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Factors Affecting the Uptake of Human Papillomavirus Vaccine among Children of Rural Women in South Eastern Nigeria: A Cross-Sectional Study

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Introduction

Human papilloma virus (HPV) infection is implicated in the cause of cervical dysplasia and cancer as well as genital warts. Cervical cancer is the second most common cancer in women worldwide and also the third leading cancer worldwide irrespective of gender [1]. More than eighty percent of the 274,000 deaths resulting from cervical cancer each year, occur in developing countries, and this proportion is expected to increase to 90% by 2024. Beyond cervical cancer, HPV is etiologically associated with 90 -93% of cases of cancer of the anus, 12-63% of cases of cancer of the oropharynx, 36-40% of cases of cancer of the penis, 40-64% of cases of cancer of the vagina and 40-51% of cases of cancer of the vulva. HPV vaccination is a primary prevention tool against the two most prevalent oncogenic strains of HPV (16 and 18) which are responsible for about 70% of cervical cancer worldwide. However, screening later in life is recommended as HPV types other than 16 and 18 are responsible for up to 30% of all cases [2].

Vaccinating girls and women before their sexual debut or those who are naïve to these two strains has potential to reduce the burden by 70%. Modeling studies have shown that if fully implemented, vaccination may lead to 66% reduction in pre-cancerous lesions which translate to about 76% decline in cervical cancer deaths. In Nigeria, two vaccines, Gardasil-quadrivalent (Merck) and

Cervarix-bivalent (GlaxoSmithKline) have being approved in line with the World Health Organization recommendation but still no national policy or programme to that effect. The recommended age range for routine immunization against HPV for females is 9 years to 26 years. Currently the vaccine is neither widely available nor affordable in Nigeria [3]. Knowledge of cervical cancer, HPV infection and vaccine is fundamental to making informed decision as regards HPV vaccine acceptance. Several studies have documented poor knowledge and attitude towards HPV infection and vaccination as one of the determinants of vaccine uptake among females [4,5]. There is paucity of data on knowledge and attitude of female towards HPV infection and vaccination. However, amongst the few studies conducted among medical students' knowledge gaps on HPV infection and vaccine were observed [6]. A study in South West, Nigeria among medical students reported good knowledge of HPV infection among two-thirds of the respondents but poor knowledge on HPV 16 vaccination. Knowledge of Physician's has also been shown to determine their recommendation of HPV vaccine, which has been reported by various studies as one of the predictors of HPV uptake [7,8]. One of the primary prevention strategies for HPV infection is vaccination. HPV vaccination can prevent more than 90% of these cancers. Two HPV vaccines (Gardasil and Cervarix) protect against the two strains of HPV types 16 and 18 [9]. The

quadrivalent vaccine is also highly efficacious in preventing genital warts, which are caused by infection with HPV type 6 causes anogenital warts and HPV type 11 causes oropharyngeal cancer [10]. Gardasil works by stimulating the immune system to attack HPV types 6, 11, 16, and 18. Once Gardasil is administered, the body's immune system recognizes the viral proteins in Gardasil as foreign, and develops antibodies against them, thus providing immunity from future infections [11,12]. It is the second most common cancer in countries with a lower human development index ranking and is the most common cancer in about 28 countries [13]. The high-risk types, HPV 16 and HPV 18, cause 70% of all invasive cervical cancers and HPV types: 6, 11, 16, 18, 31, 33, 45, 52 and 58 together can cause 95% of cervical cancers [14].

HPV vaccination is the most effective method of preventing HPV infection. This vaccine is most beneficial if delivered prior to the commencement of sexual activity. The United States of America (USA), Australia, Canada and the United Kingdom (UK) were among the first countries to introduce HPV vaccine into their national immunization programs [15]. All countries programs target young adolescent girls, with some countries also having programs for adolescent males. Specific target age groups differ as some do catch-up vaccination recommendations. The coverage of HPV vaccine achieved by the national programs has been highly variable within countries.

The Human papillomavirus vaccine is the vaccine that protects against the human papilloma virus which is known to prevent cervical cancer and other human papillomavirus infections. Human papillomaviruses (HPV) are common pathogens associated with a wide range of cutaneous and mucosal infections in childhood. The prevalence of vaccine uptake starting from the developed countries such as United States of America revealed that vaccine uptake is encouraging with over 94% response [11]. Developing countries such as most African countries revealed that vaccine uptake is still low with a percentage of 48% due to low level of education, lack of vaccines and lack of encouragement from health workers and village health extension workers. Imo State has recorded low level of vaccine uptake due to poor state of health centers in the 27 local government areas of the state and insufficient public awareness [16]. In developing countries, cervical cancer accounts for 12% of female cancers and it contributes to 80% of global cervical cancers [17]. The world health organization recommends human papillomavirus vaccination for girls aged 9-14 years as the most cost-effective public health intervention against cervical cancer. Despite this, many girls and women in Nigerian communities stay away without routine human papillomavirus vaccination and cervical cancer screenings because of a lack of awareness, and limited availability of the vaccination and screening programs. According to Herrero [18]. Human papillomavirus vaccine uptake is defined as being fully vaccinated with all three doses of the human papillomavirus vaccine. Factors that have independently associated with uptake of human papillomavirus vaccine include (a) Individual factors, (b) Community factors and (c) Health service factors. This study therefore assessed the factors affecting the uptake of human papillomavirus vaccine, among children of rural women in Southeastern Nigeria.

