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Family-Mediated HPV Vaccine Decisions in Rural India: A Multi-Stakeholder Qualitative Study from Rajasthan

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Abstract

Background

Following the 2026 introduction of India's National HPV Vaccination Programme, understanding early implementation experiences is critical to achieving high coverage. This study explored the knowledge, perceptions, barriers, facilitators, and implementation experiences related to HPV vaccination in rural Rajasthan.

Methods

We conducted 30 semi-structured in-depth telephone interviews with adolescent girls, ANMs, ASHAs, and school teachers in rural Sikar district, Rajasthan, and analysed data using Braun and Clarke's thematic analysis.

Results

We identified eight cross-cutting themes, including widespread but shallow vaccine awareness, family-mediated decision-making with limited adolescent autonomy, fertility-related rumours amplified by post-COVID mistrust, and frontline workers and teachers as trusted yet under-equipped communicators. School-based vaccination was widely accepted; however, implementation was constrained by workforce burden, logistical challenges, and difficulties reaching out-of-school girls.

Conclusion

Addressing knowledge gaps, misinformation, and implementation challenges while strengthening frontline capacity and school–health system coordination may improve HPV vaccine uptake for successful programme implementation in India. Interventions that pair school-based delivery with parent-focused communication, myth-busting on fertility, and targeted training and support for frontline workers may be critical to successful HPV vaccine scale-up in similar LMIC settings.

Introduction

Cervical cancer remains a major public health concern and is the fourth most common cancer among women globally, with an estimated 662,301 new cases and 348,874 deaths reported in 2022.[1] Nearly 90% of cervical cancer deaths occur in low- and middle-income countries, reflecting inequities in access to preventive services, screening, and treatment.[2] Persistent infection with high-risk human papillomavirus (HPV), particularly HPV-16 and HPV-18, is responsible for almost all cases of cervical cancer, and prophylactic HPV vaccination administered before exposure to the virus is a highly effective strategy for preventing HPV infection and subsequent cervical precancerous lesions.[3] Consequently, the

World Health Organization (WHO) launched the Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem, with a target of achieving 90% HPV vaccination coverage among girls by 15 years of age by 2030 as part of its 90–70–90 elimination strategy.[2]India contributes substantially to the global cervical cancer burden, accounting for approximately one-fifth of worldwide cases and deaths.[4] To strengthen primary prevention, the Government of India introduced the National HPV Vaccination Programme in 2026, offering free HPV vaccination to eligible adolescent girls through government health facilities and school-based vaccination sessions[5].

Successful implementation of HPV vaccination programmes, however, extends beyond vaccine availability. Vaccine uptake is influenced by adolescents' knowledge and perceptions, parental attitudes, cultural beliefs, trust in healthcare providers, and the effectiveness of health communication[6]. Systematic reviews from India have consistently identified inadequate awareness of HPV infection and cervical cancer, concerns regarding vaccine safety and adverse effects, misconceptions related to fertility, and parental hesitancy as major barriers to vaccine acceptance.[7, 8] Frontline healthcare workers and school teachers play a pivotal role in providing credible information, addressing misconceptions, and facilitating informed decision-making among adolescents and their families.[8]

Although several quantitative studies have assessed awareness and acceptability of HPV vaccination in India, they provide limited insight into the contextual and behavioural factors underlying vaccination decisions. Following the introduction of India's National HPV Vaccination Programme, there remains a paucity of qualitative evidence exploring adolescents' experiences, perceptions, sources of information, family influences, and perceived barriers during the early phase of programme implementation, particularly in rural settings. Such evidence is essential for understanding the factors that facilitate or hinder vaccine uptake and for informing context-specific communication strategies and programme implementation.

Therefore, this qualitative study was undertaken in Sikar district, Rajasthan, to explore stakeholders' perspectives on HPV vaccination during the early implementation of the National HPV Vaccination Programme. Specifically, the study aimed to explore adolescent girls' awareness, knowledge, experiences, and perceptions regarding HPV vaccination and cervical cancer; identify barriers and facilitators influencing vaccine uptake; examine the role of family, schools, and healthcare providers in vaccination decision-making; and generate evidence-informed recommendations to strengthen programme implementation.

Unlike prior Indian studies that focused primarily on adolescent or parental perspectives before national roll-out, we triangulate adolescents, frontline workers, and teachers during early implementation of a national school-based programme in a rural district. We extend current evidence by foregrounding family power dynamics and frontline communicators’ constraints as key mechanisms shaping HPV vaccine uptake.

Methods

Study Design and Setting

This study employed a qualitative exploratory design using semi-structured in-depth interviews (IDIs) to explore stakeholders' perspectives on the implementation and uptake of the Human Papillomavirus (HPV) vaccination programme. The study was conducted across six blocks of Sikar district, Rajasthan that were selected purposively. Sikar is a predominantly rural district where government schools and primary healthcare facilities were implementing school-based HPV vaccination activities under India's National HPV Vaccination Programme, making it an appropriate setting to explore stakeholder experiences. The study was carried out as part of the implementation research project, *"Optimizing Adolescent Healthcare Services through Health and Wellness Centres in Sikar District of Rajasthan"* (ICMR-NIHR, Jodhpur). Data were collected from 7th May 2026 to 10th June 2026 through telephonic interviews conducted in Hindi or the local language after obtaining informed verbal consent. The study is reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.[9].

