



Factors Associated with the Uptake of Human Papilloma Virus Vaccine among Girls Aged 9-14 Years in Buikwe District, Central Uganda

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Authors' contributions

This work was carried out in collaboration between both authors. Author CN Collected, processed, analyzed the data, and wrote the first draft of the manuscript. Author BJB participated in data analysis, edited the first draft and submitted the final manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: Cervical cancer is one of the leading global public health concerns. Our study aimed at determining factors associated with the uptake of the HPV vaccine among 451 girls aged 9-14 years.

Study Design and Area: We conducted a cross-sectional study that was carried out in the Buikwe district, central Uganda.

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Methods: The study was conducted using mixed methods. Quantitative data were entered using the Epidata software and exported to Stata 14 for cleaning and analysis. Atlasti 6 software was used in thematic qualitative data analysis.

Results: The level of HPV vaccine uptake was 30%. Girls whose mothers/caretakers accessed health information through the health workers ($P = 0.004$, AOR = 2.68(1.36-5.26), CI = 95%) were more likely to uptake the HPV vaccine than any other in the study population. Mothers/caretakers who are civil servants were more likely to receive the HPV vaccine ($P = 0.049$, AOR=1.78 (1.00-3.18), CI=95%). Girls whose mothers/caretakers had never heard about HPV vaccines and thought getting vaccinated is not important were less likely to uptake the HPV vaccine ($P = 0.000$, AOD = 0.31 (0.10-0.89), CI=95%) and ($P = 0.000$, AOD = 0.12 (0.05-0.28), CI=95%) respectively.

Conclusion: The level of HPV vaccine uptake among girls aged 9-14 years remains significantly low at 30%. Vaccine uptake was severely affected by the level of health education - awareness among the mothers/caretakers. There is need for strategies to improve vaccine awareness and uptake among the key stakeholders.

Keywords: Cancer; cervical cancer; human papillomavirus vaccine; vaccine uptake mothers; caretakers.

1. INTRODUCTION

Worldwide, an estimated of over 18 million new cancer cases and 9 million deaths occurred. In addition, an estimated 604 127 cervical cancer cases and 341,831 deaths occurred [1]. Nevertheless, the incidence and mortality are higher in low-and middle-income countries than in high-income countries [2]. In as much, the trend cervical cancer is projected to continue to increase, rising to 700 000 cases and 400 000 deaths in 2030, though, the burden will be more in low- and middle-income countries [3]. Previous reports show that 33.6% of females aged 10–20 years received the full course of vaccine in the more developed countries compared with only 2.7% in less developed countries. Unfortunately, the World Health Organization (WHO) targets of 90% of girls fully vaccinated with HPV vaccine by age 15 years - by 2023 have not been realized. The pooled prevalence of HPV vaccine uptake in Sub-Saharan - Africa has been reported at 28.53%. While subgroup analysis revealed the highest uptake was 62.52% from Kenya and the lowest was 3.77% in Nigeria [2,4,5]. Pooled prevalence of HPV vaccine uptake in East Africa has been reported at 35% [6]. In Uganda, the cervical cancer incidence has been previously reported as, 30/100,000 with the annual cases at 6959 and death of 4607 [7]. Numerous studies on the uptake and associated factors have been conducted in different regions of the country with varying results [8,9,10,11]. Therefore, our study aimed at determining the level of uptake of the HPV vaccine and associated factors among girls 9-14 years in Buikwe district central Uganda.

2. METHODOLOGY

2.1 Study Design and Area

We conducted a cross-sectional study using mixed methods. The study was carried out in the Buikwe district, located in the central Uganda. A quantitative design was used to determine the level of HPV vaccine uptake and the factors associated with HPV vaccine uptake, while the qualitative design was used to assess challenges that limit vaccine uptake.

2.1.1 Study population

The study enrolled girls aged between 9-14 years old, whose mothers/caretakers were the respondents for the quantitative method while key informants included nurses, clinical officers, and midwives who were respondents for the qualitative method.

