

Uptake and Completion of Human Papilloma Virus Vaccination by Adolescent Girls Attending Primary Healthcare Facilities in Soroti City, Northeastern Uganda; A Cross-Sectional Study

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Abstract

Introduction: Uganda adopted and implemented Human Papilloma Virus (HPV) vaccination since 2015 for adolescent girls aged 9-13 years for primary prevention of cervical cancer. However, the vaccine uptake and dose completion have remained relatively low national wide. Therefore, this study aimed at determining the uptake and dose completion of HPV vaccination and associated factors in Soroti city, Northeastern Uganda.

Methodology: This was a cross-sectional study that employed quantitative methods of data collection and analysis. A sample of 287 adolescent girls aged 10-19 years were selected consecutively from four health centers in Soroti City between March and April 2024. Data was analyzed using Stata statistical software, version 15.0. Descriptive statistical analysis was performed to determine the level of HPV vaccine uptake and dose completion. Bivariate and multivariate analyzes were performed using modified Poisson regression with robust error estimates to determine association between independent factors and uptake and dose completion. Results were reported with a 95% confidence interval (CI) and factors whose P-Values were less than 0.05 were considered statistically significant.

Results: Of the 287 adolescent girls, their mean age was 14 years (SD=2.9). Most of the participants were in school, 231(80.5%). Majority, 79 % (n=228) had never heard about HPV Vaccination. HPV Vaccination uptake among the study participants was suboptimal as only 58.8% (n=166) had received at least one dose whereas only 30% (n=86) had completed the two doses of the vaccine. The factors that were significantly associated with vaccination uptake were school enrollment status (P=0.022), religion (P=0.010), and awareness about HPV vaccine (P<0.001), while factors that were significantly associated with completion of HPV vaccination were: School enrollment status (P=0.046) and awareness about HPV vaccine (P=0.007).

Conclusion: The uptake and completion of HPV vaccination in Soroti was suboptimal compared to WHO target of 90%. School enrollment status and awareness about HPV vaccine were factors significantly associated with HPV uptake and dose completion. Strengthening the school-based HPV vaccination program and creating awareness about HPV vaccination, in schools, at the health facilities and in the community may significantly improve the HPV vaccination and dose completion in the region.

Keywords: Human Papilloma Virus, Adolescents, Cervical Cancer, Vaccination, Uganda

1. Introduction

Human papillomavirus (HPV) is a common sexually transmitted infection (STI) affecting about 75% of those who are sexually active at some point in their sexual lifetime [1,2]. Persistent

exposure to the high-risk strains of the viruses 16 and 18 trigger the progression of cells into pre-cancerous lesions which culminate into the cancerous lesions of the cervix. These strains account for nearly 70% of cervical cancer cases reported worldwide [3].

Cervical cancer is the 4th most common cause of cancers among women and the 4th most common cause of cancer related mortality globally. In Sub-Saharan Africa however, cervical cancer ranks highest amongst female cancers with age specific rates of more than 50 per 100,000 women in Uganda and 8 other countries in the region[4-6]. For Uganda, approximately 6,959 new cases are reported each year [7-9]. This is worrisome as Uganda has the youngest populations in the world and 50% of them aged 15-19 years[10]. Majority of women (80%) under care at Uganda Cancer Institute (UCI) are battling cervical cancer and 40% of cervical cancer patients show up in advanced stages of cancer (III/IV) with a poor prognosis and their 5-year survival is merely 20% [11,12]. World Health Organization has set a global strategy to hasten the elimination of cervical cancer as a public health problem by 2030 with an elimination threshold set at 4 cases per 100,000 women. This strategy targets 90% of girls to be fully vaccinated with the HPV vaccine by 15years [13,14]. Unfortunately, most countries have not hit the WHO 90% HPV vaccination target for adolescent girls. Even high-income countries which introduced the vaccine much earlier are still lagging the vaccination target due to several challenges which have been documented globally. Global HPV immunization coverage for 2018 was estimated at 12.2% [15,16].

