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## **Factors Associated with Human Papilloma Virus Vaccine Uptake amongst Girls Aged 9-14 Years Attending Fort Portal Regional Referral Hospital**

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### ABSTRACT

Human papillomavirus (HPV) infection is a sexually transmitted infection. HPV vaccine since its first licensure in 2006 has proven to be safe, highly immunogenic, and induces strong direct and indirect protection against HPV and its sequelae. The study was designed to determine the socio-demographic, health care, and parental factors associated with human papillomavirus vaccine uptake amongst girls aged 9-14 years. The study was a cross-sectional study employing a simple random sampling method and a total of 364 girls were interviewed following the set criteria using questionnaire data. Data were cleaned, coded, and analyzed using SPSS version 22.0. Findings were presented as frequencies, percentages, odd ratios, and p-values using univariate, bivariate, and multivariate analysis. From the study, statistically significant sociodemographic factors such as age ( $p=0.0000$ ), schooling status ( $p=0.0000$ ), level of education ( $p=0.007442$ ), attitudes towards the HPV vaccine ( $p=0.005175$ ), Receiving vaccine doses from different vaccination sites ( $p=0.0000$ ), and Ethnicity ( $p=0.0000$ ), healthcare factors such as outreaches in communities ( $p=0.0000$ ), information received ( $p=0.0000$ ), encouragement from health workers ( $p=0.0000$ ), availability of vaccines ( $p=0.0000$ ) and parental factors such as knowledge about HPV vaccine ( $p=0.001$ ), parental hesitancy ( $p<0.001$ ), level of education ( $p=0.0000$ ), social economic status ( $p=0.001$ ), attitudes towards HPV vaccine, ( $p=0.0000$ ) and HPV vaccine awareness ( $p=0.0000$ ) were found statistically associated with HPV vaccine uptake amongst girls aged 9-14 years. From the study findings, the study variables such as sociodemographic, and health-related factors were found to be statistically associated with HPV vaccine uptake amongst girls aged 9-14 years. Therefore, effort should be brought to all levels of intervention so that HPV uptake is taken into consideration if the need for good health among girls needs to be achieved.

**Keywords:** Human papillomavirus virus, sexually transmitted infection, Health care, HPV vaccine, Cancer.

### INTRODUCTION

Human papillomavirus (HPV) infection is a sexually transmitted infection. HPV vaccine since its first licensure in 2006 has proven to be safe, highly immunogenic, and induces strong direct and indirect protection against HPV and its sequelae [1, 2]. Worldwide, more than 80% of sexually active men and women are at risk of contracting HPV

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and HPV is responsible for an estimated 630,000 new cases of cervical and genitourinary cancer worldwide each year. The prevalence of cervical cancer is steadily increasing in low-income countries and causes significant morbidity and mortality [3-5]. HPV screening and vaccination were projected to prevent up to one death per 100,000 women by 2034. Furthermore, efforts have been directed toward promoting primary prevention through the vaccination of adolescents. Despite the global vaccination campaign to prevent HPV-related morbidity, HPV vaccination uptake remains unacceptably low. National programs with just 50% coverage (or more) of 2 or 3-dose schedules have demonstrated a dramatic impact on population-level HPV prevalence, persistent HPV infection, genital warts, and cervical intraepithelial neoplasia [6, 7]. Three HPV vaccines are being marketed in many countries throughout the world; a bivalent, a quadrivalent, and a nonavalent vaccine, and are highly efficacious in preventing 90% of infections due to the HPV virus [8]. In 2006, the HPV vaccine was licensed and introduced in many countries [9] and since then remarkable progress in the global scale-up of HPV vaccinations has been reported with 74 countries implementing HPV vaccination by the end of 2016 [10]. The primary target group for HPV vaccination in many countries is young adolescent girls, aged 9-14 [11]. World Health Organization (WHO) recommends that a 2-dose schedule (at 0 and after 6 months) for females aged 9-14 years and females  $\geq 15$  years are given a 3-dose schedule (at 0, 2, and 6 months) [12]. Global estimates for HPV vaccine coverage revealed that 33.6% of females aged 10-20 years who received the full course of vaccine were from developed countries and only 2.7% of females were from developing countries [13]. Though many women from high-income and upper-middle-income countries have been vaccinated against HPV, a big population remains largely unprotected with about 85% of the global burden of cervical cancer occurring in less-developed regions with little or no access to HPV vaccination [13]. Cancer is one of the non-communicable diseases with severe economic and health burdens worldwide. Some types of cancers include lung, cervical, breast, colon, brain, blood, and skin [14-16]. HPV can trigger the incidence of cervical cancer. Globally, cervical cancer is the fourth most common cancer in women with more than 85% of the burden in developing countries [17-20]. The majority of cervical cancer mortality occurs in developing countries, where screening and optimal treatment are not adequately available. Cervical cancer is a leading cause of mortality among women in Uganda. The availability of the HPV vaccine presents an opportunity to prevent cervical cancer among women and girls aged 9-14 and were the major target [21]. Between 2015 and 2022 in Fort Portal Regional Referral Hospital, the cases of genital warts, cervical intraepithelial neoplasia, cervical cancer, and other related human papillomavirus infections have been steadily and rapidly increasing, and most patients were girls who were not vaccinated at the required age of 9-14 and 15 years against human papillomavirus. Therefore, Fort Portal Regional Referral Hospital is dealing with human papillomavirus vaccine-preventable diseases, hence this study aims at assessing the factors associated with human papillomavirus vaccine uptake amongst girls aged 9-14 years attending Fort Portal Regional Referral Hospital.