2.1.2 Data collection procedures

Sampling was carried out by multi-stage systematic random sampling. Four sub-counties including; Nkokonjeru town council, Nyenga sub-county, Njeru town council, and Najja sub-county were randomly selected from the eight sub-counties of the district. Folded paper labeled with the respective counties were randomly picked from a box. Three villages were then randomly selected from each of the four sub-counties. Systematic random sampling was carried out to select the households from which the participants were selected using a calculated interval (n) for each village. The village Local leaders guided the

research assistant. The key informants were selected by purposive sampling. Five key informants were interviewed and a key informant guide was used to collect the data. Quantitative data was collected by a semi-structured questionnaire completed by mothers/caretakers.

2.1.3 Socio-demographic factors

Age of the girl participant, level of education, level of education of the mother/caretaker, mother's/caretaker's occupation, family type, number of people in household, marital status of mother/caretaker were considered.

2.1.4 Health-Facility (HF) factors

Level of HF included; health information access, facilitation of HW, funding, availability of vaccine, and government policy on HPV vaccination.

2.1.5 Statistical analysis

Quantitative data were entered into Epidata software using a predesigned entry form. The data entered were exported to Stata for cleaning and data analysis. Using Stata 14, quantitative data were cleaned and checked for completeness and consistency. Out of 475 responses, 451 entries were deemed clean and analyzed. In univariate analysis, quantitative data was summarized using tables and graphs in the form of frequencies and percentages. Binary logistic regression was employed at bivariate analysis to establish factors associated with HPV

vaccine uptake among girls aged 9-14 years at 95% confidence interval (CI) and the *P* value of 0.05% was considered significant. Multivariate logistic regression was used to eliminate confounding factors and establish factors associated with HPV vaccine uptake. For qualitative data, audio recordings were transcribed. Atlas. ti 6 software was used for data analysis.

3. RESULTS AND DISCUSSION

3.1 Socio-Demographic Factors of the Girl Study Population

Table 1 shows that more than one-third of the girls (43.48%, n=451) were aged 12-14 years old. Majority of the girls (59.46%, n=451) were still at the primary level of education. Most of the girls were Catholics (51.22%, n=451) and almost all girls lived within 5 km of the town (99.33%, n=451).

3.1.1 The sociodemographic of the mother/caretaker

Out of the 451 mothers/caretakers interviewed, 69.40% were aged 30-44 years, 47.45%, had attained secondary education and more than one-third (35.48%) were peasants. Two-thirds of the mothers/caretakers (66.96%, n=451) were either married or cohabiting, and most households (67.63%, n=451) were headed by fathers, as shown in Table 2.

Table 1. The socio-demographics of the girl study population

Variable	Frequency	Percentage
Age group		
9-10	155	34.37
11-12	100	22.17
12-14	196	43.46
Education level		
Never/Uneducated	4	0.89
Primary	268	59.42
Secondary	179	39.69
Household distance from town		
Up to 5 km	448	99.33
Less than 5k	3	0.6%
Religion of the respondent		
Catholic	231	51.22
Anglican	89	19.73
Muslim	86	19.07
SDA	21	4.66
Pentecostal/saved	24	5.32
Total	451	100

Table 2. The socio-demographics of the mother/caretaker

Variable	Frequency	Percentage (%)
Mother's age		
15-29	67	14.86
30-44	313	69.40
45-60	71	15.74
Mother's level of education		
Never/Uneducated	12	2.66
Primary	82	18.18
Secondary	214	47.45
Tertiary	109	24.17
University	34	7.54
Mother's occupation		
Peasant	160	35.48
Business lady	118	26.16
Hairdresser	10	2.22
Civil servant	125	27.72
Housewife	38	8.43
Marital status of respondent		
Single	72	15.96
Married/cohabiting	302	66.96
Divorced/separated	54	11.97
Widowed	23	5.10
The household head		
Father	305	67.63
Mother	104	23.06
Guardian	35	7.76
Brother/sister	7	1.55
Household population		
1-5	176	39.02
6-10	231	51.22
11-15	44	9.76
Family type		
Extended	189	41.91
Nuclear	262	58.09
Total	451	100

3.1.2 Vaccination information

Fig. 1 shows that less than one-third (30%, n=451) of the girls were vaccinated against HPV with at least one dose of HPV vaccine.