Uganda started piloting HPV vaccination in schools in the two districts of Nakasongola and Ibanda before rolling out the program countrywide in 2015 [17]. However, since its mass roll out in 2015, the national vaccine coverage have persistently remained low at 22%, much below the 90% WHO target by 2030 [5]. Other studies done in different regions of the country have shown similar low trends in vaccination coverage ranging between 20% in Lira to 43% in Kampala and 49% in Mbale[7,17-19]. The single most important factor identified in most of these studies as contributing to low uptake of vaccine in the country is lack of awareness about cervical cancer and the existence of HPV vaccination to prevent the cancer[17,20-23]. Other factors affecting the uptake include; myth about safety of the vaccine, fear to contract the HPV, side effects and association of the vaccine to infertility which further demonstrate the need for mass mobilization and education [7]. There are missed opportunities for HPV vaccination and dose completion for adolescent girls who visit the health facilities as their vaccination status is not routinely asked for, nor are they given opportunity to initiate or complete vaccination when visiting these primary healthcare facilities. In addition, there is no research in Teso region on the area specific factors affecting vaccine uptake in the region, whereas it is important to understand the area specific factors contributing to the observed low vaccine uptake in the various regions of the country to support in designing customized interventions to improve its uptake and coverage. The goal is to provide insights that can inform interventions to improve vaccination rates among adolescent girls and reduce the burden of cancer of the cervix. The objective of this study was therefore to assess the levels of uptake and completion of Human papilloma virus vaccination by adolescent girls attending primary healthcare facilities in Soroti City, Uganda, to design tailored interventions to improve vaccination uptake and contribute to the elimination of cervical cancer in the region.

2. Methods and Materials

2.1 Study Design and Site: A facility based cross-sectional quantitative study was employed between March and April 2024. The study was conducted in four purposively selected health facilities in Soroti City, Northeastern Uganda. These included all health center IIIs in the city that include Soroti HCIII, Kichinjaji HCIII, Eastern Division HCIII and Western Division HCIII. There are nine (9) public health facilities under the City authority, one (1) Health center IV, four (4) health center IIIs and four (4) health center IIs. In addition to the 9 public health facilities, there is one regional referral hospital under the management of the central government and several private and private not for profit health units located within the city. The public health centre IIIs were chosen to control for differences in facility levels. Together, they provide primary health care services, including immunization and HPV vaccination, OPD, child health, maternal and reproductive health care services to about 60% of the population of Soroti City. The health facilities refer all complicated cases such as blood transfusion, admission, surgeries and other emergency obstetric care services to Soroti regional referral hospital which is located within Soroti City.

On average, each of these facilities receive about 40 girls aged 10-19 years per day. These facilities receive the greatest number of patients from the catchment area and cross border population in Soroti city in Eastern Uganda. Soroti has about 6459 girls aged 10 -19 years, and lies between Latitude: 10 42' 52.70" N and longitude: 330 36' 40.07" E. The city is the largest town of Teso sub region located 290km by road via Mbale from Kampala, Uganda's capital city, with the total population of 49685 [24]. Soroti city is located in Soroti District and it borders Serere and Ngora Districts in the south, Kalaki in the West, and Katawi, Amuria Districts in the north-East [24].

2.2 Study Population: The study was conducted amongst girls between 10-19 years in the selected Health Centers IIIs at entry point care services in Soroti city, Northeastern Uganda. This is because it is the target age group and have either been vaccinated or already missed the HPV vaccination since the program targets girls aged 9-14 years in Uganda. All girls aged 10-19 years attending OPD clinic at the selected health facilities were eligible to participate in the study and all the girls presenting in OPD in the study site who were willing to consent or consented for by parent were included in the study while girls who had impaired mental judgement, too sick, in pain and girls below 18years who was not escorted by the guardian/parent and as such unable to provide valid informed consent were excluded from the study.

2.3 Sample Size Determination and Participant Recruitment

We employed Leslie Kish formula (1965), at 95% confidence interval, and used the national HPV vaccine uptake of 22% [25] to obtain a sample size of 264. We then adjusted the sample size by 10% for non-response rate and recruited 287 participants distributed in the four health facilities as follows: Eastern Division HCIII (59), Kichinjaji HCIII (74), Western Division HCIII (74) and Soroti HCIII (80).

