



## Human Papilloma Virus Transmission: Knowledge and Uptake of HPV Vaccine among In-school Adolescent Girls in South-South Nigeria

I. N. Ojule<sup>1\*</sup> and I. E. Anika<sup>2</sup>

<sup>1</sup>Department of Preventive and Social Medicine, Faculty of Clinical Sciences, University of Port Harcourt, Nigeria.

<sup>2</sup>Department of Community Medicine, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

### Authors' contributions

*This work was carried out in collaboration between both authors. Author IEA designed and carried out the study. Author INO supervised, both conducted literature search. Author INO wrote the manuscript. Both authors read and approved the final manuscript.*

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### ABSTRACT

**Background:** HPV infection is the most common STI in sexually active adolescents. It has been implicated in majority of cases of cervical cancers. HPV is preventable. Potent Vaccines are available.

**Objective:** This study assessed what adolescents know about HPV infection and HPV vaccination, their attitude and uptake of HPV vaccine. This was also to raise awareness and obtain data that will be useful in identifying where to intervene to improve coverage.

**Materials and Methods:** A descriptive cross-sectional study carried out in Rivers State, Nigeria. Study tool was a semi-structured, self-administered questionnaire. Multi-stage sampling method was used to recruit adolescent girls from secondary schools.

**Results:** 445 in-school adolescent girls aged 9 to 19 years participated. Mean age was 13.4 SD =  $\pm 2.2$  years. 36.6% and 36.8% had heard of HPV infection and HPV vaccine respectively. Only 3.1%

\*Corresponding author: Email: [inumanye.ojule@uniport.edu.ng](mailto:inumanye.ojule@uniport.edu.ng);

of the participants knew HPV could be prevented through vaccination. 71.7% indicated willingness to obtain the vaccine. Only 3.6% self reported to have received at least one dose of the vaccine at the time of the survey. Uptake of HPV vaccine ( $P=0.00$ ), willingness to be vaccinated ( $P=0.005$ ) highest among adolescents that had heard of HPV vaccine and those who perceived themselves to be at risk for HPV infection ( $P=0.005$ ). Insufficient health information, cost of HPV vaccines identified as key barriers to vaccines utilization.

**Conclusion:** Notwithstanding the low level of knowledge about HPV infection and HPV vaccines willingness to be vaccinated was high. Our study shows that uptake of vaccination is low in our locality.

*Keywords: HPV; knowledge; uptake; adolescents; Nigeria.*

## 1. INTRODUCTION

Infection with the Human papilloma virus is considered a sexually transmitted infection of public health importance. This is because it is highly infective and its clinical syndromes can in the long term induce changes in the cervical epithelium leading to cervical cancer which often present with severe morbidity and mortality [1].

Van zur Hausen worked extensively to identify HPV as a transmissible agent in the aetiology of many diseases. Together with his colleagues they were among the pioneers that identified and typed several HPV genotypes starting with types 1-3. More work led to the identification of types 16 and 18. These two proved to be most implicated in over 82% of the cases of invasive cervical cancer [2,3]. Later works by other researchers added new HPV types so that as much as 99.7% of cervical cancer cases they studied were found to be HPV-positive. Today, we know of more than 100 HPV genotypes of which 40 infect the genital tract, and about 15 of these put women at high risk for cervical cancer which has been noted to be the most serious of all HPV- inducing pathologies [4]. HPV6 and HPV11 are most commonly associated with genital warts although many other serotypes 2, 40, 42, 43, 54 have also been isolated [5].

HPV has been identified as the most common sexually transmitted virus and it has been estimated that at some point in a lifetime, about 75% of sexually active adults will be infected with HPV [6]. In the vast majority of cases, however, a strong immune system clears HPV infections before they cause harm [7].

Nonetheless, in some individuals, subclinical infections will become manifest under favourable conditions and may cause benign papillomas (such as warts -verrucae- or squamous cell papilloma), or cancers of the cervix, vulva,

vagina, penis, anus and oropharynx especially if an individual's immunity wanes. In Sub-Saharan Africa, HPV genotypes 31, 35, 52, and 58 have been reported as the most commonly isolated HPV types [8,9]. Mixed infections have also been reported to be uncommon as much as 76.1% have been reported to be isolated from a single HPV genotype [6].

