implemented HPV vaccination in practice.
[25]	United States	Mixed methods (quantitative + qualitative)	Low parental demand and awareness, limited pharmacist staff and time, lack of financial reimbursement	Not reported

educational session)²¹ found that group educational sessions not only improved parents' awareness of HPV vaccination but also enhanced their recognition of community pharmacies as valid vaccine providers.

Notably, one study (n=367 patients aged 9 and 10 years were eligible for HPV vaccination)²⁰ implemented a multifaceted intervention incorporating provider education and EHR-based parental messaging. This led to a statistically significant increase in first-dose HPV vaccination rates among children aged 9 to 10 years, from 0.5% to 12.8%. The combination of direct messaging and supportive educational materials appeared especially effective in facilitating informed parental decisions and minimizing vaccine hesitancy. Similarly, Navarrete et al (n= 203; 167 administered by SHC pharmacist; 36 administered by another health care professional at another location)²² found that 48.3% of participants completed the three-dose vaccination series after receiving education, follow-up, and direct vaccination services from pharmacists. Conversely, some studies highlighted operational challenges despite pharmacist involvement. One study (n=200; 100 patients were called to get individual counseling and receive written educational materials; 29 patients were reached; 7 received the educational intervention)¹⁹ reported limited success in actual vaccine uptake following phone-based counseling and educational sessions, primarily due to barriers such as transportation, time constraints, and low patient engagement. These findings underscore the importance of tailoring outreach methods to the specific needs and preferences of target populations.

Several studies also demonstrated the feasibility of pharmacists providing longitudinal support through follow-up interventions. One study²² emphasized the value of reminder calls and tailored education in improving completion rates of the HPV vaccine series among university students, although knowledge gaps regarding transmission and vaccine timing remained prevalent. Collectively, these findings confirm that pharmacists, through accessible and strategic interventions, can significantly contribute to increasing HPV vaccine awareness and acceptance, particularly when communication is patient-centered, sustained, and supported by system-based tools such as EHR.

Pharmacists' Readiness, Perceptions, and Barriers in HPV Vaccination Practice

Nineteen studies explored pharmacists' perspectives, perceived barriers, and readiness to engage in HPV vaccination programs. Most employed cross-sectional surveys, with a few utilizing qualitative or mixed-method approaches. The predominant countries represented were the United States, France, Italy, Japan, and Serbia. The most frequently reported challenges included insufficient pharmacist knowledge and training, lack of patient demand, time constraints, reimbursement issues, and regulatory or logistical barriers. For example, studies (n= 550; 389 completed to the survey)³³ and (n= 2802; 361 responded to the survey)²⁸ identified limited HPV-specific knowledge and low self-efficacy among pharmacists, which contributed to reduced confidence in providing counseling. Additionally, other studies (n=350; 154 completed to the survey)³⁴ and (n=304; 27 completed to the survey)³⁵ emphasized systemic limitations such as the absence of reminder systems and difficulties in securing parental consent, particularly in pediatric populations.

Interestingly, despite these barriers, several studies reported moderate to high levels of willingness among pharmacists to recommend and administer the HPV vaccine, contingent upon adequate training and regulatory support. For instance, studies (n= 3000; 215 completed to the survey)³⁶ and (n=9502; 1600 completed to the survey)³¹ highlighted that pharmacists expressed high readiness when legal and institutional frameworks were clearly defined. In these studies, pharmacists demonstrated greater comfort in providing the vaccine when supported by educational programs, digital tools, and streamlined workflows. Cultural and temporal dynamics also influenced outcomes. In Japan, one study (n= 141; 124 pharmacists into an intervention and a control group)²⁶ found that although educational interventions initially enhanced pharmacists' willingness to recommend the vaccine, this effect diminished over time, indicating the need for continuous professional reinforcement. Similarly, another study (n= 24,327 subjects were educated during the program's implementation)¹⁸ reported that Serbian pharmacists who underwent targeted HPV training exhibited significantly improved readiness to engage in vaccination services.

