

# Knowledge, Attitudes, and Uptake of the Human Papilloma Virus Vaccine among Pharmacy Students at the University of Zambia: Opportunities to Improve Vaccine Uptake

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**How to cite this paper:** Mulenga, P., Mufwambi, W., Mwaba, M., Zulu, M., Tembo, R., Mwaba, F., Mutoya, N., Chimbala, A.M., Mwanza, B., Musonda, M.S., Kasanga, M., Mugenyi, N., Daka, V. and Mudenda, S. (2025) Knowledge, Attitudes, and Uptake of the Human Papilloma Virus Vaccine among Pharmacy Students at the University of Zambia: Opportunities to Improve Vaccine Uptake. *Open Journal of Obstetrics and Gynecology*, 15, 744-763.

<https://doi.org/10.4236/ojog.2025.154061>

**Received:** March 7, 2025

**Accepted:** April 18, 2025

**Published:** April 21, 2025

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## Abstract

**Introduction:** Human Papillomavirus (HPV) infections pose a significant global health challenge, particularly among women, as high-risk HPV strains are the leading cause of cervical cancer. In Zambia, limited data exist on HPV vaccine uptake among students. This study evaluated the knowledge, attitudes, and uptake of the HPV vaccine and associated factors among female pharmacy students at the University of Zambia. **Methodology:** A quantitative, descriptive cross-sectional study was conducted among 247 randomly selected female pharmacy students at the University of Zambia from August to September 2024. The study involved second to fifth-year female pharmacy students, and it utilized a structured interview questionnaire. Data analysis was performed using IBM SPSS version 23.0, with Fisher's exact test used to determine

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associations between dependent and independent variables. Statistical significance was set at a 95% confidence level ( $p = 0.05$ ). **Results:** Among the 247 participants, 70% demonstrated good knowledge, and 80.5% had positive attitudes towards HPV vaccination. Despite this, only 6.5% had received the vaccine while 92.3% were not vaccinated. However, 70% expressed willingness to be vaccinated. The primary reason for low uptake (19.8%) was the perceived high vaccine cost. Other factors influencing knowledge and attitudes towards HPV vaccine uptake included previous sexual experience (86.7%), age at first sexual intercourse (90.2%), number of sexual partners (85.8%), condom use (87.6%), and contraceptive use (92.7%). **Conclusion:** Despite high levels of knowledge and positive attitudes, HPV vaccine uptake among female pharmacy students remained low. Addressing barriers such as cost and misconceptions through targeted awareness campaigns could improve vaccine uptake. Therefore, the government and relevant stakeholders should intensify HPV vaccination awareness initiatives to enhance acceptance and coverage among students.

## Keywords

Cervical Cancer, Vaccine Uptake, Vaccine Hesitancy, Human Papilloma Virus, HPV Vaccine, Zambia

## 1. Introduction

Globally, Human papillomavirus (HPV) infections remain a significant public health concern, particularly among early adulthood females [1]. HPV is among the most common cause of sexually transmitted infections (STIs) in men and women and is divided into high-risk and low-risk [2]. The high-risk HPV types could alter cells in ways that might eventually lead to cervical cancer and other diseases [2]. The HPV types that are considered to be high-risk include the following, among others; 16, 18, 31, 33, 34, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68, and 70 [3]. Cervical cancer has been reported to be among the major causes of morbidity and mortality in women [4].

Some warts caused by HPV in the larynx and respiratory system may indicate that a patient has respiratory papillomatosis, which could hinder breathing [5]. The papillomavirus obstructs the vocal folds' natural vibrations presenting the most prevalent symptom of hoarseness. Tumors might eventually obstruct the airway, making breathing difficult [6]. Cervical cancer is the third most common type of cancer among female students in Brazil and the fourth most common disease in the world to afflict women with 90% of cases attributed to HPV [7] resulting in a high rate of morbidity and death. According to UK Cancer Research, there were approximately 3200 new cases of cervical cancer each year between 2016 and 2018, with the highest incidence occurring in women aged 30 to 34 years [8]. HPV infection was the primary cause of cervical cancer, linked to 99.7% of all cases,

alongside other contributing risk factors [8].

It is estimated that 625,600 women worldwide develop HPV-related cancer each year [9]. In 2020, cervical cancer was the fourth most common cancer and cause of cancer-related deaths among women, with 604,127 new cases and 341,831 deaths reported globally. Notably, 93% of HPV-related malignancies in women were cervical cancers [10]. Studies have also identified HPV, a DNA virus, as the leading cause of sexually transmitted infections (STIs) worldwide [11]. The prevalence of sexually transmitted diseases (STDs) among women ranged from 3.5% to 45% [12].

According to a study conducted in Mexico, 74.42% of female students reported having a vaginal HPV infection, with HPV 18 (13.95%), 31 (10.85%), and HPV 16 (9.3%) being the most common high-risk HPV types [13]. A study conducted in South Africa found that HPV infection is the most common sexually transmitted disease (STD) worldwide. While 80% - 90% of sexually active young women contract HPV, only 3% - 4% develop cervical cancer. However, HPV remains the primary cause of cervical cancer [14]. High-risk HPV strains 16 and 18 are responsible for approximately 70% of cervical cancer cases [15].

Currently, there are three HPV vaccines on the market, which include the quadrivalent vaccine (Gardasil™, Merck), the nonavalent vaccine and the Cervarix vaccine [16]. The goal of these vaccines is to protect against HPV types 16 and 18, which are the most carcinogenic and have been known to cause the majority of cervical malignancies [16]. Consequently, low uptake and hesitancy of HPV vaccines remain a global problem [17]-[20].

A study conducted in Hong Kong, China, identified several factors contributing to the low uptake and non-compliance with HPV vaccination, particularly for cervical cancer prevention [21]. These included the lack of culturally responsive health education initiatives, inadequate training in sexuality-related communication, and insufficient support for school-based immunization programs [21]. Additional factors that contribute to low uptake of HPV vaccines include mistrust of the government, scepticism toward the vaccine, and limited knowledge about the HPV vaccine, HPV infections, and the importance of immunization [22]. Ongoing efforts aim to increase HPV vaccination rates and monitor the impact of immunization on public health [23].

A study conducted in Turkey found that 50.6% of students had never heard of HPV vaccination or screening tests, while 43.6% were unaware of HPV itself. Only 2.7% of students had received the HPV vaccine, while 15.7% expressed willingness to be vaccinated [24]. These findings indicate that the uptake of HPV vaccines is generally low.

In Africa, the highest prevalence of cervical HPV among women was in sub-Saharan Africa (24%), surpassing the rate of HPV infections worldwide [25]. In Tanzania, about 3.3% of women in the general population were estimated to harbour cervical HPV-16/18 infection at a given time, and 68.0% of invasive cervical cancers were attributed to HPVs 16 or 18 [26]. It was undeniable that HPV-associated diseases, specifically cervical cancer, posed significant causes of morbidity

and mortality in sub-Saharan Africa [25]. Over 20% of the annual deaths from cervical cancer occurred in countries in sub-Saharan Africa, such as Zambia, where it was the most common cause of cancer death among women [27].