Adolescent girls coming to the facility for any service, ranging from sexual and reproductive health care, health education, laboratory or OPD services were consecutively sampled and recruited in the study per site and an average of 20 participants were interviewed per site per day until the sample size of 287 was reached.

2.4 Study Variables: The primary Outcome was uptake of HPV vaccination, defined as the proportions of adolescent girls who had ever received at least one dose of HPV vaccine in their lifetime while secondary outcomes were: 1. dose completion defined as adolescent girls who completed two doses of the HPV vaccine and 2. Factors associated with dose completion of HPV vaccine. Independent variables included participant demographics such as current age, age of vaccination (if vaccinated), religion, tribe, staying with parents and in-school status, place of residence, and knowledge about cervical cancer, HPV and vaccine.

2.5 Data Collection Procedures: A researcher administered questionnaire was used to obtain primary data from study participants. The questionnaire was developed with checks and quality control measures to ensure valid and reliable data is collected. The questionnaire was uploaded on an android tablet and entered in an online survey tool, the kobo toolbox for ease of data collection and management. Prior to data collection, four (4) research assistants were identified and trained on sampling, consenting and interviewing processes to support data collection. They were also trained in online data collection using the kobo toolbox and the ethical processes in the conduct of research

involving minors.

2.6 Data Management and Analysis: Data entered onto the online toolkit was checked for completeness for every participant to ensure that there was no data missing at the end of the data collection process. Participants found to be missing key variables were dropped to allow for enrollment of new participants. The data was then downloaded from the online system and exported to Stata version 15.0, statistical software for further management and analysis.

Descriptive data was summarized and reported as means, standard deviations, frequencies, proportions and presented as texts, tables and graphs. Poisson regression with robust error estimator was conducted at bivariate and multivariate level to determine the levels and factors associated with HPV vaccine uptake and completion. A p-value <0.05 was considered statistically significant.

3. Results

3.1 Sociodemographic Characteristics

Of the 287 adolescent girls who were interviewed, their mean age was 14 years (SD=2.9). Majority were between 10-13 years 134(46.7%). Furthermore, most of the participants were in school 231(80.5%) and majority were Anglicans 96(33.5%) by religion. Majority of participants, n=189(66%) had never heard about cervical cancer. Only 7.3% (n=21) of the participants had heard about HPV and 79 %(n=228) had never heard about HPV Vaccination. (Table 1).

Variable	Frequency	Percentage
Age CAT/years		
10_13	134	46.7
14_16	85	29.6
17_19	68	23.7
School enrollment		
In school	231	80.5
Out of school	56	19.5
Religion		
Anglican	96	33.5
Pentecostal	62	21.6
Catholics	114	39.7
Muslims	15	5.2
Highest level of education		
primary	241	83.9
Post primary	46	16.1
Initiation of coitus		
No	222	77.4
Yes	65	22.65
Heard about cervical cancer		
No	189	65.9
Yes	98	34.1
Heard about HPV		

No	266	92.7
Yes	21	7.3
Heard of HPV vaccine		
No	228	79.4
Yes	59	20.6

Table 1: Sociodemographic Characteristics of Study Participants

3.2 Uptake and Completion of HPV Vaccination

Slightly more than half 166 (58.8 %) of the study participants reported to have received at least one dose of the vaccine while

only 30% of them had completed HPV vaccination with two doses as indicated by figure 1 below.