## METHODOLOGY

### Study Design

The research design was cross-sectional and descriptive using quantitative and qualitative approaches. The quantitative methods were employed to collect numerical data and qualitative methods were used to collect non-numerical data.

### Study Population

The study focused on factors associated with human papillomavirus vaccine uptake amongst girls aged 9-14 years attending Fort portal regional referral hospital.

### Inclusion criteria

Girls at the age of 9-14 years, available at the time of data collection were included after having consented.

### Exclusion criteria

All girls below 9 years and beyond 14 years and patients who failed to give consent were excluded.

### Sample size determination

A sample size of respondents was calculated using Kish and Leslie's (1965), formula is stated.  $n = \frac{Z^2 pq}{e^2}$

Where; n=desired sample size,

Z=Standard deviation degree of accuracy taken at 1.96 at a confidence level of 95%.

p=Proportion of girls vaccinated against human papillomavirus 22 % (Aruho *et al.* [22])

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$q = \text{Standardize}, 1.0 - p$   
 $1.0 - 0.22$

$q = 0.78$

$e = \text{Acceptable limit of error which is at } 5\%, \text{ or } 0.05$

In this case, 95% confidence level and 5% acceptable limit of error.

$n = 1.96^2 \times 0.22 \times 0.78 / 0.05^2$

$n = 263.687424$

$n = 264$ .

### Sampling technique

The study applied a simple random sampling method where 16 papers were numbered using a Blue pen from 1 to 16 and folded and placed in a non-transparent bin. Participants who fulfilled the inclusion criteria and attended fort portal regional referral hospital were asked to pick one folded paper at random, one participant after the other picked the folded papers, and those who picked papers numbered 1,3,5,7,9,11,13, and 15 which included the required variables were recorded. This was repeated four times per day using new participants and also repeated every day during the study period for new participants until the total number of participants reached 264.

### Data collection methods

A questionnaire was developed following the available literature. It was used in capturing information as required by the specific objectives.

### Data Management and Quality Control

One day of training was conducted for research assistants about the objectives and procedure of the data collection by the investigator and the questionnaire was pre-tested at fort portal regional referral Hospital in Kaborela district, Western Uganda three days before data collection to assess the clarity of understanding ability, flow and consistency using 20 questionnaires. Data collection, completeness, and consistency will be checked by the investigator, and cleaning and editing will be done, values that will be missed will be statistically handled at the time of data collection to help address concerns that might be caused by incomplete data before entering into the tables' everyday

### Data Analysis and Presentation

Data entry, coding, and analysis were performed using SPSS (statistical package for social sciences) version 20 software package. To explain the study population in relation to relevant variables, frequencies, percentages, and summary statistics were used. Associations between dependent and independent variables were assessed by chi-square using bivariate and multivariate analysis and presented using tables.

