

# Factors Associated with Human Papillomavirus Vaccine Uptake in Adolescents Aged 10-12 Years in Kiambu Sub-County, Kenya

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**Abstract-** *This study aimed to assess factors influencing HPV vaccine uptake among adolescents aged 10-12 years in Kiambu sub-county, Kenya. Despite global efforts, HPV vaccine uptake remains inadequate. Challenges identified include lack of awareness and misconceptions about the vaccine, while factors influencing uptake include age, caregiver's role, education level, and perception of vaccine importance and safety. Targeted interventions such as community health education, behavior change interventions, and accurate information dissemination are crucial to improving vaccine uptake. The study adhered to reporting guidelines and involved patient and public participation. However, limitations include potential recall bias, unexplored perception components, COVID-19-related confusion, and the cross-sectional design's inability to establish causal relationships.*

**Indexed Terms-** *Adolescents, HPV vaccine, Uptake*

## I. INTRODUCTION

Human Papillomavirus (HPV) is a common sexually transmitted infection that can lead to various types of cancers, including cervical cancer. Teenagers are at a significant risk of HPV infection due to high-risk sexual behaviors, but they often do not receive the available and affordable HPV vaccine. Globally, cervical cancer is the fourth most common cancer in women, causing about 85% of the burden, especially in developing countries. In sub-Saharan Africa, the incidence and death rates of cervical cancer are high. Cervical cancer is one of the preventable forms of cancer through the prevention of HPV infection, achievable through the highly effective and cost-effective HPV vaccine. Despite the availability of the vaccine, its uptake remains low in many countries.

Limited studies have explored the factors associated with vaccine uptake, including knowledge, perceptions, and misconceptions among adolescents and their parents. Understanding these factors is crucial for accelerating vaccination programs. In Kenya, cervical cancer incidence is increasing, and Kiambu County has recorded low HPV vaccine coverage. Challenges such as concerns about safety, effectiveness, and cultural beliefs have been reported. Factors such as awareness, attitude, maternal education, knowledge, and receiving childhood immunization have been found to affect HPV vaccination. Maternal awareness and education, in particular, play a significant role. School-based strategies and being in school have been associated with higher vaccine uptake. The HPV vaccine is highly effective in preventing cervical cancer, and increasing vaccine uptake is a priority. This study aims to assess the factors associated with HPV vaccine uptake in Kiambu County, providing insights for policy improvement and promoting further research in HPV vaccination.

## II. METHODS

This study utilized a mixed-method, cross-sectional study design to investigate factors associated with HPV vaccine uptake in Kiambu County. The research was conducted in Kiambu Sub-County, Kiambu County, and involved 30 primary schools and Kiambu Level 5 Hospital as the study sites. The target population consisted of adolescent girls aged 10-12 years, with a total population of 6,668 in the sub-county. The inclusion criteria required assent from the girls themselves and signed consent forms from their parents or guardians. Additionally, mothers or guardians with teenage girls aged 10-12 years attending the Maternal and Child Health (MCH) clinic in Kiambu Hospital and who provided consent were

also included. Exclusion criteria included absence on the data collection day and lack of parental consent. For the quantitative study, a sample size of 378 participants was determined using Fisher's et al. (1998) formula, considering a 5% margin of error, a Z-value of 1.96 corresponding to a 95% confidence level, and an estimated HPV uptake of 44%. The sampling technique involved a multi-stage cluster approach. Three clusters were formed within each type of primary school (public, private, and faith-based), resulting in a total of 30 schools. From each cluster, participants were randomly selected using a simple random sampling technique to obtain the desired sample size of 378 adolescent girls.

In addition to the quantitative study, qualitative data was collected through free listing interviews and Focus Group Discussions (FGDs) with mothers or guardians. A total of 327 questionnaires were filled, and interviews were conducted with 10 mothers/guardians during free listing interviews and 2 FGDs consisting of 10 other mothers/guardians between April 2023 and June 2023. The collected data were processed and analyzed using EPI-data V.4.6 software for quantitative data and STATA V.16 for qualitative data. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the quantitative results.

