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HPV Vaccine Uptake Barriers - National Vaccination Campaign 2025 in Pakistan

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Abstract

Aims: In low- and lower-middle-income countries (LLMICs), the world's HPV-attributable mortality is highest. Human papillomavirus (HPV)-related malignancies, especially cervical cancer, continue to be a significant public health concern. Vaccination coverage is still poor in LLMICs, even after safe and effective vaccinations have been available for almost 20 years. Efforts to expand immunization programs in these contexts have been hampered by a number of obstacles, including systemic delivery issues and health misinformation.

Methodology: This study was an observational/cross-sectional comparative study to find the factors that motivated or blocked the uptake of the HPV vaccine at Lady Willingdon Hospital (LWH) during the national campaign in Pakistan during September 2025.

A questionnaire was administered to the girls and their parents coming to the vaccination center for vaccination, and mothers who were not willing to get the vaccination for their daughters. These mothers were selected from the patients coming into the OPD of LWH for their obstetrical or gynecological issues, and the study was completed from 15th September 2025 to 31st October 2025.

Results: Results show that vaccine uptake was higher in girls whose parents' education was higher than that of the other group. In the group that did not get vaccination 56% girls were enrolled in school, whereas in the group that got vaccinated, 60% girls were enrolled in school at that time, so it was not statistically significant. Knowledge and awareness were poor in the non-vaccinated group and statistically significant. The strongest factor was social media misinformation, which acted as a barrier. At the same time, the strongest motivational factor was knowledge about the usefulness of the vaccine, which was acquired from doctors. The barrier, which was not included in the closed-ended question and came up from the open-ended question, was the misconception that this vaccine will decrease the reproductive capability of the girls, and it is the way adopted by the government to decrease population growth.

Scientific Novelty: It's a policy-related, timely study that focuses on the behavior of society in response to a real campaign initiative by the government in Pakistan.

Conclusion: Coordinated, multi-level interventions that concurrently address behavioral and structural variables are necessary to increase HPV vaccine coverage in LLMICs. The results show that in order to guarantee successful implementation, community involvement, adaptable delivery methods, and long-term sustainability planning are essential. These findings directly affect national immunization policies, the development of the health system, and the accomplishment of international goals for the eradication of cervical cancer in settings with low resources. To advance equity in HPV-related cancer prevention, implementation must be tailored to the contextual realities of LLMICs.

Keywords: Cervical cancer, HPV vaccine, Pakistan campaign, Vaccine hesitancy, health policy.

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Introduction

Human Papillomavirus (HPV) is a double-stranded DNA virus that is a causative organism for cervical, anal and oropharyngeal cancers.[1] It is a family of more than 200 types, and few are directly linked to cancer. This is the only malignancy that is preventable by a vaccine, as the root cause is addressed.[2] Australia claims that it is the only country that will eradicate cervical cancer by 2035[3]. It is evident that, like other vaccines, it is effective if given before exposure to the virus itself. Prevalence of HPV is at peak in younger women and high-risk types, such as 16 and 18, are associated with cervical and anal cancers, while low-risk types, such as 6 and 11, cause warts and respiratory papillomas. Over 90% of malignancies caused by chronic infection with high-risk HPV varieties can be prevented by safe and highly efficient HPV vaccinations, which have been available for almost 20 years. The main target for HPV vaccination is adolescents, especially those between the ages of 9 and 14, since the vaccine provides the highest level of protection when given before engaging in sexual activity [4]. An important turning point in international public health initiatives to prevent cervical cancer is the human papillomavirus (HPV) vaccination. There are numerous HPV vaccination formulations available: Gardasil 9, Gardasil, Cecolin and Cervarix [5]. Different vaccine types have been shown to increase hesitancy among people, as it leads to the doubt of which option is safer [6]. National vaccination programs, such as Pakistan's vital Program on vaccination (EPI), regularly recommend and administer a number of vaccines. Vaccination continues to be a key component of worldwide public health, rooted in the successful eradication of smallpox and continuous work against measles, rubella, polio, coronavirus disease 2019 (COVID-19), and malaria[7]. Cervical cancer is the fourth most frequent cancer in women worldwide, and its disproportionate burden in low and middle-income countries is due to limited screening access and implementation.[8,9].