Study Participants and Sampling

Participants comprised four stakeholder groups directly involved in HPV vaccination programme implementation and uptake: adolescent girls aged 14–15 years, Auxiliary Nurse Midwives (ANMs), Accredited Social Health Activists (ASHAs), and school teachers. Purposive sampling was employed to recruit participants capable of providing rich and diverse information relevant to the study objectives. Among adolescent girls, both vaccinated and unvaccinated participants were included to capture a range of experiences, perceptions, and decision-making processes. ANMs, ASHAs, and school teachers were selected based on their active involvement in adolescent health services, school health activities, or implementation of HPV vaccination. A total of 30 in-depth interviews were conducted, including 12 adolescent girls, 6 ANMs, 6 ASHA workers, and 6 school teachers. Recruitment continued until thematic saturation was achieved.

Research Team and Reflexivity

Interviews were conducted by female researchers with prior experience in qualitative data collection. The interviewers had no prior relationship with the participants, thereby minimizing potential interviewer bias. Reflexive discussions were held throughout data collection and analysis to acknowledge and minimize the influence of researchers' assumptions on data interpretation.

Data Collection

Data were collected through semi-structured in-depth interviews using an interview guide developed following a review of published literature. The guide explored participants' knowledge of cervical cancer and HPV vaccination, vaccination experiences, decision-making processes, barriers and facilitators to

vaccine uptake, sources of information, and recommendations for improving programme implementation.Separate interview guides, sharing these core domains were used for adolescent girls, ANMs, ASHAs, and teachers.

Interviews were conducted telephonically in Hindi or the local language, according to participants' preference, after obtaining informed verbal consent (and parental consent and participant assent for adolescents where applicable). Telephone interviews were conducted as these may facilitate more open discussion of sensitive topics, such as reproductive health, HPV vaccination, and cervical cancer, by reducing interviewer presence and social desirability bias. All interviews were audio-recorded with participants' permission and lasted approximately 20–30 minutes. Field notes were maintained to capture contextual observations and researchers' reflections immediately after each interview.

Data Analysis

Audio recordings were transcribed in Hindi and translated into English where necessary. Data were analysed using Braun and Clarke's six-phase thematic analysis framework, employing both deductive and inductive approaches.[10] An initial coding framework was developed based on the interview guide, while additional codes emerging from the data were incorporated iteratively. Transcripts were read repeatedly to ensure familiarity with the data before coding. Codes were generated inductively and deductively, then organised into overarching themes, which were iteratively reviewed and refined through discussions among the research team. Qualitative data management and coding were performed using ATLAS.ti software. The coding framework and thematic structure were developed iteratively through discussions among members of the research team. Selected transcripts and emerging themes were reviewed collaboratively to enhance the credibility and consistency of the analysis, with differences in interpretation resolved through discussion and consensus.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of ICMR–NIIRNCD, Jodhpur (IEC Approval No.IEC/NIIRNCD/ADH/2025). The study was carried out in accordance with the Declaration of Helsinki and Indian Council of Medical Research Ethical Guidelines for Biomedical and Health Research Involving Human Participants.[11,12] Participation was voluntary, and verbal informed consent was obtained fromparticipants. For adolescent girls, verbal parental consent and participant assent were obtained prior to interviews. Participants were assured of confidentiality, anonymity, and their right to withdraw from the study at any stage without consequences. Audio recordings, transcripts, and other study documents were stored securely and were accessible only to the research team.

Results

A total of 30 in-depth interviews (IDIs) were conducted with stakeholders involved in the implementation and uptake of the HPV vaccination programme in Sikar district, Rajasthan, comprising 12 adolescent girls aged 14–15 years, 6ANMs, 6 ASHAs, and 6 school teachers. Thematic analysis across all four

stakeholder groups was integrated into eight cross-cutting themes, each comprising two to four codes, capturing the individual, family, community, and health system factors shaping HPV vaccine uptake. Verbatim quotations are presented in the original Hindi for each code, with participant identifiers indicated in parentheses.

Knowledge and awareness of HPV and cervical cancer

Theme 1: Awareness without deeper understanding

Awareness of the HPV vaccine was widespread across adolescent girls, teachers, and frontline workers, but rarely paired with real understanding of what it protects against or how it works. Most knew only that a vaccine was being given to girls and loosely linked it to cancer prevention, while frontline workers relied on programme training and a deliberately simplified "cancer-prevention" message that avoided mention of HPV as a sexually transmitted infection.

Code 1.1: General awareness of HPV vaccination

Most participants, including adolescent girls and school teachers, had heard about the HPV vaccine before the interview, primarily through school-based vaccination activities or media exposure. However, this awareness was generally limited to knowing that a vaccine would be administered, without a clear understanding of its specific purpose or disease target.

Verbatims

“School mein bataya tha ki ek naya vaccine lagega jo ladkiyon ke liye hai.” (Girl-3)

“ANM didi aur teacher ne bataya tha ki ye vaccine lagwana hai.” (Girl-7)

“Haan, cervical cancer ke liye.” (Teacher-2)

Code 1.2: Limited understanding of cervical cancer and the vaccine’s rationale

Although many participants had heard of cervical cancer, most could not explain the disease, how HPV causes it, or how the vaccine works. Their knowledge was generally restricted to the belief that the vaccine protects against cancer at some point in the future.

