

# Uptake of the Human Papilloma Virus Vaccine and Associated Factors Among Girls Aged 9-14 Years in Buikwe District: a Cross Sectional Study.

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## Research Article

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## Abstract

**Background:** Cervical cancer is one of the leading public health global concerns. Our study aimed at determining the level of uptake of the HPV vaccine and associated factors among Ugandan girls 9-14 years, to inform policy accordingly.

**Methodology:** A cross-sectional study using mixed methods was carried out. Quantitative data were entered using Epidata and exported to Stata 14 for cleaning and analysis. Atlas.ti 6 software was used in thematic qualitative data analysis.

**Results:** Only 30% of the girls whose mothers/caretakers were civil servants received the HPV vaccine  $P = 0.049$ , AOR=1.78 (1.00-3.18), CI=95%). Girls whose caretakers accessed health information were 2.68 times more likely to uptake the HPV vaccine ( $P = 0.004$ , AOR = 2.68(1.36-5.26), CI = 95%). To the extreme, 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 ( $P = 0.030$ , AOD = 0.31 (0.10-0.89), CI=95%) and ( $P = 0.00$ , AOD = 0.12 (0.05-0.28), CI=95%) respectively. 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 reference category.

**Conclusion:** The level of HPV vaccine uptake among girls 9-14 years remains significantly low at 30% in Buikwe district. Vaccine uptake was negatively affected by level of formal education and health education awareness among the mothers/caretakers. There should be strategies to improve vaccine awareness and update among the key stakeholders. Nevertheless, health education enhances vaccine update and should be improved for better outcomes.

## Background

Cervical cancer caused by the Human Papilloma Virus (HPV), is among the public health global concerns (1). Unlike any other cancers, cervical cancer indicates countless disparities in incidence and mortality in low- and middle-income countries compared to with high - income countries (2). Cervical cancer is the leading cause of premature deaths among females aged 15–44 years in Uganda even though, vaccination against HPV tremendously lowers burden by two thirds if given promptly (3). Therefore, the government arranged for parents to have all their girl children in the said age bracket vaccinated (4). Although the vaccine uptake was initially higher it reduced to 22% in 2016, four times less than at initiation point (5). Numerous hindrances to the vaccine uptake in the target population have been previous highlighted (6).

Buikwe district in central Uganda has an extremely lower rate of HPV vaccine uptake as previously reported (7), yet there is limited information on the level and factors associated with the status quo. Therefore, this study aimed at determining the level of uptake of the HPV vaccine and associated factors among girls 9–14 years and challenges faced by health workers Buikwe district.

## **Materials And Methods**

### **Study design and population**

We conducted a cross-sectional study in Buikwe district in Central Uganda. Buikwe district has a population of 422,771 people of which 166,927 are females accounting for 49.7 percent of the total population; and 5631 girls of the population are aged 10–19 years. The district is one of those that were created under the local government Act 1 of 1997 (8). The study focused on girls 9–14 years of age. This was a cross sectional study, employing both quantitative and qualitative methods. The quantitative method was used to determine the level of HPV vaccine uptake and the factors associated with HPV vaccine uptake. Qualitative method was used to assess challenges that limit uptake of the vaccine among girls 9–14 years in Buikwe district.

### **Study population**

The study enrolled girls aged between 9–14 in Buikwe district; where mothers/caretakers of the girls were the respondents for the quantitative arm; while key informants who included nurses, clinical officers, and midwives participating in immunization were interviewed for the qualitative arm.

- **Sampling.**

For quantitative data, four sub-counties were selected randomly from eight sub-counties of the district; then three villages were randomly selected from each of the selected sub-counties. Systematic random sampling was used to select the households from which the participants were selected using a calculated interval for each village. For qualitative data, key informants were selected using purposive sampling, basing on their experience in immunization. A total of five key informants were interviewed; where health workers who were available were recruited to participate in the study. Quantitative data was collected using a semi-structured questionnaire from mothers or caretakers of the children; and key informant guide was used to collect qualitative data from the key informants. Girls aged 9–14 years whose parents/caretakers had consented to the study were included in this study. The study excluded girls who were not available in homesteads at the time the study was done. It excluded girls whose care takers were ill and weak to take part in the study. It also excluded girls between 9–14 years whose care takers had not consented to the study, as well as those below nine years and above 14 years.