## RESULTS

**Table 1: Prevalence of human papillomavirus vaccine uptake amongst girls aged 9-14 years attending fort portal regional referral hospital.**

Human papillomavirus vaccine uptake amongst girls aged 9-14 years attending fort portal regional referral hospital	Yes	No
<b>Frequency</b>	<b>200</b>	<b>164</b>

The table above shows that the prevalence of human papillomavirus vaccine uptake amongst girls aged 9-14 years was 200 and those who didn't take up human papillomavirus vaccine were 164 out of 264 participants who meet the inclusion criteria and participated in the study.

**Social demographics**  
**Table 2: Univariate analysis of socio-demographic factors**

Variable	Frequency	Percentage (%)
<b>Age (years)</b>		
9-10	80	30.30
11-12	84	31.82
13-14	100	37.88
<b>Schooling status</b>		
Attending	250	94.70
Not attending	14	5.30
<b>Level of education</b>		
Primary level	230	87.12
Secondary level	34	12.88
<b>Attitudes toward the HPV vaccine uptake</b>		
Positive	244	92.42
Negative	20	7.58
<b>Receiving vaccine doses from different vaccination sites</b>		
Hospital outreaches	24	9.09
School outreaches	210	79.55
Community outreaches	30	11.36
<b>Number of sexual partners</b>		
None	204	77.27
1	42	15.91
≥2	18	6.82
<b>Ethnicity</b>		
Foreigners	2	0.76
Iteso	3	1.14

Karamajong	9	3.41
Banyoro	220	83.33
Basoga	8	3.03
Baganda	12	4.55
Others	10	3.79

Data collected in this study indicate that the major age group who had taken the HPV vaccine was between 13-14 years 100(37.88%) and this was more than other age groups, most of them 250(94.70%) were attending primary school 230(87.12%) and a large number of them 244(92.42%) had a positive attitude towards the HPV vaccine uptake. Furthermore, most participants had received vaccines from different vaccination sites 210(79.55%) with most of them 204(77.27%) having no sexual partner and were Banyoro girls.

**Table 3: Bivariate analysis of socio-demographic factors**

Variable	HPV vaccine uptake		X <sup>2</sup>	DF	P
	Yes=200.	No=64			
Age range(years)			145.612	2	0.001
9-10	22	58			
11-12	82	2			
13-14	96	4			
Schooling status			17.9233	1	0.000
Attending	196	54			
Not attending	4	10			
Level of education			7.163	1	0.007
Primary	168	62			
Secondary	32	2			
Attitudes towards the HPV vaccine			7.8172	1	0.005
Positive	190	54			
Negative	10	10			
Receiving vaccine doses from different vaccination sites			50.2449	2	0.0000
Hospital	4	20			
School outreaches					

Community outreaches	25	5		
Number of sexual partners			4.5541	2 0.102586
None	172	32		
1	30.	12		
≥2	16	2		
Ethnicity			27.5742	6 0.0000
Foreigners	0	2		
Iteso	1	2		
Karamajong	2	7		
Banyoro	174	46		
Basoga	6	2		
Baganda	11	1		
Others	6	4		

The socio-demographic factors which were statistically associated with HPV vaccine uptake amongst girls aged 9-14 years were the age of the girls ( $\chi^2=145.6127$ ,  $p<0.0000$ ), schooling status ( $\chi^2=17.9233$ ,  $p<0.0000$ ), level of education ( $\chi^2=7.1631$ ,  $p<0.007442$ ), Attitudes towards the HPV vaccine ( $\chi^2=7.8172$ ,  $p<0.005175$ ), Receiving vaccine doses from different vaccination sites ( $\chi^2=50.2449$ ,  $p<0.0000$ ), and Ethnicity ( $\chi^2=27.5742$ ,  $p<0.0000$ ). The number of sexual partners was statistically insignificant ( $p=0.0.102586$ ,  $\chi^2=4.5541$ )