HPV infection and its related diseases are preventable. Methods of prevention include sexual abstinence, use of condoms, vaccination and microbicides. The use of condoms does not eliminate the risk of HPV infection because HPV can be transmitted from skin not covered by the condom. The HPV vaccines give better protection against HPV infection than condoms, but a combination of both vaccine and condom use provides the greatest protection [10,11]. The HPV vaccine since its development and introduction has been in widespread use in developed countries with good coverage. Its level of acceptance and use in developing countries, Nigeria included, is slowly increasing. In Nigeria, HPV vaccine was launched by the Federal Government of Nigeria in 2011 and is available mainly through private arrangements and NGO sponsored HPV vaccination projects. It is not yet embedded in our routine national immunization schedule [12].

Two vaccines are available to prevent the human papilloma virus (HPV) infections. The first invented in 2006 was a quadrivalent vaccine (Gardasil) and a bivalent vaccine (Cervarix). Gardasil also has been shown to prevent some cancers of the anus, vulva and vagina. Both vaccines are given through a series of 3 intramuscular injections with the second and third doses given one month and six months, respectively after the first dose [10,11].

Ideally, adolescent boys and girls should be given the vaccine before they become sexually

active and exposed to HPV. Even adolescents who are sexually active can be vaccinated, but they may get less benefit because they may have already been exposed to one or more of the HPV types targeted by the vaccines. The vaccines are not recommended for pregnant women.

The quadrivalent HPV vaccine is directed against HPV types 6, 11, most implicated in causing genital warts and HPV 16 and 18 most associated with cervical carcinoma [5,6]. Vaccination indications are for both young girls and boys, although more priority has been placed on female vaccination due largely to the burden of cervical cancer. Depending on funding, it is commonly given to boys and girls 11 to 12 year old, as well as catch-up vaccination in adolescents through to ages 21 and even 26 years [13].

Adolescence represents the transition phase of growth from childhood to adulthood and corresponds to the time frame of ten to nineteen years of age. This age range falls within the WHO's definition of *young people*, which refers to individuals between ages 10 and 24. The primary purpose of this period is to prepare the adolescent for adult life which comes sometimes with life-long challenges. At this time they undergo specific growth directed at attaining physical and sexual maturity [14]. This is also the period they should be equipped with appropriate information for health and living in preparation for adulthood.

This study is of a leading public health concern because of the location of the study. Obio-Akpor Local Government Area is one of the two LGAs that make up Port Harcourt metropolis. It is situated in the South-South part of Nigeria also called the Niger Delta region. This region has a non-conservative life style imposed on the environs by the crude oil operations with multinationals and also harbours virtually all Nigerian tribes in close association. Crude oil operations create artefacts of sophistication such as high costs of living, youth unrest, and other multiple positive associations for transmission of Sexually Transmitted Infections including HPV infection which has been reported as the most common STI world-wide. Our study's main objective therefore was to assess what adolescent girls know about HPV infection and vaccine, attitude and uptake of HPV vaccine in our locality. This will help to raise awareness and also obtain data that will be useful in identifying where to intervene to improve coverage.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

Obio-Akpor LGA is one of the twenty three Local Government areas that make up Rivers State. It is situated in Port Harcourt Metropolis, a major Niger Delta city, and one of the major centres of economic activities in Nigeria. The Local Government has an area of 260 km [2] and a population of 464,789 at the 2006 Nigeria Census, while a more recent survey by the Public Health Services and Solutions revealed a population of 535,800. The natives are Ikwerres and they still have a large population in the locality. Obio-Akpor comprises of three clans namely: Akpor, Evo and Apará kingdoms with 57 communities, seventeen political wards, and its headquarters in Rumuodumaya.

Rivers State has over 800 secondary schools (Private and Public). Out of this number, 16 public Secondary schools are in Obio-Akpor LGA [15]. Private secondary schools far outnumber public secondary schools as some wards do not have public secondary schools but private secondary schools are found in every ward.

### 2.2 Study Population

The target population comprised of female in-school secondary school students randomly selected from Obio-Akpor Local Government Area. The selected female students who fit into the eligibility criteria were recruited into the study. The selected female students in each school were given informed consent forms to sign after giving to their parents to sign irrespective of their age because culturally they are all viewed as minors.

### 2.3 Study Design

The study is of a descriptive cross-sectional design. Primary data was collected for the study.

### 2.4 Inclusion Criteria

All In-School adolescent girls in selected secondary schools.

