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Original Research Article

Factors influencing uptake of human papillomavirus vaccine among school-going adolescent girls (10-14 years) in Kibra Sub County, Nairobi City County, Kenya

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ABSTRACT

Background: The human papillomavirus (HPV) vaccine, which is administered to young girls prior to the initiation of sexual activity, is a crucial primary preventive measure against cervical cancer. Cervical cancer is the primary cause of cancer death and the most common cancer among Kenyan women. The study aimed to assess factors Influencing uptake of human papillomavirus vaccine among school-going adolescent girls (10-14yrs) in Kibra Sub County, Nairobi City County, Kenya.
Methods: The study used an analytical cross-sectional where both qualitative and quantitative data were obtained for triangulation purposes. Both chi-square and binary logistic regression were employed to determine the association between the independent and dependent variables. Qualitative data was analyzed thematically.
Results: The uptake of the HPV vaccine in this study was 29.9% which is a public health concern. Attending a private school (OR=2,95%CI=1.17-3.26), having guardians aged between 34-40 years (OR=4.7,95%CI=0.09-0.53), having a positive perception of the HPV vaccine (OR=2.4,95%CI=0.26-0.66) and easy access to HPV vaccination services (OR=2.7,95%CI=0.22-0.65) increased the odds of the HPV vaccine uptake. Study respondents' guardians who had a primary level of education (OR=4,95%CI=1.97-8.04), being Muslim (OR=1.9,95%CI=0.30-0.94), and the absence of HPV vaccination programs targeting school-going girls (OR=2.2,95%CI=1.36-3.46) reduced the odds of HPV vaccine uptake.
Conclusions: The uptake of the HPV vaccine was suboptimal. Attending a private school, easy access to HPV vaccination services, having guardians aged between 34-40 years, and having a positive perception of the HPV vaccine increased the odds of the HPV vaccine uptake. Multifaceted efforts should be put in place to enhance the uptake of HPV vaccines.

Keywords: Adolescent, Human papillomavirus, Uptake and vaccination

INTRODUCTION

Human Papilloma Virus (HPV) is the leading cause of several cancers such as pharyngeal, oral, anal, and genital cancers. Amongst these, cervical cancer is critical, being the third most prevalent and the fourth most common cancer-related fatalities cause in women globally.[1] Prolonged infection with oncogenic HPV serotypes causes cervical cancer. There are around 170 HPV strains, 40 of which can be transmitted sexually. Approximately 75% of those who engage in sexual activity are expected to have a lifetime HPV contract. While prolonged infection with high-risk HPV strains (11, 16, 18, 33, 51, 52, 53, 58, and 61) can cause oral-

genital cancer or warts; as a result of the body's immune system, the majority of illnesses are asymptomatic and heal on their own within two years.[2] The highest cervical cancer incidences are prevalent in low-income countries where access to preventive screening is limited and high-quality treatment is either not available or expensive.[3] In 2023, 37 countries representing more than 45% of girls aged 9-14 years old vaccinated in that year used a 1-dose schedule. Global coverage with the first dose of HPV among girls is now estimated at 27%.[4]

While promoting abstinence, condom use, and monogamous fidelity are all important parts of a comprehensive cancer control plan, HPV vaccination is the main preventative approach.[5] As the vaccines' efficacy is greatest in populations without prior exposure to HPV, prepubescent girls are the main target group for vaccination before they commence sexual intercourse.[6] Catch-up vaccines are offered for up to 26 years, even though the optimal age for vaccination is between 11 and 12. As of 2022, coverage of the first dose in the African Region stands at only 33%, falling short of the global target of 90%. Increasing coverage is essential to reduce the burden of cervical cancer and improve public health outcomes.[4] The findings of their current review showed an overall pooled estimated HPV vaccine uptake of 28.53% among schoolgirl adolescents in sub-Saharan Africa.[7]

Although HPV vaccines are effective and secure, the adoption rate among at-risk individuals is less than projected, reducing the vaccine's potential impact on public health.[8] Factors contributing to poor reception of HPV vaccination include inadequate knowledge and inaccurate information, unfavorable perceptions and norms about HPV, cervical cancer, and the HPV vaccine, and sociodemographic and cultural characteristics.[9] Acceptability studies, which have mainly been carried out in Western nations and some, more recently, in third-world countries (LMICs), typically show a high concern in these vaccinations, although safety, cost, and specific socio-cultural issues are frequently recognized as barriers.[9,10]