Table 3 shows that 72.06% (n=451) of the mothers/caretakers had heard about HPV vaccination and most of them mentioned radio (38.15%, n=325) and TV (23.69%, n=325) as their source of information. Out of 451, girls only 30 % (137/451) received all the doses. Of these, 53% (72/137) received two doses; and 47% (65/137) received a single dose.

Lack of trust for government drugs was the most mentioned reason for not considering vaccination as an important aspect. Mothers and fathers refusing their children to get vaccinated were the

least mentioned reasons for not considering vaccination as an important aspect as shown in Fig. 2.

3.1.3 Mother/caretaker socio-demographic

Table 4 indicates that the occupation of the mothers/caretakers and the household population were significantly associated with HPV vaccine uptake among girls aged 9-14 years. Girls whose mothers were civil servants ($P = 0.001$, $COR = 2.36$ (1.42-3.91), $CI=95%$) were 2.36 times more likely to uptake HPV vaccines than any other girls in the reference category. On the other hand, girls living in households with a population of 11-15 members ($P = 0.005$, $COR = 0.24$ (0.09-0.64), $CI = 95%$) were less likely to uptake the HPV vaccine compared to any other girl in the reference category.

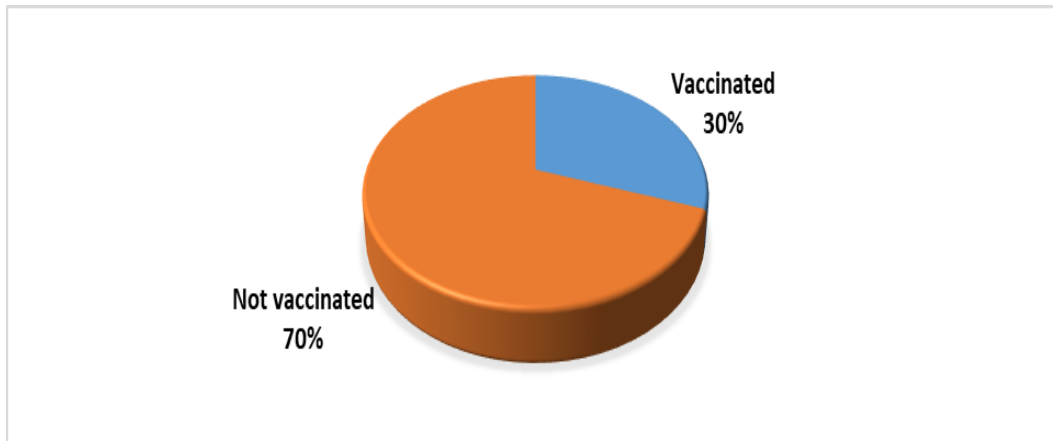


Fig 1. The vaccination status of the girl study population

Table 3. HPV vaccination information

Variable	Frequency	Percentage
Heard about HPV vaccination		
Yes	325	72.06
No	126	27.94
Source of information (n=325)		
Radio	127	38.15
TV	77	23.69
Health worker	63	19.38
School	58	18.77
Thought if getting vaccinated is important		
Yes	315	69.84
No	136	30.16
Number of HPV doses received by the girls (n=137)		
One dose	65	47.45
Two doses	72	52.55
Total	451	100