Overall, the evidence reveals a gap between pharmacists' potential role and their actual engagement in HPV vaccine delivery, largely influenced by systemic, educational, and regulatory factors. Addressing these gaps through sustained training, institutional support, and patient education is essential to fully integrate pharmacists into national HPV immunization strategies.

Discussion

This scoping review underscores the dual role of pharmacists in HPV vaccination programs: educating the public and administering the vaccine. As educators, pharmacists provided counseling, educational outreach, reminders, and communication to patients and parents. As vaccinators, they directly administered vaccines in pharmacy-based settings.^{18,21,22} Readiness to perform these roles varied depending on local regulations, prior experience, and the availability of training, with pharmacists showing higher engagement when supported by systemic infrastructure and clear protocols.^{28,31} Pharmacists' roles in HPV vaccination differ substantially between HICs and LMICs. In HICs settings such as the United States, pharmacists are authorized to directly administer vaccines, supported by established reimbursement systems, electronic health records, and standing orders that facilitate vaccination within community pharmacies. These structural enablers contribute to higher vaccination uptake and stronger integration of pharmacists into national immunization frameworks. In contrast, pharmacists in LMICs, such as India, primarily engage in educational and advocacy roles rather than direct vaccine administration. Notably, evidence from Jordan, representing a LMICs, relatively low incidence of cervical cancer among Jordanian women may, in part, be attributed to the country's conservative cultural and religious traditions, which shape attitudes toward sexual health and preventive screening behaviors.⁴⁰ These sociocultural traditions shape women's attitudes toward sexual health and preventive practices, often fostering modesty-related concerns and reluctance to engage in screening programs. Consequently, such norms also extend to perceptions of HPV vaccination, contributing to limited public awareness, hesitancy, and suboptimal vaccine uptake despite its well-established efficacy in preventing HPV-related malignancies. Beyond cultural and religious influences, women's participation in cancer screening and HPV vaccination is determined by a complex interplay of individual, societal, and systemic factors. Key barriers include limited knowledge about cervical cancer prevention, inadequate healthcare infrastructure, the absence or poor implementation of national screening policies, and restricted accessibility to healthcare facilities.⁴¹

Recently, community pharmacists in Jordan were authorized to administer the influenza vaccine—a milestone aimed at strengthening healthcare delivery and increasing vaccination coverage.^{42,43} However, similar advancements have yet to be implemented for HPV vaccination. Evidence from Jordan, representing LMICs, reveals that insufficient parental awareness, limited educational resources, and knowledge gaps among pharmacists collectively hinder efforts to improve HPV vaccine uptake.²⁷ These findings underscore the need for targeted educational initiatives to enhance pharmacists' competence and confidence regarding HPV immunization. Although pharmacists are highly accessible and well positioned to support vaccination programs, their current level of preparedness remains inadequate. Translating attitudinal readiness into consistent vaccination practice will require comprehensive policy support, standardized training programs, and clearer regulatory frameworks to effectively integrate pharmacists into national immunization strategies.

Another barriers frequently cited included limited pharmacists' HPV knowledge, time constraints, insufficient reimbursement, and challenges related to parental consent, especially in the case of adolescent vaccination.^{29,34,36} These findings demonstrate that while pharmacists are well-positioned to contribute to HPV vaccination delivery, structural and educational constraints must be addressed to fully leverage their potential.

Pharmacists have shown substantial success in other immunization programs, particularly with influenza and pneumococcal vaccines, where their roles have been well integrated into public health strategies. In a meta-analysis, it was stated that pharmacists have a major role in increasing the uptake of influenza, pneumococcal, herpes zoster, Tdap vaccinations in any form of intervention. It was stated that the magnitude of the effect of intervention by pharmacists increased overall immunization uptake by up to 51%, while the frequency of immunizations doubled when pharmacists acted specifically as administrators.⁴⁴ For example, in another study that compared total influenza vaccinations in Canada before and after regulatory licensing involving pharmacists as administrators in vaccination. This research states that in the first year after pharmacists were licensed as vaccine administrators, the vaccination coverage rate for children aged 5 years increased by 6%, from 36% in 2012–2013 to 42%.⁴⁵