In 2020, the number of newly diagnosed cervical cancer cases globally was 604,000.[11] Of the estimated 342,000 deaths, about 90% occurred in undeveloped and developing countries, where cancer management methods are still inadequate. Kenya is no exception, having one of the highest global cervical cancer prevalence and death rates.[12] According to WHO, Kenya registered 5236 new cases of cervical cancer in 2020, representing an age-standardized incidence of 31.3 per 100,000 persons. [11] Recently, the Ministry of Health has launched sensitization campaigns and Periodic Intensification of Routine Immunization (PIRI) activities in all 47 counties to improve HPV coverage to at least 80%. To achieve this target, one of the first key steps is to identify the aspects causing vaccine hesitancy among women in Kenya. This study sought to assess factors influencing the uptake of Human Papillomavirus vaccine among school-going adolescent girls (10-14yrs) In Kibra Sub County, Nairobi City County, Kenya.

METHODS

Study design

The study used an analytical cross-sectional quantitative study design supplemented with qualitative techniques. Qualitative techniques were used to obtain data from the public health staff on the state of vaccination in the sub-county and healthcare-related factors that the staff believes play a role in the uptake of the HPV vaccine. Qualitative methods were also employed in eliciting information from teachers and healthcare professionals working in schools whereby they were interviewed.

Study area

This research was conducted in Nairobi City County. Kenya's most densely populated County. According to Kenya's 2019 census, the County has over 4.3 million residents with a population density of over 6,000 persons per square kilometer.[13] The County constitutes seventeen sub-counties, 205 public schools, and 2,000 private primary schools. The study will target schools in the Kibra sub-county in the southwestern part of the County.

Study population

The study targeted the parents of adolescent girls between 10-14 years old attending primary schools in Kibra Sub-county. The study targeted both public and private schools. In addition, the study included school heads, and healthcare professionals working in schools located within Kibra Sub-county. To gain insights from them, key informant interviews were conducted with them into the school-level policies, practices, and support related to HPV vaccination programs.

Sample size determination

Sample size calculation for quantitative data was calculated by the use of the Fischer formula, as a result, 385 study respondents were recruited in this study.

Inclusion criteria

The research subjects encompassed parents of girls aged between 10-14 years of age and who provided their consent for study participation. School heads or healthcare professionals working in educational institutions within the Kibra sub-county were also involved in the study. Those directly involved in school-level health programs or decision-making processes were included in the study.

Exclusion criteria

All study subjects who fulfilled the requirements for inclusion were included in the investigation; however, those who were ill at the time of the investigation were not included. Furthermore, this investigation did not include any parents who did not provide their consent. All school administrators and school-level medical personnel who were ill at the time of the investigation or who did not provide informed consent were omitted from the investigation.

Sampling technique

In this study, Purposive sampling was employed to select Nairobi County. A stratified random sampling method was used by stratifying the schools into public and private institutions. Simple random sampling was used to select the schools and the study participants. This study was carried out in April 2024 to May 2024.

Data collection tools and procedures

A semi-structured questionnaire was used to capture quantitative data. Section A of the questionnaire captured data on HPV vaccine uptake, Section B captured data on sociodemographic factors influencing HPV vaccine uptake, Section C captured data on parental perceptions influencing HPV vaccine uptake, and Section D captured data on health system factors influencing HPV vaccine uptake. Key informant guides were used to obtain qualitative data from the key informants.

Statistical analysis

Quantitative data was keyed into Excel for purposes of cleaning, and editing to aid in validation for inconsistency, extreme values, and missing variables. Cleaned data was entered into a statistical package for social sciences version 29 for analysis. Categorical variables were presented in the form of frequencies and percentages. The Chi-square test for independence was conducted in bivariate analysis. Statistical significance was set at a $p \leq 0.05$. Variables that were significant in the bivariate analysis were imported for multivariate analysis where binary logistic regression was applied to develop a logistic regression model. Finally, data was presented in the form of tables and figures. Qualitative data was analyzed thematically.