In 2019, Zambia launched a free national HPV vaccination program for girls aged 14 to reduce the high morbidity and mortality associated with cervical cancer [28]. The vaccines are administered through schools, health facilities, and community outreach posts [28]. Additionally, research revealed that schools possessed the highest coverage (96.0%) among the eight districts sampled for 2020 [29]. The coverage percentage for community outreach sites was 6.0%, whereas the coverage percentage for health facilities was only 1.0% [29]. Notably, there are gaps in knowledge of HPV vaccines coupled with a lot of myths and misconceptions about the vaccines [30]. However, there is still little information regarding the uptake of HPV vaccines among university students in Zambia. Hence, this study aimed to evaluate the knowledge, attitudes, and uptake of the HPV vaccine and associated factors among Pharmacy students at the University of Zambia.

## **2. Materials and Methods**

### **2.1. Study Design and Setting**

A descriptive cross-sectional study design was employed using a quantitative approach to evaluate the uptake of the HPV vaccine and associated factors among pharmacy students at the University of Zambia, Ridgeway campus (UNZA-RWC). The study was conducted from August 2024 to September 2024. UNZA-RWC is a medical campus offering programs in Medicine, Pharmacy, Biomedical Sciences, Nursing, Public Health, Physiotherapy, and Radiography.

### **2.2. Study Population**

The study population consisted of second-year to fifth-year female undergraduate pharmacy students studying at UNZA-RWC. At the time, there were 311 registered female pharmacy students comprising 79 second-year students, 65 third-year students, 82 fourth-year students, and 85 fifth-year students.

### **2.3. Sample Size Determination**

The sample size was determined using Taro Yamane's formula. A total of 311 female pharmacy students were registered with the University of Zambia. Using a margin of error of 5%, we estimated the minimum sample size to be 175 female pharmacy students to be included in the study. To address the design effect, we adjusted the sample size by multiplying the minimum sample size by 1.5 resulting in a sample size of 263.

### **2.4. Sample Selection**

A total of 175 participants were randomly selected from the target population to participate in the study to obtain a representative sample. Since the sample was selected randomly, every potential participant meeting the inclusion criteria had

an equal chance of being chosen to participate in the study.

### **2.5. Inclusion and Exclusion Criteria**

This study included undergraduate female pharmacy students at the Ridgeway campus who were available and provided informed and written consent to participate in the study. Additionally, only registered pharmacy female students were included in this study. However, the study excluded undergraduate female pharmacy students who were not available during the data collection period.

### **2.6. Data Collection**

A data collection tool was adopted from a recent study on the knowledge, attitude and uptake of human papillomavirus vaccination among female undergraduates in Lagos State, Nigeria [31]. It contained closed-ended questions used to collect data. Informed consent was obtained from every respondent. The questionnaire was divided into four sections to investigate the rate of uptake of the HPV vaccine among pharmacy students and associated factors. The first part of the questionnaire described the social-demographic characteristics of participants; the second part addressed HPV vaccine uptake among pharmacy students; the third part explored the factors associated with vaccine uptake and the fourth part addressed reasons for vaccine hesitancy.

### **2.7. Data Analysis**

Data from questionnaires were initially entered into a Microsoft Excel Spreadsheet version 21 to create a database, from which the data were then double-checked for completeness and consistency. Data were then exported to Statistical Package for Social Sciences (SPSS) version 23 for statistical analysis. To test the association between dependent and independent variables, descriptive statistics (percentages, or frequency) were calculated, and descriptive cross-tabulation was used to see the relationship between dependent and independent variables. Data were presented in the form of tables. The results were summarized into the socio-demographic characteristics, knowledge, and attitude scores of study participants. Due to a small sample size, Fischer's exact test was used to identify the factors that influence HPV vaccine uptake. Statistical significance was set at  $p < 0.05$ . The knowledge and attitude scoring criteria were adopted from a study done in Bangladesh [32]. The score was set to evaluate good or poor knowledge and positive or negative attitude respectively. Good knowledge and positive attitude were classified as having at least 60% while scoring below 60% was regarded as poor knowledge and negative attitude towards vaccine uptake.

### **2.8. Ethical Approval**

Ethical approval was obtained from the University of Zambia, School of Health Sciences Research Ethics Committee (UNZAHSREC). The study protocol was approved under protocol ID: 20231270134 from UNZAHSREC and the National

Health Authority (NHRA) under the reference number NHRA5932/13/08/2024. Permission to collect data was sought from the School of Health Sciences through the Department of Pharmacy. This study was a questionnaire-based study in which direct or physical interaction was conducted with the participants. All participants were provided with information sheets, and informed consent was obtained from all participants before commencing the research. The participants were informed of the purpose of the study. All information collected during all stages of the research was handled with strict confidentiality and used only for this research.

### 3. Results

#### Socio-Demographics Characteristics and Sexual History of the Participants

The socio-demographic data from this study indicate that the majority of participants were young women between the ages of 20 and 25, predominantly Christian, and at various stages of their pharmacy education. The distribution of students across different academic years was relatively even, with second-year students making up the largest proportion (30%). Regarding sexual history, 45.7% of participants reported having prior sexual experience, with most initiating sexual activity between the ages of 17 and 24. A significant proportion (63.2%) reported having fewer than three sexual partners, suggesting relatively conservative sexual behaviours. However, a notable percentage (32.4%) did not disclose their number of sexual partners, indicating potential sensitivity surrounding this topic. Condom use was reported by 59.1% of sexually active participants, demonstrating a relatively high level of protective behaviour. However, contraceptive use was nearly evenly split, with 38.9% using contraceptives and 38.1% not using them. A considerable percentage (23.1%) chose not to disclose their contraceptive use, which may reflect personal reservations or privacy concerns (**Table 1**).