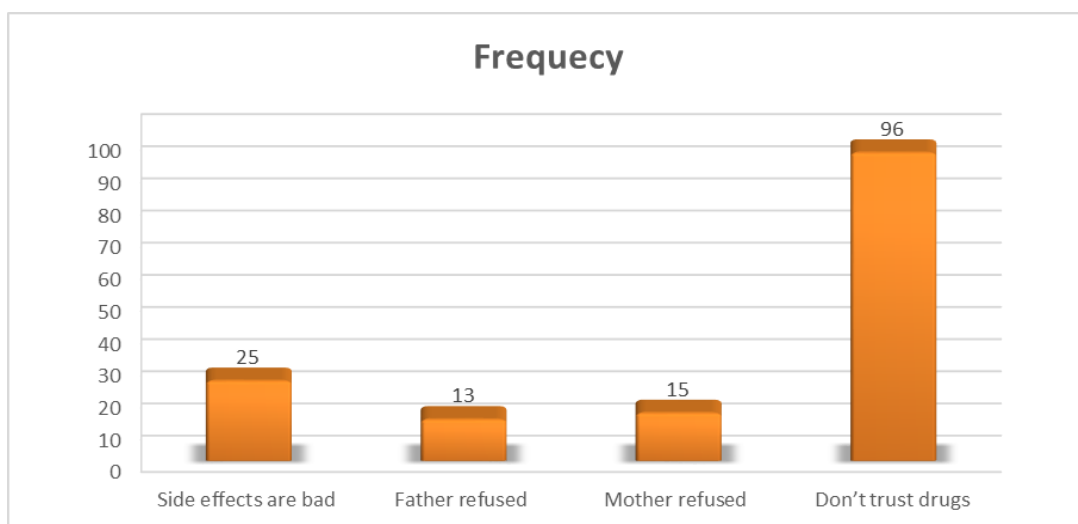


Fig. 2. Reasons why respondents thought that getting vaccinated is not important

Table 4. Mothers/caretaker factors associated with HPV vaccine uptake

Factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	P-values
	Yes (137)		No (314)			
	F	%	F	%		
Mother's age groups						
15-29	24	17.52	43	13.69		
30-44	95	69.34	218	69.43	0.78(0.45-1.36)	0.382
45-60	18	13.14	53	16.88	0.61(0.29-1.26)	0.183
Mother's level of education						
Never/Uneducated	4	2.92	8	2.55		
Primary	20	14.60	62	19.75	0.65(0.18-2.37)	0.509
Secondary	53	38.69	161	51.27	0.66(0.19-2.27)	0.509
Tertiary	47	34.31	62	19.75	1.529(0.43-5.34)	0.517
University	13	9.49	21	6.69	1.24(0.31-4.95)	0.763
Mother's occupation						
Peasant	39	28.47	121	38.54		
Business lady	36	26.28	82	26.11	1.26(0.78-2.32)	0.256
Hairdresser	2	1.46	8	2.55	0.78(0.16-3.81)	0.754
Civil servant	54	39.42	71	22.61	2.36(1.42-3.91)	0.001*
Housewife	6	4.38	32	10.19	0.58(0.23-1.49)	0.261
Marital status of respondent						
Single	22	16.06	50	15.92		
Married/cohabiting	94	68.61	208	66.24	1.03(0.579-1.79)	0.925
Divorced/separated	13	9.49	41	13.06	0.72(0.32-1.60)	0.422
Widowed	8	5.84	15	4.78	1.21(0.45-3.27)	0.704
The household head						
Father	95	69.34	210	66.88		
Mother	30	21.90	74	23.57	0.90(0.54-1.46)	0.660
Guardian	11	8.03	24	7.64	1.01(0.48-2.15)	0.973
Brother/sister	1	0.73	6	1.91	0.37(0.44-3.10)	0.358
Household population						
1-5	61	44.53	115	36.62		
6-10	71	51.85	160	50.96	0.84(0.55-1.27)	0.402
11-15	5	3.65	39	12.42	0.24(0.09-0.64)	0.005*

Table 5. Association between HPV vaccine uptake by girls and the HPV vaccine information known by the mothers/caretakers

Factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	P-values
	Yes (137)		No (314)			
	F	%	F	%		
Heard about HPV vaccination						
Yes	131	95.62	194	61.78		
No	6	4.38	120	38.22	0.07 (0.03-1.17)	0.000*
Thought if getting vaccinated is important						
Yes	121	88.32	194	61.32		
No	16	11.68	120	38.22	0.21(0.12-0.38)	0.000*

Table 6. Association between socio-economic factors of the caretaker/mothers and the HPV vaccine uptake

Factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	P-values
	Yes (137)		No (314)			
	F	%	F	%		
Health information access means by the respondent						
Radio	57	41.61	184	58.60		
TV	46	33.58	94	29.94	1.58(1.00-2.51)	0.052
Health worker	28	20.44	30	9.55	3.01(1.66-5.46)	0.000*
Newspapers	1	0.73	4	1.27	0.81(1.52-7.37)	0.849
Health facility farness from the respondent household						
≤1km	60	43.80	136	43.31		
2-3km	54	39.42	147	46.82	0.83(0.54-1.29)	0.410
≥4km	23	16.79	31	9.81	1.68(0.91-3.12)	0.100