Ethical consideration

Ethical clearance and approval to conduct the study were obtained from the Mount Kenya University Institution of Ethics and Review Committee (MKU/ISERC/3157). Permission to carry out the study was obtained from NACOSTI(NACOSTI/P/23/31657), and permission to research the study area was obtained from appropriate departments from the Nairobi County government. Confidentiality of the participant information was highly maintained, whereby a unique number was assigned to the questionnaire instead of the respondent's name. Participation of the respondents in this study was purely voluntary whereby the researcher asked for an informed ascent form before data collection.

RESULTS

Social demographic characteristics

As provided in Table 1 below, more than a third (40.3%) of the study respondents' guardians were aged between 34-40 years. Only a few (14.8%) of the study respondents' guardians were aged between 27-33 years. More than half (51.9%) of the study respondents were between grades 7^{th}-8^{th} which could be linked to their age. More than a third (39%) of the guardians had attained a primary level of education The majority (80.5%) of the households had no health insurance coverage. More than half (54.5%) of the study respondents obtained their care from community health clinics. Only a few (13.5%) obtained healthcare services from a physician. More than half (54%) of the study respondents were earning between 1-10000 Kshs, and only a few (11.2%) of the study respondents were earning between 30001-40000 Kshs. Concerning religion, close to three-quarters (72.2%) of the study respondents were Christian. Lastly, concerning the type of school attended by the study respondents, close to three-quarters (71.7%) of the study were schooling in public schools while more than a quarter (28.3%) of the study respondents were schooling in private schools.

Table 1: Descriptive statistics on social demographic characteristics.

Independent variables	Categories	Frequencies	Valid percentage	Mean	STD
Age of the respondents				12.05	1.30
Age of the guardian (in years)	27-33	57	14.8		
	34-40	155	40.3		
	41-47	115	29.9		
	48-54	58	15.1		
School grade	4^{th}-6^{th} grade	185	48.1		
	7^{th}-8^{th} grade	200	51.9		
Guardian's level of education	Never been to school	52	13.5		
	Primary	150	39		

Continued.

Independent variables	Categories	Frequencies	Valid percentage	Mean	STD
	Secondary	77	20		
	Vocational	48	12.5		
	Tertiary	58	15.1		
Daughters' primary source of healthcare	Physician	46	11.9		
	School-based clinic	69	17.9		
	Community clinic	210	54.5		
	Private clinic	60	15.6		
Household health insurance status	Insured	75	19.5		
	Not insured	310	80.5		
Household income level	1-10000	208	54		
	10001-20000	84	21.8		
	20001-30000	50	13		
	30001-40000	43	11.2		
Religion	Muslims	107	27.8		
	Christians	278	72.2		
Type of school attended	Private	109	28.3		
	Public	279	71.7		

Uptake of HPV vaccine

Close to a third (29.9%) of the investigation's subjects had received the vaccine for HPV, as shown in Table 2 below. Conversely, nearly three-quarters (70.1%) of the study subjects had not received the vaccine for HPV. Thirty-three percent of the study participants reported receiving their second dose, whereas over half (67%) had received their first. While only a small percentage of the subjects (26.7%) reported paying for HPV immunization services, the majority (71.3%) reported not paying for such services.

Table 2: Uptake of HPV vaccine.

Independent variables	Categories	Frequencies	Valid percentage
Uptake of HPV vaccine	Yes	115	29.9
	No	270	70.1
HPV doses administered	1st dose	77	67
	2nd dose	38	33
Vaccines payment	yes	33	28.7
	no	82	71.3
Place where the vaccine was received	At school	91	79.1
	Healthcare facility	24	20.9

Social demographic factors associated with the uptake of HPV vaccines

Regarding the social demographic factors influencing the uptake of HPV immunization, the following variables were imported for binary logistic regression analysis because they showed a significant statistical correlation when the bivariate analysis was done: the guardian's age ($\chi2=11.999$, df=3,p=0.007), education level ($\chi2=30.219$,df=4,p=<0.000), the daughter's primary healthcare provider($\chi2=21.956$, df=3,p=<0.000), religion ($\chi2=6.131$,df=1,p=0.013), and type of school attended ($\chi2=7.998$,df=1,p=0.005). The HPV vaccination uptake was not statistically correlated with household income level ($\chi2=4.862$, df=3,p=.182), student grade ($\chi2=0.303$,df=1,p=0.615), or household health insurance status ($\chi2=0.013$,df=1,p=.91).