**Table 1.** Socio-demographic characteristics and sexual history of the participants.

Variable	Characteristic	Frequency (n)	Percentage (%)
Age (years)	17 - 19	13	5.3
	20 - 22	111	44.9
	23 - 25	111	44.9
	Above 25	12	4.9
Year of Study	Second	74	30
	Third	63	25.5
	Fourth	55	22.3
	Fifth	55	22.3
Religion	Christian	245	99.2
	Others	2	0.8

## Continued

Previous sexual experience	NA	12	4.9
	No	122	49.4
	Yes	113	45.7
Age at first sexual intercourse	<16	9	3.6
	17 - 19	72	29.1
	21 - 24	84	34
	NA	82	33.2
Number of sexual partners	<3	156	63.2
	4 - 6	8	3.2
	7 - 9	3	1.2
	NA	80	32.4
Use of condoms for sexual intercourse	NA	62	25.1
	No	39	15.8
	Yes	146	59.1
Use of contraceptives	NA	57	23.1
	No	94	38.1
	Yes	96	38.9

**Participants' knowledge of HPV infection and vaccination**

The majority of participants (25.1%) recognized that HPV causes both genital warts and cervical cancer. Regarding symptoms, 16.2% identified vaginal bleeding and pain during sexual intercourse as indicative of HPV infection. Most respondents (74.5%) acknowledged sexual intercourse as the primary mode of HPV transmission, with 47% associating multiple sexual partners as a key risk factor. When asked about prevention, 34.4% agreed that HPV vaccination, condom use, regular screening, and abstinence were effective preventive measures. Over half of the participants (56.3%) believed that the HPV vaccine could protect against cervical, vaginal, and vulvar cancers, while 64.4% correctly identified injections as the mode of vaccine administration. However, uncertainty remained regarding the recommended vaccine doses, as 63.6% were unsure of the exact number. Despite this, 55.5% understood that the vaccine should ideally be administered before the onset of sexual activity (Table 2).

**Table 2.** Participants' knowledge of HPV infection and vaccination.

Variable	Characteristic	Frequency (n)	Percentage (%)
Diseases caused by HPV	Genital warts and Cervical cancer	62	25.1
Symptoms of HPV infection	Vaginal bleeding and Pain during sexual intercourse	40	16.2
Mode of HPV transmission	Sexual intercourse	184	74.5
Risk factors of HPV infection	Multiple sexual partner	116	47.0

## Continued

Methods of Preventing HPV	HPV vaccination, Condom use, Regular HPV screening and Abstinence	85	34.4
What HPV vaccine can prevent against	Cancer of the cervix, vagina, vulva	139	56.3
Route of HPV vaccine administration	Through Injections	159	64.4
Recommended doses for HPV vaccine	I don't know	157	63.6
Recommended age of vaccination with HPV vaccine	Before the first sexual intercourse	137	55.5

### Participants' attitude towards the uptake of HPV vaccination

A majority of participants (76.9%) agreed that the HPV vaccine effectively prevents cervical cancer. More than half (52.6%) believed they were at risk of contracting HPV and expressed willingness to receive the vaccine. Additionally, 70.4% were confident that vaccination would protect them from cervical cancer. A significant proportion (83.4%) believed it was preferable to be vaccinated before becoming sexually active. However, there were mixed opinions on vaccine eligibility, with 59.5% supporting vaccination for students at a subsidized cost, while 67.6% disagreed with the notion that only sexually active individuals should receive it. Concerns about the potential long-term effects of the vaccine were noted by 51.8% of respondents, although 27.5% disagreed with this concern. Despite these uncertainties, the majority (91.9%) expressed the need for more information before getting vaccinated, and 85.8% supported integrating the HPV vaccine into the National Immunization Program (Table 3).

**Table 3.** Participants' attitude towards the uptake of HPV vaccination.

Variable	Agreed n (%)	Disagreed n (%)	Undecided n (%)	Neutral n (%)
Respondent's knowledge attitude towards the uptake of HPV vaccination questions				
HPV vaccine is effective in preventing cervical cancer	190 (76.9)	9 (3.6)	47 (19.0)	1 (0.4)
I will take the vaccine because I feel at risk	130 (52.6)	33 (13.4)	81 (32.8)	3 (1.2)
I feel the vaccine will keep me safe from cervical cancer	174 (70.4)	24 (9.7)	47 (19)	2 (0.8)
I feel it is better to be vaccinated before becoming sexually active	206 (83.4)	11 (4.5)	28 (11.3)	2 (0.8)
I will take the vaccine if available in the clinic to students at a subsidized price	147 (59.5)	44 (17.8)	53 (21.5)	3 (1.2)
I feel only sexually active ladies should get the vaccine	47 (19.4)	167 (67.6)	30 (12.1)	3 (1.2)
HPV vaccine may have long-term effects on me	49 (19.8)	68 (27.5)	128 (51.8)	2 (0.2)
More information on HPV and its vaccine will be needed before I take the vaccine	227 (91.9)	4 (1.6)	14 (5.7)	2 (0.8)
Should be included in Immunization programs	212 (85.8)	2 (0.8)	3 (1.2)	30 (12.1)

### Uptake of HPV vaccine among the participants

A significant majority of participants (92.3%) reported that they had never received the HPV vaccine, with only 6.5% having been vaccinated against cervical cancer. Despite concerns about low vaccine uptake and completion rates, a promising 70% of respondents expressed willingness to receive the vaccine, indicating a potential for increased coverage if accessibility and awareness are improved (Table 4).

**Table 4.** Uptake of HPV vaccine among the study participants.

Variable	Yes n (%)	No n (%)	Neutral n (%)
Ever received the HPV vaccine	16 (6.5)	228 (92.3)	3 (1.2)
Willingness to be vaccinated	173 (70)	65 (26.3)	9 (3.6)

#### Reasons for non-uptake of HPV vaccine

The results indicate that nearly half of the participants (49.8%) were not sexually active, which may have influenced their decision not to receive the HPV vaccine. Cost was also a concern, with 19.8% perceiving the vaccine as too expensive, although 62.8% found this reason inapplicable. Additionally, 14.6% believed they were too old for the vaccine, while 69.2% did not consider age a limiting factor. A very small proportion (0.8%) reported being already infected with HPV and saw no reason for vaccination, whereas 21.9% were not infected, and the majority (77.3%) did not comment on this aspect (Table 5).

**Table 5.** Reasons for non-uptake of HPV vaccine.

Reasons for non-uptake of the HPV vaccine	Yes n (%)	No n (%)	NA n (%)
Not sexually active	123 (49.8)	42 (17.0)	82 (33.2)
Too expensive	49 (19.8)	43 (17.4)	155 (62.8)
Too old for the vaccine	36 (14.6)	40 (16.2)	171 (69.2)
Already infected with HPV	2 (0.8)	54 (21.9)	191 (77.3)

#### Overall Knowledge and Attitudes toward HPV vaccines among Study Participants

The majority of participants (70%) demonstrated good knowledge of the HPV vaccine, while 80.5% exhibited a positive attitude toward its uptake. Statistical analysis revealed a significant association between knowledge levels and age groups ( $p = 0.014$ ) as well as attitudes toward vaccine uptake and age ( $p = 0.034$ ). These findings suggest that both knowledge and attitudes toward the HPV vaccine improve with age (Table 6).

**Table 6.** Overall knowledge and attitude towards HPV vaccines among participants.

Variable	Level of measurement	n (%)	17-19	20-22	23-25	>25	P-value
<b>Knowledge</b>	Good	173 (70)	6	71	85	11	0.014
	Poor	74 (30)	7	40	26	1	

## Continued

<b>Attitude towards HPV vaccine uptake</b>	Positive	199 (80.6)	9	82	97	11	0.034
	Negative	48 (19.4)	4	29	14	1	

A relationship was found between attitudes toward the HPV vaccine and factors including age, year of study, previous sexual experience, condom use, and contraceptive use (**Table 7**).

