Original Research Article

KNOWLEDGE AND UPTAKE OF HUMAN ~~PAPILLOMAVIRUS~~PAPILLOMAVIRUS VACCINE AMONG FEMALE ADOLESCENTS IN PORT HARCOURT, NIGERIA. A CALL FOR URGENTINTERVENTION

ABSTRACT

Background: Human Papillomavirus (HPV) i~~I~~nfection with high-risk types~~ of the Human Papilloma virus (HPV)~~ has been associated with~~the~~ cancer development ~~of cancers~~ in both ~~females and males~~genders, affecting the genital, oropharyngeal and anal regions. Safe and effective vaccines are available against high-risk types~~ which are~~ responsible for most~~majority of~~cervical cancercases~~ of cervical cancer~~. Weconducted~~T~~this study ~~was conducted~~ to assess HPV vaccine~~the level of~~ knowledge and uptake ~~of the HPV vaccine~~among female adolescents in Port Harcourt, Nigeria.

Methodology:~~A descriptive cross-sectional survey~~ We conducted a descriptive cross-sectional survey among Port Harcourt metropolis aged 9 – 19female~~in school female~~ public and private secondary school students~~students of both public and private secondary schools in Port Harcourt metropolis, aged 9 – 19 years~~. Using multistage sampling,we recruited~~A total of~~ 328 participants~~ were recruited using multi-stage sampling~~ and socio-demographics, sexual history and information about HPVknowledge~~. Information on socio-demographics, sexual history, knowledge of HPV, its vaccine~~and ~~and~~ its vaccine uptake ~~werecollected~~ using a self-administered, semi-structured questionnaire.Using SPSS version 23,~~Data was analyz~~we analysed data~~ed using SPSS version 23~~. Descriptive and analytical tests we~~re~~ performed to determine associations and predictors of vaccine uptake.

Results: The ~~level of~~ knowledge of the availability, protective role, and HPV vaccine administrationschedule ~~for administration of the HPV vaccine~~ was poor (≤36%). Only 2.1% of the girls interviewed were vaccinated,~~with~~ and42.9% ~~of these~~ had~~ving~~taken only one dose. T~~,~~ thus their~~being~~vaccination was ~~incompletely~~incomplete~~ vaccinated~~.The mean age at vaccine uptake was 13.4±1.2 years. The most common reason ~~given~~ for not ~~having~~ taking~~en~~ the vaccine~~,is~~ wasunawareness ~~of the vaccine~~(322/328). Vaccine u~~U~~ptake ~~of the vaccine~~ was better among public schoolstudents~~ at public schools~~.

Conclusion: Social mobili~~z~~sation towards HPV infection primary prevention ~~of HPV infection~~ should also focus on adolescents. Social media and school health programmes/clubs should be exploited~~/~~ and improved to provide detailed and adolescent-friendly information ~~necessary~~ to stimulate improved vaccineuptake~~ of the vaccine~~ and ~~thus~~ reduce HPVinfection's~~the~~devastating potential consequences ~~of infection with the HPV~~.

*Keywords:*adolescents,cervical cancer,Human ~~P~~Papillomavirus~~V~~,Nigeria,Port Harcourt,Vaccine~~, Cervical cancer, Adolescents, Port Harcourt, Nigeria~~.

Comment [DO1]: -I consider the title too long and unnecessary to state where the research was carried out, as this is explicitly stated in the section on Materials and Methods. I suggest to the authors a shorter title such as "KNOWLEDGE AND UPTAKE OF HUMAN PAPILLOMAVIRUS VACCINE AMONG FEMALE ADOLESCENTS IN PORT HARCOURT. "