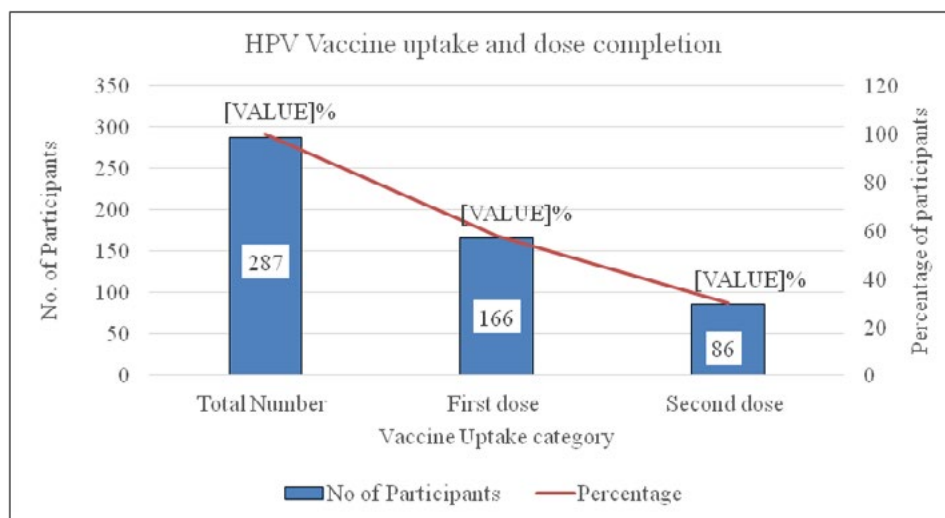


Figure 1: Proportion of HPV Vaccinated and their Percentages by Category

3.3 Factors Associated with HPV Vaccination Uptake

School enrollment, (aPR=0.56 (95% CI, 0.34-0.92, P=0.022), religion (aPR=0.74 (95%CI; 0.59-0.93, P=0.01), and awareness

about HPV vaccine (aPR=1.50 (1.24-1.82, P<0.001), were found to be associated with uptake of HPV vaccination. (Table2).

Variable	Frequency (N=287)	Vaccination uptake		PR (95%CI)	aPR (95%CI)	P-Value for aPR
		YES, N=166 (57.8%)	NO, N=121 (42.2%)			
Age CAT/years						
10_13	134	81(60.5)	53 (39.6)	1	1	
14_16	85	49(57.7)	36 (42.4)	0.95 (0.76-1.19)	0.98 (0.78-1.23)	0.856
17_19	68	36(52.9)	32 (47.1)	0.875 (0.67-1.14)	1.19 (0.86-1.64)	0.295
School enrollment						
In school	231	147 (63.6)	84 (36.4)	1	1	
Out of school	56	19 (33.93)	37 (66.1)	0.53 (0.37-0.78)	0.56 (0.34-0.92)	0.022
Religion						
Anglican	96	65 (67.7)	31 (32.3)	1	1	
Pentecostal	62	36 (58.1)	26 (41.9)	0.85 (0.67-1.10)	0.90 (0.71-1.15)	0.418
Catholics	114	56 (49.1)	58 (50.9)	0.72 (0.57-0.92)	0.74 (0.59-0.93)	0.010
Muslims	15	9 (60.0)	6 (40)	0.88 (0.57-1.37)	0.87 (0.56-1.34)	0.531
Highest level of education						
Primary	241	136 (57.1)	102 (42.9)	1	1	
Post primary	46	30 (61.2)	19 (38.8)	1.10 (0.87-1.42)	0.95 (0.69-1.32)	0.770
Initiation of coitus						
No	222	139 (62.6)	83 (37.4)	1	1	

Yes	65	27 (41.5)	38 (58.5)	0.66(0.49-.09)	0.78 (0.51-1.18)	0.240
Awareness about cervical cancer						
No	189	98(51.9)	91(48.2)	1	1	
Yes	98	68(69.4)	30(30.61)	1.33 (1.10-1.62)	1.21 (0.98-1.48)	0.076
Awareness about HPV						
No	266	149 (56.0)	117 (43.98)	1	1	
Yes	21	17 (80.95)	4 (19.1)	1.44 (1.14-1.82)	0.97 (0.75-1.26)	0.827
Awareness about HPV vaccine						
No	228	117 (51.3)	111 (48.7)	1	1	
Yes	59	49 (83.1)	10 (16.95)	1.61 (1.36-1.92)	1.50 (1.24-1.82)	0.000
Notes: Bold=Significant at bivariate level with P<0.05. All factors were adjusted for each other at multivariate level. PR=Prevalence ratio, aPR=adjusted prevalence ratio.						