**Table 7.** Relationship between participant's knowledge of HPV vaccines and socio-demographic characteristics.

Variable	Characteristics	Attribute	Good n (%)	Poor n (%)	P-value
Knowledge	Age (years)	17 - 19	7 (53.8)	6 (46.1)	0.014
		20 - 22	71 (63.9)	40 (36.0)	
		23 - 25	85 (76.5)	26 (23.4)	
		>25	11 (91.6)	1 (8.3)	
	Year of Study	Fifth	42 (76.3)	13 (23.6)	0.1777
		Fourth	42 (76.3)	13 (23.6)	
		Third	44 (69.8)	19 (30.1)	
		Second	45 (60.8)	29 (39.1)	
	Religion	Christian	172 (70.0)	73 (29.7)	0.510
		Others	1 (50)	1 (50)	
	Previous sexual experience	Yes	83 (73.4)	30 (26.5)	0.532
		No	82 (67.2)	40 (32.7)	
		NA	8 (66.6)	4 (33.3)	
	Age at first sexual intercourse	<16	5 (55.5)	4 (44.4)	0.073
17 - 21		52 (72.2)	20 (27.7)		
21 - 24		65 (77.3)	19 (22.6)		
NA		52 (63.4)	30 (36)		
Number of sexual partners	<3	114 (73.0)	42 (26.9)	0.242	
	4 - 6	7 (87.5)	1 (12.5)		
	7 - 9	2 (66.6)	1 (33.3)		
	NA	50 (62.5)	30 (60)		
Use of condoms	Yes	102 (69.8)	44 (30.1)	0.788	
	No	29 (74.3)	10 (34.4)		
	NA	42 (67.7)	20 (32.2)		
Use of other contraceptives	Yes	68 (70.8)	28 (29.1)	0.984	
	No	65 (69.1)	29 (30.8)		
	NA	40 (70.1)	17 (29.8)		

### Relationship between participants' attitudes towards HPV vaccine and socio-demographic characteristics.

A relationship was observed between attitudes toward the HPV vaccine and factors such as age, year of study, previous sexual experience, condom use, and contraceptive use (Table 8).

**Table 8.** Relationship between participants' attitudes towards HPV vaccines and socio-demographic characteristics.

Variable	Characteristics	Attribute	Positive n (%)	Negative n (%)	P-value
Attitude towards HPV vaccine uptake	Age	17 - 19	9 (69.2)	4 (30.7)	0.031
		20 - 25	97 (87.3)	14 (12.6)	
	Year of Study	Fifth	50 (90.9)	5 (9.09)	0.016
		Fourth	45 (81.8)	10 (18.1)	
		Third	53 (84.1)	10 (15.8)	
		Second	51 (68.9)	23 (31.0)	
	Previous sexual experience	Yes	98 (86.7)	15 (13.2)	0.008
		No	95 (77.8)	27 (22.1)	
		17 - 21	65 (90.2)	7 (9.7)	
		21 - 24	70 (83.3)	14 (20)	
	Number of sexual partners	Neutral	58 (70.7)	24 (29.2)	0.015
		<3	134 (85.8)	22 (14.1)	
		4 - 6	7 (87.5)	1 (12.5)	
	Use of condoms during sexual intercourse	NA	55 (68.7)	25 (31.2)	0.002
		Yes	128 (87.6)	18 (12.3)	
Use of other contraceptives	No	29 (74.3)	10 (25.6)	0.001	
	Yes	89 (92.7)	7 (7.2)		
	No	71 (75.5)	23 (24)		
		Neutral	39 (68.4)	18 (31.5)	

## 4. Discussion

To the best of the researchers' knowledge and comprehension, this was the first study to evaluate the knowledge, attitudes, and uptake of the HPV vaccine among pharmacy students at the University of Zambia.

In the current study, 247 females were recruited, and it was found that most (44.9 %) of the participants were in the age range of 20 - 25 years. The majority of the participants (30%) were in the second year of study. Close to half (49.4%) have had previous sexual experience and (45.7%) had their first sexual experience between the ages of 21 - 24 years. The majority (63.2%) of those who were sexually active had less than three sexual partners, 59.0% of them used condoms during sexual intercourse, while 38.9% used other forms of contraceptives.

Another study conducted in Greece found that the majority of participants were

between the ages of 18 and 26 (60.4%,  $n = 1915$ ), were pursuing health-related programs, and faced difficulties accessing healthcare services (59%,  $n = 1862$ ) [33]. A study conducted in Colombia found that 76% of participants had their first sexual intercourse after the age of 14, and 37% had only one sexual partner [24]. Similarly, a study in South Africa reported that at the time of the study, 63% ( $n = 277$ ) of students were sexually experienced [15]. Among them, 77.3% ( $n = 214$ ) had been sexually active in the past 12 months, with 79.4% having only one sexual partner. Regarding condom use, 4.7% never used condoms, 42.5% used them consistently, and 52.8% used them inconsistently [15].

In our study, most participants had good knowledge of HPV and the vaccine. In the present study, 16.2% of participants were aware of the symptoms of HPV infection, while 47.0% recognized its risk factors. Additionally, 25.1% were aware of diseases caused by HPV, and 74.5% understood its mode of transmission. The good knowledge of HPV and the vaccine found in our study is similar to findings from other studies conducted elsewhere [31] [34]. Conversely, the good knowledge reported in our study is better than that reported in Ethiopia where only 59.2% of the participants had good knowledge regarding HPV and the vaccine [14].

In another study, only 38% of participants recognized an association between HPV and cervical cancer, even though 49% of participants knew that HPV is a widespread infection [35]. A study done in Italy reported that 29.2% and 31.7% of the participants were vaccinated or did not recall receiving an HPV vaccine, and 39.1% had already received at least one dose [36].

A study conducted in Kenya found that while 95% of participants were aware that HPV infection and cervical cancer are preventable, they had limited knowledge about these conditions. However, 61% correctly identified Pap smears as a method for cervical cancer screening. Additionally, 84% recognized cervical cancer as a serious and life-threatening disease, yet they lacked awareness of HPV symptoms, warning signs, and modes of transmission [37]. In another study from Uganda, nearly half (49.2%) of participants had minimal understanding of HPV vaccination, while 70.6% were aware of it. Furthermore, 66.6% believed that vaccination reduces the risk of cervical cancer, and 68.7% knew the target age group for the HPV vaccine. However, 52.9% were unaware of the appropriate interval between vaccine doses, while 54.8% knew the recommended number of doses. Notably, 17.0% incorrectly believed that vaccination is only recommended for sexually active individuals [38]. In Zambia, among 319 women surveyed, 96.8% had heard of cancer, with 74.7% specifically aware of cervical cancer. Additionally, 73.3% believed cervical cancer was preventable, while 42.2% identified sexual activity or having multiple partners as risk factors [27]. Encouragingly, the majority (57.8%) of the participants suggested that limiting the number of sexual partners was a preventive measure against cervical cancer [27].