Materials and Methods

Study Area and Study Design

The study was conducted in Umuna, Orlu. Orlu is the second largest city in South East, Imo State, Nigeria with a population of 420,600 as at 2006 national census. They obtain health care from Umuna Primary Health Care Uhi/Diakuma, Onuimo. The major illnesses suffered include malaria, pneumonia, diarrhoea, HIV and tuberculosis. The study used a community based descriptive cross-

sectional survey, its population comprised of all mothers who are resident of Umuna, Orlu LGA.

Study Design

The study used a community based descriptive cross-sectional survey.

Study Population

The study population comprised of all mothers who are resident of Umuna, Orlu LGA.

Inclusion Criteria

Mothers who are 18 years and above and are permanent residence of Umuna were included in the study after giving informed consent.

Exclusion Criteria

Mothers who were mentally sick, had severe illness, withdrew consent or were absent from home or data collection day.

Sample Size Determination

The sample size was determined using Cochran's sample size formula.¹⁹

$$n = z^2pq/d^{19}$$

n = minimum sample size when the population is >10000

z = 1.96; the standard normal deviate corresponding to 95% confidence interval,

p = prevalence rate (34%), from a previous study.²⁰

d = desired level of precision = 0.05 q = 1 - p

Substituting the formula above;

$$n = 1.96^2 \times 0.34 \times 0.66 / 0.05^2$$

$$= 3.8416 \times 0.2244 / 0.0025$$

$$0.8621 / 0.0025 = 344.82$$

The minimum sample size required is 344.82. To accommodate for non-response, an additional 20% (68.8) of this sample size was included resulting in a total sample size of 412.8, which was approximated to 430 participants.

Sampling Techniques and Data Collection Method

A community based cross-sectional descriptive design which used a convenience sampling techniques to select the study area; based on proximity, security challenges and accessibility of the study area. A simple random sampling technique was used to select 430 women who participated in the study.

Data Management

Measurement of Variables

The statements require responses from the women about their knowledge, attitude and willingness to uptake. For knowledge, a score of 2 was given to a correct answer and 0 to a wrong answer and 1 to an I don't know answer. It was graded as 0-11 scores for poor knowledge, 12-16 scores for moderate knowledge and 17-24 scores for good knowledge. For attitude, a score of 2 was given to a correct attitudinal response and 0 to a wrong attitudinal response and 1 to a not sure response. It was graded as 0-6 scores for poor attitude, 7-9 scores for moderate attitude and 10-14 scores for good attitude. For willingness to uptake, a score of 2 was given to a willing response and 0 to an unwilling response and 1 to a not sure response. It was graded as 0-6 scores for poor willingness, 7-8 scores for moderate willingness and 9-12 scores for good willingness.

Data Analysis

Data was collected, collated, coded and entered into a spreadsheet using Microsoft excel for cleaning. After cleaning the data,

analysis was performed using SPSS version 28.0 (IBM-SPSS). Descriptive and inferential statistics comprised of frequencies, percentages and chi-square.

Ethical Considerations

The study design and protocol were submitted to the Ethics Review Committee of Imo State University Teaching Hospital (IMSUTH) for approval. An introductory letter from the Department of Community Medicine IMSUTH was presented and permission sought from the selected community participating in the study. Written informed consent were obtained from the selected participants prior to enrollment in the study. The consent forms was read for participants unable to read or write. Simplified and thorough explanations of the content of the forms was provided and subsequently, they were asked to sign or thumb print after understanding and giving consent. Utmost confidentiality was ensured and the respondents was informed of their right to withdraw from participation in the study at any time they so wish.

Results

A total of 430 rural women in Umuna, Orlu were interviewed on factors affecting the uptake of human papillomavirus vaccine.