In the focus group discussion (FGD), the participants were encouraged to sit in a circular arrangement to facilitate easier discussion. Verbatim notes were taken by the principal investigator to capture every detail of the discussion. The interview was conducted in English, and participants' knowledge of the topic, including the disease, challenges, barriers, experiences, and fears related to vaccine uptake, were recorded by a research assistant. Both the free listing interviews and the FGD were conducted in a health facility in Kiambu. The exercise involved one research assistant and two independent guides. The interview was recorded and later transcribed verbatim.

### III. RESULTS

*The Initiation and Completion of the HPV Vaccine*  
The initiation and completion of the HPV vaccine among the target population were at 69.1% and 63.0%,

respectively. The negative correlation coefficient of -0.411\*\* between age and HPV vaccine initiation suggests that as adolescents' age increases, there is a tendency for a decrease in vaccine initiation rates. However, there is no significant correlation between age and the number of doses of the HPV vaccine received, indicating that age might not be a major determinant of completing the recommended vaccine doses. The majority of the participants (66.9%) were provided with a health record/card related to the HPV vaccine, but 23.0% reported not being provided with a health record/card. The majority of participants (69.1%) were informed that the HPV vaccine protects them from cervical cancer, while 30.9% were not. 74.9% of participants reported that the HPV vaccine was good, while 14.7% said it was not. A smaller proportion (10.4%) thought it was not important for girls, while two were unsure.

Table 1: Results showing initiation & completion rate of adolescent girls HPV vaccine vaccination

Category	Variables	Frequenc y	Percentag e
Have you received the HPV vaccine?	Yes	226	69.1%
	No	85	26.0%
	I don't know	16	4.9%
	Total	327	100.0%
How many doses of HPV vaccine have you received?	None	85	27.3%
	One	30	9.6%
	Two	196	63.0%
	Total	311	100.0%
Were you provided with a health record/card ?	Yes	225	69.9%
	No	97	30.1%
	Total	322	100.0%
Before or after receiving the vaccines, were you told what it	Yes	226	69.1%
	No	101	30.9%
	Total	327	100.0%

protects you from?				
What can you say about HPV vaccine?	It is not good	48	14.7%	
	It is good	245	74.9%	
	It is not important for girls	34	10.4%	
	Total	327	100.0%	

Factors associated with HPV vaccine uptake in early adolescents aged 10-12 years in Kiambu Town Sub-County include knowledge and attitude towards the HPV vaccine. Among the participants, 69.3% correctly identified the HPV vaccine as a preparation that protects against HPV-caused diseases. Additionally, 52.5% knew that it is not exclusively for girls of their age. Furthermore, 66.7% of respondents correctly stated that it is given through an injection. Moreover, 72.3% of participants correctly mentioned that the vaccine protects against cancer of reproductive organs. Additionally, 67.3% were informed about when to come back for the second dose.

*Knowledge and attitude of adolescent girls towards HPV Vaccine*

Table 2: Knowledge/attitude Towards HPV Vaccine.

Category	Variables	Frequency	Percentage
What is a HPV vaccine?	A preparation that protects our bodies from HPV-caused diseases.	174	69.3
	A type of medicine to cure COVID-19	8	3.2
	I don't know	69	27.5
	Total	251	100.0
HPV vaccine is for girls of your	True	99	31.1
	False	167	52.5
	I don't know	52	16.4

Category	Variables	Frequency	Percentage	
ONLY	Total	318	100.0	
	How is the HPV vaccine given?	Injection	218	66.7
		Mouth drop	22	6.7
		I don't know	87	26.6
	Total	327	100.0	
What diseases does HPV cure?	Cancer of reproductive organs	232	72.3	
	Stomach cancer	18	5.6	
	I don't know	71	22.1	
	Total	321	100.0	
How many times should one receive HPV vaccine injection?	Once	59	18.3	
	Two times only	96	29.8	
	Twice in a duration of 3 months	66	20.5	
	Twice in a duration of 6 months	101	31.4	
	Total	322	100.0	
What is the right time to receive HPV vaccines?	Below 9 years	9	60	
	Below 9-14 years	215	73.6	
	All age	17	5.8	
	Total	292	100.0	
According to you, is HPV vaccine important for girls?	Yes	251	78.4	
	No	69	21.6	
	Total	320	100.0	
Do you think the HPV vaccine is safe?	Yes	261	81.6	
	No	8	2.5	
	Don't know	51	15.9	
	Total	320	100.0	

The table provides insights into the knowledge and attitudes of adolescent girls towards the HPV vaccine.