Parental acceptance plays a crucial role in the success of pharmacist-delivered HPV vaccination initiatives, particularly for adolescents. Studies show that mothers and female guardians often exhibit higher vaccine awareness and willingness to act following pharmacy-based counseling.^{18,21} Nevertheless, concerns regarding vaccine safety, social stigma, and lack of understanding about HPV transmission continue to act as substantial deterrents to vaccine uptake.^{29,35} In another study regarding parents' acceptance in France of a scenario where the pharmacist played a full role in the administration of HPV vaccination, according to some parents (38%), even though the scenario was simple and practical, most parents (66%) still regretted the absence of a general practitioner in this scenario, especially because they felt the doctor provided a sense of security if they had questions or concerns.⁴⁶ These findings indicate that even effective pharmacist interventions can fall short without targeted efforts to improve parental confidence and awareness. Community engagement and culturally sensitive education are, therefore, essential components of any pharmacy-based HPV immunization strategy.

To overcome parental hesitancy, studies have highlighted the effectiveness of pharmacist-led interventions such as personalized counseling, the use of culturally tailored educational materials, and consistent reminder systems through calls or electronic health records.^{20,26} Direct messaging, in particular, showed statistically significant increases in first-dose HPV vaccine uptake, underscoring the value of proactive, accessible communication. Pharmacists who were trained in empathy-based communication reported greater success in addressing vaccine concerns and improving parental consent rates.²⁶ These findings suggest that combining education with system-level tools and interpersonal trust-building techniques can meaningfully address psychosocial barriers. As such, future programs should integrate both structural support and interpersonal strategies to increase effectiveness.

A training program, such as administration training, certification, an on-demand CPE program, and developed online kit has been shown to significantly influence the success of pharmacists in delivering vaccination services. A study by Carroll et al⁴⁷ in Australia on an influenza vaccination training program showed a significant increase in pharmacists' knowledge by 24.4%, clinical skills by 27.1%, and confidence by 80.7%. Another study by Skoy et al⁴⁸ in the United States showed that after training pharmacists, there was an increase in Tdap vaccination uptake of 7.62%, zoster live 5.85%, zoster recombinant 5.56%, pneumococcal conjugate 9.58%, and pneumococcal saccharide 7.72%.

While evidence from this review demonstrates that pharmacist-led interventions can meaningfully enhance HPV vaccine awareness, intent, and uptake, the magnitude of impact varied depending on the intervention design and contextual support. Multi-component strategies that combined education, electronic health record (EHR) reminders, and on-site vaccination demonstrated the most consistent improvement in initiation and series completion rates, suggesting that integrating educational and operational components may be essential to convert vaccine intent into action. In contrast, education or counseling alone, although effective in improving knowledge and attitudes, generally resulted in modest gains in vaccination intent and limited measurable uptake, particularly where structural barriers such as time constraints, cost, and access persisted.

To our knowledge, this is the first scoping review that not only identifies pharmacists' roles in HPV vaccination programs but also assesses the effectiveness of their interventions and the challenges in implementation. Clinically, the findings support expanding pharmacist authority to administer HPV vaccines and integrating vaccination training into standard pharmacy curriculum. Regulatory clarity, financial reimbursement models, and interprofessional collaboration will be essential to support widespread implementation. The findings of this review underscore the need for strengthening system-level enablers to maximize pharmacists' contributions to HPV vaccination programs. Establishing clear legal authority, reimbursement pathways, and inventory management support, such as centralized purchasing systems—would facilitate the sustainable integration of pharmacists into immunization frameworks. Embedding digital reminder systems and EHR messaging, alongside pharmacist-led education and on-site vaccination, can help convert vaccine intention into initiation and completion. Furthermore, sustained training focusing on risk communication, empathy-driven counseling, and culturally sensitive engagement is essential to maintain pharmacist readiness and public trust. Co-designing intervention strategies with communities may also help mitigate stigma and privacy concerns, particularly among adolescents and young women. Collectively, these policy and practice considerations are critical to translating the demonstrated potential of pharmacists into measurable public health gains.