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1. INTRODUCTION

Human ~~Papilloma virus~~Papillomavirus (HPV) infection is the most common viral infection of the genital tract [~~(~~1, 2]~~)~~. It is widely documented that sexually active individuals~~about~~ three-quarters of ~~sexually active individuals of both the male and female gender,~~will get infected with ~~the~~ HPV at least once in their lifetime [~~(~~3]~~)~~.~~Reported~~Nigeria's prevalence rates ~~in Nigeria~~ range from 10% in Port Harcourt ~~([~~4]~~)~~, 18.6%~~ (3)~~ and 26.3% in Ibadan [3,5]~~, (5)~~ to 37% in Abuja [~~(~~6]~~)~~. ~~The~~ HPV infection sequelae ~~of HPV infection could~~ include cervical, vaginal, vulval, and anal cancer in females, anal and penile cancer in males and oropharyngeal carcinoma in~~ bothmales and females~~both genders. These lesions are, however, more common in immunocompromised persons~~. ([7,11,7])~~. ~~Therefore, apart from~~Some HPV infection reports indicate that ~~causing most cervical cancers which are the greatest public health concern associated with HPV infection, high-risk~~high-risk HPV types (HrHPV) are responsible for approximately~~account for about~~ 12% of oropharyngeal cancers, 90% of anal cancers and 50% of vulvar, vaginal, and penile cancers [~~(~~8,9]~~)~~. HPV-associated cancers~~The~~ incidence rates ~~of various HPV associated cancers~~ in females in 2021, according to the ICO/IARC, are 11.9 for cervical cancer, 0.37 for anal cancer, 0.91 for vulval cancer, 0.16 for vaginal cancer, 0.11 for oropharyngeal cancer, 0.53 for cancer of the oral cavity and 0.15 for laryngeal cancer [~~(~~10]~~)~~. Nigeria'sc~~C~~ervical cancer incidence ~~in Nigeria~~ is still unacceptably high even though there are ~~well documented~~well-documented, scientifically proven, effective, and accessible methods for its prevention. It is the second most frequent cancer among Nigerianwomen~~ in Nigeria~~, still more common among women between 15–44 years old~~being more common among women aged between 15 and 44 years~~. Recent estimates indicate that in Nigeria, 12,075 women are diagnosed with cervical cancer and 7,968 die ~~from the disease per year~~yearly[~~(~~1010]~~)~~.

For HPV infection and its sequelae~~the~~primary prevention~~of HPV infection and its sequelae~~, safe and effective HPV vaccines made fromvirus-like particles (VLPs) comprised of self-

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assembled pentamers of the viral L1 protein capsid have been developed since 2006 and were recommended for use by the ~~World Health Organization (~~WHO~~)~~ in 2009. All these vaccines confer immunity against the most common ~~high oncogenic~~high-oncogenic risk HPV types responsible for cancerous change [~~(~~11]~~)~~. There are three types ~~which are~~ approved for use. The bivalent vaccine (Cervarix®, manufactured by Merck, MSD, UK), approved for use in 2006, protects against HPV types 16 and 18; the quadrivalent vaccine (Gardasil®, manufactured by GlaxoSmithKline, Brentford UK) approved for use in 2009 protects against HPV types 6, 11, 16 and 18~~ and the~~. The nonavalent HPV vaccine (Gardasil®9, also manufactured by GlaxoSmithKline, Brentford UK),~~which was~~ approved for use in 2014,~~provides protection~~protects against an additional five most common carcinogenic HrHPV types; 31, 33, 45, 52 and 58. Cervarix® targets the L1 protein from HPV types 16 and 18; Gardasil® targets L1 from HPV types 16, 18, 6 and 11, while Gardasil®9 an adjuvanted non-infectious recombinant 9-valent vaccine, targets L1 from 16, 18, 31, 33, 45, 52, 58, 6 and 11. These vaccines all induce HPV type-specific L1 antibodies which block the virus from interacting with its specific receptors at the epithelial cells and thereby provide humoral immunity against HPV infections in ~~females who are~~ HPV-negative females[~~7~~7,~~(~~11~~11~~–, ~~7,12,~~ 13].~~)~~

WHO's recommendation regarding HPV prevention is that the primary targets be all girls and boys aged 9~~–~~–15 years; however,it encourages vaccination in all persons through age twenty-six years if they have not been vaccinated~~ before~~. Though approved through forty-five ~~(45)~~ years of age in some countries, such as the United States of America, it is best before the onset of sexual intercourse~~,~~ because vaccination after exposure doesn~~'~~ot offer any added protection against the already contracted virus type. Those aged 9 ~~–to~~ 14 years at the first ~~time of the first~~ dose should ~~employ~~ usea two~~2~~-dose schedule at ~~(~~0 and ~~,~~6 months~~)~~, while a three~~3~~-dose plan at~~schedule (~~0, 1–2 and~~,~~ 6 months~~) is~~ are recommended by ≥ ~~for those~~ 15 years~~ or older (up to through~~ 26 years,~~)~~ as well as for immunocompromised~~ persons [~~(14,15]~~)~~. The effectiveness of these three~~ (3)~~ vaccines at

