Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 3s, https://carcinogenesis.com/

Knowledge, Attitude, and Practice of HPV vaccination in prevention of Cervical Cancer among Indian females of reproductive age group: A narrative review

Amrit Podder[1]*, Priyanka Karumuri[2], Jayballabh Kumar[1], Ashwani Sharma[1], Jyoti P Khodnapur[3], Sumangala M Patil[3], Devesh Kumar[4], Arkajit Dasgupta[5], Manjunatha R Aithala[6]

[1]Department of Physiology, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[2]Chief Consultant, Nirmala Hospital & IVF Clinic, Ichchapuram, Srikakulam, Andhra Pradesh, India

[3]Department of Physiology, Shri B M Patil Medical College, Hospital & Research Centre, BLDE (Deemed to be) University, Vijayapura, Karnataka, India

[4]Department of Physiology, Autonomous State Medical College, Shahjahanpur, Uttar Pradesh, India

[5]Department of Biochemistry, Teerthanker Mahaveer Medical College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

[6]Department of Physiology, Al Ameen Medical College, Vijayapura, Karnataka, India

***Corresponding Author**

Email Id: amritpodder0@gmail.com

ORCID Id: 0000-0002-9816-3347

ABSTRACT

Cervical cancer remains a major cause of morbidity and mortality among Indian women despite being largely preventable through human papillomavirus (HPV) vaccination and screening. Over the past 15 years, India has seen variable progress in HPV vaccination awareness, attitudes, and uptake. This narrative review synthesizes peer-reviewed studies, systematic reviews, program documents, and Government of India notifications to examine the knowledge, attitudes, and practices (KAP) relating to HPV vaccination in Indian females of reproductive age and to identify barriers and facilitators to effective rollout. We searched major databases and grey literature covering PubMed/PMC, Scopus, DOAJ, Google Scholar and government releases, focusing on KAP studies, implementation pilots, policy milestones, and syntheses. Key findings of our review are evident that knowledge about HPV and its vaccine is heterogeneous as many studies report low-to-moderate awareness, higher among urban, educated and health professional groups and lower among rural and low literacy groups. Attitudes are often receptive when adequate information is provided, but concerns about safety, cost, cultural acceptability and misinformation reduce acceptance. Reported vaccine uptake prior to national rollout was very low (pooled estimates <10% in several systematic reviews), though pilot programmes (e.g., Sikkim) demonstrated high coverage when school-based, state-supported campaigns were used. Major policy milestones occurred in 2022–2023, including national decisions to prioritize HPV vaccination and the availability of an indigenously produced, lower cost vaccine, which create favorable conditions for rapid expansion. We highlight gaps in population level awareness, health worker training, communication strategies, equitable access, and monitoring. Recommendations from our review may include but not limited to school-based delivery, community engagement, provider education, cost-reduction strategies, tracking systems, and research on long-term impact.

Keywords: *HPV, cervical cancer, vaccine, knowledge, attitude, practice, India*

How to Cite: Amrit Podder, Priyanka Karumuri, Jayballabh Kumar, Ashwani Sharma, Jyoti P Khodnapur, Sumangala M Patil, Devesh Kumar, Arkajit Dasgupta, Manjunatha R Aithala, (2025) Knowledge, Attitude, and Practice of HPV vaccination in prevention of Cervical Cancer among Indian females of reproductive age group: A narrative review, *Journal of Carcinogenesis, Vol.24, No.3s*, 1-6.

1. INTRODUCTION

Cervical cancer is an eminently preventable disease, yet it continues to be a leading cause of cancer morbidity and mortality among women in low- and middle-income countries (LMICs), including India. Persistent infection with oncogenic human papillomavirus (HPV) types (notably 16 and 18) accounts for the majority of cervical cancers worldwide. Prophylactic HPV vaccines (bivalent, quadrivalent, and nonavalent) have shown high efficacy in preventing infection and precancerous lesions due to vaccine HPV types and form a cornerstone of primary prevention strategies complemented by effective screening programs. The World Health Organization (WHO) has set an ambitious 2030 global cervical cancer elimination target that includes 90% of girls fully vaccinated with HPV vaccine by 15 years of age, 70% of women screened, and 90% of women with precancerous or cancerous lesions having access to treatment targets that require rapid scale-up of vaccination and screening activities globally and in India [1].