### **Data analysis**

Quantitative data was entered into Epidata software using a predesigned entry form. The data entered was exported to Stata for cleaning and data analysis. Using Stata 14, quantitative data was cleaned and checked for completeness and consistence. Out of 475 responses, 451 entries were deemed clean and analyzed. At univariate analysis, quantitative data was summarized using tables and graphs in 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 p value of 0.05% was considered significant. At multivariate logistic regression was employed to eliminate confounding factors and establish factors associated with HPV vaccine uptake.

For qualitative data, audio recordings were transcribed saved on a computer. Atlas.ti 6 software was used in the analysis of qualitative data. The transcripts were sorted and checked for spellings, consistence and incompleteness. The transcripts were coded using initial codes. Here all new ideas and thoughts were coded after which they were grouped to form themes.

immunization focal persons in the district. The collected data will be destroyed after a period of five years.

## Results

### Socio-demographic factors of the respondent

Table 1 shows that more than one third of the respondents (43.48%, n = 451) recruited into the study were aged 12–14 years and majority of the girls (59.46%, n = 451) were still in primary level of education. Most of the girls were Catholics (51.22%, n = 451) and almost all girls lived within 5Km from the town (99.33%, n = 451).

Table 1  
The socio-demographics of the study population

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

## The sociodemographic of the parent/caretaker

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

Table 2  
The socio-demographics of the mother/caretaker

<b>Variable</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Mothers age group</b>		
15–29	67	14.86
30–44	313	69.40
45–60	71	15.74
<b>Mothers level of education</b>		
Never/Uneducated	12	2.66
Primary	82	18.18
Secondary	214	47.45
Tertiary	109	24.17
University	34	7.54
<b>Mothers' occupation</b>		
Peasant	160	35.48
Business lady	118	26.16
Hair dresser	10	2.22
Civil servant	125	27.72
Housewife	38	8.43
<b>Marital status of respondent</b>		
Single	72	15.96
Married/cohabiting	302	66.96
Divorced/separated	54	11.97
Widowed	23	5.10
<b>The household head</b>		
Father	305	67.63
Mother	104	23.06
Guardian	35	7.76
Brother/sister	7	1.55
<b>Household population</b>		

Variable	Frequency	Percentage (%)
1–5	176	39.02
6–10	231	51.22
11–15	44	9.76
<b>Family type</b>		
Extended	189	41.91
Nuclear	262	58.09
<b>Total</b>	<b>451</b>	<b>100</b>

## Vaccination information

Figure 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 about HPV vaccination. Out of 30% (137/451) who received the HPV vaccines, 53% (72/137) received two doses; and 47% (65/137) received single doses of the vaccine.

Table 3  
HPV vaccination information of the study population

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Heard about HPV vaccination</b>		
Yes	325	72.06
No	126	27.94
<b>Source of information (n = 325)</b>		
Radio	127	38.15
TV	77	23.69
Health worker	63	19.38
School	51	18.77
<b>Thought if getting vaccinated is important</b>		
Yes	315	69.84
No	136	30.16
<b>Number of HPV doses received by the girls (n = 137)</b>		
One dose	65	47.45
Two doses	72	52.55
<b>Total</b>	<b>451</b>	<b>100</b>

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.

## Socio-economic factors

More than a half of the respondent (53.44, n = 451) accessed health information through the radios and 1.11% (n = 451) accessed health information through newspapers. Most of the respondents lived within a radius of either up to 1 km (43.46%, n = 451) or 2-3km (44.57%, n = 451). More than three quarters of the respondents (87.04%, n = 451) depended on the garden as their food source and more than a half of the respondents (57.27%, n = 451) relied on electricity as their source of light (Table 4).