Table 1: Socio-Demographic Characteristics of the Respondents

Variables	Frequency	Percentage
Age grouping		
19-34 years	108	25.1
35-49 years	238	55.3
≥50 years	84	19.5
Total	430	100.0
Marital status		
Married	387	90.0
Single	27	6.3
Divorced/Separated	16	3.7
Total	430	100.0
Religion		
Catholic	249	57.9
Anglican	97	22.6
Pentecostal	83	19.3
Muslim	1	0.2
Total	430	100.0
Highest educational level		
None	45	10.5
Primary	59	13.7
Secondary	143	33.3
Tertiary	183	42.6
Total	430	100.0
Occupation		
None	64	14.9
Trading/Business	221	51.4
Farmer	45	10.5
Civil servant	86	20.0
Others	14	3.3
Total	430	100.0
Monthly income		

Less than N10,000	103	24.0
N10,000 -N20,000	145	33.7
N21,000 -N50,000	99	23.0
Above N50,000	83	19.3
Total	430	100.0
Grouping-Number of Male Children		
0-1 Male Child	128	29.8
2-3 Male Children	236	54.9
4-5 Male Children	60	14.0
6 or more Male Children	6	1.4
Total	430	100.0
Grouping-Number of Female Children		
0-1 Female Child	141	32.8
2-3 Female Children	253	58.8
4-5 Female Children	32	7.4
6 or more Female Children	4	.9
Total	430	100.0
Routine immunization status of your children		
None	28	6.5
Incomplete	57	13.3
Complete	345	80.2
Total	430	100.0
Husband's highest educational level		
None	53	12.3
Primary	56	13.0
Secondary	125	29.1
Tertiary	196	45.6
Total	430	100.0
Husband's Occupation		
None	54	12.6
Trading/Business	204	47.4
Farmer	34	7.9
Civil servant	119	27.7
Others	19	4.4
Total	430	100.0

Table 1 Above shows the socio-demographic characteristics of the respondents. It revealed that more than half (55.3%) of the respondents were within 35-49 years, most of the women (90.0%) of the respondents were married, 42.6% of the respondents had tertiary education, 51.4% of the respondents were traders/business women, one-third (33.7%) of the respondents earned #10,000 - #20,000 monthly, 80.2% of the respondents had completed the routine immunization for children, 45.6% of the respondents husbands had tertiary educational as their highest qualification while 47.4% of the respondents husbands were traders/business men.

Table 2: Knowledge of HPV Infection and Vaccination among Rural Women in Umuna, Orlu

Variables	Frequency	Percentage
Heard of Human papillomavirus infection (HPV)		
Yes	136	31.6
No	294	68.4
Total	430	100.0
Can HPV infection cause cervical cancer and genital warts		
Yes	100	23.3
No	123	28.6
I don't know	207	48.1
Total	430	100.0
Can you get an HPV infection through sexual intercourse		
Yes	116	27.0
No	65	15.1
I don't know	249	57.9
Total	430	100.0
Can you get an HPV infection through hugging and kissing		
Yes	27	6.3
No	151	35.1
I don't know	252	58.6
Total	430	100.0
Can HPV-positive pregnant women pass the virus to their unborn child		
Yes	42	9.8
No	45	10.5
I don't know	343	79.8
Total	430	100.0
Can HPV infection be prevented by early vaccination		
Yes	117	27.2
No	21	4.9
I don't know	292	67.9
Total	430	100.0
Does HPV vaccine effectively prevent anal and Oropharyngeal cancer		
Yes	30	7.0
No	29	6.7
I don't know	371	86.3
Total	430	100.0
When do HPV vaccines have a better effect		
Before virus exposure	72	16.7
After virus exposure	5	1.2
Neither	37	8.6
I don't know	316	73.5
Total	430	100.0
When is HPV vaccine best taken		
Before 1st sexual intercourse	49	11.4
After 1st sexual intercourse	13	3.0

Neither	56	13.0
I don't know	312	72.6
Total	430	100.0
Can condoms effectively prevent HPV infection		
Yes	82	19.1
No	52	12.1
I don't know	296	68.8
Total	430	100.0
Is HPV vaccine given free of charge in the hospital		
Yes	42	9.8
No	29	6.7
I don't know	359	83.5
Total	430	100.0
Can HPV vaccine be given to boys		
Yes	70	16.3
No	16	3.7
I don't know	344	80.0
Total	430	100.0

Table 2 reveals the knowledge of HPV infection and vaccination among rural women in Umuna, Orlu. It revealed that 68.4% of the respondents have not heard about human papilloma virus (HPV) infection, 48.1% of the respondents don't know whether HPV infection cause cervical cancer and genital warts, 57.9% of the respondents don't know if one can get an HPV infection through sexual intercourse, 58.6% of the respondents don't know if one can get an HPV infection through hugging and kissing, over three-quarter (79.8%) of the respondents don't know if an HPV-positive pregnant women can pass the virus to their unborn child, 67.9% of the respondents don't know if an HPV infection be prevented by early vaccination, majority (86.3%) of the respondents don't know if HPV vaccine effectively prevent anal and Oropharyngeal cancer, while 68.8% of the respondents don't know if condoms effectively prevent HPV infection.