Table 7. Factors associated with HPV uptake by girls at multivariate analysis

Factors	HPV vaccine uptake				Adjusted Odds Ratios (COR) at 95% Confidence Interval (CI)	P-values
	Yes (137)		No (314)			
	F	%	F	%		
Mother's occupation						
Peasant	39	28.47	121	38.54		
Business lady	36	26.28	82	26.11	1.35(0.73-2.47)	0.329
Hairdresser	2	1.46	8	2.55	0.81(0.15-4.31)	0.803
Civil servant	54	39.42	71	22.61	1.78(1.00-3.18)	0.049*
Housewife	6	4.38	32	10.19	0.99(0.34-2.93)	0.992
Household population						
1-5	61	44.53	115	36.62		
6-10	71	51.85	160	50.96	0.80(0.50-1.31)	0.379
11-15	5	3.65	39	12.42	0.31(0.10-0.89)	0.030*
Heard about HPV vaccination						
Yes	131	95.62	194	61.78		
No	6	4.38	120	38.22	0.12 (0.05-0.28)	0.000*
Thought if getting vaccinated is important						
Yes	121	88.32	194	61.32		
No	16	11.68	120	38.22	0.34(0.19-0.28)	0.001*
Health information access means by the respondent						
Radio	57	41.61	184	58.60		
TV	46	33.58	94	29.94	1.66(0.98-2.82)	0.057
Health worker	28	20.44	30	9.55	2.68(1.36-5.26)	0.004*
School	5	3.65	2	0.64	5.07(0.90-28.51)	0.066*
Newspapers	1	0.73	4	1.27	0.68(0.07-7.01)	0.743
Source of food for the respondent						
Garden	107	78.10	272	86.62		
Market	30	21.90	42	13.38	1.44(0.78-0.89)	0.242

3.1.4 HPV vaccine information

Table 5 indicates that mothers/caretakers being informed about HPV vaccination and the thought if getting vaccinated is important or not were significantly associated with HPV vaccine uptake among girls aged 9-14 years. Girls whose mothers had not heard about HPV vaccination ($P = 0.000$, $COR = 0.07$ (0.03-1.17), $CI = 95\%$) and those whose mothers/caretakers did not think that getting vaccinated is important ($P = 0.000$, $COR = 0.21$ (0.12-0.38), $CI = 95\%$) were less likely to uptake HPV vaccine compared to any other girls in the reference category.

3.1.5 Socio-economic factors

Table 6 shows that health information access means by the mother/caretaker and the food source of the mother/caretakers were associated with the uptake of the vaccines among girls aged 9-14 years. Girls whose mothers/caretakers accessed health information through health workers ($P = 0.000$, $COR = 3.01$ (1.66-5.46), $CI = 95\%$) were more likely to uptake HPV vaccine.

3.1.6 Factors associated with HPV uptake at multivariate analysis

Multi-logistic regression analysis was employed to establish factors associated with the uptake of the HPV vaccine among girls aged 9-14 years. From the Table 7, the mother's occupation, household population, the thought of getting vaccinated or not, having heard about HPV vaccination, and health information access means by the respondents statistically determined HPV vaccine among the participants. Girls whose mothers/caretakers were civil servants were 1.78 times more like to uptake the HPV vaccine than any other girls in the reference category ($P = 0.049$, $AOR=1.78$ (1.00-3.18), $CI=95\%$).

Girls from households with a population of 11-15 were 0.321 less likely to uptake HPV vaccines than any other girls in the reference category ($P = 0.030$, $AOR = 0.31$ (0.10-0.89), $CI=95\%$). Girls whose mother/caretakers had never heard about HPV vaccines were 0.12 less likely to uptake the HPV vaccine than any other girls in the reference in the study population ($P = 0.000$, $AOR = 0.12$ (0.05-0.28), $CI=95\%$). Girls whose mothers/caretakers thought that getting vaccinated is not important ($P = 0.001$, $AOR = 0.34$ (0.19-0.28) were 0.34 times less likely to uptake the HPV vaccine than any others girls in the reference category. Girls whose mothers/caretakers accessed health information through the health workers ($P = 0.004$, $AOR =$

2.68(1.36-5.26), $CI = 95\%$) were 2.68 times more likely to uptake the HPV vaccine than any other girls in the reference category.