In India, the epidemiologic burden of cervical cancer has historically been high, with substantial regional heterogeneity. Since HPV vaccines became available in India (first marketed in 2008), their uptake has been limited by cost, programmatic complexity, controversies around pilot projects, and by variable community and provider awareness and acceptance. Several states (notably Sikkim and Punjab) implemented state-level HPV vaccination programmes with high uptake among targeted cohorts, demonstrating proof of concept that school-based, state-funded approaches can achieve high coverage. National policy momentum increased between 2021–2023. India's National Technical Advisory Group on Immunization (NTAGI) recommended HPV vaccine introduction into the Universal Immunization Program (UIP) and the Government has prioritized HPV vaccination in recent health budgets and press communications; in parallel an indigenously manufactured HPV vaccine (CERVAVAC/CERVAVAX produced by Indian manufacturers) was approved/announced, improving prospects for affordable programmatic scale-up [2, 3, 4].

A comprehensive understanding of the population's knowledge, attitude and practices (KAP) around HPV vaccination is essential for successful program design and scale-up. KAP studies identify gaps in awareness, misconceptions, sociocultural barriers and operational constraints, and can inform targeted health education, demand generation, and delivery strategies. Multiple KAP surveys and qualitative studies over the last decade document widely varying levels of awareness and acceptability often linked to education, urbanicity, socioeconomic status and exposure to health education. Systematic syntheses suggest a pattern of modest knowledge, generally favorable attitudes when information is provided, but persistently low vaccine coverage until recent programmatic changes [5, 6, 7].

This narrative review synthesizes evidence published from January 2010 to December 2024 from peer-reviewed literature, systematic reviews, implementation reports, and Government of India communications to describe levels of knowledge, attitudes and practices related to HPV vaccination in Indian women of reproductive age and relevant stakeholders (parents, adolescents, health-care providers), identify key barriers and facilitators to vaccine acceptance and uptake, summarize programmatic and policy developments in India that affect vaccine scale-up, and propose prioritized actions to accelerate equitable HPV vaccine coverage in India.

2. MATERIALS AND METHODS

Scope and Objectives: This narrative review covers literature from January 1, 2010 through December 31, 2024 and examines studies, reviews, and official documents addressing knowledge, attitudes, and practices regarding HPV vaccination among Indian females of reproductive age (defined broadly as adolescence through childbearing age) as well as studies involving parents, health-care providers and program implementers when relevant to vaccine KAP and uptake.

Search Strategy: We searched the electronic databases PubMed/PMC, Scopus, DOAJ and Google Scholar for English-language articles published between 2010 and 2024 using combinations of terms including: "HPV vaccination", "human papillomavirus vaccine", "knowledge", "attitude", "practice", "KAP", "awareness", "acceptance", "uptake", "coverage", and "India". We supplemented database searches with targeted searches for systematic reviews and meta-analyses, government press releases and policy documents (Ministry of Health and Family Welfare, NTAGI recommendations, press information bureau), and implementation reports from state programmes and international partners (WHO, Gavi, etc.). Search terms and strategy were intentionally broad to capture diverse study designs (cross-sectional KAP surveys, qualitative studies, implementation evaluations, and policy documents). We manually scanned reference lists of relevant reviews and major primary studies for additional sources.

Inclusion and Exclusion Criteria: We included cross-sectional surveys of knowledge/attitudes/practices among adolescents, young women, parents, and health professionals; qualitative studies exploring barriers/facilitators; implementation/pilot evaluations; systematic reviews/meta-analyses with Indian data; and Government of India notifications and press releases relevant to HPV vaccine policy and rollout in India. Excluded were case reports, studies with no Indian data, and articles outside the 2010–2024 window.