**Table 4**  
**Socio-economic factors of the mothers/caretakers**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Health information access means by the respondent</b>		
Radio	241	53.44
TV	140	31.04
Health worker	58	12.86
School	7	1.55
Newspapers	5	1.11
<b>Health facility farness from the respond's household</b>		
≤ 1km	196	43.46
2-3km	201	44.57
≥ 4km	54	11.97
<b>Source of food for the respondent</b>		
Garden	379	84.04
Market	72	15.96
<b>Main source of water for the respondent</b>		
Borehole	55	12.20
Piped water	170	37.69
Well	218	48.34
Rain	8	1.77
<b>House make of the respondent</b>		
Bricks with cement	74	16.41
Bricks without cement	330	73.17
Mud	47	10.42
<b>Light source for the respondents</b>		
Electricity	256	57.27
Paraffin	65	14.54
Solar	95	21.25
Candle	31	6.94

Variable	Frequency	Percentage
Total	451	100

## Factors associated with HPV vaccine uptake among girls at bivariate analysis

### Child socio-demographics

There was no association between child demo-graphics and HPV vaccine uptake at bivariate analysis (Table 5)

Table 5  
Child Sociodemographic factors associated with HPV vaccine uptake

factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	<i>P</i> values		
	Yes (137)		No (314)					
	F	%	F	%				
<b>Child's age group</b>								
9–10	44	32.12	111	35.35				
11–12	27	19.71	73	23.25	0.93 (0.53–1.63)	0.809		
12–14	66	48.18	130	42.40	1.28 (0.81–2.02)	0.289		
<b>Education level of the children</b>								
Never/Uneducated	3	2.19	1	0.32				
Primary	75	55.47	192	61.15	0.13 (0.01–1.29)	0.081		
Secondary	58	42.34	121	38.54	0.16 (0.02–1.57)	0.116		
<b>Household distance from town</b>								
Up to 5 km	136	99.27	312	99.36				
Less than 5k	1	0.73	2	0.64	1.15(0.10-12.75)	0.911		
<b>Religion of the respondent</b>								
Catholic	66	48.18	165	52.55				
Anglican	26	18.98	63	20.06	1.03(0.60–1.77)	0.909		
Muslim	31	22.63	55	17.52	1.41(0.84–2.38)	0.200		
SDA	5	3.65	16	5.10	1.41(0.83–238)	0.643		
Pentecostal/saved	9	6.57	15	4.78	0.78(0.28–2.22)	0.363		

## Mother/caretaker socio-demographic

Table 6 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 the households with a population of 11–15 members ( $P= 0.05$ , COR = 0.24 (0.09–0.64), CI = 95%) were less likely to uptake HPV vaccine compared to any other girl in the reference category.

Table 6  
Mothers/caretaker factors associated with HPV vaccine uptake

factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	<i>P</i> -values		
	Yes (137)		No (314)					
	F	%	F	%				
<b>Mothers age groups</b>								
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		
<b>Mothers level of education</b>								
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		
<b>Mothers' occupation</b>								
Peasant	39	28.47	121	38.54				
Business lady	36	26.28	82	26.11	1.26(0.78–2.32)	0.256		
Hair dresser	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)	<b>0.001*</b>		
Housewife	6	4.38	32	10.19	0.58(0.23–1.49)	0.261		
<b>Marital status of respondent</b>								
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		
<b>The household head</b>								
Father	95	69.34	210	66.88				
Mother	30	21.90	74	23.57	0.90(0.54–1.46)	0.660		

factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	<i>P</i> -values		
	Yes (137)		No (314)					
	F	%	F	%				
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		
<b>Household population</b>								
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)	<b>0.005*</b>		
<b>Family type</b>								
Extended	54	39.42	135	42.99				
Nuclear	83	60.58	179	57.01	1.16(0.77–1.75)	0.479		

## HPV vaccine information

Table 7 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 others girls in the reference category.

Table 7  
Association between HPV vaccine uptake by girls and the HPV vaccine information known by the caretakers

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

## Socio-economic factors

Table 8 shows that health information access means by the mother/care taker and the food source of the mother/care takers 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%) and schools ( $P=0.014$ , COR = 8.07(1.52–42.72), CI = 95%) were more likely to uptake HPV vaccine than any other girl in the reference category. Girls whose mothers/caretakers considered market as their food source ( $P=0.24$ , COR = 1.82(1.08–3.05) were more likely to uptake HPV vaccines than any other girls in the reference category.