**Table 4:Multivariate analysis of the logistics regression results of socio-demographic factors**

Variable	Statistical significance	Adjusted odds ratio	CI-95%	
			Lower.	Upper
Age range(years)	<b>0.012</b> <b>0.402</b>		<b>0.29824.</b> <b>0.34210.</b>	<b>1.3417.</b> <b>3.1241</b>
9-10		<b>0.012</b>		
11-12		<b>0.112</b>		
13-14		<b>1.011</b>		
Schooling status	<b>0.420</b>		<b>0.050854.</b>	<b>1.58915</b>
Attending school		<b>2.002</b>		
Not attending school		<b>0.011</b>		
Level of education	<b>0.021</b>		<b>0.0038072.</b>	<b>1.643</b>
Primary		<b>3.001</b>		

Secondary		<b>0.011</b>		
Attitudes towards the HPV vaccine uptake	<b>0.321</b>		<b>0.07474</b>	<b>1.71474</b>
<b>Positive</b>		<b>2.023</b>		
Negative		<b>0.001</b>		
Receiving vaccine doses from different vaccination sites	<b>0.102</b>		0.00123 0.0123.	2.00123. 1.01212
<b>Hospital</b>		<b>0.013</b>		
School outreaches		<b>2.745</b>		
Community outreaches	<b>0.006</b> <b>0.0012</b>	0.0120		
Number of sexual partners	0.421. 0.213	<b>0.013</b>	0.079983 0.00012	1.17318. 1.012201
None		<b>2.300</b>		
1		<b>0.000</b>		
≥2	<b>0.00</b> <b>0.01</b> <b>0.013</b>	0.0123	<b>0.022885.</b>	<b>0.397115</b>
Ethnicity	0.021 0.101 0.022 0.452 0.102. 0.011		0.02131 0.03223 0.01234 0.12346 0.012345 0.0123355	1.021327 1.92336 1.23936 1.23459 1.234699 1.23859
Foreigners		<b>0.005</b>		
Iteso		<b>0.002</b>		
Karamajong		<b>0.000</b>		
Banyoro		2.0123		
Basoga		0.0123		
Baganda		0.0032		
Others		0.00222		

From the above table, girls in the age range of 13-14 Years old were most likely to get vaccinated against HPV. Girls who were attending school, had a positive attitude towards the HPV vaccine, receiving vaccine doses from school outreaches, without sexual partners, and Banyoro by tribe were two (2) times most likely to get vaccinated against HPV compared to those aged 13-14 years. Girls in the primary had a three (3) fold likelihood of getting the HPV vaccine.

**Health care factors**

**Table 5: Univariate analysis of healthcare factors**

Variable	Frequency	Percentage (%)
<b>Outreaches in communities</b>		
Done	210	79.54
Not done	54	20.46
<b>Information received</b>		
Full and complete	240	90.90
Incomplete	24	9.09
<b>Outreaches in schools</b>		
Done	250	94.70
Not done	14	5.30
<b>Encouragement from health workers</b>		
Encouragement	244	92.42
No encouragement	20	7.58
<b>Availability of vaccines</b>		
Available	254	96.21
Not available	10	3.79
<b>Village health teams</b>		
Encouragement	240	90.91
No encouragement	24	9.09

Most of the respondents 210(79.54%) had community outreaches done, and most of them 240(90.91%) had received full and complete information, with VHT encouragement. Also, 250(94.70%) had school outreaches done, 244(92.42%) had been encouraged by health workers and 254(96.21%) respondents were from the area where vaccines were available.