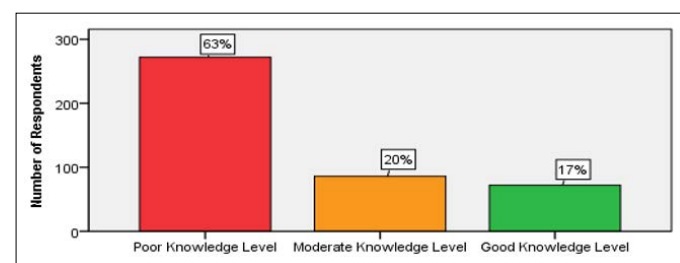


Figure 1: Level of Knowledge of HPV Infection and Vaccine among Rural Women Umuna Orlu

Figure 1 above revealed that 63.0% of the respondents had poor knowledge level, 20.0% of the respondents had moderate knowledge level while 17.0% had good knowledge level.

Table 3: Attitude Towards HPV Infection and Vaccination among Rural Women in Umuna, Orlu

Variables	Frequency	Percentage
Do you think HPV infection is real		
Yes	204	47.4
No	22	5.1
Not sure	204	47.4
Total	430	100.0
Do you think HPV vaccination is necessary for your child		
Yes	188	43.7
No	54	12.6
Not sure	188	43.7
Total	430	100.0
Do you think both boy and girl children should take HPV vaccine		
Yes	115	26.7
No	20	4.7
Not sure	295	68.6
Total	430	100.0
Do you think HPV vaccine will encourage children to have sex		
Yes	68	15.8
No	75	17.4
Not sure	287	66.7
Total	430	100.0
Do you think HPV vaccine can harm your children		
Yes	22	5.1
No	168	39.1
Not sure	240	55.8
Total	430	100.0
Do you think Government should stop promoting HPV vaccine		
Yes	23	5.3
No	214	49.8
Not sure	193	44.9
Total	430	100.0
What do you prefer to give your teenage children		
HPV Vaccine	74	17.2
Condoms	31	7.2
Both vaccine and condoms	142	33.0
None of them	183	42.6
Total	430	100.0

Table 3 shows attitude towards HPV Infection and Vaccination among Rural Women in Umuna, Orlu. It revealed that 47.4% of the respondents thinks that HPV infection is real, 47.3% of the respondents thinks that HPV vaccination is necessary for their child, 68.6% of the respondents think that both boy and girl children should take HPV vaccine, 66.7% of the respondents thinks that HPV vaccine will encourage children to have sex, 55.8% of the respondents thinks that HPV vaccine can harm children, 44.9% of the respondents thinks that government should stop promoting HPV vaccine, 42.6% of the respondents preferred not to give their teenage children neither condom nor vaccine.

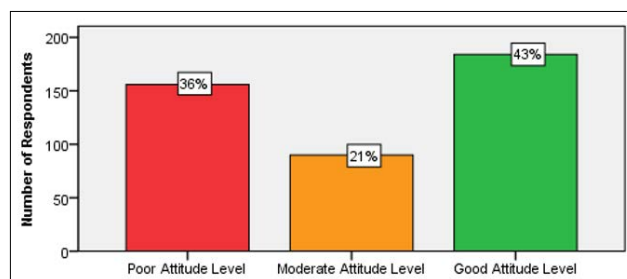


Figure 2: Level of Attitude Towards HPV Infection and Vaccine among Rural Women Umuna Orlu

Figure 2 above revealed that 36.0% of the respondents had poor attitude level, 21.0% of the respondents had moderate attitude level while 43.0% had good attitude level.

Table 4: Willingness to Uptake HPV Vaccine among Rural Women Umuna Orlu

Variables	Frequency	Percentage
Are you willing to give or continue to give HPV vaccine to any of your children		
Yes	212	49.3
No	98	22.8
Not sure	120	27.9
Total	430	100.0
Are you willing to encourage family and friends to give their children HPV vaccine		
Yes	133	30.9
No	56	13.0
Not sure	241	56.0
Total	430	100.0
Are you willing to vaccinate your child if asked to pay for the HPV vaccine		
Yes	111	25.8
No	120	27.9
Not sure	199	46.3
Total	430	100.0
If family and friends have vaccinated their children will that influence your willingness to vaccinate yours		
Yes	269	62.6
No	48	11.2
Not sure	113	26.3
Total	430	100.0
If a Doctor or nurse recommends HPV vaccine will that influence your willingness to vaccinate your child		
Yes	344	80.0
No	35	8.1
Not sure	51	11.9
Total	430	100.0
If pastor, priest or imam recommends HPV vaccine will that influence your willingness to vaccinate your child		
Yes	274	63.7
No	41	9.5
Not sure	115	26.7
Total	430	100.0

Table 4 above reveals the willingness to uptake HPV vaccine among rural women Umuna Orlu. It revealed that 49.3% of the respondents are willing to give or continue to give HPV vaccine to any of their children, 56.0% of the respondents are not sure if they are willing to encourage family and friends to give their children HPV vaccine, 62.6% of the respondents accept that family and friends that vaccinated their children will influence their willingness to vaccinate theirs, 80.0% of the respondents accepts that if a doctor or nurse recommends HPV vaccine, it will influence their willingness to vaccinate their child while 63.7% of the respondents accepts that if a pastor, priest or imam recommends HPV vaccine, that it will influence their willingness to vaccinate their child.