Verbatims

“Bas itna pata hai ki cancer se bachne ke liye lagate hain, aur zyada nahi pata.” (Girl-5)

“Naam suna hai lekin ye kis wajah se hota hai ya kaise bachta hai, nahi pata.” (Girl-2)

“Pura detail nahi pata ki kitni dose lagti hai.” (Teacher-2)

Code 1.3: Incomplete knowledge of vaccine purpose

ANMs, ASHAs, and teachers reported that their own knowledge of the vaccine came mainly from government training or informal sources such as news and social media, rather than structured or biomedical education. While this equipped them to explain the programme operationally, several felt underprepared to answer more detailed questions.

Verbatims

"Training mein vaccine ke baare mein bataya gaya tha aur uske baad programme samajhne mein aasani hui." (ANM-1)

"Training mein vaccine ke baare mein bataya tha, lekin aur practical jankari mile toh achha rahega." (ASHA-3)

"News aur social media se jaankari mili." (Teacher-2)

Code 1.4: Simplified cancer framing

ASHAs and ANMs described consciously explaining the vaccine as protection against cervical cancer rather than discussing HPV as a sexually transmitted infection, viewing this framing as easier for families to accept and understand during counselling.

Verbatims

"Hum bas itna batate hain ki ye cancer se bachav ka tika hai." (ASHA-1)

"Cancer se bachne ki baat samjhane par log jaldi maan jaate hain." (ASHA-4)

"Hum parents ko samjhate hain ki ye bachhedani ke cancer se bachav ki vaccine hai." (ANM-3)

Interpretation: Awareness did not translate into understanding. The simplified framing improved acceptance but reinforced shallow knowledge, leaving providers and families underequipped to address deeper questions or misconceptions.

Psychological readiness and family-mediated decision-making

Theme 2: Pre-vaccination fear and the reassuring role of counselling

Girls commonly felt anxious before vaccination, and the main drivers were fear of injections and uncertainty about side effects; teachers also noticed this anxiety in their students.In practice, the side effects experienced were mild and self-limiting, such as injection-site pain or low-grade fever. Pre-vaccination counselling by teachers and health workers emerged as central to easing this fear, with girls feeling noticeably more comfortable once the vaccine's purpose and likely side effects were explained beforehand.

Code 2.1: Initial fear of vaccination

Girls frequently described feeling nervous before vaccination, mainly due to fear of injections and uncertainty about possible side effects. Teachers similarly observed this initial anxiety among their students.

Verbatims

"*Injection se thoda dar lag raha tha ki dard hoga." (Girl-5)*

"Pehle dar tha, lekin baad mein laga ki itni dikkat nahi hui." (Girl-6)

"Bachchiyon ko pehle injection ka dar rehta hai." (Teacher-2)

Code 2.2: Side effects experienced were mild and transient

Girls who had received the vaccine commonly reported mild side effects, such as pain at the injection site or a low-grade fever, that resolved on their own without requiring medical attention.

Verbatims

"Haath mein thoda dard hua tha, phir theek ho gaya." (Girl-1)

"Thoda bukhar aaya tha, lekin ek-do din mein theek ho gaya." (Girl-9)

Code 2.3: Counselling builds confidence

Both girls and teachers described pre-vaccination counselling as central to reducing fear and improving acceptance, with girls reporting greater ease once the vaccine's purpose and side effects had been explained in advance.

Verbatims

"Doctor pehle achhe se samjhayenge toh dar kam ho jayega." (Girl-6)

"Pehle samjha diya jaye toh bachchiyan bina dare vaccine lagwa leti hain." (Teacher-1)

"ANM aur teachers ke samjhane se bachchiyan comfortable ho jaati hain." (Teacher-5)

Interpretation: Initial fear was real but largely disproportionate to the mild side effects actually experienced. Counselling bridged this gap, suggesting that structured, advance communication is a simple and effective lever for improving vaccine acceptance and reducing anxiety.

Theme 3: Family-mediated decision-making and limited adolescent autonomy

Vaccination decisions rested largely with the family rather than the girls themselves, with parents and senior family members acting as the final decision-makers. Mothers featured as trusted intermediaries, typically reassured by health workers first and then conveying that information to their daughters. Even

girls who were willing to be vaccinated recognised that the final choice lay with their parents, leaving them with limited autonomy over a decision that directly concerned them.

Code 3.1: Parents as final decision-makers

Girls and ASHAs consistently reported that vaccination depended on parental, and often paternal or elder, permission, rather than the girl's own willingness, underscoring the central role of family hierarchy in vaccine acceptance.

Verbatims

"Mummy-papa ne haan bola tabhi vaccine lagi." (Girl-4)

"Ghar walon ki permission ke bina vaccine nahi lag sakti." (Girl-8)

"Ghar ke bade mana kar dein toh vaccine lagwana mushkil ho jata hai." (ASHA-4)

Code 3.2: Mothers as trusted intermediaries

Many girls described their mothers as the family member they trusted most on health matters, with mothers frequently reassured and informed by health workers before conveying that information to their daughters.

Verbatims

"Mummy ne bola ki doctor bol rahe hain toh lagwa leni chahiye." (Girl-2)

"Mummy ne samjhaya ki ye sehat ke liye achha hai." (Girl-6)

Code 3.3: Limited adolescent autonomy

Despite being the recipients of the vaccine, girls felt they had little say in the decision; even those willing to be vaccinated acknowledged that the final choice rested with their parents.