Data extraction and Synthesis: For included studies we abstracted information on population, setting (urban/rural; state), sample size, key KAP metrics (e.g., percent aware of HPV, percentage willing to accept vaccine, actual uptake/coverage), reported barriers and facilitators, and interventions examined (e.g., health education, school-based delivery). We synthesized findings thematically (knowledge, attitude, practice/uptake, and policy/program context) and highlighted temporal trends and illustrative program experiences (e.g., Sikkim, pilot activities) and policy milestones (NTAGI recommendations, introduction of an indigenously produced vaccine and inclusion plans). Limitations of the underlying literature (heterogeneity of measures, non-representative samples, publication bias) are addressed in the discussion.

3. RESULTS

Evidence across four interlinked domains are going to be narrated here such as levels of knowledge and awareness; attitudes and perceived acceptability; reported practices and vaccine uptake; and programmatic/policy developments and demonstration projects in India. Representative studies and syntheses are cited in each subsection to anchor the narrative.
Levels of knowledge and awareness: Across India, reported awareness of HPV, its relationship to cervical cancer, and the availability/role of HPV vaccines varies widely. Studies among health-care students and professionals tend to report relatively higher awareness compared with community samples and general female populations. For example, KAP surveys among medical, dental and paramedical students commonly show high awareness of cervical cancer as a public health issue and moderate to high knowledge of HPV as an aetiologic agent and of vaccine existence; however, important knowledge gaps persist (age at vaccination, dosing schedules, vaccine efficacy vs need for screening). Studies among community women and adolescent girls frequently report low awareness, often single digit to low double digit percentages knowing about HPV or the vaccine, although urban and higher education subgroups show higher awareness. Systematic syntheses pooling Indian studies have estimated variable pooled knowledge levels (many studies report inadequate awareness overall) [5, 8, 9].

Qualitative work and survey analyses show that information channels strongly shape awareness are health-care providers, media, school health programs and social networks are principal information sources. Where targeted school or community education was provided (pilot programmes, health education interventions), knowledge improved substantially and was associated with more favorable attitudes. Health-worker knowledge is a critical determinant of program success: studies show that when clinicians and frontline workers understand vaccine benefits, they are more likely to recommend it, which in turn improves parental acceptance. Nonetheless, studies also document persistent misinformation and confusion about vaccine safety and the age/time for vaccination (before sexual debut), pointing to the need for consistent messaging and provider training [10, 11].

Attitudes and perceived acceptability: Attitudes toward HPV vaccination are generally positive when people are informed about vaccine benefits and safety. Multiple Indian studies, and systematic regional syntheses, report that acceptance of HPV vaccination (willingness to vaccinate one's daughter or self) is frequently moderate to high in knowledge-aware populations, even when the same populations have low prior awareness. Attitudinal barriers include concerns about safety and side effects, cultural or moral anxieties about vaccinating pre-adolescents (fear of encouraging sexual activity), distrust arising from past controversies in pilot projects, and cost concerns where vaccine is out-of-pocket. Attitudes among parents and caregivers are especially influenced by perceived vaccine safety, endorsement by trusted health professionals and recommendations from school authorities. Importantly, multiple intervention studies show that targeted information and counseling can convert hesitant attitudes into acceptance [6, 12].

A consistent theme in qualitative research is the central role of trust: trust in the health system, in the safety track record of the vaccine, and in the motives of program implementers. Where trust is high (for example, in states with transparent, well-organized programmes), acceptance is higher. In contrast, rumors, adverse event scares (even if unconfirmed), and poor communication have caused transient drops in acceptance in some localities [6, 10].

Reported practices and vaccine uptake: Reported vaccine uptake (actual receipt of at least one dose) prior to national programme expansion was low across many settings. Systematic reviews and meta-analyses of Indian and South Asian studies reported pooled vaccine uptake estimates in the single digits to low teens (e.g., pooled uptake ~4% in one Indian synthesis; pooled uptake in South Asia ~8%), with high heterogeneity across studies and settings. These low national figures mask high local successes: state-level programmes (Sikkim, parts of Punjab) and organized school-based campaigns have achieved very high coverage (>80–90%) among targeted cohorts when vaccines were provided free and delivered via schools with active community engagement. These pilot successes demonstrate operational feasibility but require political will, financing and robust delivery platforms for scale-up [5, 12].