The findings indicate that a significant proportion of respondents (69.3%) correctly recognized the HPV vaccine as a preparation that protects against HPV-caused diseases. However, there were some misconceptions, as 3.2% believed it was a cure for COVID-19. It is encouraging to note that more than half of the participants (52.5%) knew that the HPV vaccine is not exclusively for girls of their age. Additionally, a majority (66.7%) correctly identified that the HPV vaccine is given through an injection. The awareness of the vaccine's purpose was relatively high, with 72.3% recognizing its role in protecting against cancer of reproductive organs. These findings highlight the importance of ongoing education and awareness campaigns to address misconceptions and promote accurate knowledge about the HPV vaccine among adolescent girls.

*Institutional and maternal factors affecting HPV vaccine uptake in early adolescents*

Table 3 presents important institutional and maternal factors that influence the uptake of the HPV vaccine in early adolescents. The findings reveal that lack of awareness and knowledge about the vaccine among mothers is a significant barrier. Limited awareness campaigns by healthcare institutions contribute to this lack of understanding. Cultural beliefs and misconceptions, such as associating the HPV vaccine with COVID-19 or relying solely on divine healing, also impact vaccination decisions. Access to healthcare facilities and flexible vaccination schedules are crucial for ensuring adequate vaccine coverage, particularly in remote areas. The education level of mothers plays a role, as those with lower education may struggle to comprehend the importance of the HPV vaccine. Family support and positive interactions with healthcare providers are influential in encouraging vaccination. The table underscores the importance of targeted awareness campaigns, culturally sensitive approaches, improved access to healthcare, and effective communication to address these factors and enhance HPV vaccine uptake in early adolescents.

Table 3: Institutional/Maternal Factors Influencing HPV Vaccine Uptake in Early Adolescents.

Factors	Maternal Factors (Mothers' Perspectives)	Institutional Factors (Healthcare System)
Awareness and Knowledge	The responses gathered in the focus group discussion (FGD) indicate that most mothers may lack awareness about the HPV vaccine, its benefits, and potential risks, as expressed by the statement "Lack of awareness of what it does to my daughter."	Healthcare institutions within Kiambu County have limited awareness campaigns about HPV and its importance for adolescents, resulting in limited knowledge about the vaccine.
Cultural Beliefs	Cultural beliefs or misconceptions about vaccines affect mothers' willingness to consent to HPV vaccination. For instance, parents who subscribe to the Kavonoki religion/faith hold the view that God heals and not drugs. The FDG as establishes a misconception among some mothers that the HPV vaccine is related to COVID-19.	Most of the healthcare providers are not trained to address parental cultural concerns effectively.
Access to Healthcare	Mothers in remote or underserved areas face challenges in accessing healthcare	Limited healthcare facilities in certain regions result in

Factors	Maternal Factors (Mothers' Perspectives)	Institutional Factors (Healthcare System)
	facilities for vaccination. Most parents risk of being sent away from the facility due to lateness, as described in the quote "the nurse sent me away that I brought my girl late... but it was around 3 pm." This challenge highlights the importance of flexible vaccination schedules to accommodate parents' circumstances.	reduced vaccine availability.
Education Level	Mothers with lower education levels may struggle to understand the importance of HPV vaccination and its benefits. The crosstabulation results in Table 4.5 suggest that parents with primary education were less likely to vaccinate their adolescent daughters than their counterparts with secondary education.	Healthcare materials may not be presented in a manner that is easily comprehensible for all mothers in the study area.