As provided in Table 3, study respondents who were attending private schools were 2 times more likely to be vaccinated for HPV vaccines as compared to those who were attending public schools. In addition, study respondents' guardians who were aged between 34-40 years were 4.7 more likely to have daughters vaccinated for HPV as compared to those respondent's guardians aged 45-54 years. Study respondents who were Muslims were 1.9 times less likely to be vaccinated for HPV vaccines as compared to Christians.

Study respondents' guardians who had a primary level of education were 4 times less likely to have daughters vaccinated for HPV as compared to those with a tertiary level of education.

These findings also agreed with the qualitative findings where one of the key informants narrated that;

"*Guardians with low education levels are more susceptible to misinformation and myths about vaccines. They may be influenced by anti-vaccine rhetoric or false information about the safety and efficacy of the HPV vaccine. Guardians with lower education levels may have a mistrust of healthcare providers or the medical system. This distrust can stem from past negative experiences, cultural beliefs, or a general skepticism of medical recommendations, leading to hesitancy in following vaccination advice…..*"(KII 1, Teacher,2024).

Table 3: Binary logistic regression table with significant variables on social demographic factors.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.	
							Lower	Upper
Age of the parent in years			11.490	3	0.009			
27-33	-1.409	0.466	9.141	1	0.092	0.244	0.098	0.609
34-40	1.549	0.464	11.149	1	0.001	4.7	0.086	0.527
41-47	-1.255	0.504	6.196	1	0.313	0.285	0.106	0.766
48-54						Ref		
Religion	0.630	0.289	4.736	1	0.020	0.533	0.302	0.939
Christians						Ref		
Type of school	-0.671	0.261	6.615	1	0.010	1.955	1.173	3.260
Public						Ref		
Primary source of healthcare			18.478	3	0.179			
Physician	1.903	0.694	7.529	1	0.236	6.707	1.722	26.115
School-based clinic	-0.845	0.414	4.178	1	0.241	0.429	0.191	0.966
Community clinic	-0.017	0.362	0.002	1	0.962	0.983	0.483	1.998
Private clinic						Ref		
Education level			27.188	4	0.000			
Never been to school	0.792	0.439	3.260	1	0.071	2.208	0.934	5.215
Primary	-0.381	0.359	14.792	1	0.000	3.980	1.969	8.047
Secondary	0.538	0.379	2.016	1	0.156	1.713	0.815	3.599
Vocational	0.382	0.416	0.844	1	0.358	0.682	0.302	1.542
Tertiary						Ref		

Table 4: Binary logistic regression table on the influence of parental perception of HPV vaccine and the uptake of HPV vaccines.

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I	
							Lower	Upper
Perception factor overall			13.654	2	0.001			
Positive perception	0.876	0.237	13.649	1	0.000	2.4	0.261	0.663
Neutral	-0.485	0.521	0.867	1	0.352	0.616	0.222	1.709
Negative perception						Ref		

Table 5: Binary logistic regression table with significant variables on healthcare-based factors.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.	
							Lower	Upper
Access to HPV vaccination			14.444	4	0.006			
Very easy	0.978	0.283	11.973	1	0.001	2.7	0.216	0.654
Easy	-0.564	0.421	1.793	1	0.181	0.569	0.249	1.299
Neutral	-0.905	0.470	3.700	1	0.064	0.405	0.161	1.017
Difficulty	-0.082	0.406	0.041	1	0.839	0.921	0.415	2.042
Very difficult						Ref		
Vaccination Programs targeting schools	-0.776	0.237	10.677	1	0.001	2.2	1.364	3.458

Continued.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.	
Present						Ref		
HPV vaccination awareness campaigns	0.916	0.254	13.022	1	0.08	2.500	1.520	4.113
Absent						Ref		

Association between parental perception of HPV vaccine and HPV vaccines uptake

The chi-square test of independence revealed a statistically significant relationship between the perception of the HPV vaccine and the uptake of HPV vaccines ($\chi2$=13.986, df=2, p=0.001). As provided in Table 4, Further analysis with logistic regression a positive perception of the HPV vaccine increased the odds of the HPV vaccine by 2.4.