### 2.5 Sampling Technique

Multistage sampling method was used to collect data from the participants.

Stage 1. Selection of Administrative Wards from which Study participants were recruited. Four

wards were selected from the 17 administrative wards in the Obio–Akpór Local Government Area by simple random sampling using a table of random numbers.

Stage 2. Selection of Secondary Schools from eligible Wards. A total of four secondary schools were selected from the wards by simple random sampling using a table of random numbers.

Stage 3. Selection of Study Subjects from classes of eligible Schools.

Each school was divided into six strata using each class level (JSS1 to SS3) as one stratum. Equal numbers of students were selected from each school and class level. This implied that 114 adolescent girls per selected school and using systematic sampling, 19 students per class level using information in the class register. The sampling interval ( $k$ ) was calculated using the formula ( $k = N/n$ ), where  $N$  is the population of female students in each class (most of the classes had several arms), and  $n$  is the number of the study participants required to be sampled from the classes. Sample size 445 was arrived at.

## 2.6 Study Instrument and Method of Data Collection

A simple semi-structured questionnaire was the data collection tool. The questionnaire was self-administered on a 'wait and get' basis as the school Principals gave us one hour during break time to have it done. Researchers and class teachers were on hand to explain, guide and supervise the activity. The students and teachers cooperated with us because we explained to them the benefits of the research. It was assumed that any child in secondary school should be able to answer the questions as well as questions pertaining to their parents. After collecting the questionnaire, we spent 30 minutes health educating the students and staff on HPV infection and vaccine.

A pre-test was carried out in a secondary school in Emohua local government area, a neighbouring LGA. Four girls from each class level participated in the pre-test. The selected study participants self-assessed themselves.

The questionnaire had five sections. The first section assessed the socio-demographic characteristics such as age, class level, religion, occupation, and level of education of parents.

The second section assessed their sexual activity and preventive measures.

The third section assessed their knowledge of Human Papilloma Virus and HPV Vaccine. It included variables (enquiries made) like if they had ever heard of HPV, HPV vaccine, cervical cancer, whether they knew that HPV was a risk factor for cervical cancer, whether they knew that HPV was sexually transmitted, and whether they knew that HPV vaccination was given to young people.

The Fourth section assessed their attitude and willingness towards the uptake of HPV vaccine.

The fifth section assessed the participants' present vaccination status (uptake of HPV vaccine).

It also assessed their actual and perceived barriers to vaccination - if the vaccine was too costly, not safe, may expose adolescents to risky sexual behaviour, afraid to take multiple injections and if they did not trust the efficacy of the vaccine.

## 2.7 Data Analysis

Retrieved questionnaire were checked for accuracy and completeness and entered directly into Microsoft excel 2013 sheets. Subsequently analyzed using IBM SPSS statistics (statistical package for the social sciences) application version 20 for windows operating system owned by IBM SPSS Statistics; as acquired on 31<sup>st</sup> October 2015 by UNICOM Systems Inc., a division of UNICOM Global, under the UNICOM Intelligence brand. Descriptive analysis was used to generate frequencies for all variables of interest. Data were presented as mean (Standard deviation) for continuous variables and as a percentage for categorical variables. Chi square was used to test bivariate relationship between 2 main variables and covariates.

## 3. RESULTS

### 3.1 Socio-demographic Characteristics of Participants

Four hundred and sixty four questionnaires were distributed to the participants. Nineteen questionnaires were returned with incomplete or ambiguous responses and were excluded from the analyses. We had 445 completely filled questionnaires. The response rate was 95.9%.

The socio-demographic characteristics of the respondents are outlined in Table 1. The ages of the respondents ranged from 9 to 19 years with a mean age of 13.4 years  $\pm$  2.2 years. Christianity and Islam were the only religions of the study subjects, with no representation in other (minority) religions. Four hundred and twenty one (94.6%) subjects were Christians and 24(5.4%) Muslims.

Tertiary education, 212 (47.6%) was modal in the level of educational attainment of the fathers of

the participants while Two hundred and four (45.8%) mothers of the participants completed secondary school and this constituted the modal class.

One hundred and ninety eight (44.5%) fathers of the participants were professional workers and that constituted the commonest frequency. Only 25 (5.6%) of the fathers were retired, constituting the lowest frequency. More than a third of the mothers were professionals 152 (34.2%).