Factors	Maternal Factors (Mothers' Perspectives)	Institutional Factors (Healthcare System)
Family Support	Positive family attitudes toward vaccines could encourage mothers to seek HPV vaccination for their children. When asked during the FDG what they say about the health care workers working in their health facility, most participating parents noted: "They are good, give us good services and educate us.....but they don't tell us what is there and what is not there."	Lack of family support or encouragement may lead to lower vaccine uptake.
Healthcare Provider Interaction	The FDG and interview results indicate that supportive healthcare providers who explain the benefits of the HPV vaccine can positively influence maternal decisions regarding HPV vaccination of their adolescent girls.	Insufficient communication between healthcare providers and mothers may lead to misconceptions, as implied in this response from a participant in the FDG: "'Lack of clarity about what it is for - 'It is said to protect against COVID-19!'"

Crosstabulation for HPV Vaccines.

Table 4 presents a comprehensive overview of the factors influencing HPV vaccine uptake among the respondents. The data reveals that a significant proportion of the participants, across different age groups and grades, have received the HPV vaccine. Mothers, who serve as primary caregivers in most cases, show a high level of awareness and responsibility regarding vaccination, ensuring their daughters receive the vaccine. Interestingly, respondents with higher education levels and employed caregivers tend to have higher vaccination rates. The table also shows a strong belief in the importance and safety of the HPV vaccine among the majority of respondents. These findings emphasize the positive impact of education, caregiver involvement, and awareness campaigns in promoting HPV vaccine uptake. Nevertheless, the data also highlights the need for targeted interventions to address misconceptions and uncertainty among a small portion of respondents. Overall, the table provides valuable insights for healthcare providers and policymakers to further improve HPV vaccine coverage and address concerns effectively.

Table 4: Crosstabulation for HPV Vaccines.

Count		Have you received the HPV vaccine?			
		Yes	No	I don't know	Total
Age	10 years	85	78	16	179
	11 years	98	0	0	98
	12 years	43	7	0	50
	Total	226	85	16	327
Grade	4th Grade	43	58	8	109
	5th Grade	15	27	8	192
	6th Grade	26	0	0	26
	Total	226	85	16	327
Respondent's caregiver	Mother	213	85	16	314
	Father	13	0	0	13

Count		Have you received the HPV vaccine?			
		Yes	No	I don't know	Total
Educational status of respondent's caretaker	Primary	107	25	8	140
	Secondary	119	60	8	187
	Total	226	85	16	327
Occupation of respondent's caretaker	Employed	100	19	8	127
	Self-employed	10	39	0	49
	Unemployed	42	27	8	77
Total	152	85	16	253	
According to you, is HPV vaccine important for girls?	Yes	226	25	0	251
	No	0	53	16	69
	Total	226	78	16	320
Do you think the HPV vaccine is safe?	Yes	226	35	0	261
	No	0	8	0	8
	Don't know	0	35	16	51
Total	226	78	16	320	

The inferential statistics showed that the combined predictor variables (Occupation of respondent's caretaker, Respondent's caregiver, Grade, Educational status of respondent's caretaker, and Age) accounted for approximately 4.6% of the variance in HPV vaccine uptake. The regression model was statistically significant ( $p = 0.049$ ), indicating that the predictors collectively contributed to explaining the variation in vaccine uptake. The educational status of the respondent's caretaker and the occupation of the respondent's caretaker were significant predictors.

Adolescents whose caretakers had higher educational statuses were more likely to receive the vaccine (Beta = -0.231,  $p = 0.003$ ), and similarly, those with employed caretakers were more likely to receive the vaccine (Beta = -0.206,  $p = 0.009$ ). Age, grade, and occupation of the respondent's caregiver did not significantly influence vaccine uptake. Regarding the correlation between age, HPV vaccine initiation, and the number of doses received, no specific findings or statistics were mentioned in the provided text.