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protecting females against cervical intra-epithelial lesions (CIN) caused by infection with HPV types covered by the vaccines ~~have~~ hasbeen widely reported. ~~and~~ HPV vaccination has also been shown to provide herd protection ~~been shown to provide herd protection as well~~[~~(~~16,17]~~)~~. It is also very reassuring to note that reports of cross-reactivity of vaccine types not contained in the bivalent and quadrivalent vaccines (Cervarix® and Gardasil®) with other high oncogenic risk types not covered by these vaccines do occur, thus offering further protection to vaccinated females (18~~–, 19,~~20).

Most secondary school students lie within the recommended age for vaccination; therefore, it is pertinent that these students are aware of and are fully vaccinated~~,~~to prevent cervical cancer later in life if they get exposed. The median age at the sexual debut of Nigerian women is reported as 16.7 ~~–~~ 17.9 years which is within the age of adolescence [~~(~~10~~10~~]~~)~~, and young women~~,~~ below 25 years~~ of age~~ have been observed to have the highest rates of HPV infection [~~(~~21]~~)~~. It is estimated that if 90% of adolescent girls get the HPV vaccine globally, over 40 million lives could be saved in the next century [~~(~~22]~~)~~. In a studyof Americanwomen, ~~in the United States of America,~~ 25% of persons aged between ~~fourteen (14) and nineteen (19)~~14 –19 years were ~~found to be~~ positive for HPV [~~(~~23]~~)~~. Early vaccination is ~~therefore~~ paramount to prevent HPV infection~~,~~ as a proxy for cervical cancer prevention.HPV infection p~~P~~revention ~~of HPV infection~~ is more effective and efficient because ~~the~~ HPV infectiontreatment ~~of HPV infection~~ is fraught with ~~a lot of~~many challenges as there is no treatment for the viral infection itself [~~(~~24~~)~~]. T~~and t~~reatment modalities for the diseases caused by the virus have been associated with poor outcomes~~,~~ and~~s well as~~ recurrence [~~(~~25~~)~~].

~~The~~ HPV vaccination introduction and sustenance ~~of HPV vaccination~~ in ~~various~~ severalcountries~~across the worl~~have~~d,has~~ led to a significant decline in cervical cancer ~~the~~ incidence rates ~~of cervical cancer~~ [~~(~~26~~)~~]; however, it is currently not a component of the

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Nigerian N~~n~~ational I~~i~~mmuni~~s~~zation P~~p~~rogramme. These ~~HPV~~ vaccines are available in Nigeria but ~~unfortunately~~ are neither given free nor subsidized by the government because it is not part of the n~~N~~ational i~~I~~mmuni~~s~~zation p~~P~~rogramme. The bivalent vaccine, which is the most commonly available, costs ~~≈about~~~~₦~~30,000~~costs about thirty thousand naira~~($70) per girl who is 9 ~~–~~ 15 years ~~of age~~ or ~~≈~~~~₦~~45,000~~forty-five thousand naira~~ ($105) per girl who is above 15 years~~of age,~~ to be fully vaccinated. This vaccine is outrightly unaffordable by most in the lower and middle class, ~~and~~ particularly ~~so for~~ those with multiple children in that age group. Among the population with higher socio-economic status who can afford the vaccines, their appreciation of the benefits would determine their decision on whether to procure these vaccines~~ therefore, their appreciation of the benefits would determine their decision on whether to procure these vaccines or not~~. Their knowledge of the impact, modes of transmission, and, most importantly, the means of preventing HPV infectionguidet~~T~~his decision. ~~is guided by their level of knowledge of the impact, modes of transmission, and most importantly, the means of preventionof HPV infection.~~

Over the years in Nigeria, ~~attempts at public enlightenment and increased vaccination coverage have been made by various~~ concerned parties~~,~~ from both the public and private sectorshave~~sector~~attempted public enlightenment and increased vaccination coverage. Many of these have ~~subsidized~~ screening and vaccination activities ~~given along with~~and health education programmes. The expected impact of these activities would include increased uptake of the HPV vaccines. ~~It is expected~~Likely,~~that~~ adolescents in senior secondary schools in urban settings such as the Port Harcourt metropolis should more likely be aware of and be~~en~~ vaccinated against cervical cancer than their rural counterparts. This study was designed to assess the knowledge of HPV vaccines and their uptake~~,~~ as a measure of the impact of such activities and thus guide future interventions against cervical cancer in Port Harcourt, Nigeria.