There are several limitations of this review. First, this review did not include a formal quality appraisal of the included studies. This is consistent with the methodological purpose of scoping reviews, which aim to provide an overview of the available evidence and identify research gaps rather than to evaluate study rigor. However, the lack of critical appraisal limits our capacity to assess the strength and reliability of the findings. Second, The variability in study outcomes may also reflect contextual confounders, including concurrent national vaccination campaigns, secular trends in vaccine awareness, and the selection of highly motivated practice sites, which could have amplified observed effects. Furthermore, differences in regulatory scope, resource availability, and public trust across settings contributed to heterogeneity in outcomes and implementation feasibility. Importantly, consent procedures, privacy concerns, and social stigma were identified as pivotal challenges in adolescent vaccination programs. Empathetic, culturally sensitive counseling approaches and reliable digital recall systems have been reported to mitigate hesitancy and improve follow-up compliance, underscoring the value of pharmacist engagement in both education and sustained behavioral reinforcement.

Conclusion

This scoping review comprehensively mapped the roles, interventions, and perceived barriers of pharmacists in HPV vaccination programs across diverse healthcare contexts. Evidence consistently demonstrates that pharmacist-led interventions—such as individualized and group education, direct counseling, reminder messaging, and vaccine administration—positively influence HPV vaccine awareness, intent, and uptake. When adequately supported by regulatory authorization, structured training, and system-level tools such as EHR, pharmacists can serve as accessible and trusted vaccination providers who effectively bridge gaps in preventive healthcare. The findings of this review provide actionable insights for health policy and pharmacy practice by identifying key enablers of pharmacist-led HPV vaccination.

However, several limitations must be acknowledged. Most included studies did not report stratified outcomes by socioeconomic status, rurality, ethnicity, or insurance coverage, limiting the assessment of equity in HPV vaccination access. Future studies should incorporate equity frameworks such as PROGRESS-Plus to better understand how contextual and demographic factors influence pharmacists' involvement in vaccination services. The included studies were predominantly conducted in HICs, limiting the generalizability of findings to LMICs settings where health system

capacity and regulatory frameworks differ substantially. Moreover, methodological heterogeneity, the reliance on cross-sectional designs, and the use of a limited number of databases may constrain the strength of evidence and introduce potential publication bias. Therefore, caution is warranted when extrapolating these findings to broader populations or different health system contexts. While current evidence supports pharmacists' contribution to HPV vaccination, future research should employ broader searches, standardized frameworks, and implementation-focused designs to strengthen the evidence base and inform scale-up across diverse health systems.

Future research should focus on addressing these evidence gaps through well-designed studies in LMICs, with particular emphasis on cost-effectiveness, equity, and cultural acceptability of pharmacist-led vaccination programs. Additionally, standardized outcome measures and rigorous evaluation frameworks are needed to strengthen evidence comparability. Policymakers and public health authorities should prioritize the inclusion of pharmacists in national immunization strategies, supported by training, legal empowerment, and sustainable financing mechanisms. By strategically integrating pharmacists into multidisciplinary vaccination initiatives, healthcare systems can advance equitable access to HPV prevention and contribute meaningfully to the global goal of cervical cancer elimination.

Abbreviations

ASR, age-standardized incidence rate; COVID-19, coronavirus disease 2019; EHR, electronic health record; HICs, high-income countries; HPV, human papillomavirus; JBI, Joanna Briggs Institute; LCR, long control region; LMICs, low- and middle-income countries; MMAT, Mixed Methods Appraisal Tool; PCC, Population–Concept–Context; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PRISMA-ScR, PRISMA extension for Scoping Reviews; RCT, randomized controlled trial; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; WHO, World Health Organization.

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Disclosure

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