Research Problem

In Pakistan, daily, a woman in eight families is lost to cervical cancer. It translates into more than 3000 lives every year among Pakistani women. However, vaccination application in Pakistan shows intricate geopolitical and sociological issues. Since the HPV vaccine was gradually introduced in Pakistan in 2025, coverage has fallen short of the government target of 90% by 2027 and has not fully reached the targeted 9-14-year-old females.

Research Focus

On September 15, 2025, Pakistan began a phased rollout of the HPV vaccine Cecolin Bivalent for 16 & 18 types (single Dose) for girls aged 9 to 14 in provinces and one administrative area (Punjab, Sindh, Islamabad & AJK). Before this project, information on the prevalence and preventability of cervical cancer was spread through community channels and the media. The national objective is to achieve 90% single-dose coverage among an estimated 13 million eligible girls between 2025 and 2027, according to program targets that are made public. Approximately 34% of single-dose administrative coverage had been reported in implementing areas by September 25, 2025; however, more detailed documentation is needed regarding the exact denominators, reporting sources, and accuracy of these numbers. This early deficit creates a number of issues regarding the structural, geopolitical, and socio-cultural elements that could make it more difficult to achieve national goals.[10]

Research Aim and Question:

The question arises why the campaign was not able to reach its target coverage. What are the factors related to people that led to the barriers in the vaccination process? In this study, the factors that have led to the limited coverage and are linked to the girls and their parents are identified in an effort to address them, and before the next program launch, specific and focused efforts to rectify these can be helpful to achieve the national goal.

Research Methodology

The cross-sectional comparative study took place during the two months, 15 September 25 to 31 October 25, when the campaign (national vaccination campaign to prevent cervical cancer, 15-27 September 2025) was launched. Ethical approval was taken from the IRB/ BOS of Lady Willingdon Hospital. The research was done at Lady Willingdon Hospital, a 325-bed tertiary care maternity center in Lahore (Punjab, Pakistan). The daily OPD load of patients is around 450-550 women per day. Convenient sampling was used, and the sample size was 650 mothers. As the campaign was for adolescent girls from 9-14 years, the mothers of girls of this age group were selected and divided into two groups. Informed consent was taken from every participant.

Group 1: vaccinated girls' mothers---One group was those mothers who had brought their daughters to the vaccination center for a single dose HPV vaccine (156), and those mothers who were coming to OPD for their treatment and had their daughters vaccinated at schools were 59, hence making a total of 215 in number.

Group 2: non-vaccinated girls" mothers---group two included those mothers who were not willing to get their daughters vaccinated, and they were visiting OPD for their obstetrical or gynecological issue, and were 435. Both groups were asked about the factors that were either hindering or motivating the uptake of this vaccination. An open-ended question was also added, which asked them directly what the greatest fear or strongest drive was for this vaccination uptake. The questionnaire was divided into five broad sections. Section 1 was the demographic

section, which had 12 questions gathering background information. Section 2 has questions to assess knowledge about vaccination and screening for cervical cancer. Section 3 has questions to address the factors that acted as barriers to the uptake. Section 4 has the questions that encompass any positive attitude towards the vaccination, and the motivational factors were asked. Section 5 has the open-ended questions to ask about any other barrier or motivational factor that was not in the questionnaire, but the mother thought it was the actual or additional reason for the uptake or rejection of the vaccine. The data was entered in SPSS and analyzed.

Results

Individual-level obstacles included a lack of knowledge, false beliefs about HPV and the vaccine, and anxiety about adverse reactions, especially on reproductive capability. Adolescent vaccine decision-making was influenced by interpersonal dynamics, specifically parental consent, gendered norms, and community support. Vaccine, inadequate delivery systems, and restricted outreach to youth who were not enrolled in school were examples of structural obstacles. Key facilitators included community sensitization, trusted healthcare professionals, and CWH-based delivery methods.