Table 8  
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)	<i>P</i> - values		
	Yes (137)		No (314)					
	F	%	F	%				
<b>Health information access means by the respondent</b>								
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)	<b>0.000*</b>		
School	5	3.65	2	0.64	8.07(1.52-42.72)	<b>0.014*</b>		
Newspapers	1	0.73	4	1.27	0.81(1.52-7.37)	0.849		
<b>Health facility farness from the respond's household</b>								
≤ 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		
<b>Source of food for the respondent</b>								
Garden	107	78.10	272	86.62				
Market	30	21.90	42	13.38	1.82(1.08-3.050)	<b>0.024*</b>		
<b>Main source of water for the respondent</b>								
Borehole	15	10.95	40	12.74				
Piped water	62	45.26	108	34.39	1.53(0.78-3.00)	0.213		
Well	57	41.61	161	51.27	0.94(0.49-1.84)	0.866		
Rain	3	2.19	5	1.59	1.60(0.34-7.53)	0.552		
<b>House make of the respondent</b>								
Bricks with cement	25	18.25	49	15.61				
Bricks without cement	101	73.72	229	72.93	0.86(0.51-1.48)	0.594		
Mad	11	8.03	36	11.46	0.60(0.26-1.37)	0.226		
<b>Light source for the respondents</b>								

Factors	HPV vaccine uptake				Crude Odds Ratios (COR) at 95% Confidence Interval (CI)	<i>P</i> -values		
	Yes (137)		No (314)					
	F	%	F	%				
Electricity	84	62.69	172	54.95				
Paraffin	20	14.93	45	14.38	0.91(0.51–1.64)	0.753		
Solar	21	15.67	74	23.64	0.58(0.34–1.01)	0.053		
Candle	9	6.72	22	7.03	0.84(0.37–1.90)	0.671		

## Factors associated with HPV uptake by girls 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 below, mother's occupation, household population, thought if 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 ( $P= 0.049$ , AOD = 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 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 HPV vaccine than any other girls in the reference in the study population ( $P= 0.00$ , 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 reference category.

Table 9  
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	%				
<b>Mothers' occupation</b>								
Peasant	39	28.47	121	38.54				
Business lady	36	26.28	82	26.11	1.35(0.73–2.47)	0.329		
Hair dresser	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)	<b>0.049*</b>		
Housewife	6	4.38	32	10.19	0.99(0.34–2.93)	0.992		
<b>Household population</b>								
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)	<b>0.030*</b>		
<b>Heard about HPV vaccination</b>								
Yes	131	95.62	194	61.78				
No	6	4.38	120	38.22	0.12 (0.05–0.28)	<b>0.000*</b>		
<b>Thought if getting vaccinated is important</b>								
Yes	121	88.32	194	61.32				
No	16	11.68	120	38.22	0.34(0.19–0.28)	<b>0.001*</b>		
<b>Health information access means by the respondent</b>								
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)	<b>0.004*</b>		
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		
<b>Source of food for the respondent</b>								

Factors	HPV vaccine uptake				Adjusted Odds Ratios (COR) at 95% Confidence Interval (CI)	<i>P</i> -values		
	Yes (137)		No (314)					
	F	%	F	%				
Garden	107	78.10	272	86.62				
Market	30	21.90	42	13.38	1.44(0.78–0.89)	0.242		

## Discussion

Cervical cancer is one of the commonest cancers that affect majority of women in Uganda and approximately 3.6% of women are carriers of HPV (9). It is established that the primary prevention cervical cancer is vaccinating girls aged 9–14 years before exposure and recognized as a crucial approach in the prevention of cervical cancer (10). Our study reports 30% ( $n = 451$ ) of the girls received at least one dose of the vaccine; while only 53% of those vaccinated received 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 (11). From these results, 43.48%, ( $n = 451$ ) of the girls were 12–14 years. 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 (9).