#### IV. DISCUSSION

The findings of the present study align with previous research conducted in different settings. Sriram and Ranganathan (2019) conducted a study in the United States and identified similar barriers to HPV vaccine uptake, including lack of awareness and knowledge about HPV, concerns about vaccine safety, and parental hesitancy. These findings suggest that addressing these barriers is crucial to improve vaccine coverage among adolescents in different countries.

Similarly, Nabirye et al. (2020) explored health system factors influencing HPV vaccine uptake in Uganda, and their findings resonate with the current study. Limited knowledge and awareness, inadequate communication, and challenges in accessing vaccination services were identified as key factors impacting vaccine uptake. This highlights the importance of improving health system factors to facilitate the successful implementation of HPV vaccination programs.

The study by Kisaakye et al. (2018) focused on HPV vaccine uptake among female adolescents in Uganda, and their findings coincide with the present study's results. Factors such as knowledge about HPV, education level, and healthcare provider recommendations were associated with higher vaccine uptake, while barriers such as lack of awareness, concerns about vaccine safety, and financial constraints were linked to lower uptake. These findings underscore the need for targeted educational campaigns and supportive healthcare services to improve vaccine coverage.

Additionally, the systematic review conducted by Loke et al. (2017) provided a broader perspective on

HPV vaccine uptake among adolescents. The review highlighted the influence of factors such as knowledge, healthcare provider recommendations, parental attitudes, socioeconomic status, and access to healthcare services on vaccine uptake. The findings emphasize the importance of addressing these multifaceted factors to optimize HPV vaccine coverage.

Furthermore, Tung et al. (2016) focused on HPV vaccine uptake among adolescent girls and young women in Australia. Their findings align with the current study, emphasizing the role of healthcare provider communication, positive attitudes towards vaccination, and accurate knowledge about HPV in promoting vaccine uptake. Addressing concerns about vaccine safety, enhancing awareness, and considering socioeconomic disparities are crucial for improving vaccine coverage in this population.

The findings from these studies collectively support the importance of enhancing knowledge, addressing concerns, improving healthcare provider communication, and strengthening health system factors to promote HPV vaccine uptake among adolescents. These insights can inform the development of targeted interventions and strategies to enhance vaccine coverage and reduce the burden of HPV-related diseases globally.

#### CONCLUSION

This study provides insights into the factors associated with HPV vaccine uptake among adolescents in the Kiambu sub-county of Kenya. The findings highlight the importance of knowledge and positive attitudes towards the vaccine in motivating uptake. However, further efforts are needed to improve vaccine coverage, especially in underserved areas and among populations with low awareness. Future studies can explore additional factors that may influence vaccine uptake and develop targeted interventions to increase vaccination rates.

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#### REFERENCES

- [1] Kisaakye, E., Namakula, J., Kihembo, C., Kisakye, A., Nsubuga, P., & Babirye, J. N. (2018). Level and factors associated with uptake of human papillomavirus infection vaccine among female adolescents in Lira District, Uganda. *Pan African Medical Journal*, 31(1).
- [2] Loke, A. Y., Kwan, M. L., Wong, Y. T., & Wong, A. K. Y. (2017). The uptake of human papillomavirus vaccination and its associated factors among adolescents: a systematic review. *Journal of primary care & community health*, 8(4), 349-362.
- [3] Nabirye, J., Okwi, L. A., Nuwematsiko, R., Kiwanuka, G., Muneza, F., Kanya, C., & Babirye, J. N. (2020). Health system factors influencing uptake of Human Papilloma Virus (HPV) vaccine among adolescent girls 9-15 years in Mbale District, Uganda. *BMC public health*, 20, 1-11.
- [4] Sriram, S., & Ranganathan, R. (2019). Why human papilloma virus vaccination coverage is low among adolescents in the US? A study of barriers for vaccination uptake. *Journal of family medicine and primary care*, 8(3), 866.
- [5] Tung, I. L., Machalek, D. A., & Garland, S. M. (2016). Attitudes, knowledge and factors associated with human papillomavirus (HPV) vaccine uptake in adolescent girls and young women in Victoria, Australia. *PloS one*, 11(8), e0161846.