Verbatims

"Humari marzi se zyada ghar wale decide karte hain." (Girl-5)

"Agar mummy-papa mana kar dein toh hum nahi lagwa sakte." (Girl-10)

"Pehle mummy-papa ko samjhana padta hai, tabhi vaccination ho pata hai." (ASHA-1)

Interpretation: Adolescent willingness alone rarely determined uptake; family hierarchy was decisive. This points to the importance of directing counselling efforts at parents, particularly mothers and elders, since securing their acceptance is the practical gateway to vaccinating the girls.

Trust, misinformation, and communication

Theme 4: Misinformation, fertility-related myths, and COVID-19-linked distrust

Misinformation emerged as a major barrier to acceptance, with girls, ANMs, and ASHAs independently reporting community rumours that the vaccine could cause infertility or unspecified future harm. Teachers noted that suspicion carried over from the COVID-19 vaccination experience had spilled into scepticism about the HPV vaccine. These fears were amplified through informal networks of neighbours, relatives, and social media, which participants felt often outweighed accurate information from formal health sources.

Code 4.1: Fertility-related rumours

Girls, ANMs, and ASHAs independently described rumours circulating in the community that the vaccine could cause infertility or other unspecified harm, which discouraged some families from consenting to vaccination.

Theme	Codes
1. Awareness without deeper understanding	1.1 General vaccine awareness 1.2 Limited disease understanding 1.3 Programme-oriented worker knowledge 1.4 Simplified cancer framing
2. Pre-vaccination fear and counselling	2.1 Fear of injections 2.2 Mild, transient side effects 2.3 Counselling builds confidence
3. Family-mediated decision-making	3.1 Parents as final decision-makers 3.2 Mothers as trusted intermediaries 3.3 Limited adolescent autonomy
4. Misinformation and COVID-linked distrust	4.1 Fertility-related rumours 4.2 Residual COVID-19 mistrust 4.3 Social media misinformation
5. Trusted but under-equipped communicators	5.1 Most trusted information sources 5.2 Repeated visits build trust 5.3 Need for refresher training
6. School-based delivery and coordination gaps	6.1 Convenient, well-supported sessions 6.2 Integrated identification records 6.3 Absenteeism follow-up challenge 6.4 Need for advance planning
7. Health system constraints	7.1 Heavy frontline workload 7.2 Documentation and incentive gaps 7.3 Hard-to-reach girls
8. Recommendations	8.1 Sustained awareness campaigns 8.2 Stronger parental engagement 8.3 Training and IEC support

Verbatims

“Kuch log bolte hain ki vaccine se problem ho sakti hai.” (Girl-6)

“Kuch log bolte hain ki vaccine se aage chal kar problem ho sakti hai.” (ANM-6)

“Kuch log bolte hain ki vaccine se bachchi ko aage problem ho sakti hai.” (ASHA-2)

Code 4.2: Post-COVID vaccine suspicion

Teachers felt that concerns arising during the COVID-19 vaccination programme had carried over into scepticism about the HPV vaccine, with some parents viewing newer vaccines with heightened suspicion as a result.

Verbatims

“Covid vaccination ke baad log is vaccine ko bhi shanka ki nazar se dekhte hain.”(Teacher-2)

“Log purane vaccine ke anubhav ko is vaccine se bhi jod dete hain.” (Teacher-4)

Code 4.3: Social media misinformation

Participants described rumours spreading through neighbours, relatives, and social media, which ANMs and teachers felt were a major driver of hesitancy, sometimes outweighing accurate information from formal sources.

Verbatims

“Gaon mein afwahein fail jaati hain, phir log vaccine lagwane se hichkichate hain.” (ANM-3)

“Social media par chal raha hai ki vaccine se maa banne mein dikkat aati hai.” (Teacher-2)

“Sabse badi dikkat misinformation hai, isi wajah se log mana kar dete hain.” (Teacher-6)

Interpretation: Hesitancy was driven less by absence of information than by competing misinformation, particularly fertility-related myths and residual COVID-19 distrust. Countering it requires proactive, trusted messaging that directly addresses these specific fears rather than relying on formal channels alone.

Theme 5: Frontline workers and teachers as trusted but under-equipped communicators

Girls consistently identified teachers, ANMs, and doctors as their most trusted sources of vaccine information, well above television and social media. ASHAs described trust-building as a continuous effort, often requiring repeated home visits and personalised counselling before hesitant families agreed. Yet despite this trusted position, frontline workers and teachers felt under-equipped, reporting a

lack of practical training and IEC materials to confidently address difficult questions and parental concerns.

Code 5.1: Most trusted information sources

Girls consistently named teachers, ANMs, and doctors as their primary and most trusted sources of information about the vaccine, while television and social media were reported to contribute comparatively little to their knowledge.

Verbatims

"Teacher aur doctor ne vaccine ke baare mein achhe se samjhaya." (Girl-1)

"School mein ANM didi ne bataya tha ki ye vaccine kis liye lagti hai." (Girl-7)

"Doctor aur teacher se jo jankari milti hai usi par zyada bharosa hota hai." (Girl-10)

Code 5.2: Repeated visits build trust

ASHAs described community mobilisation as a continuous process, often requiring multiple household visits and personalised counselling before hesitant families agreed to vaccination.