## Factors associated with the uptake of HPV vaccines among girls

Results from this study show a number of factors associated with HPV vaccine uptake. These include; the mother's occupation, household population, thought of whether getting vaccinated is important or not, being aware of HPV vaccination, and health information access means by the respondents. The study shows 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. This was in agreement with a similar study carried out in Kenya (12). However, reports from several developed countries showed that occupation was infrequently measured thus limiting conclusion on its association with uptake of the vaccine. In the said reports, it was noted that there are visible differences in relationships between the socioeconomic factors and uptake of the preventive strategies in developing countries (13).

This study shows that girls from households with a population of 11–15 were 0.31 times less likely to uptake HPV vaccines any other girls in the reference category ( $P = 0.030$ ). This finding was in agreement with a study elsewhere in Uganda (14). A study carried out in Nigeria showed that household size influences the health utilization of individuals (15). Large family size has been reported to be negatively

associated with the utilization of health services (16). This explains why in this study, girls from larger households of 11–15 people were less likely to receive the vaccine.

Results of this study show that girls whose mothers/caretakers had never had about HPV vaccines were 0.1 times less likely to uptake HPV vaccine ( $P= 0.000$ ). This is consistent with the finding of a study in USA (17). However, in studies where mothers/caretakers were knowledgeable about HPV vaccination, the likelihood to their girls to be vaccinated was shown to be higher (14). This finding is consistent with results from previous studies that reported an association between HPV vaccination and mothers' vaccination knowledge (18). Evidence in Central Uganda has suggested the need for creating awareness among parents/caretakers in regards to HPV vaccination to be able to improve the uptake of HPV vaccination in Uganda (14). In the same vein, more awareness is needed enhance knowledge and promote vaccine acceptance among mothers/caretakers. 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 ( $P= 0.001$ ). A study conducted in Nigeria showed that good attitude towards the vaccine was positively associated HPV vaccination where practice of vaccination increased with good attitude (19). This can be attributable to lack of awareness among mothers/caretakers which should be addressed probably through health education and mass sensitization if we are to see improvement in the uptake of the HPV vaccines among girls.

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 report here in Uganda which revealed that mothers who received recommendation from health workers were 21 times more likely to report initiation of HPV vaccines (14). In addition, previous reports show that doctors were a more trusted source of information about the vaccine and parents who were directly educated about the vaccine by medical workers decided to have their children vaccinated (20). This is in phase with the current study findings which shows that individuals thought that getting vaccinated is not important was significantly associated to rejection of the HPV vaccine ( $P= 0.001$ ). Contacts between the mothers/girls with health workers can improve the uptake of the vaccine among girls. This is largely shown by our results where health workers are the only source of information that was significantly associated with HPV uptake ( $P= 0.004$ ). In fact, the study shows that lack of trust in government drugs was the most mentioned reason for not considering HPV vaccination, thus the importance of gaining trust in HPV vaccines if their uptake is to be improved in the district. It is more therefore likely that those who got information regarding HPV vaccination from health workers gained more trust regarding safety of the vaccine hence its improved uptake.

## Conclusion

Uptake of the HPV vaccine is defined by taking at least one dose of the HPV vaccine in this study. The vaccine uptake 30% we report is significantly lower than the Country's target of 80%. Knowledge and awareness about the HPV vaccine were statistically significant factors associated with HPV vaccine

uptake; while the mother's occupation, household population, strongly influenced uptake of the vaccine. The district authorities and MoH should, therefore, strengthen strategies to create more awareness about the HPV vaccine through health workers and schools Administrators and teachers. This is because accessing health information from them significantly determines HPV vaccine uptake as shown in this study.

## Declarations

### Ethical consideration

Ethical Clearance was sought from the Research and Ethics committee of Uganda Christian University. Permission was sought from the district health department of Buikwe district prior to the study. Voluntary informed consent was obtained from the respondents. Research assistants were introduced to the chair persons of the respective villages, who permitted them to start collecting data. Privacy and anonymity of the study participants was assured by recording unique numbers as their IDs, and then interviewing the participant in an isolated place. Data collected was stored in a folder encrypted with a password to ensure confidentiality.