Table 2: Factors Associated with HPV Vaccine Uptake

3.4 Factors Associated with HPV Vaccine Dose Completion (95%CI; 1.15-2.48, P=0.007) were associated with HPV vaccine dose completion. (Table3). We found that school enrollment status (aPR=0.36, 95%CI; 0.13-0.98, P=0.046) and awareness about HPV vaccine (aPR=1.69

Variable	Frequency (N=287)	Vaccination uptake		PR (95%CI)	aPR (95%CI)	P-Value for aPR
		YES, N=86 (29.9%)	NO, N=201 (70.1%)			
Age CAT/years						
10_13	134	42 (31.3)	92 (68.6)	1	1	
14_16	85	29 (34.1)	56 (65.8)	1.09 (0.73-1.60)	1.08(0.71-1.62)	0.725
17_19	68	15 (22.1)	53 (77.9)	0.70 (0.42-1.17)	1.13(0.58-2.20)	0.714
School enrollment						
In school	231	80 (34.6)	151 (65.4)	1	1	
Out of school	56	6 (10.7)	50 (89.1)	0.31 (0.14-0.67)	0.36(0.13-0.98)	0.046
Religion						
Anglican	96	32 (33.3)	64 (66.7)	1	1	
Pentecostal	62	24 (38.7)	38 (61.3)	1.16 (0.76-1.77)	1.22 (0.80-1.86)	0.351
Catholics	114	25 (21.9)	89 (78.1)	0.66 (0.42-1.03)	0.67 (0.43-1.04)	0.072
Muslims	15	5 (33.3)	10 (66.7)	1 (0.76-1.77)	0.96 (0.44-2.07)	0.907
Highest level of education						
Primary	241	71 (29.5)	170 (70.5)	1	1	
Post primary	46	15 (32.6)	31 (67.39)	1.11 (0.69-1.75)	0.92 (0.53-1.61)	0.779
Initiation of coitus						
No	222	76 (34.2)	146 (65.7)	1	1	
Yes	65	10 (15.4)	55 (84.6)	0.45 (0.25-0.82)	0.68 (0.32-1.46)	0.320
Heard about cervical cancer						
No	189	50 (26.5)	139 (73.5)	1	1	
Yes	98	36 (36.7)	62 (63.3)	1.39 (0.98-1.96)	1.23 (0.83-1.82)	0.299
Heard about HPV						
No	266	76 (28.5)	190 (71.4)	1	1	
Yes	21	10 (47.6)	11 (52.4)	1.67 (1.02-2.72)	1.01 (0.59-1.73)	0.299
heard of HPV vaccine						
No	228	59 (26.9)	169 (74.1)	1	1	
Yes	59	27 (45.7)	32 (54.2)	1.77 (1.24-2.52)	1.69 (1.15-2.48)	0.007

Table 3: Factors Associated with HPV Vaccine Dose Completion

4. Discussion

The aim of our study was to assess the levels of uptake and completion of Human papilloma virus vaccination by adolescent girls in Soroti City, Eastern Uganda and the factors associated with the level of uptake and dose completion. Our findings revealed that HPV vaccine uptake was still sub optimal, slightly above 50% of the eligible population had vaccinated, while dose completion was only at 30% as compared to WHO target of above 90% [26]. Our study though reported suboptimal uptake of HPV vaccination has shown that there has been significant improvement in vaccine coverage, as compared to the previous studies conducted in similar settings which reported much lower uptake of 19.6% [19] and 22% [7] in northern districts of Uganda. Studies conducted in developed countries have showed varied levels of vaccine uptake, ranging from as low as 2.4% in Hong Kong to 99% in Scotland [11,27]. In USA only two third of girls aged 13–17 year-old had initiated the HPV vaccine while only 51.1% of these had received all the recommended doses [28]. This demonstrates the need to focus on interventions to increase rate of uptake and dose completion in our country and similar settings.