**Table 1. Socio-demographic characteristics of study participants number of study participants, n = 445**

<b>Socio-demographic characteristics</b>		
<b>Age (Years)</b>	<b>No</b>	<b>%</b>
9	8	1.8
10	28	6.3
11	42	9.4
12	74	16.6
13	90	20.2
14	77	17.3
15	45	10.1
16	28	6.3
17	30	6.7
18	15	3.4
19	8	1.8
Mean Age = 13.4 SD = $\pm$ 2.2		
<b>Educational level</b>		
JS1	72	16.2
JS2	75	16.9
JS3	71	16.0
SS1	73	16.4
SS2	76	17.1
SS3	78	17.5
<b>Religion</b>		
Christian	421	94.6
Islam	24	5.4
Others	0	0.0
<b>Education</b>	<b>Father n (%)</b>	<b>Mother n (%)</b>
Primary	24 (5.4)	40 (9.0)
Secondary	174 (39.1)	204 (45.8)
Tertiary	212 (47.6)	172 (38.7)
Koranic	3 (0.7)	1 (0.2)
None	32 (7.2)	28 (6.3)
<b>Occupation</b>		
Professional	198 (44.5)	152 (34.2)
Skilled Worker	166 (37.3)	69 (15.5)
Unskilled Worker	36 (8.1)	142 (31.9)
Unemployed	20 (4.5)	41 (9.2)
Retired Worker	25 (5.6)	41 (9.2)

### 3.2 Sexual Activity and Contraceptive Use

84/445 (18.9%) of the participants reported that they had boyfriends. We found out that 58/445(12.9%) had sexual experience. The mean age of the first sexual experience was 12.7 years  $\pm$  3.1 years. Among those who had sexual experience, 23/58 (39.7%) were reported to be sexually active. 18/58 (31.0%) have had more than one partner, and only 5(1.1%) regularly used condoms.

### 3.3 Knowledge of Human Papilloma Virus and Its Vaccine

The proportion of participants that had heard of HPV infection and its vaccine was low. The distribution of respondents' correct answers to each of the different questions on knowledge of HPV infection, cervical cancer and HPV vaccine showed that 163/445(36.6%) had heard of HPV infection while only 60/163(36.8%) had heard of HPV vaccine. A slightly higher percentage of all the participants, 195/445 (43.8%) had heard of

**Table 2. Knowledge of the HPV infection**

Question on knowledge of HPV	Response		N=445
	Yes (%)	No (%)	
Ever heard of HPV	163 (36.6)	282 (63.4)	N=445
Ever heard of Cervical Cancer	195 (43.8)	205 (56.2)	N=445
Ever heard of HPV Vaccine	60 (36.8)	103 (63.2)	N=163
Aware that HPV can cause Cervical Cancer	62 (38.0)	101 (62.0)	N=163
<b>Knowledge of transmission of HPV</b>	<b>Correct Response No (%) N=163</b>		
Through Sexual Intercourse	132 (81%)		
Through Skin Contact	2 (1.2%)		
Through Kissing	3 (1.8)		
Do Not Know	26 (15.9)		
<b>Who can be infected?</b>			
Male only	5 (3.1%)		
Female only	120 (73.6%)		
Both Male and Female	28 (17.2%)		
Do Not Know	10 (6.1)		
<b>Ways of preventing HPV infection</b>			
Sexual Abstinence	83 (50.9%)		
Vaccination	5 (3.1%)		
Condom Use	22 (13.5)		
Good Hygiene	37 (22.7)		
Do Not Know	16 (9.8)		
<b>Who should be given vaccine</b>			
Girls	130 (79.8%)		
Boys	2 (1.2)		
Do Not Know	31 (19.0)		
<b>Age group eligible for HPV vaccine</b>			
Before 8 years	16 (9.8)		
9 - 19 years	21 (12.9)		
Above 20 years	19 (11.7)		
Do Not Know	107 (65.4)		
<b>Source of Information n =163 that had ever heard of HPV</b>			
Friends	3 (1.8)		
Information from Health Providers	5 (3.1)		
Information from Parents	16 (9.8)		
Internet	2 (1.2)		
Posters in Pharmacies/ Chemist Stores	3 (1.8)		
Radio	16 (9.8)		
School Lecturers	103 (63)		
Television	15 (9.2)		