### Competing interests

There are no competing interests.

### Authors' contributions

CN collected, processed, analyzed data and also wrote the first draft of manuscript. BJB participated in data analysis, edited the first draft prepared and submitted the final manuscript.

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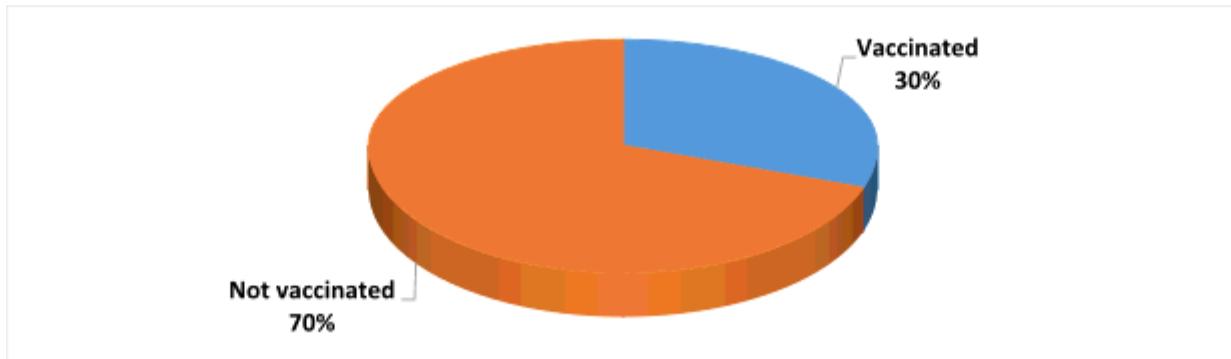
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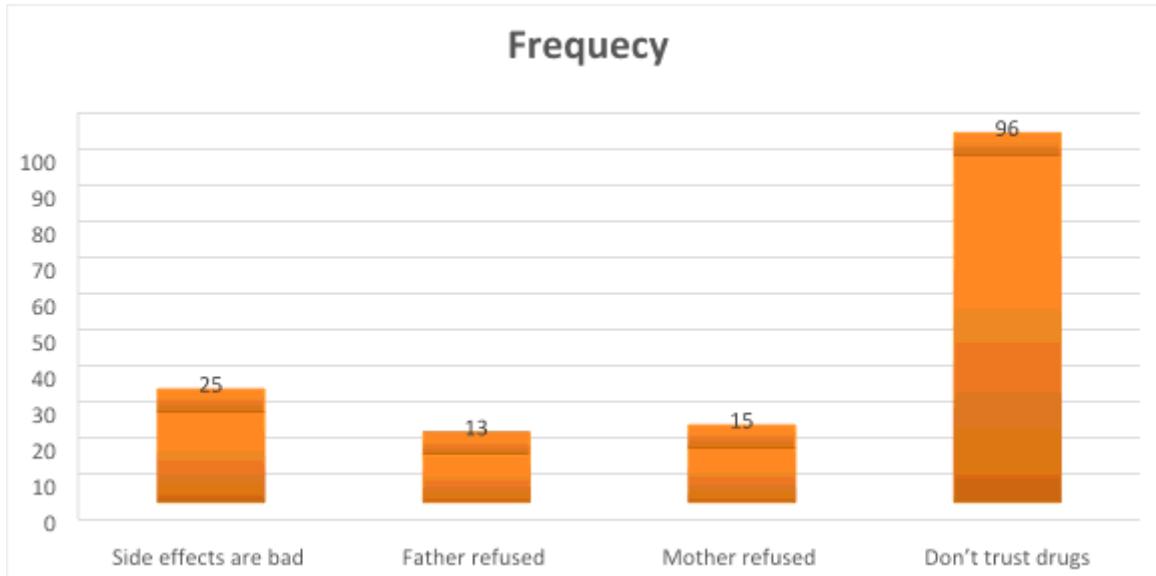
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## Figures



**Figure 1**

The vaccination status of the girls whose respondents were interviewed



**Figure 2**

## **Reasons why respondents thought that getting vaccinated is not important**