Section 1: Demographics

In section one, demographic data was gathered. In group 1 (n=215), the average age of mothers was 32 years, and in group 2, it was 34 years. Fathers age was 36 in group 1 and 37.2 in group 2.

The education level of mothers is depicted in Table 1)

Table 1: Education level of mothers

Sr no.	Education level	Group 1 n=215	Group 2 n=435
1	No education	1%	2%
2	Primary	8%	18 %
3	Less than 10	7%	30%
4	10-12	40%	35%
5	Graduate	30%	15%
6	Professional	5%	1%

In the next table, the girls aged 9-14 years of these mothers were asked about their presence in schools and whether they had received the vaccination of the EPI program of Pakistan. It was evident that those whose parents did not get them vaccinated in childhood made up the majority of those who did not get this vaccine either. Table 2

Table 2: Girls' school and EPI enrollment

Girls (9-14)	Group 1 n=215	Group 2 n=435
In school	60.4%	56%
Out of school	39.55%	44%
EPI vaccinated	76%	45.2%

Section 2: Knowledge and Awareness

Table 3: Mothers' knowledge and awareness about cervical cancer and vaccine

Sr no	Questions		Group 1 n=215	Group 2 n=435
1	Cervical cancer knowledge	Yes	54%	22%
		No	46%	77.6%
2	Cause of cancer known		20%	1.7%
3	Symptoms of cancer known		15%	0.5%
4	Screening available		5%	0.64%
5	vaccination availability known		76%	64%
6	Age of vaccination		19%	14%

Table 4: Sources of information about the vaccine

Sr. No.	Source of information	Group1n=215	Group 2 n=435
1	Face book	5.2	11%
32	Instagram	3%	12%
4	Tik Tok	18%	32%
5	U tube	1%	9%
6	Phone message before call by govt	87%	81%
7	News TV	1%	0.1%
8	Newspaper	0.2%	0%
9	Neighbours and relatives	34%	58%
10	Doctors/ GP/ known Doctors	67%	21%
11	Teachers/ school	45%	24%
12	Ulma	2%	8%
	Single source	nil	nil
	Multiple sources	All has multiple sources	all

Section 3: barriers to uptake of vaccination (filled only for group 2 non-vaccinated)

Table 5: Barriers to the uptake of HPV vaccination

Sr. No.	Barriers	Group 2 n=435
1	Gender ;girls should not take it	45.3%
2	Side effects will occur	92%
3	Menses will be disturbed or not start	84%
4	Influencers negative comments	65%
5	School information and doubts	34%
6	Polio vaccination mistrust	25%
7	Mistrust on government	35.7%
8	Against religion	26%

Section 4: Motivational factors for uptake of HPV vaccination (only for the group 1 vaccinated group)

Table 6: Motivational factors for uptake

Sr. No.	Motivational factors	Group 1 n=215
1	Free availability	47%
2	School encouragement	17%
3	Single shot	11.4%
4	Low side effects	38%
5	Cancer prevention high rate	66%
6	Easy availability	56%
7	History of cervical cancer in family or acquaintances	9%

Section 5: Additional factors

Any factor not covered in closed-ended questions was explored by a single open-ended question that mothers wanted to discuss.

In barriers, this misconception appeared in 34% of mothers that this vaccine may affect reproductive capability if their daughters, and the method of population control used by the government in disguise of vaccination.

In motivational factors, the information provided by the doctors known to the families, especially the gynecologists' encouragement, was around 48% and led to the uptake.

Statistical analysis:

For this study, Group 1 (n = 215) represents mothers whose daughters received HPV vaccination, and Group 2 (n = 435) represents mothers whose daughters did not receive HPV vaccination.

- Continuous variables (maternal and paternal age): Independent samples t-test

- Categorical variables (education, awareness, EPI status, school enrolment, information sources): Chi-square test

Data were analyzed using SPSS version 21. Continuous variables were expressed as mean $\pm$ standard deviation, and categorical variables as frequencies and percentages. An independent samples t-test was used to compare the mean parental ages between groups. Associations between categorical variables were examined using Chi-square or Fisher's exact tests where appropriate. A p-value of <0.05 was considered statistically significant.