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2. MATERIAL AND METHODS

We conducted~~A~~ a cross-sectional descriptive study ~~carried out~~ in the Port Harcourt metropolis, Rivers State, ~~the~~a predominantly urban region ~~of Rivers State,~~ in the Nigeriasouth-south geopolitical zone~~ of Nigeria~~. The research~~It~~ was conducted among Port Harcourt metropolis aged between 9 – 17 year~~in school~~ female secondary school students~~ in Port Harcourt metropolis aged between 9 and 17 years~~. Port Harcourt metropolis is Nigeria's~~the~~ hub of oil and gas exploration activities. It, ~~in Nigeria and~~ therefore, harbours numerous industries operating in this sector as well as complimentary sectors including hospitality and therefore encourages indiscriminate social and sexual activities that allowsexual infection~~for~~ transmission~~of sexually transmitted infections~~. Transactional sex and multiple sexual partners are common occurrences. Most public enlightenment and educational activities tend to be concentrated here as well. Public schools are government-funded and tend to be over-subscribed, usually by students from families in the lower socio-economic class~~ of society~~. The reverse is the case for private-owned schools, which are moderately populated and enjoy better funding and management. Students at private schools are usually from upper-middle to upper-class families, and ~~and~~ are generally believed to have access to better educational content and opportunities.

Participants were selected using a multistage sampling technique. S~~Information on their s~~ocio-demographic ~~details~~variables such as age, HPV vaccine~~, including their age,~~knowledge~~ ofHPV vaccine~~ and respondents'~~the~~ vaccination status ~~of respondents~~ were collected using self-administered, structured questionnaires. Data ~~was~~ wereanalyzed using Statistical Package for Social Sciences version 23. Five questions were used to measure knowledge. Participants responded with "*Yes*," "*No*," or "*I do not know*" to these questions. The maximum total score ranged from 0–5, with a higher score indicating better knowledge about the vaccine. Participants'~~The~~ overall knowledgelevel~~ of knowledge ofparticipants~~ was categoris~~z~~ed using the modified Bloom's criteria~~(Seid & Hussen, 2018)~~.The ~~G~~good

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knowledge score was 4-5 (80% -100%), the moderate score was 2.5-3.9 (5050 -79%), and poor if the score was less than <2.5 (<50%).

Chi-square analysis was used to determine associations between their socio-demographic characteristics, school proprietorship and knowledge, as well as uptake of the vaccine. Bivariate logistical regression was used to determine HPV vaccine the predictors of HPV vaccine uptake for effect size (odds ratio) at a 95% confidence interval. A variable was considered significant if *Pp* ≤5%.

3. RESULTS AND DISCUSSION
3.1 RESULTS

Three hundred and twenty-eight (328) participants were interviewed. Their mean age was 13.8±0.1 years and the majority (63; (19.2%) were 13 yrsears old. Table 1 shows the study participant'socio-demographic characteristics of study participants.

Table 1.: Participant'Ssocio-demographic characteristics ofparticipants (N=328)

Variables	n (%)
Age (years)	
9	1 (0.3)
10	14 (4.3)
11	23 (7.0)
12	40 (12.2)
13	63 (19.2)
14	58 (17.7)
15	60 (18.3)
16	46 (14.0)
17	16 (4.9)
18	2 (0.6)
19	5 (1.5)
Religion	
Christian	321 (97.9)
Muslim	7 (2.1)
School Type	
Public	164 (50.0)
Private	164 (50.0)
Class	
JSS1	35 (10.7)

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Comment [DO9]: Three hundred and twenty-eight (328) participants were interviewed. Their mean age was 13.8 ± 0.1 years, and the majority, 63 (19.2%), was 13. Table 1 shows the study participants' socio-demographic characteristics.

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JSS2	40 (12.2)
JSS3	98 (29.9)
SS1	46 (14.0)
Fathers' educational level	
Primary	7 (2.1)
Secondary	103 (31.4)
Tertiary	218 (66.5)
Mothers'educational level	
Primary	13 (4.0)
Secondary	108 (32.9)
Tertiary	207 (63.1)

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Table 2 shows the HPV vaccines knowledgethe level of knowledge of HPV vaccines among the study participants. Correct responseshave been emboldened. TheMmajority did not have basic information about the availability, protective role, and vaccineadministration schedule for administration of the vaccine.