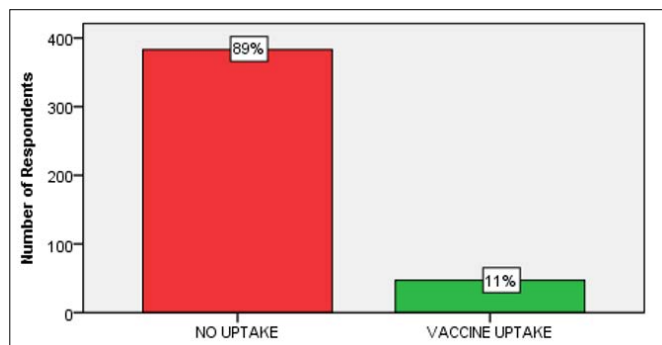


Figure 3: Level of HPV Vaccine Uptake among Rural Women in Umuna Orlu

Figure 3 above revealed that 89.0% of the respondents had no uptake of HPV vaccine, while 11.0% of the respondents' had vaccine uptake.

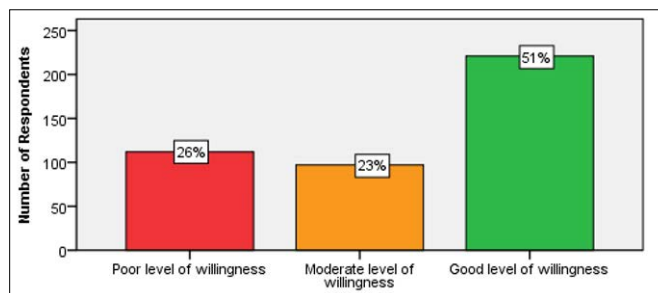


Figure 4: Level of Willingness to Uptake HPV Vaccine among Rural Women in Umuna Orlu

Figure 4 above revealed that 26.0% of the respondents had poor level of willingness, 23.0% of the respondents had moderate level of willingness while 51.0% had good level of willingness to uptake the vaccine.

Table 5: Association between Socio-Demographic Characteristics and HPV Vaccine Given to Children

Variable		Have you given HPV vaccine to any of your children?		Total % N=430
	Yes	No	Total (%)	$\chi^2/p\text{-value}$
Age Grouping				
19-34 years	18.5	81.5	108(100.0)	10.063/.007*
35-49 years	23(9.7)	215(90.3)	238(100.0)	
50 years and above	4(4.8)	80(95.2)	84(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Marital status				
Married	41(10.6)	346(89.4)	387(100.0)	0.504/0.777
Single	4(14.8)	23(85.2)	27(100.0)	
Divorced/Separated	2(12.5)	14(87.5)	16(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Religion				
Catholic	31(12.4)	218(87.6)	249(100.0)	2.088/0.554
Anglican	7(7.2)	90(92.8)	97(100.0)	
Pentecostal	9(10.8)	74(89.2)	83(100.0)	
Muslim	0(0.0)	1(100.0)	1(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Highest educational level				
None	0(0.0)	45(100.0)	45(100.0)	10.112/0.018*
Primary	7(11.9)	52(88.1)	59(100.0)	
Secondary	12(8.4)	131(91.6)	143(100.0)	
Tertiary	28(15.3)	155(84.7)	183(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Occupation				
None	4(6.3)	60(93.8)	64(100.0)	6.287/0.179

Trading/Business	23(10.4)	198(89.6)	221(100.0)	
Farmer	6(13.3)	39(86.7)	45(100.0)	
Civil servant	10(11.6)	76(88.4)	86(100.0)	
Others	4(28.6)	10(71.4)	14(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Monthly Income				
Less than N10,000	8(7.8)	95(92.2)	103(100.0)	5.380/0.146
N10,000 -N20,000	20(13.8)	125(86.2)	145(100.0)	
N21,000 -N50,000	14(14.1)	85(85.9)	99(100.0)	
Above N50,000	5(6.0)	78(94.0)	83(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Grouping-Number of Male Children				
0-1 Male Child	16(12.5)	112(87.5)	128(100.0)	1.234/0.745
2-3 Male Children	24(10.2)	212(89.8)	236(100.0)	
4-5 Male Children	7(11.7)	53(88.3)	60(100.0)	
6 or more Male Children	0(0.0)	6(100.0)	6(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Grouping-Number of Female Children				
0-1 Female Child	10(7.1)	131(92.9)	141(100.0)	4.116/0.249
2-3 Female Children	32(12.6)	221(87.4)	253(100.0)	
4-5 Female Children	5(15.6)	27(84.4)	32(100.0)	
6 or more Female Children	0(0.0)	4(100.0)	4(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Routine immunization status of your children				
None	2(7.1)	26(92.9)	28(100.0)	3.192/0.203
Incomplete	10(17.5)	47(82.5)	57(100.0)	
Complete	35(10.1)	310(89.9)	345(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Husband's highest educational level				
None	2(3.8)	51(96.2)	53(100.0)	4.648/0.199
Primary	6(10.7)	50(89.3)	56(100.0)	
Secondary	12(9.6)	113(90.4)	125(100.0)	
Tertiary	27(13.8)	169(86.2)	196(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Husband's Occupation				
None	0(0.0)	54(100.0)	54(100.0)	13.688/0.008*
Trading/Business	20(9.8)	184(90.2)	204(100.0)	
Farmer	4(11.8)	30(88.2)	34(100.0)	
Civil servant	18(15.1)	101(84.9)	119(100.0)	
Others	5(26.3)	14(73.7)	19(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Group Knowledge Score				
Poor Knowledge Level	22(8.1)	250(91.9)	272(100.0)	6.650/0.036*
Moderate Knowledge Level	15(17.4)	71(82.6)	86(100.0)	
Good Knowledge Level	10(13.9)	62(86.1)	72(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	
Group Attitude Score				
Poor Attitude Level	19(12.2)	137(87.8)	156(100.0)	0.636/0.728