cervical cancer. Of those who had heard of HPV infection, 62/163(38.0%) knew that HPV is a risk factor for cervical cancer. 34/163(23.1%) of the participants perceived that they can be at risk for HPV infection. Majority, 132/163(81%) of the participants who had heard of HPV infection knew that it could be transmitted through sexual relations although 2/163(1.2%) thought it could be transmitted through skin contact. When asked about HPV prevention, about half, 83/163(50.3%) pointed out it could be prevented through sexual abstinence, while 22/163(13.5%) knew it can be prevented with the use of condom. Only 5(3.1%) reported it could be prevented through vaccination. Among those who had heard of HPV infection, 28(17.2%) correctly specified that both male and female could be infected with HPV, and 21/163(12.9%) were aware of the age group eligible for the HPV vaccination. On investigation of the sources of information regarding HPV, 103/163(63%) indicated school lessons, (9.8%) received their information from their parents, (9.8%) from radio, (3.1%) from health providers, (9.2%) from television, (1.8%) from friends, and only (1.2%) from posters in pharmacy/ chemist shops.

### 3.4 Attitude towards HPV Vaccine

In assessing the attitude of the adolescents towards HPV Vaccine, almost three quarters of all participants (71.7%) indicated that they were willing to be vaccinated despite the already reported poor knowledge of HPV infection and its vaccine. Almost a quarter of participants (22.5%) declared unwillingness, while (5.8%) were indifferent towards being vaccinated. The

willingness to be vaccinated was high though some of the participants expressed fears about the vaccine's effectiveness and safety (37.5%) and (32.6%) respectively. Questions about sexual behaviour as it relates to uptake of vaccination, (29.9%) of the participants reported that HPV will not encourage promiscuity while only (10%) felt otherwise. Twenty-five percent of the participants felt that boys should receive HPV vaccine. Over all, more than half of the study participants, (53.3%) want Government to pay for the vaccine, (13.9%) want Non-Governmental Organisations to pay, (3.1%) preferred payment by insurance, and (9.2%) agreed individuals are capable of paying out of pocket.

### 3.5 Uptake of HPV Vaccine

Only 3.6% self-reported (immunization cards not sighted) to have received at least one dose of the vaccine as at the time of the survey. It is of note that 137/445(30.8%) did not know their vaccination status.

### 3.6 Reasons for Unwillingness to Take HPV Vaccination

Included waiting for direction from parents, not being old enough, fear of creating the impression that they are sexually active. Others included refusal on religious ground and they do not know much about the vaccine so why take what you do not know. Perceived barriers included ignorance of where to access the vaccine, vaccine cost and its dangers to health. Lack of information was the main reason for not being willing to be vaccinated.

**Table 3. Association between some socio-demographics and heard of HPV vaccine among study participants**

Heard of HPV vaccine	Yes (%)	No (%)	X <sup>2</sup>	P Value
<b>Class level</b>			<b>14.648</b>	<b>0.012</b>
JSS1	5(8.3)	17(16.5)		
JSS2	1(1.7)	18(17.5)		
JSS3	18(30.0)	21(20.4)		
SS1	6(10.0)	11(10.7)		
SS2	17(28.3)	16(15.5)		
SS3	13(21.7)	20(19.4)		
<b>Religion</b>			<b>0.302</b>	<b>0.582</b>
Christian	90(95.7)	331(94.3)		
Muslim	4(4.3)	20(5.7)		
<b>Mothers education</b>			<b>5.104</b>	<b>0.277</b>
Primary	11(11.7)	29(8.3)		
Secondary	49(52.1)	155(44.2)		
Tertiary	30(31.9)	142(40.5)		
Koranic	1(1.1)	2(0.6)		
None	3(3.2)	23(6.6)		

There was no statistically significant difference in knowledge of HPV vaccine with increasing class level, (P = 0.012) see Table 3. Religion and mother's educational level had no significant association with the knowledge of HPV vaccine (P =0.582 and P=0.277 respectively).