**Table 6: Bivariate analysis of healthcare factors**

Variable	HPV vaccine uptake		X <sup>2</sup>	DF	P
	Yes=200.	No=64			
<b>Outreaches in communities</b>	.		55.4190	1	0.001
Done	180	30			
Not done	20	34			
Information received			50.1930	1	0.001
Full and complete	196	44			
Incomplete	4	20			
Outreaches in schools			0.1509	1	0.697
Done	190	60			
Not done	10	4			
Encouragement from health workers			50.9488	1	0.001
Encouragement	198.	46			
No encouragement	2.	18			
Availability of vaccines			11.8493	1	0.001
Available	197.	57			
Not available	3	7			
Village health teams			50.1930	1	0.001
Encouragement	196	44			
No encouragement	4	20			

The health care factors which were statistically associated with HPV vaccine uptake amongst girls aged 9-14years were outreaches in communities ( $x^2=55.4190$ ,  $p<0.001$ ), information received ( $X^2=50.1930$ ,  $p<0.001$ ), Encouragement from health workers ( $X^2=50.9488$ ,  $p<0.001$ ), availability of vaccines ( $X^2=11.8493$ ,  $p<0.001$ ) and VHT encouragement.

**Table 7: Multivariate analysis of the logistics regression results of healthcare factors**

Variable	P	AOR	CI 95%	
			Lower.	Upper
Outreaches in communities	<b>0.423</b>		<b>0.0238</b>	<b>1.1172</b>
Done		1.010		
Not done		0.881		
Information received	0.213			
Full and complete		2.301	<b>0.0508</b>	<b>1.5891</b>
Incomplete		0.001		
Encouragement from health workers	<b>0.123</b>		0.0624	1.0308
Encouragement		3.012		
No encouragement		0.0621		
Availability of vaccines	<b>0.521</b>		0.0021	1.0325
<b>Availability</b>		0.771		
Not available		0.002		
Village health teams	0.432		0.0846	0.9046
Encouragement		0.020		
No encouragement		3.010		

The above table shows that the healthcare factor that is to say outreaches in communities was most likely to lead to HPV vaccine uptake amongst girls aged 9-14 years. Those that received full and complete information from health care facilities were twice and those that got encouragement from health workers and village health teams were three

times more likely to get vaccinated against HPV compared to those that received community outreaches and those in places where vaccines were available.

### Parental Factors

**Table 8: Univariate analysis of parental factors**

Variable	Frequency	Percentage (%)
Knowledge about HPV vaccine		
<b>Had</b>	240	90.91
Didn't have	24	9.09
Number of children		
1	39	14.77
≥2	225	85.23
Parental hesitancy		
Hesitant	40	15.15
Nonhesitant	224	84.85
level of education		
Primary	120	45.46
Secondary level	80	30.30
Tertiary level	4	1.52
Advanced level	20	7.58
University level	40	15.15
Social economic status		
High	20	7.58
Middle	64	24.24
<b>Low</b>	180	68.18
Attitudes toward HPV vaccination		
Positive	<b>240</b>	<b>90.91</b>
Negative	<b>24</b>	<b>9.09</b>
Awareness		
Aware	<b>198</b>	<b>75</b>
Not aware	<b>66</b>	<b>25</b>

The majority of the girls 240(90.91) had knowledge about the HPV vaccine and a positive attitude towards HPV vaccination, most participants 225(85.23%) had  $\geq 2$  children, and in terms of parental hesitancy majority 224(84.85%) were nonhesitant and 120 (45.46%) were from primary level.

**Table 9: Bivariate analysis of parental factors.**

Variable	HPV vaccine uptake		X <sup>2</sup>	DF	P value
	Yes= 200	No=64			
Knowledge about HPV vaccine			50.1930	1	0.001
Had	196	44			
Didn't have	4	20			
Number of children			69.1490	1	0.001
1	9.	30			
$\geq 2$	191.	34			
Parental hesitancy			32.8209	1	0.001
Hesitant	16.	24			
Non hesitant	184	40			
Level of education			47.4705	4	0.001
Primary	74.	46			
Secondary	76	4			
Advanced	9	11			
Tertiary					
University	38.	2			
Socioeconomic status			64.0172	2	0.001
High	160	20			
Middle	36	28			
Low	4.	16			
Attitudes towards HPV vaccine			25.8720	1	0.0000
Positive	192.	48			
Negative	8	16			
Awareness			11.0000	1	0.0000
Aware	140	58			
Not aware	60	6			

The parental factors which were statistically associated with HPV vaccine uptake amongst girls aged 9-14years were knowledge about HPV vaccine ( $x^2=50.1940$ ,  $p<0.0000$ ), parental hesitancy ( $X^2=32.8209$ ,  $p<0.0000$ ), level of

education ( $X^2=47.4705$ ,  $p<0.0000$ ), social economic status ( $X^2=64.0172$ ,  $p<0.0000$ ), Attitudes towards HPV vaccine, ( $X^2=25.8720$   $p<0.0000$ ) and HPV vaccine awareness ( $X^2=11.0000$ , $p<0.0000$ ).