Moderate Attitude Level	8(8.9)	82(91.1)	90(100.0)	
Good Attitude Level	20(10.9)	164(89.1)	184(100.0)	
Total	47(10.9)	383(89.1)	430(100.0)	

The following socio-economic characteristics were significantly associated with HPV vaccine given to children: age grouping ($p=0.007$), highest level of education level ($p=0.018$), husband's occupation ($p=0.008$), and group knowledge score ($p=0.036$)

Discussion

It is no coincidence that in many sub-Saharan nations, including Nigeria, HPV infection and, by extension, cervical cancers—both of which are preventable—continue to rank as the top causes of illness and mortality. According to this study, rural women in Umuna Orlu had a very low (11.0%) uptake of the HPV vaccine and very poor awareness or attitude regarding HPV infection as a cause of cervical cancer. More than half (55.3%) of the respondents were within 35-49 years, 90.0% of the respondents were married. This may be explained by the fact that the majority of participants were adults who had attained marriageable age. According to the national baseline survey of beneficial and detrimental traditional practices impacting women and girls in Nigeria conducted in 1998, the average age for marriage in Nigeria is 17 years of age and older. The study found strong positive correlation between respondent age group ($p=0.007$) and HPV vaccine intake in children. More than half (57.9%) of the respondents were Catholics. This can be attributed to the fact that this study was conducted in Imo state which is one of the five Igbo speaking states of south east Nigeria where Christianity is the prevalent religion.²¹ Traders and businesswomen make up 51% of the respondents. This is explained by Nigeria's high jobless rate. Approximately one-third (33.7%) of the respondents made between ₦10,000 and ₦20,000 monthly. The type of goods they sell and the state of the rural economies may be to blame for this.

The study found that the respondents knew relatively little about HPV. Approximately 63.0% lacked enough awareness about HPV and the HPV vaccine. A research of female teenagers in Ibadan South West, Nigeria, found that just 31.8% of respondents had excellent understanding of the HPV vaccine, which is comparable to this finding [22]. In contrast, a survey of medical and dentistry students at university of Benin, Nigeria, found that 41.2% of them knew a lot about HPV infection and infection prevention [23]. The respondents were medical students who may have attended lectures on HPV, which could explain their comparatively higher level of knowledge. The study found strong positive correlation between respondent knowledge ($p=0.036$) and HPV vaccine intake in children. Women in Umuna's lack of awareness about HPV infection are undoubtedly a significant setback that could compromise efforts to prevent HPV infection and cervical cancer in any community. This exemplifies the adage "you cannot give what you do not have." The positive feature of this research, however, is that it emphasizes the necessity of inclusive activities that target children, adolescents, young adults, and both males and females in order to raise awareness of HPV and cervical cancer.

The finding in this study is similar to that of a study conducted among female students in the university of Lagos Nigeria, where about 62% of the respondents did not know that HPV infection can cause cervical cancer, 47% of the respondents haven't heard about HPV infection, about two-third of the respondents (65.6%) did not know whether HPV infection cause cervical cancer and genital warts while 63.2% don't know if one can get an HPV

infection through hugging and kissing.²⁴ In our survey, 86.3% of respondents were unsure if the HPV vaccine effectively prevents anal and oropharyngeal cancer, and more than two-thirds (67.9%) were unaware that early immunization can prevent HPV infection. Their degree of education and exposure may be the cause of this. This study discovered a significant positive correlation between children's HPV vaccine intake and their greatest degree of schooling ($p=0.018$).