There was a statistically significant increase in willingness to be vaccinated among those who

have heard of HPV vaccine, (P= 0.00). Participants who perceived themselves to be at risk for HPV infection were more willing to be vaccinated. This was statistically significant, (P = 0.005). Religion and the educational level of the mother had no statistically significant influence on the willingness to be vaccinated (P= 0.115 and 0.175 respectively), Table 4. Having a boyfriend and exposure to sexual activity had no

**Table 4. Association between some socio-demographics and attitude of participants towards vaccination (N = 445)**

Willingness to be vaccinated	Yes (%)	No (%)	Do Not Know/	X <sup>2</sup>	P Value Not sure (%)
<b>Socio-demographics</b>					
Religion				4.330	0.115
Christian	304 (95.3)	91 (91)	26 (100)		
Moslem	15 (4.7)	9 (9.0)	0 (0.0)		
<b>Mother's educational level</b>					
Primary	31 (9.7)	6 (6.0)	3(10.7)	9.214	0.115
Secondary	151 (47.31)	44 (44.0)	9(32.1)		
Tertiary	119(37.31)	39 (39.0)	14 (50.0)		
Koranic	2 (0.6)	1 (1.0)	0 (0.0)		
None	14(4.4)	10(10.0)	2(7.1)		
<b>Had a boyfriend</b>					
Yes	60 (18.8)	19 (19)	19 (19.2)		
No	259 (81.2)	81 (81)	21 (80.8)	0.004	0.998
<b>Had sexual activity</b>					
Yes	46 (14.4)	11 (11)	1 (3.8)		
No	273 (85.6)	89 (89)	25 (96.2)	2.812	0.241
<b>Feels at risk</b>					
No	115 (40.1)	25 (26.9)	4 (28.6)	14.71	0.005
Yes	66 (23.0)	15 (16.1)	1 (7.1)		
<b>Heard of human HPV infection?</b>					
Yes	83 (88.8)	11 (11.7)	0 (0.0)		
No	236 (67.2)	89 (25.4)	26 (7.4)	17.702	0.000

**Table 5. Association between heard of HPV vaccine, vaccination status and parents' occupation**

Have received vaccine	Yes (%)	No (%)	Don't know (%)	X <sup>2</sup>	P Value
<b>Heard of HPV Vaccine</b>					
Yes	5 (5.3)	81 (86.2)	8 (8.5)	27.864	0.000
No	11(3.1)	211 (60.1)	129 (36.8)		
<b>Mothers occupation</b>					
Professional	7 (43.8)	100 (34.2)	45 (32.8)	3.279	0.916
Skill	6 (37.5)	11 (38.0)	51 (37.2)		
Unskilled	3 (18.8)	45 (15.4)	21 (15.3)		
Retired	0 (0.0)	9 (3.1)	6 (4.4)		
Unemployed	0 (0.0)	27 (9.2)	14 (10.2)		
<b>Fathers occupation</b>					
Professional	8 (50.0)	125 (42.8)	65 (47.4)	7.712	0.462
Skill	6 (37.5)	115 (39.4)	39 (28.5)		
Unskilled	1 (6.2)	20 (6.8)	15 (10.9)		
Retired	1 (6.2)	14 (4.8)	10 (7.3)		
Unemployed	0 (0.0)	18 (6.2)	8 (5.8)		

statistically significant influence on the willingness of the participants to be vaccinated, (P= 0.998 and 0.241 respectively).

There was a significant increase in the uptake of HPV vaccine among participation who had heard of HPV vaccine, (P = 0.00) (Table 5).

#### 4. DISCUSSION

The knowledge of HPV vaccine was low among the participants of this study. Majority of the participants had no awareness of HPV infection and its vaccine. Only 36.8% had heard of HPV vaccine. These findings are consistent with similar study among Northern Nigerian female students [16] and among Italian adolescents [17]. Both reported low level of knowledge of HPV infection and its vaccine. In contrast to these findings, studies with similar design on adolescents' knowledge of HPV and its vaccine in Canada, Spain, Germany [13,18,19] showed increased knowledge among study participants. The difference here is that the studies were carried out in developed countries where well planned government funded immunization schedules have been in existence for a decade or more in majority of the countries.