Verbatims

"Kai baar do-teen baar jaana padta hai tab jaake ghar wale maan jaate hain." (ASHA-2)

"Do-teen baar samjhane ke baad kai ghar wale maan jaate hain." (ASHA-3)

"Log hamari baat par bharosa karte hain, isliye baar-baar jaakar samjhate hain." (ASHA-6)

Code 5.3: Need for refresher training

Despite being trusted, ASHAs, ANMs, and teachers felt they lacked sufficient practical training and educational materials to confidently answer difficult questions or address parental concerns.

Verbatims

"Kabhi-kabhi log aise sawal puchte hain jinka jawab dene mein dikkat hoti hai." (ASHA-6)

"Training milegi toh hum aur achhe se samjha paayenge." (Teacher-3)

"Poster, pamphlet aur awareness programme aur zyada hone chahiye." (ANM-6)

Interpretation: Frontline workers and teachers are the system's most credible communicators but are not adequately resourced to fulfil that role. Investing in refresher training and stronger IEC materials

would strengthen the very channel families trust most, directly improving the programme's capacity to counter hesitancy.

Health system and delivery constraints, including stakeholder recommendations

Theme 6: School-based delivery: broad acceptance with persistent coordination gaps

School-based delivery was widely valued by girls and ANMs as a convenient, organised way to reach large numbers of eligible girls efficiently, with identification and mobilisation supported by integrated school, ASHA, and Anganwadi records. However, absenteeism on the day of vaccination remained a recurring operational challenge, requiring systematic record-keeping and follow-up to trace missed girls. Teachers and ANMs also called for stronger advance planning and closer school–health system coordination to ensure sessions ran smoothly and reached everyone.

Code 6.1: Convenient, well-supported sessions

Girls and ANMs alike described school-based vaccination as the most convenient and accessible delivery approach, allowing large numbers of eligible girls to be vaccinated efficiently in an organised setting.

Verbatims

“School mein vaccine lagti hai toh sabke liye aasaan rehta hai.” (Girl-7)

“School mein hi camp lagna chahiye taki sab ladkiyon ko vaccine mil sake.” (Girl-2)

“School mein hi vaccination session lagta hai aur wahin sab eligible ladkiyon ko vaccine lagayi jaati hai.” (ANM-2)

Code 6.2: Integrated identification records

ANMs and ASHAs described using school enrolment records, household surveys, and Anganwadi registers together to identify eligible girls and reduce the likelihood that any girl would be missed.

Verbatims

“School list ke saath ASHA ki list bhi dekhte hain taaki koi ladki chhoot na jaye.” (ANM-1)

“Ghar-ghar jaake batate hain ki kis din vaccine lagegi aur ladki ko lekar aana hai.” (ASHA-1)

“Register aur school ki list se pata karte hain ki kis ladki ko vaccine lagni hai.” (ASHA-5)

Code 6.3: Absenteeism follow-up challenge

Girls, teachers, and ANMs all identified absenteeism on the day of vaccination as a barrier to coverage, requiring systematic record-keeping and follow-up to ensure that eligible girls were not permanently

missed.

Verbatims

"Jo us din school nahi aaye unki vaccine nahi lag payi." (Girl-3)

"Jo bachchiyan us din school nahi aati, unka baad mein record maintain karna chahiye." (Teacher-2)

"Jo bachchiyan us din school nahi aati, unko baad mein dhoondhkar vaccine lagani padti hai." (ANM-6)

Code 6.4: Need for better programme coordination

Teachers and ANMs recommended more consistent advance planning and communication between schools and the health department to ensure that vaccination sessions ran smoothly and reached all eligible girls.

Verbatims

"Health department aur school milkar kaam karein to programme aur achha chalega." (Teacher-3)

"Pehle se planning aur information mil jaye toh aur aasani hoti hai." (Teacher-6)

"School ke teachers aur health team milkar pehle se planning karte hain, isse session achhe se ho jata hai." (ANM-4)

Interpretation: School-based delivery is an effective and well-accepted platform, but its coverage is limited by coordination and follow-up gaps rather than acceptance. Strengthening advance planning, inter-departmental communication, and mechanisms to track absentees would close the remaining gap between a well-designed approach and complete coverage.

Theme 7: Health system constraints: workload, incentives, and reaching the vulnerable

Frontline workers described the HPV vaccination programme as adding to an already heavy workload of routine immunisation, maternal and child health duties, and other concurrent national programmes. This burden was compounded by extensive documentation, inadequate incentives, and transport difficulties, particularly when reaching remote areas. ANMs and ASHAs further noted that out-of-school, dropped-out, and geographically remote girls were the hardest to identify and vaccinate, requiring additional targeted outreach beyond the school platform.

Code 7.1: Increased workload for frontline workers

ANMs and ASHAs described the vaccination programme as adding to an already substantial workload of routine immunisation, maternal and child health duties, and other concurrent national programmes.

Verbatims

“Routine ka kaam bhi rehta hai aur vaccination programme bhi, isliye workload kaafi badh jata hai.” (ANM-4)

“Ek saath bahut programmes chalte hain, sab manage karna padta hai.” (ANM-1)

“Pehle se bahut kaam rehta hai, HPV ke liye alag se ghar-ghar bhi jana padta hai.” (ASHA-2)

Code 7.2: Documentation and incentive gaps

Participants described extensive documentation and reporting requirements alongside inadequate incentives and transport difficulties, particularly when travelling to remote areas.