Cost and access were major determinants where vaccines required out-of-pocket payment, uptake was low. Prior to domestic production of lower-cost vaccines, the per-dose price (~INR 2,500–3,000 in private markets) made the series

unaffordable for many families and constrained public adoption. Delivery modality mattered: school-based, state-funded campaigns reporting high institutional support, parental consent strategies, and active community mobilization produced the highest coverage. Catch-up campaigns (adolescent girls older than the primary target) were feasible but required additional communication and logistical planning [6, 2].

Programmatic/policy developments and demonstration projects in India: Key policy and program milestones in India during the review period materially affect the KAP landscape and prospects for scale-up. Importantly, several state pilots (Sikkim 2018, Punjab in some districts) showed the feasibility and public appetite for school-based delivery approaches, often achieving high coverage when vaccines were free and school systems engaged. In 2022, national deliberations intensified and NTAGI recommended introduction of HPV vaccine into the Universal Immunization Programme and proposed an initial school-based catch-up approach, reflecting WHO guidance and India's cervical cancer control priorities. Government press releases and budget statements in 2022–2024 signalled commitment to prioritize HPV vaccination for girls aged 9–14 and to roll out a free/affordable programme in phases. The Government of India also celebrated the availability of an indigenously produced, lower-cost HPV vaccine (commercial names sometimes reported as CERVAVAC / Cervavax) which reduces financial barriers to a national roll-out. Operational roll-out in 2023–2024 included pilot administration in several states and capacity building for frontline workers and school systems; media and health education campaigns increased public interest (observable, for example, via Google Trends analyses), but coverage data remain in flux as national phases scale up and programme monitoring systems are strengthened [2, 3, 4].

4. DISCUSSION

This narrative review synthesizes a heterogeneous but instructive body of literature on HPV vaccine knowledge, attitudes and practices across India between 2010 and 2024. The patterns that emerge are clear and policy-relevant.

Principal findings and Interpretations: First, awareness about HPV and the vaccine remains uneven: health professionals and students typically have higher awareness than the general population, but even among health workers important knowledge gaps exist (vaccine schedule, target age, need for continued screening). Low public awareness in many community samples contributes to low baseline demand and yet, when clear, culturally sensitive information is provided, acceptability frequently increases. This suggests that demand is information-sensitive and responsive to credible communication [8, 9].

Second, attitudes show potential for high acceptance but are constrained by safety concerns, cultural reservations about vaccinating pre-adolescents, and cost. The evidence underscores the importance of trusted endorsers (clinicians, school authorities) and transparent safety communication to counter misinformation. Past controversies in pilot projects (where consent processes or adverse event reporting were perceived to be inadequate) left a lingering wariness in some communities addressing such trust deficits is critical [6, 10].

Third, the practice/uptake picture before national scale-up was sobering: pooled estimates of uptake were low in India, but local state successes show that high coverage is achievable with school-based, publicly funded programmes. Cost is a primary practical barrier early private market prices limited access for the majority. The arrival of an indigenously manufactured HPV vaccine and NTAGI's recommendation for UIP inclusion change the cost–program calculus and create a window of opportunity for rapid scale-up [3, 5].

Fourth, operational lessons are robust: (a) school-based delivery with parental consent and clear pre-vaccination communication yields high coverage; (b) health-worker training is indispensable because provider recommendation strongly predicts uptake; (c) community engagement and response to local concerns (including robust adverse-event surveillance and rapid communication) are essential to sustain trust.

Comparison with International Evidence: India's KAP patterns mirror those observed in many LMICs: limited baseline awareness, generally favorable attitude when informed, and low vaccine coverage where cost or programmatic support is limited. International experience underscores the value of school-based delivery, strong provider recommendation, and integrated communication campaigns—strategies that are being adopted or tested in India. WHO's 90–70–90 elimination targets add urgency and global impetus to India's national efforts [1, 2].