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Comment [DO12]: Table 2 shows the level of knowledge of HPV vaccines among the study participants. Correct responses have been emboldened. The majority did not have basic information about the availability, protective role, and vaccine administration schedule.

Table 2: Participants'kKnowledge of HPV vaccines among participants (N=328)

Questions	Yes n (%)	No n (%)	I dkKnow n (%)
There is a vaccine to protect one from HPV	**99(30.2)**	12(3.7)	217(66.2)
The HPV vaccine can protect one from most cervical cancers	**71(21.6)**	25(7.6))	232(70.7)
HPV vaccines are most effective if given to people who have never had sex	**26(7.9)**	10(3.2)	292(89)
The HPV vaccine requires two or three doses	**106(32.3)**	27(8.2)	195(59.5)
The HPV vaccine is available in Nigeria	**118(36)**	11(3.4)	199(60.7)

Figure 1 shows participants' scores on knowledge of HPV vaccine. Only 8.5% (28/328)had good knowledge of the vaccines.

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Figure 1~~:~~.Participants'k~~K~~nowledge of HPV vaccine ~~among Participants~~

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Table 3 shows the participants'distribution of HPV vaccine uptake among ~~participants~~. Few participants reported ~~to~~ have~~e~~ing taken the HPV vaccine 7(2.1%) and of this proportion, ~~some~~ 3(42.9%) said, ~~reported~~ having taken only one dose. The mean age at vaccine uptake was 13.4±1.2 years. The most common reason ~~given~~ for not ~~having taken~~taking the vaccine, ~~is~~ wasthat they didno~~'~~t know about it (322/328).

The question on reasons for non-uptake of the vaccine had the option of multiple answers (tick all that apply) thus the varied total proportions.

Table 3: HPV vaccine uptake among participants (N=328)

Variables	n (%)
I have taken HPV Vaccine	
Yes	7(2.1)
No	321(97.9)
If yes, Number of Doses taken	
One	3(42.9)
Two	2(28.6)
Three	2(28.6)
If No, Reason(s) why*	
I did~~n~~ not~~'t~~ know about it	322(98.2)
I didn~~'~~ot know where to get it	4(1.2)
It is too expensive	2(0.6)

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$Others	2(0.6)

$ Underage, Uninfected, Unnecessary

*The question on reasons for non-uptake of the vaccine had the option of multiple answers (tick all that apply) thus the varied total proportions

Table 4 shows participants' ~~the~~ association between ~~participants'~~ socio-demographic characteristics and HPV vaccine uptake. It ~~shows~~ offers~~that there was~~ a significant statistical association between religion and HPV vaccine uptake (X^2 = 5.057, ~~P~~p = .025).There was no statistically significant association between HPV vaccine uptake and school proprietorship.However, v~~V~~accine uptake and knowledge ~~was~~ were ~~however~~ better among public schools'students ~~at public schools~~ than private schools'students ~~at private schools~~, though the difference was not statistically significant.

Table 4: Association between socio-demographic characteristics and HPV vaccine uptake (N=328)

Variables	Vaccine uptake		X^2	p~~P~~-Value
	Yes n (%)	**No n (%)**		
Age (years)				
9		1(100)		
10		14(100)		
11		23(100)	4.135	0.941
12		40(100)		
13	1(1.6)	62(98.4)		
14	2(3.4)	56(96.6)		
15	2(3.3)	58(96.7)		
16	1(2.2)	45(97.8)		
17	1(6.3)	15(93.8)		
18		2(100)		
19		5(100)		
School				
Public	6(3.7)	158(96.3)	3.649	0.056
Private	1(0.6)	163(99.4)		
Religion				
Christian	6(3.7)	315(98.1)	5.057	0.025*
Muslim	1(0.6)	6(85.7)		
Class			4.680	0.456
JSS1		35(100)		
JSS2		40(100)		
JSS3	4(4.1)	34(95.9)		
SS1		46(100)		
SS2	2(3)	64(97.0)		
SS3	1(2.3)	42(97.7)		

* Significant at p<~~0~~.05, X^2 Chi-square

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Table 5 shows the HPV vaccine predictors of ~~HPV vaccine~~ uptake among participants in a logistic regression analysis. It shows that awareness (heard) of HPV (OR: 0.14, ~~CI at~~ 95% CI: 0.03–0.76) was associated with HPV vaccine uptake. Those who had heard of HPV had ~~a~~ significantly 86% lower~~ed~~ odds of taking the vaccine than those who had never heard of HPV. It also shows that Christians were over ~~8~~ eighttimes more likely to take the HPV vaccine than Muslims though the association was not statistically significant.