The vaccine completion rate in our study was low as only 30% of study participants had completed the vaccination. This reflects the difficulty of ensuring that girls who initiate HPV vaccination receive at least 2 doses. Despite a marked improvement in the vaccine uptake, the girls who start vaccination do not complete the recommended doses. Earlier studies in Kampala, a highly urban city in Uganda, HPV vaccination dose completion was found to be equally low, at 43% [17]. There is therefore needed to critically examine and rapidly adopt the WHO recommendation of single HPV Vaccine dose for adolescent girls before initiating sexual activity [15]. This will enable rapid scale up and dose completion of HPV vaccination globally and specifically in SSA.

Our findings revealed that school enrollment status was significantly associated with both uptake and completion of HPV vaccination. School-based approach to HPV vaccine delivery has been used widely in both developed and developing countries, with significant successes in coverage reported [29]. In Sweden for example, the school-based vaccine delivery approach appeared to be the most effective and equitable delivery mode for reaching high population vaccination coverage, including high-risk groups for cervical cancer mode of HPV vaccine delivery and equity in vaccine uptake while in Texas, USA, it was noted that strong support at district and school levels is vital for gaining principal and school nurse buy-in for the school-based vaccination program [30,31]. Many countries in SSA, including Uganda have adopted the free of charge school-based HPV vaccination strategy to increase uptake of the vaccination, with promising results such as 72% vaccine coverage in South Africa [32]. It is therefore important to strengthen the implementation of school-based vaccination program to improve the uptake and completion of HPV vaccine in Uganda and SSA. Uganda currently targets schoolgirls in primary four for vaccination. This is one of the loopholes in the school-based vaccination program which could be contributing to suboptimal uptake and thus a comprehensive

school-based approach needs to be designed to give opportunity to all the eligible girls to get vaccinated. In addition, there is need to close the gaps for missing opportunities for those girls who are out of school by promoting vaccination in health facilities for adolescent girls who could have dropped out of school or those missed the vaccine at school.

Awareness about HPV vaccine was found to be significantly associated with uptake and completion of HPV vaccination in our study. A very small proportion of girls (20%) in our study had ever heard about HPV vaccination. This is worrying as it implies that even as the school-based vaccination program is implemented, priority is not given in provision of health education and knowledge to the girls on HPV, cervical cancer and HPV vaccination, no wonder even the few who initiate the vaccination fail to complete the dosing. Other studies in Uganda and elsewhere made similar observations that awareness about HPV vaccination was lacking among the study participants and was the most important risk factor for low uptake of the vaccine [17,20–23]. The low level of HPV vaccine uptake and completion noted in our study highlight the need for tailored approaches towards increasing knowledge and awareness about HPV vaccination through the school-based programs.

5. Study Limitations

This was a cross-sectional study, and no follow-up was done to participants who had received only one dose. The study was facility based and the focus was only on those who had sought medical care from the public health facilities. Those who received health care services from private health facilities were not given the chance to participate in the study, and this could have led to over estimation of vaccination uptake. Besides, clients who are most likely to visit the health facilities are those who usually take up the health services.

Ethical Consideration

The proposal was reviewed by the Department of Nursing, Soroti University School of Health Sciences and later submitted to Mbale Regional Referral Hospital Research and Ethics Committee (MRRHREC), which reviewed and granted ethical approval, REC Number MRRH-2024-384. The Department of Nursing, School of Health Sciences, Soroti University provided an introductory letter to the Soroti City Health Office for permission to conduct the study. Administrative clearance from the City Health Office and facility in-charges was sought. Written informed consent was sought from participants who had attained majority age (18 and 19 years) while assent of the minors and their parental consent was obtained prior to interviewing them. The participants were at free will to withdraw from the study at any point without any penalty. Confidentiality was upheld by administering questionnaires in a secure place and personal identifiers such as age, national identification number or phone contacts were excluded. The computerized data was kept secure by pass-wording and encrypting it only to be accessible to the authorized study team.

Contribution of Authors.

LDN, Conceptualization, proposal development, data collection, analysis and report writing

JK, CM, HA and JN, Proposal development, review and report writing

ME, Data analysis and report writing

RO, Proposal development, supervision, data analysis and report writing.

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