Demographic Characteristics

Maternal mean age was 32 years in Group 1 and 34 years in Group 2, while paternal mean age was 36 and 37.2 years, respectively.

Educational Status

The educational profile differed considerably between groups. Group 1 had a substantially higher proportion of graduate and professionally educated mothers (35%) compared with Group 2 (16%), whereas lower educational attainment was more frequent in Group 2. This pattern strongly suggests a significant association between higher maternal education and HPV vaccine uptake (Chi-square test, $p<0.001$).

School Enrollment

School attendance among girls aged 9–14 years was comparable between groups (60.4% vs. 56.0%; χ^2 test, $p\approx 0.33$), indicating that school enrollment alone was not significantly associated with HPV vaccine uptake.

Childhood EPI Vaccination

Previous participation in the childhood immunization program differed markedly between groups (76.0% vs. 45.2%; χ^2 test, $p<0.001$). This finding suggests that prior acceptance of routine childhood vaccination was strongly associated with subsequent HPV vaccine acceptance.

Knowledge and Awareness

Mothers in Group 1 were significantly more likely to report knowledge of cervical cancer than mothers in Group 2 (54% vs. 22%; χ^2 test, $p<0.001$). Awareness of HPV vaccine availability was also significantly higher among vaccinated girls' mothers (76% vs. 64%; χ^2 test, $p\approx 0.003$).

Knowledge regarding the appropriate age for vaccination was low in both groups (19% vs. 14%) and the difference was not statistically significant ($p\approx 0.12$).

Sources of Information

Healthcare professionals were a significantly more common information source among vaccinated mothers (67% vs. 21%; χ^2 test, $p<0.001$). Teachers and schools were also more frequently cited in Group 1 (45% vs. 24%), suggesting an important role for educational institutions in vaccine promotion.

TikTok, social media and information from neighbors or relatives were more frequently reported in Group 2, indicating that informal sources may contribute to misinformation and vaccine hesitancy.

Discussion

Though there is a lot of evidence on the effectiveness of HPV vaccination around the world, there is a gap in local research on cultural beliefs, awareness and social trust in vaccination in the Pakistani socio-religious context. Despite an effective vaccine being available in Pakistan, cervical cancer is still going to be a problem in Pakistan due to misinformation, low awareness and distrust of vaccination campaigns.

This study demonstrates that HPV vaccine uptake among mothers of adolescent girls is influenced by a complex interaction of educational, informational, behavioral, and sociocultural factors. Mothers whose daughters received HPV vaccination were generally better educated and possessed substantially greater knowledge regarding cervical cancer and HPV vaccination. The findings suggest that maternal education may improve health literacy and facilitate informed decision-making regarding preventive healthcare interventions [11,12]

A particularly important finding was the strong association between previous participation in Pakistan's Expanded Program on Immunization (EPI) and HPV vaccine acceptance. Mothers who had previously accepted routine childhood vaccinations were significantly more likely to vaccinate their daughters against HPV. This observation suggests that vaccine confidence tends to persist across different immunization programs and that strengthening public trust in routine vaccination services may improve HPV vaccine uptake [13]. This is the same trend as seen in low and middle-income countries, and our findings also support this trend. [13, 14]

Knowledge gaps regarding cervical cancer were substantial. Less than one-quarter of mothers in the non-

vaccinated group had heard about cervical cancer, and awareness regarding symptoms, causes, screening, and the appropriate age for vaccination remained poor in both groups. These findings are concerning because parental knowledge is consistently identified as one of the strongest predictors of HPV vaccine acceptance. In other provinces of Pakistan, the same pattern emerged [15].

The study also highlights the crucial role of trusted sources of information. Mothers whose daughters were vaccinated were significantly more likely to receive information from healthcare professionals. School enrollment was not grossly different in both groups, probably because the teachers were not themselves convinced to get vaccinated, so they were not able to convince the parents.

Conversely, mothers in the non-vaccinated group relied more heavily on social networks and social media platforms, including TikTok and information from neighbors and relatives. Informal information channels may facilitate the spread of misinformation and contribute to vaccine hesitancy. Similar factors, especially influence of social media, have emerged as a strong factor to affect the choices, and strict rules from governments should be implemented to stop the misinformation [16, 17].