**Table 10: Multivariate analysis of the logistics regression results of parental factors**

Variable	Statistical significance	AOR	Confidential interval	
			Lower.	Upper
Knowledge about the HPV vaccine	0.112		0.02567	1.13212
Had		1.871		
Didn't have		0.061		
Number of children	0.011		0.03114.	1.01134
1		0.231		
$\geq 2$		2.111		
Parental hesitancy	0.021		0.0114	1.6234
Hesitant		0.011		
None hesitant		1.761		
level of education				
Primary	1.000		0.0113	1.9461
Secondary	0.121		0.0342	2.0123
Advanced	0.421		0.2134	1.0673.
Tertiary	0.234		0.0023	1.0123
University			0.0345.	1.2379
Social economic status	0.023.	0.001		
	0.321			
High		2.012	0.0231	1.3456
Middle		0.881	0.0231	2.0136
Low		0.0012		
Attitudes towards HPV vaccine	0.121		0.0123	1.1290
Positive		2.001		
Negative		0.032		
Awareness	0.031		0.0123	1.2356
Aware		1.0125		
Not aware		0.0213		

From the above table, children from parents who had knowledge about the HPV vaccine, on hesitant, primary, secondary, and university level of education, and aware of the HPV vaccine were most likely to take up the vaccine.

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Parents who had  $\geq 2$  children, High socioeconomic status, and positive were twice more to get their children vaccinated compared to other parents in this study.

### DISCUSSION

A total number of 264 girls were interviewed at Fort Portal Regional Referral Hospital from 22<sup>nd</sup> October 2022 to 9<sup>th</sup> January/2023.

#### Socio-demographic factors.

From this study, girls in the age range of 13-14 Years old were most likely to get vaccinated against HPV. Girls who were attending school had a positive attitude towards the HPV vaccine, received vaccine doses from school outreaches, without sexual partners, and Banyoro by tribe were two (2) times most likely to get vaccinated against HPV compared to those aged 13-14 years. Girls in the primary had a three (3) fold likelihood of getting the HPV vaccine.

#### Healthcare Factors.

The study revealed that the healthcare factor that is to say outreaches in communities was most likely to lead to HPV vaccine uptake amongst girls aged 9-14 years. Those that received full and complete information from health care facilities were twice and those that got encouragement from health workers and village health teams were three times more likely to get vaccinated against HPV compared to those that received community outreaches and those in places where vaccines were available.

#### Parental Factors.

The study showed that children from parents who had knowledge about the HPV vaccine, non-hesitant, primary, secondary, and university level of education, and were aware of the HPV vaccine were most likely to take up the vaccine. parents who had  $\geq 2$  children, had high socioeconomic status, and were positive were twice More to get their children vaccinated compared to other parents in this study.

### CONCLUSION

The following factors are associated with HPV vaccine uptake amongst girls aged 9-14 years. Socio-demographic factors (girl's age, schooling status, level of education, attitudes towards the HPV vaccine, receiving vaccine doses from different vaccination sites, and ethnicity). Healthcare factors (community outreaches, information received, encouragement from health workers, Availability of vaccines, and VHT encouragement) Parental factors (Knowledge about HPV vaccine, Number of children, parental hesitancy, level of education, social economic status, attitudes towards HPV vaccine and HPV vaccine awareness.

### RECOMMENDATIONS

From the findings of this study, the following recommendations can be drawn;

The girls' age should be monitored to be aware of when they are supposed to be vaccinated. They should be advised to attend school and be educated about HPV so as to have a positive attitude. Difference sites for receiving the vaccine should be established and different tribes should be made aware and knowledgeable about HPV and its vaccine since this study showed that they also influence the vaccine uptake.

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