About three-quarter (73.5%) of the respondents don't know whether HPV vaccines have a better effect. This could be attributed to the poor level of HPV vaccine campaign in Nigeria. Most of the respondents (72.65%) don't know when HPV vaccine best taken, 68.8% of the respondents don't know if condoms effectively prevent HPV infection. These reflect the level of education and their knowledge of contraceptives uses. This poor knowledge is comparable to the 31.1% reported in a study among university students in Lagos, Nigeria [24]. And in others countries of the world like Ghana (17.9%) [25]. Eighty three percent of the respondents don't know if HPV vaccine is given free of charge in the hospital while (80.0%) of the respondents don't know if HPV vaccine can be given to boys. The low level of knowledge found in this study may be related to the little coverage that is given to HPV and sex education programs in Nigeria [26].

Despite the poor knowledge of HPV and its vaccine among the respondents, majority of them (43%) had positive attitude towards HPV infection and vaccine. This finding is similar to studies among mothers of adolescent in Nigeria, where 53.5% had positive attitude towards the uptake of HPV vaccine for their daughters and another study conducted among Ghanaian women which reported that 64% of the respondents were willing to vaccinate themselves or their daughters [25]. It revealed that (47.4%) of the respondents thinks that HPV infection is real, 47.3% of the respondents thinks that HPV vaccination is necessary for their child. High acceptance of HPV vaccination or high interest in obtaining HPV vaccines has been reported in recent studies in Italy and Honduras with >70% willingness of the majority of the adolescents and young women to recommend the vaccine to others or to accept it for themselves [27]. A study done among students in Berlin, Germany reported that 79% of the respondents had positive attitude to the uptake of HPV vaccine [28]. A systematic review in developing countries of South-East Asia Region reported the percentage of knowledge of availability of HPV vaccine to be varied from 7.8-97.5%, while the positive attitude ranged from 36.1-92.1% [29].

In this present study, 68.6% of the respondents think that both boy and girl children should take HPV vaccine, 66.7% of the respondents thinks that HPV vaccine will encourage children to have sex, 55.8% of the respondents thinks that HPV vaccine can harm children. This findings corroborates a similar finding from a study conducted among female students in Benin, Nigeria, where about 65.7% of the respondents think that both boy and girl children should take HPV vaccine, and another study done among female adolescents in Ibadan, where only about 61.1% thinks that HPV vaccine encouraged children to have sex [22,23]. Likewise, a study conducted among female medical students in a tertiary institute in India reported that only 6.8% of the respondents believed that HPV vaccine can harm children.³⁰ Forty-four

(44.9%) of the respondents thinks that Government should stop promoting HPV vaccine and (42.6%) of the respondents preferred not to give their teenage children neither condom nor vaccine. This could be attributed to their level of knowledge or rather the degree of their ignorance of HPV infection. The reason (36%) of the respondents had poor attitude in this study may be due to the fact that Nigerian government is just started to organize a subsidized vaccination program for HPV. On the contrary, similar studies conducted in some developed countries like Germany and the United States reported a considerable high good attitude of HPV vaccines of 53% and 62.4% respectively [31]. The higher good attitude of HPV vaccine seen in developed countries could be attributed to vaccination subsidy in such countries. In order to increase the HPV vaccination rate in Nigeria, the government may need to consider subsidizing the cost.

Striving for the program coverage and access to the HPV vaccine is very important to decrease the burden of cervical cancer. The study estimated the level of uptake of HPV vaccination at 11% which is below the targeted coverage of 80% required to eliminate common serotypes (i.e., 16 and 18) from targeted populations. Our result is consistent with results from a study which was conducted among 10th-grade students in Berlin, Germany, 2010 [5]. In this study, HPV-vaccine uptake was low. The finding was also consistent with a finding from a similar study in the Minakulu sub-county Oyam district, Uganda, in which the uptake was 12.4% [32]. However, this was extensively higher than the study conducted among female teachers in selected secondary schools in Ibadan, Nigeria (4.1%) and much lower than the finding of a study done in a developed country, in which the uptake level was much higher in Taiwan (91%) and in Scotland (94.4%) [22]. The difference between the finding and the previous study might be due to the vaccine accessibility; as this country are have better access coverage. They had also implemented routine HPV vaccination for all eligible girls/women.

Low uptake of HPV vaccines among students have also been reported in previous studies in Nigeria such as Lagos (2.6%) [24]. Benin City (3.7%) [23]. Ibadan (4.1%), and Port Harcourt (5.1%) [33]. In contrast, a much higher uptake was reported in developed countries like the United States of America (47.3%) [34]. And Germany (67.0%) [34]. Other factors that militate against HPV vaccine uptake in Nigeria as has been documented in previous reports include cost and availability of vaccines [35].