Fear of adverse effects emerged as the predominant barrier to vaccine uptake. Concerns regarding side effects, menstrual disturbances, infertility, and government-sponsored population control were highly prevalent among mothers of unvaccinated girls.[18]. Similar misconceptions have been reported in several low- and middle-income countries and represent major impediments to HPV vaccine implementation. The persistence of infertility myths is particularly important because reproductive concerns directly influence parental decision-making in conservative societies [19].

Gender-related concerns, mistrust of government initiatives, and residual distrust generated by previous vaccination campaigns further contributed to vaccine hesitancy [20]. These findings suggest that HPV vaccination programs cannot rely solely on vaccine availability and must address broader socio-cultural determinants of health behavior. In our neighboring countries, like India, the same issues are highlighted when vaccine drives are started [21, 22].

Among mothers who accepted vaccination, the principal motivating factors were the perceived effectiveness of the vaccine in preventing cervical cancer, easy access, free availability, and reassurance regarding safety [23,24]. Furthermore, advice from trusted physicians, particularly gynecologists, emerged as an influential facilitator. This finding underscores the importance of healthcare professionals as credible messengers capable of correcting misconceptions and promoting evidence-based decision-making. Polio vaccine campaigns are regularly repeated in Pakistan, and more or less the same factors can be identified [25].

Collectively, these findings suggest that successful implementation of HPV vaccination programs in Pakistan will require multifaceted interventions incorporating community sensitization, physician-led education, school-based delivery systems, and targeted communication strategies aimed at addressing misconceptions regarding fertility and vaccine safety [26, 27].

Conclusion

HPV vaccination uptake was positively correlated with higher maternal education, prior acceptance of childhood immunization, and increased awareness of cervical cancer. Infertility beliefs, side effect worries, and false information spread via unofficial social networks were the main causes of vaccine hesitation. The adoption of the HPV vaccine in Pakistan may be significantly increased by physician involvement, school-based programs, and culturally aware community education activities.

There is a dearth of local research on cultural beliefs, awareness, and social trust in vaccination in the Pakistani socio-religious context. The HPV vaccination has been used around the world for many years, both in Muslim and other countries; even then, the uptake here was low despite free availability. The barriers include misconceptions, limited knowledge, and mistrust of previous immunization initiatives and social media rumors.

Recommendations

- A coordinated, multi-sectoral strategy based on the findings of this study is advised to reduce the HPV vaccine coverage gap and promote cervical cancer prevention.
- Health Communication: To dispel myths and increase vaccine confidence, create and fund behaviorally based education initiatives that are aimed at teenagers, caregivers, and community influencers. Social media regulations may be needed.
- Inclusive Delivery Models: immunization campaigns in schools, but should be initiated after teachers' education and training, for acceptance by the teachers first, while creating concurrent outreach for other girls [29].
- The results encourage the creation of culturally aware, school-based HPV vaccination programs that are supplemented by community involvement tactics and doctor-led counseling. By dispelling myths about

infertility and vaccine safety, reputable medical professionals and community leaders may significantly increase HPV vaccine adoption and support Pakistani efforts to prevent cervical cancer, as suggested in neighboring countries' research [30].

Limitations

This is a single-centered study and has no input from the girls themselves. We recommend carrying out studies in other centers and schools. Moreover, as this study is about the questions asked from mothers only, questions and interviews from girls and fathers will open newer insights. Convenience sampling limits representativeness.

Declarations

Author contributions

Conceptualization, Kiren Khurshid Malik; methodology, Kiren Khurshid Malik; software; validation; formal analysis; investigation; resources; data curation; writing—original draft preparation, Kiren Khurshid Malik; writing—review and editing; visualization, Kiren Khurshid Malik; supervision, Kiren Khurshid Malik; project administration, Kiren Khurshid Malik. All authors have read and agreed to the published version of the manuscript.

Data availability statement:

The data presented in this study are available on request from the corresponding author

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Informed consent statement

Mentioned

Conflicts of interest

None

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