Healthcare-based factors associated with the uptake of HPV vaccines

Concerning healthcare-based factors influencing the uptake of HPV vaccination; the following variables were imported for binary logistic regression analysis because they showed a significant statistical relationship when the bivariate analysis was done; access to HPV vaccination services ($\chi2$=15.76, df=4, p=0.003), awareness campaigns ($\chi2$=12.066, df=1, p=0.001) and the existence of school-based HPV vaccination programs ($\chi2$=11.058, df=1, p=0.001). The uptake of HPV vaccination was not statistically correlated with discussions of the vaccine or medical providers' recommendations for HPV vaccination ($\chi2$=3.122, df=1, p=0.077).

As provided in Table 5, easy access to HPV vaccination services increased the odds of HPV vaccine uptake by 2.7, while the absence of HPV vaccination programs targeting school-going girls reduced the odds of HPV vaccination by 2.2.

These findings were concurrent with the qualitative findings where one of the key informants narrated that;

"…*Schools offer a structured environment where large numbers of adolescents can be reached systematically. This organization ensures that more students are vaccinated within a short period. Furthermore, School-based programs often integrate HPV vaccination with other routine health services, such as physical exams and other immunizations. This holistic approach makes it easier to include the HPV vaccine as part of comprehensive adolescent health care*……"(KII 7, Headteacher, 2024).

DISCUSSION

Close to a third (29.9%) of the study respondents had been vaccinated with the HPV vaccine. The findings from this study were in close range (28.53%) with those of a study carried out in SSA.[7] This was contrary to another study carried out in Ethiopia which reported a higher uptake of HPV vaccines of 48.6%, while another study carried out in Kenya reported a lower rate (13.2%) of HPV vaccine uptake.[13,14] Study respondents' guardians who were aged between 34-40 years were 4.7 more likely to have daughters vaccinated for HPV. Parents in this age group tend to be more health-conscious and informed about preventive healthcare measures. They are more likely to be aware of the benefits of vaccines, including the HPV vaccine, and the importance of protecting their children from preventable diseases. The findings from this study agreed with those of a study carried out in Ethiopia.[13] Another study carried out in Nigeria also reported similar findings.[15]

Study respondents who had a primary level of education were 4 times less likely to have daughters vaccinated for HPV. Lower education levels often correlate with reduced health literacy. Guardians may have difficulty understanding medical information and the benefits of vaccinations, including the HPV vaccine, leading to reluctance or refusal to vaccinate their children. Findings from this research agree with those of a study carried out among United States youths where the guardian's level of education was associated with the uptake of HPV vaccines.[16] Study respondents who were Muslims were 1.9 times less likely to be vaccinated for HPV vaccines as compared to Christians. Health information and communication that does not consider cultural and religious contexts may fail to resonate with Muslim communities which may lead to poor uptake of HPV vaccines. Effective communication requires culturally sensitive messaging that addresses specific concerns and values. This was contrary to a study done in Kenya where religion was not associated with the uptake of the HPV vaccines.[17] Study respondents who were attending private schools were 2 times more likely to be vaccinated for HPV vaccines as compared to those who were attending public schools. Parents who choose private education for their children may have more resources and support networks to navigate healthcare systems and overcome barriers to vaccination. These findings were in agreement with a study done in Ethiopia. [18] However, another study was done in Kenya type of school attended was not associated with the uptake of the HPV vaccine.[17]

A positive perception of the HPV vaccine increased the odds of the HPV vaccine by 2.4. Hearing positive stories and testimonials from individuals who have received the HPV vaccine can reassure others and motivate them to get vaccinated. The results from this study were in

agreement with those of a study carried out in SSA. [19] Similarly, another study carried out in Uganda was in harmony with these findings.[20] The absence of HPV vaccination programs targeting school-going girls reduced the odds of HPV vaccination by 2.2. Without school-based vaccination programs, adolescents may face barriers in accessing HPV vaccines. These findings were contrary to another study carried out in Ethiopia.

CONCLUSION

The uptake of the HPV vaccine in this study was 29.9% which is a public health concern. Attending a private school, having guardians aged between 34-40 years, having a positive perception of the HPV vaccine and easy access to HPV vaccination services increased the odds of the HPV vaccine uptake. Study respondents' guardians who had a primary level of education, being Muslim, and the absence of HPV vaccination programs targeting school-going girls reduced the odds of HPV vaccine uptake. Multifaceted efforts should be put in place to enhance the uptake of HPV vaccines.

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