3.2 Discussion

Cervical cancer is one of the most common cancers that affect majority of women in Uganda. Approximately 3.6% of women are carriers of HPV. It is established that the primary prevention of cervical cancer is vaccinating girls aged 9—14 years old (m) before exposure [7]. Our study reports only 30% (n=451) vaccine uptake, of at least one dose and 53% of the two doses. This is, however, significantly lower than Uganda's HPV vaccination target of 80% coverage as recommended by the 2011-2020 Global Vaccine Action Plan. From these results, 43.48%, (n=451) of the girls were 12-14 years old(m). While this age group covered the largest number of the participants, less than 30%, (n=451) were vaccinated with at least one dose of the vaccine. This was significantly below the country's target of 80% vaccination coverage by the age of 10 years [7]. Nevertheless, our results are higher than previously reported elsewhere in central and Northern Uganda [8,9,10,11], though, still below the target. This shows that there are gaps in the awareness and other challenges at all levels of the stakeholders. Furthermore, the variability in vaccine uptake in the different parts of the country could be(m) due to motivation, the different facilities, and implementation strategies by the respective carders.

3.2.2 Factors associated with vaccine uptake

Results from this study show several factors associated with HPV vaccine uptake. These include; the mother's occupation, household population, whether getting vaccinated is important or not, being aware of HPV vaccination, and health information access. We report that girls whose mothers/caretakers were civil servants were 1.78 ($P = 0.049$) times more likely to uptake the HPV vaccine than any other girls in the reference category. Interestingly our report is in phase with other reports from more developed countries [12-14] and a previous report from Wakiso, central Uganda. Civil servants have attained higher education levels but also have a reasonable income both of which key factors that enhance healthcare uptake in any setting. In this study we(m) report that girls from households with a population of 11-15 members, were 0.31 times less likely to uptake HPV vaccines than any other girls in the reference category ($P = 0.030$). This finding agreed with a study elsewhere in Ethiopia and

Uganda [15,16,17,18]. Family size perhaps gives false health security in this regard but also could be a justification for the fears of the safety of the vaccines to safeguard the family members. Results of this study show that girls whose mothers/caretakers had never heard (m) about HPV vaccines were 0.1 times less likely to uptake HPV vaccine ($P = 0.000$). This is consistent with the finding previously reported from a study in Kampala, central Uganda [9]. These are clear and sound testimonies to the fact that awareness is a critical factor for healthcare uptake. Evidence in Central Uganda has suggested the need for creating awareness among parents/caretakers in regards health care uptake and vaccination in particular to be able to improve the HPV vaccine uptake in Uganda. In fact, in studies where mothers/caretakers were knowledgeable about HPV vaccination, the likelihood for their girls to be vaccinated was higher as it were with results from previous studies globally [4,6,12-14,19]. Thus, more effort is needed to augment awareness, enhance knowledge, and promote vaccine acceptance among the stakeholders. Girls whose mothers/caretakers thought that getting vaccinated is not important were 0.34 times less likely to uptake the HPV vaccine than any others girls in the reference category ($P = 0.001$). Previous studies show that a good attitude towards the vaccine was positively associated with vaccine uptake [4,10,11-14,16-19]. It is said that knowledge is power. Thus, knowledge and awareness change the attitude and positively influences health care uptake. This study established that girls whose mothers/caretakers accessed health information through the health workers were 2.68 times more likely to uptake the HPV vaccine than any other girls in the reference category ($P = 0.004$). This is consistent with the previous reports elsewhere and in Uganda [9,10,11,19]. This global agreement shows that health information is more effective in the integrated approach and in as much seriously needed in Uganda.

4. CONCLUSION

The vaccine uptake of 30% we report is significantly lower than the international and National targets of over 80%. Knowledge and awareness about the HPV vaccine were statistically significant factors associated with HPV vaccine uptake; as the mother's occupation, household population strongly influenced uptake of the vaccine. The district, regional authorities, and Ministry of Health should therefore

strengthen integrated strategies to create more awareness about the HPV vaccine among the stakeholders.

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Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT

As per international standards, parental written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was reviewed and approved by Uganda Christian University Research Ethics Committee, REC Number: UG-REC-026

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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