Another report from Port Harcourt also noted low level of knowledge of HPV and HPV Vaccine among undergraduates and even lower level of knowledge among ante-natal mothers [20]. These were two female groups who were older than our participants and were expected to have better knowledge of both HPV infection and the Vaccine. George-Opuda and colleagues' report lends credence to the low level of knowledge reported in this study. A probable reason for this low level of knowledge is the fact that HPV vaccine is not routinely administered in our country so most people are not aware of the vaccine. Despite the low knowledge of HPV and its vaccine, a higher percentage of participants had heard of cervical cancer. Ezenwa et al. in Nigeria [12], and another study among adolescent girls in Ethiopia [21] also reported a good level of knowledge of cervical cancer. More than a third of the participants, (38%) knew that HPV is a risk factor for cervical cancer. This contrasted with results of the study conducted among Spanish, Cameroonian, and German [18,19,22] adolescent girls which showed that knowledge of cervical cancer and its relationship with HPV was high but in agreement with the studies in Nigeria and Ethiopia [12,21] which showed that despite the high level of awareness

of cervical cancer, the knowledge of its relationship with HPV was low. The results across the continents have consistently shown higher level of awareness, knowledge of HPV infection and Vaccine in high income countries compared with LMIC. Although, one of the very few results that reported otherwise came from Cameroon, a low income country. For the Cameroon study [22], however, we discovered that the researchers carried out massive sensitization and educational exercises for the girls and their parents before the survey. The vaccines were also donated free for the survey. This must have accounted for the high level of knowledge of the adolescent participants in their survey.

Our survey found out that increasing class level and religion were not significantly associated with the knowledge of HPV vaccine. Our result resonates with another study [23]. However, the above contrasted with two studies [24,25] that reported adolescent's educational level, religion, personal and moral beliefs are important factors influencing the knowledge of HPV vaccine. These various reports have shown that awareness creation is effective and in virtually all settings where Consumers are reasonably enlightened and well informed, knowledge of health matters is usually high. The low level of knowledge of HPV vaccine from our result and those of other studies in our locality shows that much work is needed to create awareness for HPV vaccine in Rivers state and Nigeria at large. The small proportion of the study respondents who have knowledge of HPV infection and its vaccine can take the advantage of this fact, and act as a vanguard for disseminating information to others especially their peers.

Majority (71.7%) of the girls were willing to be vaccinated against HPV. This shows they appreciate preventive measures against diseases. Our result is similar to the results of the studies by Dempsey [26], Pelucchi [17], and Di Giuseppe [27], who reported high rates of willingness to be vaccinated with HPV vaccine. However, our result is incongruent with the results of studies by Ayse [28], Mortensen [29] which showed low rate of acceptance of HPV vaccine.

The Cameroon study [26] had very high percentages of knowledge of HPV, HPV Vaccine, cervical cancer and willingness to be vaccinated but this did not translate into reality because despite prior sensitization and education just

before the survey, they were only able to vaccinate 34% of the young participants notwithstanding knowledge and willingness levels that averaged 80%.

Knowledge of HPV vaccines in this study is a significant factor affecting the decision for vaccination, which is consistent with studies conducted by other researchers [18,28,17]. Conversely, Dempsey et al. [26] carried out a well-designed randomized intervention study within a cross-sectional survey to assess Parental HPV vaccine acceptability. Parents who received the HPV information sheet had higher mean scores on the HPV knowledge assessment tool than the control group. However, despite this apparent improvement in knowledge, there was not a statistically significant difference in HPV vaccine acceptability between the two groups. Providing parents with an HPV information sheet did seem to improve knowledge about HPV, but this increased knowledge had little effect on the acceptability of these vaccines by parents for their children. Instead, attitudes and life experiences seemed to be more important factors influencing HPV vaccine acceptability among parents. In our study, the participants have a positive attitude towards uptake of HPV Vaccine as more than two-thirds were willing to be vaccinated despite the low level of knowledge of HPV infection. In our study, we observed that knowledge did not translate into appropriate practices, rather what did were morbidity fears. Perceiving oneself at risk for HPV infection and related diseases is an important factor driving the decision for vaccination in this study. This is in accordance with the findings from similar studies [17,21,30] but varies with the result of Ayse et al. [28]. Majority of the participants who had heard of HPV infection reported that it could be transmitted through sexual relationships but to our surprise we noted that having a boyfriend and exposure to sexual intercourse did not influence the willingness of the participants to be vaccinated. This supports the findings of Jena and colleagues [31]. They worked on incidence of STIs after HPV vaccination among adolescents and reported that HPV vaccination was not associated with increases in STIs in a large cohort of females, suggesting that vaccination is unlikely to promote unsafe sexual activity.