Strengths and Limitations of the Evidence base: The available literature includes many cross-sectional, facility-based and convenience-sample studies not nationally representative household surveys and thus limiting generalizability. Heterogeneity in KAP instruments, difference in age groups studied, and publication bias impede meta-analytic precision. However, systematic reviews and pooled estimates (despite heterogeneity) consistently point to low baseline coverage and moderate awareness. Program evaluations from state pilots provide high-value operational evidence. Finally, policy documents and government press releases (2022–2024) show strong recent political commitment, but national coverage

data and equity analyses will require robust monitoring as programmes scale [5, 7].

Programmatic research implications priorities: For policy makers and implementers we highlight prioritized, evidence-informed actions:

School-based primary delivery with catch-up options: Evidence from Sikkim and other pilots shows that school delivery achieves high coverage when aligned with clear consent procedures and community engagement. Phased roll-out targeting girls aged 9–14 (with catch-up) is programmatically viable [2].

Provider training and motivation: Invest in pre-service and in-service training for doctors, nurses, ANMs and school-health staff to ensure consistent, accurate messaging and strong provider recommendation—one of the strongest predictors of uptake [11].

Cost and procurement strategies: With indigenous vaccine availability, negotiate sustainable pricing and ensure supply chain robustness. Free public vaccination removes the primary financial barrier for most families [3].

Targeted communication and community engagement: Use formative research to tailor messaging for diverse communities; address safety concerns proactively; employ trusted community influencers and school authorities. Rapid, transparent adverse-event management and communication will maintain trust [6, 10].

Monitoring, evaluation and research: Establish systems for accurate administrative coverage data, independent coverage surveys, and research on long-term impact and equity (urban/rural, socioeconomic, gender). Implementation research should test strategies to reach out-of-school girls and marginalized populations [1].

Integration with screening and wider cervical cancer control: Vaccination reduces future cancer burden but does not obviate screening for adult women. Integrate HPV vaccination rollout with strengthened screening and treatment pathways for maximum health gain [2].

Equity Considerations: Program design must prioritize reaching rural, low-income and out-of-school girls who historically have lower awareness and access. Targeted outreach, flexible delivery strategies (community sessions, adolescent health clinics) and social protection approaches (free vaccines, transport support) can mitigate inequities. Robust disaggregated coverage monitoring will be essential to ensure equitable impact.

Recommendations from our review: Our study recommend **national phased roll-out emphasizing school-based delivery** for girls aged 9–14 with planned catch-up cohorts, drawing on operational lessons from state pilots to achieve rapid, high coverage, **comprehensive provider training and clear clinical guidelines** to ensure high-quality, consistent counselling and to make provider recommendation routine**, sustained, culturally sensitive demand-generation campaigns** co-designed with communities and schools to address safety concerns and misinformation, and to explain the life-course logic (vaccinate before sexual debut**), free public provision and strategic procurement** to remove cost barriers leveraging domestically produced vaccines and pooled procurement to ensure affordability and supply security, **monitoring and evaluation systems** to track coverage, equity, safety events and program impact; invest in independent coverage surveys and implementation research to optimize delivery to out-of-school and marginalized girls, i**ntegrate vaccination with screening and treatment scale-up** so the whole cervical cancer prevention cascade (vaccination, screening, treatment) advances in parallel toward elimination targets.

Limitations of the review: Limitations of this narrative review include reliance on heterogenous KAP studies (non-representative sampling in many instances), variable measurement instruments and the rapidly changing policy environment in 2022–2024 which may render some operational details provisional. Nonetheless, the overall evidence base supports an urgent, well-planned scale-up of HPV vaccination in India with strong emphasis on equitable access, communication, provider engagement and integrated cervical cancer control.

Acknowledgements: We acknowledge the work of many investigators across India whose KAP surveys, implementation reports and qualitative studies informed this synthesis, and the policy teams in the Government of India for steering program planning.