Verbatims

“Register bharna aur reporting karne mein bhi kaafi samay lagta hai.” (ANM-5)

“Mehnat zyada hoti hai lekin us hisaab se incentive nahi milta.” (ASHA-4)

“Door ke gaon mein jana padta hai, transport ki bhi dikkat rehti hai.” (ASHA-6)

Code 7.3: Reaching vulnerable and out-of-school girls

ANMs and ASHAs highlighted that girls who had dropped out of school, lived in remote hamlets, or were otherwise unavailable were more difficult to trace and required additional targeted outreach.

Verbatims

“School se bahar ki ladkiyon ko dhoondhna thoda mushkil hota hai.” (ANM-1)

“Door ki dhaniyon mein rehne wali bachchiyon tak pahunchne ke liye alag se mehnat karni padti hai.” (ANM-4)

“Jo school nahi jaati unko dhoondhna aur samjhana zyada mushkil hota hai.” (ASHA-6)

Theme 8: Recommendations for strengthening programme implementation

Participants across all groups offered concrete suggestions for strengthening the programme. They called for sustained, multi-platform awareness campaigns through schools, rallies, and mass media, often invoking the scale of communication seen during the COVID-19 pandemic. Girls and ANMs stressed the importance of engaging parents with clear information about the vaccine's benefits before sessions, while ANMs and teachers sought refresher training and improved IEC materials to communicate more confidently with families.

Code 8.1: Strengthening awareness campaigns

Participants across groups recommended continuous awareness activities using schools, rallies, and mass media, drawing comparisons to the scale of communication seen during the COVID-19 pandemic.

Verbatims

“School mein iske baare mein aur achhe se batana chahiye.” (Girl-3)

“Jaise Covid ke time awareness hui thi, waise hi baar-baar campaign chalna chahiye.” (Teacher-2)

“School ke through rally aur awareness programme hone chahiye.” (Teacher-6)

Code 8.2: Prioritising parental outreach

Girls and ANMs emphasised that parents should receive clear information about the vaccine’s benefits before vaccination sessions, as informed parents were seen as more likely to support and encourage vaccination.

Verbatims

“Sabse pehle mummy-papa ko samjhana chahiye.” (Girl-9)

“Parents ko bhi vaccine ke fayde batane chahiye.” (Girl-4)

“Jab parents ko achhe se samjhate hain ki vaccine cancer se bachati hai, toh woh maan jaate hain.” (ANM-2)

Code 8.3: Training and IEC support

ANMs and teachers recommended sustained institutional support in the form of refresher training and accessible information materials to strengthen their ability to communicate confidently with families.

Verbatims

“Regular training aur upar se support milta rahe toh programme aur achha chalega.” (ANM-3)

“Posters aur information material school mein hona chahiye.” (Teacher-5)

Interpretation: The recommendations converge on three practical priorities: intensified and continuous awareness, proactive family engagement, and better-equipped frontline communicators. These directly mirror the gaps identified across earlier themes, suggesting a clear and internally consistent roadmap for improving programme implementation.

Discussion

This multi-stakeholder qualitative study during early national HPV vaccine roll-out in rural Rajasthan highlights how shallow awareness, family hierarchy, fertility-related myths, and overburdened yet trusted frontline workers collectively shape HPV vaccine uptake. We contribute three advances: (1) we empirically show how adolescent autonomy is constrained by family decision structures, (2) we

document how COVID-era mistrust spills over to new vaccines, and (3) we identify frontline workers and teachers as key but structurally under-resourced communicators in a national school-based programme.This finding gap is consistent with a recent scoping review of HPV vaccination barriers in India, which noted that frontline health workers are rarely included as a distinct analytic voice alongside adolescents and parents.[8]Unlike previous Indian qualitative studies, this study provides early implementation evidence from India's National HPV Vaccination Programme, informing communication, frontline training, and school-based delivery strategies.

Across all four participant groups, awareness that "a vaccine is being given to protect against cancer" was widespread, yet a nuanced understanding of HPV infection, its transmission, and the biological rationale for vaccination was consistently limited, even among frontline health workers, whose knowledge was largely programme-oriented rather than biomedical. This finding is consistent with a national evidence identifying poor HPV/cervical cancer awareness as a major barrier to uptake in India,[8] and a Delhi-NCR/Tripura/Karnataka multisite study where only 1 of 28 male participants had heard of the vaccine.[13] ASHAs and teachers, the two groups families rely on most for information, themselves reported gaps in technical knowledge, suggesting these gaps are transmitted along the information chain rather than resolved by it.