Overall, the present study found that the majority (80.6%) of participants had a positive attitude toward HPV vaccination. Additionally, 85.5% felt that “HPV vaccination should be included in the National Program on Immunization pro-

grams to target universities as well, while 19.8% believed that “the HPV vaccine may have long-term negative effects on them.” Only 6.5% of participants had received the HPV vaccine, with 5.7% completing the full dose series. However, 70% expressed willingness to be vaccinated. Our findings are similar to those reported in Nigeria in which most female students had positive attitudes towards HPV and the vaccine but very low uptake at 2.6% [31]. In the present study, the three most commonly cited barriers to HPV vaccine uptake were not being sexually active (49.8%), believing they were too old for the vaccine (14.6%), and the cost of the vaccine (19.8%). The findings of the present study corroborate results reported in a similar study conducted in Bangladesh that found that 75.88% of participants had a positive attitude toward HPV vaccination [32].

In the present study, only 28.3% of participants were aware of the availability of the HPV vaccine. However, 89.5% of female students stated that they would recommend the vaccine to their peers [39]. A study conducted in Ethiopia found that 75.4% (312 out of 414) of participants agreed that the HPV vaccine helps prevent HPV infection. Additionally, 72.7% (301 participants) recognized cervical cancer as a fatal disease, while 72.9% (302 participants) believed that HPV immunization could reduce the risk of cervical cancer [40]. A study conducted in Uganda on attitudes and HPV vaccine uptake found that 70% of participants recognized HPV infections as the primary cause of cervical cancer. Additionally, 93.7% agreed that cervical cancer is a fatal disease. A significant majority (88.7%) believed that vaccinating early adolescents against HPV is essential, while 72.17% acknowledged the vaccine’s effectiveness in preventing cervical cancer. Furthermore, 55.22% of participants felt that the HPV vaccine had no adverse effects [41]. According to a study done in Zambia on attitude and uptake of the HPV vaccine, the discovery that adolescent girls in Zambia had a positive attitude toward the HPV vaccine is encouraging since it might be utilized to emphasize the vaccine’s positive messaging and increase future uptake. In Zambia, the percentage of eligible females who received the first and second doses of the HPV vaccine in 2021 was just 39% and 31%, respectively [30].

The differences between our study findings and those reported by other authors may be attributed to variations in study designs, sample sizes, and the timing of data collection, as new information and public health messaging evolve. Additionally, some countries have more robust vaccination mandates and policies, leading to higher uptake rates, while others experience lower adoption due to weaker regulations. Access to healthcare services, information, and infrastructure also plays a crucial role in shaping knowledge, attitudes, and HPV vaccine uptake. This study found that a high level of general knowledge about HPV was positively associated with a favourable attitude toward vaccination and a higher likelihood of intention to vaccinate among unvaccinated participants at higher risk. Addressing these gaps by enhancing knowledge and improving vaccine uptake remains essential.

This current study showed that age influenced the students’ knowledge of the HPV vaccines. This could be because the age range of 20 - 25 years usually points

to participants who were in their 4<sup>th</sup> and 5<sup>th</sup> year of study. The knowledge gained through the courses included in the program, along with factors such as age, year of study, prior sexual experience, age at first sexual activity, number of sexual partners, and the use of condoms and other contraceptives, were identified as influencing attitudes toward HPV vaccine uptake. The fifth-year participants had learnt about the importance of vaccines hence their positive attitude. With regards to the number of sexual partners participants might perceive themselves at higher risk for contracting HPV, which could make them more likely to view the vaccine as important. Participants with sexual experience might be better informed about sexually transmitted infections, including HPV, hence a favourable attitude towards HPV vaccination as a preventive measure.

According to a study conducted in Ethiopia, knowing about the HPV vaccine was substantially correlated with hearing about HPV infection, having a positive attitude toward the vaccine, and having a history of sexual intercourse [42]. Compared to their others, students with a history of sexual encounters were nearly three times more likely to be knowledgeable about the HPV vaccine. Individuals who were informed about their HPV infection had a 1.6-fold higher probability of knowing more about the HPV vaccine than those who had negative attitudes about it [42]. Individuals who had a favourable attitude towards the HPV vaccine had a 1.46-fold higher probability of expanding their knowledge about the vaccine compared to those who had a negative attitude towards it [42]. In another study in Ethiopia, being informed had an 8.51-fold higher probability of adopting HPV vaccination than ignorance. Compared to students who resided in urban regions, those who lived in rural areas had a 75% lower likelihood of practising HPV vaccination [43]. In another study done in China, findings indicated that having a high HPV vaccination knowledge score was a significant factor in the intention to receive the vaccine. These findings highlight the need for culturally appropriate sexual health education and interventions, focusing on safe practices, contraceptive use, and addressing barriers to open discussions about sexual behaviours [44].

Overall, the present findings highlight a diversity of sexual behaviours among the participants, with a significant number engaging in protective measures such as condoms and contraceptive use. However, the high rates of non-disclosure on certain sensitive topics suggest the need for further exploration into factors influencing students' willingness to share personal health information. These insights are critical for designing targeted health education programs that address gaps in sexual health awareness and promote informed decision-making among university students. Key areas for intervention include delivering targeted messages on HPV vaccine safety, enhancing students' knowledge, and utilizing trusted influencers such as healthcare providers, faith leaders, and peer caregivers to promote vaccination [45]. Additionally, countries should prioritize expanding vaccine availability and enhancing knowledge, particularly on its role in cancer prevention. Increased awareness helps counter misinformation and boosts acceptance. Key factors supporting vaccine uptake include reducing hesitancy, integrating

HPV vaccination into routine primary school immunization programs, and ensuring vaccination for both genders [46]. Additionally, adopting a one-dose HPV vaccine strategy could enhance acceptance, increase coverage, and alleviate financial, infrastructure, and workforce constraints [46]. It is also critical to address cost barriers to improve vaccine uptake [47] [48]. Universities need to implement effective school-based HPV vaccination programmes to address hesitancy [48] [49]. There is a need to instigate key strategies to promote HPV vaccine uptake including distributing educational materials and conducting educational meetings, developing educational resources, utilizing mass media, engaging patients, families, and caregivers, fostering network collaboration, and scaling up implementation [50]. Additionally, securing new funding, enhancing adaptability, and tailoring strategies to specific needs remain crucial [50].