Table 5: Predictors of HPV vaccine uptake

Variables	OR at 95%	~~CI at~~ 95%CI	*p*~~P~~-Value
Knowledge of HPV			
Poor			
Moderate	1.58	0.62–4.08	0.35
[1]Good	0.29	0.20–1.6	0.57
Religion			
Christian	8.75	0.91–84.35	0.06
[1]Muslim			
School			
Public	0.16	0.02–1.36	0.09
[1]Private			
Awareness of Ca Cervix			
Yes	0.49	0.11–2.23	0.36
[1]No			
Awareness of HPV			
Yes	0.14	0.03–0.76	0.02*
[1]No			
Class			
[1]JSS1			
JSS2	1.00	0.00	1
JSS3	0.00	0.00	0.998
SS1	0.00	0.00	0.998
SS2	0.00	0.00	0.998
SS3	0.00	0.00	0.998
Fathers' Education			
[1]Primary			
Secondary	0.35	0.08–1.57	0.17
Tertiary	0.00	0.00	0.999
Mothers' Education			
[1]Primary			
Secondary	0.00	0.00	0.998
Tertiary	0.00	0.00	0.999

*** Significant at ~~P~~*p*≤~~0~~.05, OR: Odds Ratio, CI: Confidence Interval, [1]: Reference**

3.2DISCUSSION

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The knowledgelevel ~~of knowledge~~ of our study participants on HPV vaccines, their protective effect, recommended mode of administration and availability in Nigeria was ~~quite~~ relativelypoor. ~~Not more than~~ Only a maximum of 36% were aware of this very pertinent information. This level of knowledge was less than a report of 64.3% awareness of HPV vaccines among undergraduate students in Port Harcourt, some of whom were adolescents[~~(~~27]~~)~~; however, just like in this study, only about 20% of those were aware of the recommended age for vaccination. ~~I believe that i~~In addition to the above finding, poor knowledge of the transmission dynamics of HPV and its association with cervical cancer, as reported from a similar study [~~(~~27~~27~~]~~)~~, contributes significantly~~is a major contributor~~ to poor vaccine uptake. It~~This~~ is because knowing that HPV infection may be asymptomatic for long periods before cancer development~~,~~ should motivate those who are financially capable of procuring the vaccine~~,~~ to do so, but that is not the case. ~~It will~~We were not ~~also be~~ surpris~~ing~~ed if vaccinated girls ~~are~~ wereunaware of their vaccination status and ~~of~~ HPV and cervical cancer-related information. ~~as t~~ They may not have been enlightened ~~on these~~ by healthcare providers who administered the vaccines~~,~~ because they are minors. Gualano *et al*.~~This~~also ~~was~~ reported this ~~byGualano *et al*.~~[~~,~~28], as fewer vaccinated girls reported ~~that they~~ receiving~~ed~~vaccine~~information~~information ~~about the vaccines~~ fromhealthcare professionals. In contrast, most~~while the majority~~had received it from their parents.~~(29).~~

HPV vaccine uptake was also extremely poor, with only 7(2.1%) girls ~~having been~~ vaccinated, among whom only 2(28.6%) were ~~completely~~ vaccinated entirely, which~~. This~~ is ~~quite~~ rather unfortunate considering cervical cancer cases ~~that~~ 99% ~~of cervical cancer cases~~ are associated with genital HPV infection [~~(~~33~~)~~] and sadly, the case in most parts of Nigeria and the developing world. Globally, in ~~at the time of~~ June 2020, only 55% (107/194) of WHO's Member ~~s~~States had commenced HPV vaccination. The Americas and Europe have led this move, with 85% and 77% of the countries in these regions ~~having~~ have ~~commenced~~ started vaccination. The United States, Australia, and Canada were the first countries to