Consistent with evidence from other low- and middle-income country settings, health workers and teachers emerged as the most trusted sources of information for both adolescents and parents in this study, more so than family members, television, or social media. A comparative study of health worker communication strategies for HPV vaccination in Kenya, India, and Nigeria found that intensive, targeted social mobilisation by frontline workers laid the groundwork for early community acceptance in the Indian rollout,[14] and a 2026 qualitative study of Indian higher-secondary students found they expressed high trust in their science teachers specifically, even while relying on media sources in practice because school-based vaccine education was seen as too limited.[15]This is consistent with a broader systematic review of teachers' perceptions of adolescent HPV vaccination, which similarly positions teachers as credible but variably prepared vaccine communicators within school-based programmes.[16]

Adolescent girls consistently described themselves as having limited say in the final vaccination decision, which rested with parents, most often mediated through mothers who were themselves reassured by health workers or teachers. This finding is consistent with a mixed-methods study of parental HPV vaccine decision-making in Puducherry, South India, in which mothers constituted 95% of parental respondents, with fathers underrepresented largely due to work schedules rather than disengagement from the decision itself.[17] It also aligns with broader evidence that vaccine decision-making in India is rarely an individual act but one embedded in family and community hierarchies extending beyond the primary caregiver[18]. Programme messaging and counselling efforts may therefore need to more deliberately engage fathers and senior family members, who were specifically identified by ASHAs in this study as key decision-makers despite their absence from the consultation itself.

Fertility-related rumours were independently reported across all four groups, circulating via informal networks and social media corroborating fertility misconceptions as a dominant national barrier.[8] Several teachers linked this hesitancy to residual COVID-19 mistrust, consistent with a 23-country survey (23,000 adults) showing pandemic experience reduced trust in routine/new immunisation, with 23% reporting reduced vaccine willingness beyond COVID-19.[19] A South Indian district study similarly traced anti-vaccine rumours to social media misinformation.[20]These findings suggest that HPV vaccine communication in this setting cannot be designed in isolation from the community'sbroader, still-evolving relationship with vaccination following the pandemic.

The pre-vaccination fear girls described, and its resolution through counselling by teachers and health workers, is consistent with wider evidence that clinicians and school staff shape adolescents' HPV vaccination experience more directly than information campaigns delivered at a distance.[6,15] This reinforces a point already emerging in this discussion that the same frontline workers and teachers best placed to reassure anxious girls are also the ones who feel under-equipped to do so confidently. A similar tension runs through the health-system findings. The workload, documentation burden, and inadequate incentives reported by ANMs and ASHAs echo broader evidence of task overload across India's community health workforce, where several concurrent national programmes draw on the same personnel and resources.[21] This overload carries an equity cost: ANMs and ASHAs independently identified out-of-school and remote girls as the hardest to reach, echoing a Uttar Pradesh study on how school-based platforms structurally exclude dropouts without dedicated outreach.[22] School-based delivery was nonetheless widely favoured, consistent with evidence that it outperforms facility-based approaches.[16] However, teachers' concerns about limited planning, incomplete parental communication, and inconsistent absentee follow-up suggest the administrative systems supporting this platform have not kept pace with its acceptability

These findings can also be mapped onto the WHO’s Behavioural and Social Drivers (BeSD) of Vaccination framework, which organises determinants of uptake into four domains: thinking and feeling, social processes, motivation, and practical issues[23]. In our data, thinking and feeling was reflected in persistent knowledge gaps and fertility-related misconceptions (Themes 1 and 4); social processes were evident in family-mediated decision-making and the central role of trusted frontline workers and teachers (Themes 3 and 5); and practical issues dominated discussion of school-based delivery and health system workload (Themes 6 and 7). Motivation appeared closely tied to the other three domains rather than operating independently, consistent with the framework’s emphasis on their interdependence. Situating our findings within this established model suggests that interventions addressing a single domain in isolation, for example, awareness campaigns targeting thinking and feeling alone are unlikely to succeed without parallel attention to the social and practical domains identified here.

Strengths and limitations

This study's principal strengths lie in its multi-stakeholder design, which allowed triangulation of adolescent, health worker, and teacher perspectives, and in its qualitative approach, which enabled an in-

depth exploration of participants' beliefs, motivations, and lived experiences that a structured survey could not have captured. However, the findings are based on a small, purposively selected sample from one district in Rajasthan, limiting generalisability to other states or to urban settings with different health system configurations. As with all qualitative interview-based research, responses may have been subject to social desirability bias, particularly among government frontline workers describing programme performance. Although conducted in one district, the programme design and sociocultural dynamics resemble many rural settings in India and other LMICs adopting school-based HPV vaccination.

Implications for practice

These findings point to several actionable priorities primarily at the level of policy and practice.Structured, refresher-based training for ANMs, ASHAs, and teachers should go beyond programme logistics to build confidence in addressing parental questions on safety and fertility. Fathers and senior family members, not only mothers, should be deliberately engaged in counselling and IEC efforts. COVID-19-linked vaccine mistrust should be explicitly addressed within HPV-specific communication. Finally, school–health system coordination, particularly around advance planning, parental communication, and systematic follow-up of absentee girls, should be strengthened to protect the equity gains of school-based delivery.These actions could be anchored within existing platforms such as India's School Health and Wellness Programme, which already links schools and primary healthcare facilities and would not require new infrastructure to implement.

Conclusion

HPV vaccine acceptance in this rural Rajasthan setting was shaped not by outright refusal, but by a combination of persistent knowledge gaps, family-mediated decision-making, unresolved misinformation, and health system constraints. Together, these determined whether awareness translated into actual uptake. Adolescent girls, frontline health workers, and teachers independently converged on similar barriers and similar solutions. This convergence indicates that programme communication must extend beyond reaching families alone: it must also equip the frontline workers and teachers on whom that communication ultimately depends.

Our findings underscore that achieving cervical cancer elimination targets will require not only vaccine supply and school-based platforms, but sustained investments in trusted human intermediaries and context-sensitive communication in rural LMIC settings.