5. CONCLUSIONS

Over the 2010–2024 period, India's HPV vaccine landscape evolved from limited private-market availability with low national uptake to growing policy momentum and the availability of an indigenously manufactured vaccine that lowers the

cost barrier. The KAP literature paints a consistent picture: knowledge is uneven and often poor in general populations, attitudes are amenable to improvement with targeted education, and actual vaccine uptake has been limited except in well-implemented, state-funded school programmes. These findings have clear programmatic implications. If India executes a carefully designed, well-funded national HPV vaccination programme (with school-based delivery, strong community engagement, and robust monitoring) it can substantially accelerate progress toward the WHO cervical cancer elimination targets and materially reduce the country's avoidable cervical cancer burden.

REFERENCES

[1] WHO Immunization Data portal - Detail Page. Immunization Data. 2023. URL: https://immunizationdata.who.int/global/wiise-detail-page/human-papillomavirus-%28hpv%29-vaccination-coverage

[2] Padma TV. India resolves to reduce cervical cancer by vaccinating girls. www.gavi.org. 2024. URL: https://www.gavi.org/vaccineswork/india-resolves-reduce-cervical-cancer-vaccinating-girls

[3] Mehra R, Ray A, Kumari A, Kaur A, Hora R, Quadri SF, et al. Google Trends for the Human Papillomavirus Vaccine in India From 2010 to 2024: Infodemiological Study. J Med Internet Res. 2025 May 27;27:e69729. DOI: 10.2196/69729.

[4] Devnath, R., & Sharma, K. (2024). Government's bold initiatives: tackling cervical cancer in India with determination and commitment. *Current Medical Research and Opinion*, *40*(9), 1647–1649. DOI: 10.1080/03007995.2024.2388221

[5] Pal D, Sahoo BK, Taywade M, Maji S. Evidence of Knowledge, Attitude, and Practice Regarding Human Papilloma Virus Vaccination at the Community Level in India: A Systematic Review and Meta-analysis. Asian Pac J Cancer Prev. 2024 Mar 1;25(3):793-800. DOI: 10.31557/APJCP.2024.25.3.793

[6] Shah P, Shetty V, Ganesh M, Shetty AK. Challenges to Human Papillomavirus Vaccine Acceptability among Women in South India: An Exploratory Study. Am J Trop Med Hyg. 2021 Aug 9;105(4):966-973. DOI: 10.4269/ajtmh.20-1650

[7] Union Minister Dr Jitendra Singh Advocates for United Efforts to Tackle Cervical Cancer at "Together Against HPV" Conclave. Pib.gov.in. 2017. URL: https://www.pib.gov.in/PressReleseDetail.aspx?PRID=2085299&utm_

[8] Swarnapriya K, Kavitha D, Reddy GM. Knowledge, Attitude and Practices Regarding HPV Vaccination Among Medical and Para Medical in Students, India a Cross Sectional Study. Asian Pac J Cancer Prev. 2015;16(18):8473-7. DOI: 10.7314/apjcp.2015.16.18.8473

[9] Chowdhury S, Ara R, Roy S, Tanvir SMS, Eva FN, Neela TM, Moonmoon AA, Sifat S, Zamila M, Hawlader MDH. Knowledge, attitude, and practices regarding human papillomavirus and its' vaccination among the young medical professionals and students of Bangladesh. Clin Exp Vaccine Res. 2022 Jan;11(1):63-71. DOI: 10.7774/cevr.2022.11.1.63

[10] Krokidi E, Rao AP, Ambrosino E, Thomas PPM. The impact of health education interventions on HPV vaccination uptake, awareness, and acceptance among people under 30 years old in India: a literature review with systematic search. Front Reprod Health. 2023 May 5;5:1151179. DOI: 10.3389/frph.2023.1151179

[11] Kataria I, Siddiqui M, Treiman K, Foley S, Anand M, Biswas S, et al. Awareness, perceptions, and choices of physicians pertaining to human papillomavirus (HPV) vaccination in India: A formative research study. Vaccine X. 2022 Oct 15;12:100228. DOI: 10.1016/j.jvacx.2022.100228

[12] Noreen K, Naeem Khalid S, Murad MA, Baig M, Khan SA. Uptake and determinants of HPV vaccination in South Asia: a systematic review and meta-analysis. Front Public Health. 2024 Dec 11;12:1453704. DOI: 10.3389/fpubh.2024.1453704