Religion is another factor which did not influence the willingness to be vaccinated in this study. This is in accordance with some studies [12,17]. A study from Turkey reported otherwise [32],

they noted that low socioeconomic status, moral and religious beliefs were viewed as major barriers to vaccine compliance and acceptance. Fortunately, this is not so in our findings, as religion did not affect the decision for vaccination. Reasons for the moral and religious influence can be deduced by looking at doctrinal values of the great religions in that they teach chastity. A typical Nigerian parent will likely feel that the adolescent age is too young and unprepared for discussions bordering on morbidity in relation to sexual activity. HPV Vaccination is often associated with protection of the female reproductive system and this reasoning tallied with our report as few participants identified boys with HPV vaccination. This agrees with the results of another study [25]. Globally what obtains is poor knowledge of HPV vaccination for boys except in countries where vaccination of Boys has been incorporated into the routine immunization schedule. Young people of both sexes, parents and the general population therefore need further information in order to increase knowledge and uptake of HPV Vaccine.

All over the world people are reluctant to pay out-of-pocket medical bills. The three-dosed vaccine is expensive by any standard especially as it is a common knowledge that people are more inclined to paying for curative care than preventive care. Majority of our study participants felt government (53.3%) should pay for the vaccine.

The vaccination status of the participants (3.6%) was low and this included participants who had received only one injection out of the three. What it means is that actual coverage is very low. This is similar to a previous study carried out in this locality by Ojima and colleagues where only 5.1% of the participants received at least one dose of HPV Vaccine. Their study participants were undergraduates who were expected to be more knowledgeable about HPV, its vaccine and therefore higher uptake was expected [33]. Other Nigeria studies also found uptake to be low [12,24]. In contrast, the vaccination status is high in developed countries where sensitization, education and incorporation of the vaccine into the routine immunization schedule is common [13,18,19,30]. One important predictor of vaccine uptake in our study was awareness of HPV Vaccine ( $P = 0.00$ ). Barriers to uptake of HPV vaccine among the few who do not want to be vaccinated included waiting for approval from parents, they are not yet old enough, they are not yet sexually active, not sure if their religion will

permit, they do not have sufficient information on the vaccine, they do not know where to access the vaccine, that it will give people the impression that they are sexually active and it is costly. Insufficient knowledge was the main reason for not being willing to be vaccinated in this study. This supports the previous studies in Nigeria [12,24]. It is also consistent with the results from studies [19,25,28], which reported that the reason for unwillingness to be vaccinated against HPV arose from the need for more information, concerns about vaccine safety or demand for knowing the opinion of the doctor about the HPV vaccine. Vaccine cost was of concern to some of the adolescents. Most of them hinted that Government should foot the bill. Cost of HPV vaccine as a major barrier by many adolescents and parents were cited in several literatures [34,29,25]. Scheduling the vaccine into the National immunization program will help remove the cost barrier for vast majority of people and increase vaccine uptake.

## 5. LIMITATIONS OF THE STUDY

- Our study should be interpreted in line with these limitations;
- The results of the study reflect the opinions of a group of Obio-Akpor LGA adolescents. Hence, these results cannot be generalized for overall Nigeria.
- A self-administered questionnaire was used to collect data which often yield Self-report bias.
- Vaccination status was based on the students' report and not confirmed by medical records.
- KAP assessment from population surveys invariably poses the problem of social desirability, whereby respondents are reluctant to admit poorly acceptable KAP to avoid giving a negative impression. This may result in over or under reporting of facts as the respondents may want to meet up with what he or she feels is expected of him or her by the society.

## 6. CONCLUSION

- The low knowledge of HPV infection and its vaccine from the result of this study shows that much work is needed to create awareness for HPV vaccination to young people, their parents and paediatricians.
- Multi-sectoral approach involving the Ministries of Health, Education and

Information is what is needed. Health Education should be re-introduced into the basic school curriculum by the Ministry Of Education so that topics such as HPV can be taught.

- The target for the success of HPV vaccination campaign should be to increase the people's knowledge on this topic. Public health information systems should be used to highlight the need for a training programme focused on the epidemiology of HPV infection.
- Physician's knowledge of HPV infection as well as attitude and practices towards HPV vaccination of young boys and girls should be evaluated and improved on if necessary.

## CONSENT

Parents received informed consent form through the students to sign. The students also signed an informed consent form after explanation of the research process. The consent form covered all the principles of research ethics which included confidentiality, Autonomy, Non- maleficence and beneficence.

## ETHICAL APPROVAL

Ethical approval for this research was obtained from the Ethics Committee of the University of Port Harcourt.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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