We are aware that our study had limitations. This study addresses a sensitive topic, as HPV vaccines are linked to sexual activity, which may have made participants uncomfortable, potentially limiting the depth and honesty of their responses and influencing the overall findings. Another limitation is the reliance on a self-administered questionnaire, which introduces the possibility of inaccurate or incomplete responses. Additionally, the study's quantitative approach with randomly selected participants means that findings may vary in different contexts, particularly if a larger sample of female students were included. Furthermore, since participant enrollment was restricted to a single location, further research is necessary to assess the transferability of these results to other settings.

## 5. Conclusion

This study found a low uptake of the HPV vaccine despite participants demonstrating good knowledge of HPV and its vaccine. However, attitudes toward vaccination were generally positive. Factors influencing vaccine uptake included age, while attitudes were associated with year of study, previous sexual experience, age at first sexual intercourse, number of sexual partners, condom use, and use of other contraceptives. Vaccine hesitancy was primarily driven by inadequate information, fear of side effects, cost, and other concerns. To address these barriers, targeted health education programs aimed at increasing awareness and knowledge of the HPV vaccine among female undergraduates at the University of Zambia, Ridgeway Campus, are highly recommended. Additionally, integrating the HPV vaccine into the National Program on Immunization (NPI) would enhance accessibility. Further research is needed to explore knowledge, attitudes, and uptake of the HPV vaccine among female students across universities nationwide, regionally, and globally. Scaling up vaccine uptake through extensive sensitization campaigns and public awareness efforts can help mitigate hesitancy and improve vaccination rates.

## Recommendations

- **Incorporate HPV vaccination into school health programs** to facilitate easy

access for adolescents, eliminating the need for clinic visits.

- **Integrate HPV and sexual health education into school curricula** to enhance knowledge and reduce the stigma associated with the vaccine.
- **Combat misinformation, particularly on social media**, by collaborating with platforms to monitor and flag false information regarding the HPV vaccine.
- **Implement mandatory HPV vaccination policies** as part of the standard immunization schedule, with appropriate opt-out provisions for religious and medical reasons.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] Smith, J.S., Melendy, A., Rana, R.K. and Pimenta, J.M. (2008) Age-Specific Prevalence of Infection with Human Papillomavirus in Females: A Global Review. *Journal of Adolescent Health*, **43**, S5.e1-S5.e62. <https://doi.org/10.1016/j.jadohealth.2008.07.009>
- [2] Burd, E.M. (2003) Human Papillomavirus and Cervical Cancer. *Clinical Microbiology Reviews*, **16**, 1-17. <https://doi.org/10.1128/cmr.16.1.1-17.2003>
- [3] Petca, A., Borislavski, A., Zvanca, M., Petca, R., Sandru, F. and Dumitrascu, M. (2020) Non-Sexual HPV Transmission and Role of Vaccination for a Better Future (Review). *Experimental and Therapeutic Medicine*, **20**, Article No. 186. <https://doi.org/10.3892/etm.2020.9316>
- [4] Covaliu, B.F., Forray, A.I., Tomic, M., Vlad, C., Cadariu, P.A., Ungurean, C., *et al.* (2025) Understanding Cervical Cancer Screening Attendance: Barriers and Facilitators in a Representative Population Survey. *Cancers*, **17**, Article 706. <https://doi.org/10.3390/cancers17040706>
- [5] Patel, C., Brotherton, J.M., Pillsbury, A., Jayasinghe, S., Donovan, B., Macartney, K., *et al.* (2018) The Impact of 10 Years of Human Papillomavirus (HPV) Vaccination in Australia: What Additional Disease Burden Will a Nonavalent Vaccine Prevent? *Eurosurveillance*, **23**, 30-40. <https://doi.org/10.2807/1560-7917.es.2018.23.41.1700737>
- [6] Donne, A. (2015) Recurrent Respiratory Papillomatosis. In: Costello, D. and Sandhu, G., Eds., *Practical Laryngology*, CRC Press, 141-147. <https://doi.org/10.1201/b19781-13>
- [7] da Silva, R.L., da Silva Batista, Z., Bastos, G.R., Cunha, A.P.A., Figueiredo, F.V., de Castro, L.O., *et al.* (2020) Role of HPV 16 Variants among Cervical Carcinoma Samples from Northeastern Brazil. *BMC Women's Health*, **20**, Article No. 162. <https://doi.org/10.1186/s12905-020-01035-0>
- [8] Chan, D.N.S., Li, C., Law, B.M.H., Choi, K.C., Lee, P.P.K. and So, W.K.W. (2023) Factors Affecting HPV Vaccine Uptake among Ethnic Minority Adolescent Girls: A Systematic Review and Meta-Analysis. *Asia-Pacific Journal of Oncology Nursing*, **10**, Article ID: 100279. <https://doi.org/10.1016/j.apjon.2023.100279>
- [9] Hakura, A. (1987) Human Papillomavirus and Cancer. *Skin Research*, **29**, 939-950.
- [10] Patzi-Churqui, M., Terrazas-Aranda, K., Liljeqvist, J., Lindh, M. and Eriksson, K. (2020) Prevalence of Viral Sexually Transmitted Infections and HPV High-Risk Genotypes in Women in Rural Communities in the Department of La Paz, Bolivia. *BMC*

*Infectious Diseases*, **20**, Article No. 204.