Declarations

Ethics approval and consent to participate:

Ethical approval was obtained from the Institutional Ethics Committee of ICMR-NIIRNCD, Jodhpur (IEC-NIIRNCD/2025/IR/08). Verbal informed consent was obtained from adolescent girls, Healthcare

providers (ANMs, ASHAs) and teachers before the interviews. Participants were informed about the purpose of the study, confidentiality of their responses, and their right to withdraw at any time. No personally identifying information has been reported in this manuscript. As interviews were conducted telephonically, interviewers confirmed that participants were in a private and comfortable setting before beginning the interview.

Consent for publication:

Not applicable.

Availability of data and materials:

The datasets generated and analysed during the current study are not publicly available due to participant confidentiality considerations but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

RKS: Conceptualization, Writing- Original draft preparation & Methodology, Supervision, Writing- Reviewing and Editing.

KM, RC, SA: Writing- Original draft preparation & Methodology, Data analysis, Writing- Reviewing and Editing.

NC, MK: Writing-Reviewing and Editing & Methodology and Data analysis.

PG, DK, SP, PK, DC, KM, PC : Data collection, Transcription and Translation, Thematic coding

NKJ, PB: Supervision, Writing-Reviewing and Editing.

All authors reviewed the manuscript.

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Figures

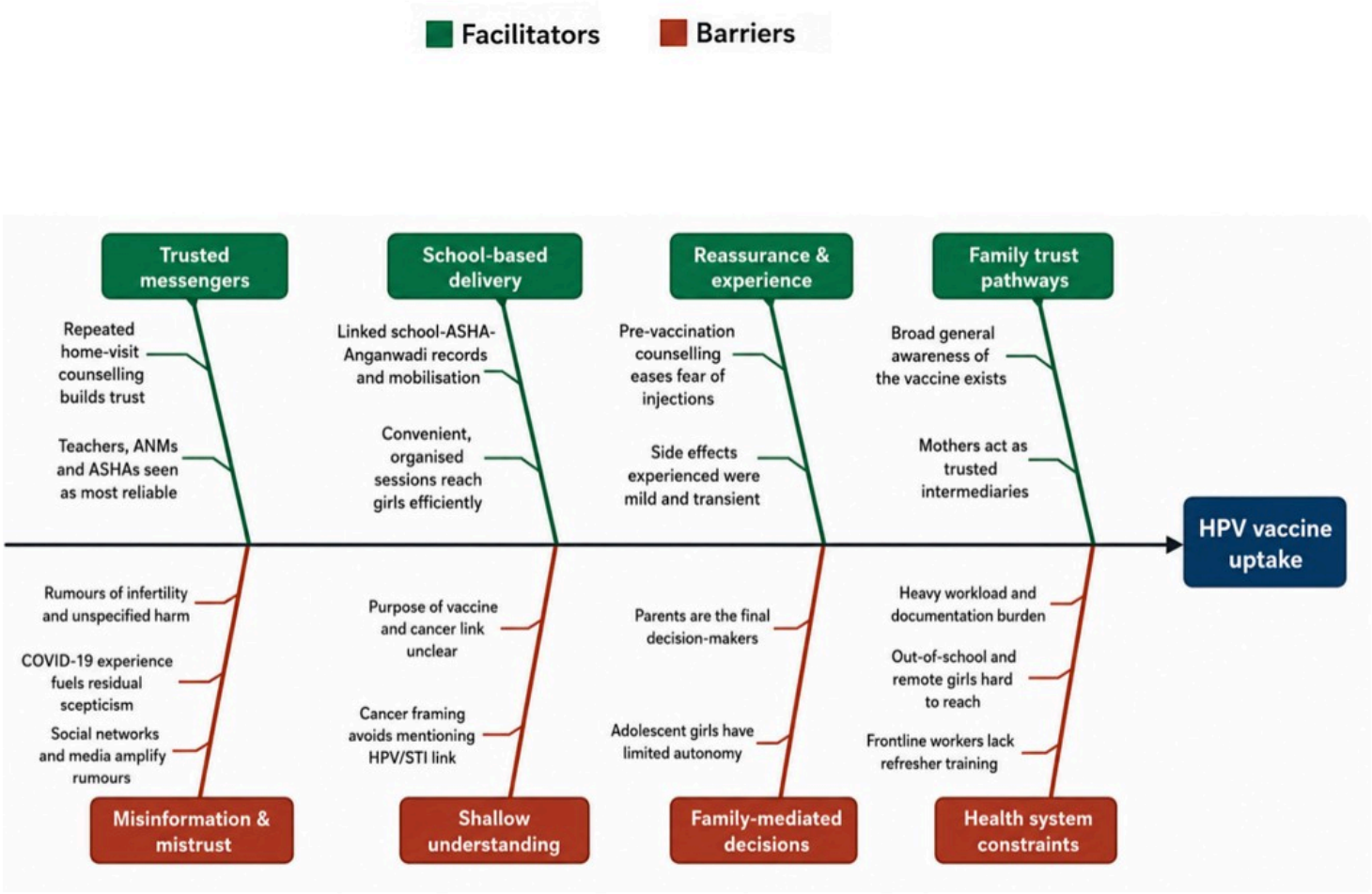


Figure 1

Unnumbered image in the Result section.