The low uptake of the HPV vaccine was attributed to inadequate training among health workers about the vaccines. Additionally, low uptake may also be attributed to the lack of Information, Education and Communication (IEC) materials on HPV vaccine in health facilities, schools and other communal places such as markets. These IEC materials are usually a way of communicating health related information to a vast majority of the population, this agrees with findings from one study which stressed the lack of education material on HPV vaccination given by health professionals to mothers as a barrier to vaccine uptake and emphasized the need to improve education about cervical cancer, prevention and HPV vaccination [36]. Majority (80.0%) of the respondents accepts that if a doctor or nurse recommends HPV vaccine, it will influence their willingness to vaccinate their child. Several studies have highlighted the need for health workers to be trained to provide adequate information about this vaccine. In many of these studies, health workers are the most preferred source of information and influence the decision to vaccinate [37,38]. Furthermore, receiving adequate information from a health care provider greatly improved uptake of the vaccine, this finding is

similar to other studies, where healthcare professionals impacted the choice for mothers to receive the HPV vaccine and these decisions were shaped by confidence in the vaccination program and healthcare providers. This may call for health workers to provide a brief discussion on the vaccine, its benefits and possible side effects prior to administration [36].

Additionally, the study also tried to investigate factors associated with HPV vaccine uptake. Accordingly, 63.7% of the respondents accepts that if a pastor, priest or imam recommends HPV vaccine, that it will influence their willingness to vaccinate their child, 49.3% of the respondents are willing to give or continue to give HPV vaccine to any of their children, 56.0% of the respondents are not sure if they are willing to encourage family and friends to give their children HPV vaccine, 46.3% of the respondents are not sure if they are willing to vaccinate their child if asked to pay for the HPV vaccine, 62.6% of the respondents accept that family and friends that vaccinated their children will influence their willingness to vaccinate theirs were all significantly associated with vaccine uptake. The result was in line with the qualitative result from a focused group discussion of a study from the Ibanda District of Uganda in which being exposed to information was associated with HPV vaccination [32]. This might be due to information that helps to cultivate the vaccine benefit. In addition to this, information helps to create a positive attitude toward the vaccine.

More than half of the respondents (51.0%) had good level of willingness to uptake HPV vaccine. A study in northern Nigeria revealed that more than 70% of women of child bearing age expressed willingness to accept HPV vaccine. Also, majority of mothers and caregivers in Nigeria were willing to have their daughters vaccinated against HPV infection.³⁶ This positive disposition expressed by both female students and mothers/caregivers is quite encouraging and it can be utilized to improve HPV vaccine uptake in the target population.

The study is without limitation as instrument that was used was self-reporting and interviewer-administered, therefore, it had an increased risk of reporting and interviewer biases. The risk of reporting bias was reduced by reassuring the respondents of their anonymity and confidentiality of responses. Interviewer bias was also a limitation. The risk of interviewer bias was reduced by adequately training the interviewers. The use of non-probability sampling techniques to select the participants for the study could limit the generalization of the findings. To minimally reduce this effect, the participants was selected randomly as they are encountered until the desired sample size was achieved.

Conclusions

We found out that the uptake of HPV vaccine was low. Factors found that was associated with HPV vaccine uptake included: attaining secondary school education, positive attitude towards the vaccine, influence of family and friends who have vaccinated their children, if the vaccine was recommended by a doctor or a nurse, recommendation of pastor, priest or imam. Other factors associated with uptake of HPV vaccine included; availability of vaccines and receiving full information about the vaccine. The respondent's knowledge of HPV and its vaccine was generally poor and the uptake of HPV vaccine was very low. Although there was good willingness to uptake HPV vaccine among the respondents.

Recommendation

- It is sad to note that more than a decade after the launch of HPV vaccine in Nigeria, it is yet to be made readily available

to the populace at a cost that they can afford. An intensive health promotion programme to raise awareness about the existence of HPV vaccines and its uptake coupled with readily available HPV vaccines will go a long way in the prevention of HPV infection and cervical cancer in Nigeria.

- Regular HPV vaccination schedules and sensitizations should be done to build positive attitudes towards the vaccine which have paramount importance to increasing the uptake.
- The Ministry of Health and implementing partners must aim at raising awareness about the HPV vaccine as a primary preventive mechanism against cervical cancer through various forms of media. In addition, the Government must nurture a public private partnership to include private health facilities in providing the HPV vaccine so as to increase coverage in areas that are mainly served by the private health services. The Ministry of Health must ensure that the expected target for coverage is communicated to all relevant stakeholders so that they work towards it and are capable of monitoring and evaluating their work.
- The Federal Government of Nigeria through the Federal Ministry of Health and the National Primary Health Care Development Agency should take urgent steps to incorporate HPV vaccine into the routine immunization schedule of the country in line with the WHO recommendation, so that young girls can be immunized against HPV infection for free. At worst, government should highly subsidize the HPV vaccine to drastically reduce the cost so that it is conveniently affordable to the huge population of low and no-income earners in the country. This will help to reduce the huge health resource that would have been expended on treatment of cervical cancer and its complications.
- Also, to minimize the effect of the limitations mentioned above scholars with similar interests are recommended to conduct a community-based study.

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