<https://doi.org/10.1186/s12879-020-4931-1>

- [11] Burd, E.M. (2003) Human Papillomavirus and Cervical Cancer. *Clinical Microbiology Reviews*, **16**, 1-17. <https://doi.org/10.1128/cmr.16.1.1-17.2003>
- [12] Soheili, M., Keyvani, H., Soheili, M. and Nasser, S. (2021) Human Papilloma Virus: A Review Study of Epidemiology, Carcinogenesis, Diagnostic Methods, and Treatment of All HPV-Related Cancers. *Medical Journal of The Islamic Republic of Iran*, **35**, 499-514. <https://doi.org/10.47176/mjiri.35.65>
- [13] Pedroza-Gonzalez, A., Reyes-Real, J., Campos-Solorzano, M., Blancas-Diaz, E.M., Tomas-Morales, J.A., Hernandez-Aparicio, A.A., et al. (2022) Human Papillomavirus Infection and Seroprevalence among Female University Students in Mexico. *Human Vaccines & Immunotherapeutics*, **18**, Article ID: 2028514. <https://doi.org/10.1080/21645515.2022.2028514>
- [14] Mihretie, G.N., Liyeh, T.M., Ayele, A.D., Belay, H.G., Yimer, T.S., Miskr, A.D., et al. (2023) Female Adolescents' Knowledge and Acceptability of Human Papillomavirus Vaccine in Debre Tabor Town, Ethiopia: A Cross-Sectional Study. *BMJ Open*, **13**, e061813. <https://doi.org/10.1136/bmjopen-2022-061813>
- [15] Hoque, M.E., Ghuman, S. and Van Hal, G. (2013) Human Papillomavirus Vaccination Acceptability among Female University Students in South Africa. *Asian Pacific Journal of Cancer Prevention*, **14**, 4865-4869. <https://doi.org/10.7314/apjcp.2013.14.8.4865>
- [16] Basu, P., Banerjee, D., Singh, P., Bhattacharya, C. and Biswas, J. (2013) Efficacy and Safety of Human Papillomavirus Vaccine for Primary Prevention of Cervical Cancer: A Review of Evidence from Phase III Trials and National Programs. *South Asian Journal of Cancer*, **2**, 187-192. <https://doi.org/10.4103/2278-330x.119877>
- [17] Chido-Amajuoyi, O.G., Pande, M., Agbajogu, C., Yu, R.K., Cunningham, S. and Shete, S. (2022) HPV Vaccination Uptake, Hesitancy, and Refusal: Observations of Health-Care Professionals during the COVID-19 Pandemic. *JNCI Cancer Spectrum*, **6**, pkac053. <https://doi.org/10.1093/jncics/pkac053>
- [18] Sendekie, A.K., Abate, B.B., Adamu, B.A., Tefera, A.M., Mekonnen, K.T., Ashagrie, M.A., et al. (2025) Human Papillomavirus Vaccination Hesitancy among Young Girls in Ethiopia: Factors and Barriers to Uptake. *Frontiers in Public Health*, **13**, Article 1507832. <https://doi.org/10.3389/fpubh.2025.1507832>
- [19] Dera, M., Wondimagegnehu, A. and Asfaw, Z.G. (2023) Determinants for Hesitancy in Human Papillomavirus (HPV) Vaccine Uptake among School Girls in Jimma Town, Ethiopia. A Mixed Approach: Quantitative and Qualitative. *Reproductive Health*, **20**, Article No. 175. <https://doi.org/10.1186/s12978-023-01711-y>
- [20] Dang, J.H.T., Gori, A., Rios, L., Rolon, A.M., Zhang, J. and Chen, M.S. (2024) "You Don't Know If It's the Truth or a Lie": Exploring Human Papillomavirus (HPV) Vaccine Hesitancy among Communities with Low HPV Vaccine Uptake in Northern California. *Vaccines*, **12**, Article 372. <https://doi.org/10.3390/vaccines12040372>
- [21] Chu, J.K., Sing, C., Li, Y., Wong, P.H., So, E.Y. and Wong, I.C. (2024) Factors Affecting Human Papillomavirus Vaccine Acceptance among Parents of Primary 4 to 6 Boys and Girls in Hong Kong. *Hong Kong Medical Journal*, **30**, 386-399. <https://doi.org/10.12809/hkmj2311144>
- [22] Rockcliffe, L., McBride, E., Heffernan, C. and Forster, A.S. (2018) Factors Affecting Delivery of the HPV Vaccination: A Focus Group Study with NHS School-Aged Vaccination Teams in London. *The Journal of School Nursing*, **36**, 135-143. <https://doi.org/10.1177/1059840518792078>

- [23] Meites, E., Wilkin, T.J. and Markowitz, L.E. (2022) *Human Vaccines & Immunotherapeutics*, **18**, Article ID: 2016007. <https://doi.org/10.1080/21645515.2021.2016007>
- [24] Sarmiento-Medina, M.I., de Amaya, M.P., Villamizar-Gómez, L., González-Coba, A.C. and Guzmán-Barajas, L. (2024) High-Risk HPV Prevalence and Vaccination Coverage among Indigenous Women in the Colombian Amazon: Implications for Cervical Cancer Prevention. Cross-Sectional Study. *PLOS ONE*, **19**, e0297579. <https://doi.org/10.1371/journal.pone.0297579>
- [25] Lekoane, K.M.B., Kuupiel, D., Mashamba-Thompson, T.P. and Ginindza, T.G. (2019) Evidence on the Prevalence, Incidence, Mortality and Trends of Human Papilloma Virus-Associated Cancers in Sub-Saharan Africa: Systematic Scoping Review. *BMC Cancer*, **19**, Article No. 563. <https://doi.org/10.1186/s12885-019-5781-3>
- [26] ICO/IARC HPV Information Centre (2023) II. Complementary Data on Cervical Cancer Prevention Figure 2. Estimated Coverage of Cervical Cancer Screening in United Kingdom. HpvcentreNet, 1-15.
- [27] Liu, F.W., Vwalika, B., Hacker, M.R., Allen, S. and Awtrey, C.S. (2012) Cervical Cancer and HPV Vaccination: Knowledge and Attitudes of Adult Women in Lusaka, Zambia. *Journal of Vaccines & Vaccination*, **3**, 6816.
- [28] Lubeya, M.K., Zekire Nyirenda, J.C., Chanda Kabwe, J. and Mukosha, M. (2022) Knowledge, Attitudes and Practices towards Human Papillomavirus Vaccination among Medical Doctors at a Tertiary Hospital: A Cross Sectional Study. *Cancer Control*, **29**, 1-10. <https://doi.org/10.1177/10732748221132646>
- [29] Simuyemba, M.C., Chama-Chiliba, C.M., Chopolola, A., Sinyangwe, A., Bchir, A., Asimwe, G., et al. (2024) An Evaluation of the Cost of Human Papilloma Virus (HPV) Vaccine Delivery in Zambia. *BMC Infectious Diseases*, **24**, Article No. 369. <https://doi.org/10.1186/s12879-024-09222-2>
- [30] Lubeya, M.K., Chibwasha, C.J., Mwanahamuntu, M., Mukosha, M., Frank, S. and Kawonga, M. (2023) “When You Get the HPV Vaccine, It Will Prevent Cervical Cancer; It Will Act as a Shield”: Adolescent Girls’ Knowledge and Perceptions Regarding the Human Papillomavirus Vaccine in Zambia. *Frontiers in Health Services*, **3**, Article 1208458. <https://doi.org/10.3389/frhs.2023.1208458>
- [31] Oluwole, E., Idowu, O., Adejimi, A., Balogun, M. and Osanyin, G. (2019) Knowledge, Attitude and Uptake of Human Papillomavirus Vaccination among Female Undergraduates in Lagos State, Nigeria. *Journal of Family Medicine and Primary Care*, **8**, 3627-3633. [https://doi.org/10.4103/jfmipc.jfmipc\\_520\\_19](https://doi.org/10.4103/jfmipc.jfmipc_520_19)
- [32] Chowdhury, S., Ara, R., Roy, S., Tanvir, S.M.S., Eva, F.N., Neela, T.M., et al. (2022) Knowledge, Attitude, and Practices Regarding Human Papillomavirus and Its’ Vaccination among the Young Medical Professionals and Students of Bangladesh. *Clinical and Experimental Vaccine Research*, **11**, 63-71. <https://doi.org/10.7774/cevr.2022.11.1.63>
- [33] Donadiki, E.M., Jiménez-García, R., Hernández-Barrera, V., Carrasco-Garrido, P., López de Andrés, A., Jimenez-Trujillo, I., et al. (2013) Knowledge of the HPV Vaccine and Its Association with Vaccine Uptake among Female Higher-Education Students in Greece. *Human Vaccines & Immunotherapeutics*, **9**, 300-305. <https://doi.org/10.4161/hv.22548>
- [34] Addisu, D., Gebeyehu, N.A. and Belachew, Y.Y. (2023) Knowledge, Attitude, and Uptake of Human Papillomavirus Vaccine among Adolescent Schoolgirls in Ethiopia: A Systematic Review and Meta-Analysis. *BMC Women’s Health*, **23**, Article No. 279. <https://doi.org/10.1186/s12905-023-02412-1>
- [35] Darraj, A.I., Arishy, A.M., Alshamakh, A.H., Osaysi, N.A., Jaafari, S.M., Sumayli,

- S.A., *et al.* (2022) Human Papillomavirus Knowledge and Vaccine Acceptability in Jazan Province, Saudi Arabia. *Vaccines*, **10**, Article 1337. <https://doi.org/10.3390/vaccines10081337>
- [36] Di Giuseppe, G., Angelillo, S., Bianco, A., Gallè, F., Licata, F., Liguori, G., *et al.* (2023) Evaluating Knowledge, Attitudes, and Behaviors toward HPV Infection and Vaccination among University Students in Italy. *Vaccines*, **11**, Article 1517. <https://doi.org/10.3390/vaccines11101517>
- [37] Masika, M.M., Ogembo, J.G., Chabeda, S.V., Wamai, R.G. and Mugo, N. (2015) Knowledge on HPV Vaccine and Cervical Cancer Facilitates Vaccine Acceptability among School Teachers in Kitui County, Kenya. *PLOS ONE*, **10**, e0135563. <https://doi.org/10.1371/journal.pone.0135563>
- [38] Bitariho, G.K., Tuhebwe, D., Tigaiza, A., Nalugya, A., Ssekamatte, T. and Kiwanuka, S.N. (2023) Knowledge, Perceptions and Uptake of Human Papilloma Virus Vaccine among Adolescent Girls in Kampala, Uganda; a Mixed-Methods School-Based Study. *BMC Pediatrics*, **23**, Article No. 368. <https://doi.org/10.1186/s12887-023-04174-z>
- [39] Jeannot, E., Viviano, M., Follonier, M., Kaech, C., Oberhauser, N., Mpinga, E.K., *et al.* (2019) Human Papillomavirus Infection and Vaccination: Knowledge, Attitude and Perception among Undergraduate Men and Women Healthcare University Students in Switzerland. *Vaccines*, **7**, Article 130. <https://doi.org/10.3390/vaccines7040130>
- [40] Yohannes, E., Beyen, M.W., Bulto, G.A., Chaka, E.E., Debelo, B.T., Erena, M.M., *et al.* (2023) Knowledge and Attitude toward Human Papillomavirus Vaccination and Associated Factors among Adolescent School Girls in Ambo Town, Ethiopia, 2021: A Multicenter Cross-sectional Study. *Health Science Reports*, **6**, e130. <https://doi.org/10.1002/hsr2.1305>
- [41] Kisaakye, E., Namakula, J., Kihembo, C., Kisakye, A., Nsubuga, P. and Babirye, J.N. (2018) Level and Factors Associated with Uptake of Human Papillomavirus Infection Vaccine among Female Adolescents in Lira District, Uganda. *Pan African Medical Journal*, **31**, Article 184. <https://doi.org/10.11604/pamj.2018.31.184.14801>
- [42] Lakneh, E.A., Mersha, E.A., Asresie, M.B. and Belay, H.G. (2022) Knowledge, Attitude, and Uptake of Human Papilloma Virus Vaccine and Associated Factors among Female Preparatory School Students in Bahir Dar City, Amhara Region, Ethiopia. *PLOS ONE*, **17**, e0276465. <https://doi.org/10.1371/journal.pone.0276465>
- [43] Hailu, G., Wirtu, D., Tesfaye, T. and Getachew, M. (2023) Human Papillomavirus Vaccine Uptake and Associated Factors among Adolescent Girls in High Schools of Nekemte City, Western Ethiopia, 2020. *BMC Women's Health*, **23**, Article No. 560. <https://doi.org/10.1186/s12905-023-02702-8>
- [44] Dapari, R., Li, M., Chen, X., Cui, J., Ahmad Zamzuri, M.I., Hassan, M.R., *et al.* (2024) Factors Influencing HPV Vaccine Acceptance among Females in Mainland China: A Systematic Review. *Clinical Epidemiology and Global Health*, **26**, Article ID: 101514. <https://doi.org/10.1016/j.cegh.2024.101514>
- [45] Moucheraud, C., Ochieng, E., Ogutu, V., Chang, L.C., Golub, G., Crespi, C.M., *et al.* (2024) Intervention-amenable Factors Associated with Lack of HPV Vaccination in Kenya: Results from a Large National Phone Survey. *Vaccine*, **42**, Article ID: 126410. <https://doi.org/10.1016/j.vaccine.2024.126410>
- [46] Xu, M., Choi, J., Capasso, A. and DiClemente, R. (2024) Improving HPV Vaccination Uptake among Adolescents in Low Resource Settings: Sociocultural and Socioeconomic Barriers and Facilitators. *Adolescent Health, Medicine and Therapeutics*, **15**, 73-82. <https://doi.org/10.2147/ahmt.s394119>

- [47] Holman, D.M., Benard, V., Roland, K.B., Watson, M., Liddon, N. and Stokley, S. (2014) Barriers to Human Papillomavirus Vaccination among US Adolescents. *JAMA Pediatrics*, **168**, 76-82. <https://doi.org/10.1001/jamapediatrics.2013.2752>
- [48] Kaul, S., Do, T.Q.N., Hsu, E., Schmeler, K.M., Montealegre, J.R. and Rodriguez, A.M. (2019) School-based Human Papillomavirus Vaccination Program for Increasing Vaccine Uptake in an Underserved Area in Texas. *Papillomavirus Research*, **8**, Article ID: 100189. <https://doi.org/10.1016/j.pvr.2019.100189>
- [49] Vijayalakshmi, K. and Goei, A.H.Y. (2022) Improved Population Coverage of the Human Papillomavirus Vaccine after Implementation of a School-Based Vaccination Programme: The Singapore Experience. *Singapore Medical Journal*, **64**, 294-301. <https://doi.org/10.11622/smedj.2022053>
- [50] Lubeya, M.K., Mwanahamuntu, M., Chibwesa, C.J., Mukosha, M., Monde, M.W. and Kawonga, M. (2023) Implementation Strategies Used to Increase Human Papillomavirus Vaccination Uptake by Adolescent Girls in Sub-Saharan Africa: A Scoping Review. *Vaccines*, **11**, Article 1246. <https://doi.org/10.3390/vaccines11071246>