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implement HPV vaccination as part of their national immuni~~z~~sation programmes ~~since~~ in 2006 and have been followed by many other countries [~~(~~30]~~)~~. Other low- and middle-income countries had lagged; however, a significant number commenced in 2019. ~~In the WHO AFRO region, o~~Only about 31% of countriesin the WHO AFRO regionhad ~~commenced~~ startedvaccination as part of their national immuni~~s~~zation programme[~~(~~26~~26)~~]. Globally, ~~in terms of~~regarding coverage (uptake of final dose), only about 15 ~~-~~–20% of girls in the target age had received at least one dose by mid-year 2020, which ~~. This~~ leaves a ~~large~~ significant girlsproportion ~~ofgirls~~ (~~abou~~≈~~t~~ 70%) who live in countriesthat ~~that~~ have not yet introduced HPV vaccination into their national immuni~~s~~zation schedules largely unvaccinated, among who~~m~~ are the majority ~~of the~~more density ~~most~~ populatedlous countries ~~in the world~~worldwide, including Nigeria [~~(~~26~~26)~~].The 90% HPV vaccination coverage target ~~for HPV vaccination~~ by 2030 set in the recently approved WHO/UNICEF Cervical Cancer Elimination Gglobal Sstrategy ~~for cervical cancer elimination as a public health problem~~ is not likely achievable in Nigeria if~~our~~ thecurrent situation persists.

Among our study participants, s~~S~~tudents of junior secondary school class 3 comprised the highest number of ~~vaccine~~vaccineses, while Christians were more likely vaccinated. Most of the unvaccinated reported unawareness of the vaccine~~,~~ as the reason. The HPV vaccine knowledgelack ~~of knowledge of the HPV vaccine~~ has been widely reported ~~to be~~as a ~~major~~ significantcontributor to poor ~~vaccine~~ uptake [29~~28~~,~~(~~31~~,~~32,28,33]~~)~~. To reverse this dangerous trend,~~All hands~~everyone must ~~be on deck~~take action ~~to reverse this dangerous trend~~, which requires~~. This calls for~~ urgent and sustained ~~action~~ effort ~~from~~ bylocal governments, state and national health authorities, school health programmescoordinators ~~of school health programs~~, non-governmental and community-based organi~~s~~zations, professional organi~~s~~zations, and indeed well-intentioned~~meaning~~ individuals to ~~give~~ devotetime, resources and, most importantly, to develop strategies~~ze~~ and implement effective interventions to improverates ~~geometrically~~exponentially ~~improve these indices~~. On

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the contrary, a study among teenage girls in Italy indicated that the main reasons for non-adherence to vaccination were the disagreement of the parents (45.3%) and the lack of evidence on efficacy (26.8%) [(29~~28~~)], reasons which may still be linked with poor knowledge.

A school-based approach to HPV vaccination may ~~greatly~~ significantlyimprove the Nigeriaindices~~in Nigeria~~. If school administrators champion~~ the~~HPV vaccination throughsocial marketing of ~~HPV vaccination through~~ their school health programme,~~;~~ enlighten the pupils'parents~~ of their pupils,~~ and bargain with vaccine suppliers to get the best deals for their students as a whole unit; ~~it~~ parents would be more ~~easily~~ readily~~bought~~ buy into it~~by parents~~, would be re-enforced by the pupils and lead to improved knowledge/awareness and thereby increased vaccine uptake. The school-based approach for vaccination and health promotion has been reported to have shown better efficacy than a facility-based approach [(26~~26~~])~~)~~. Among teenage girls who participated in a study in Italy, 71.8% indicated ~~that~~ it would be ~~useful~~ helpfulto discuss HPV, it~~'~~s transmission, clinical features, prevention, vaccination, and cervical cancer at school [(29~~28~~)].

Public school s~~S~~tudents~~ at public schools~~ had better vaccine uptake, as ~~more of those~~most ~~who were~~ vaccinated with at least one ~~dose of the~~ HPV vaccine were~~ also~~ from ~~the~~ public schools 6(85.7%). However,~~, though~~ the difference was not statistically significant.~~I~~ We~~would~~ attribute this observation to free vaccination campaigns/outreaches ~~that tend to~~ targeting public schools because their students are ~~believed~~ considerednto be from more ~~indigent~~disadvantaged families than ~~those in~~ private school~~s~~ students. Therefore, public school s~~S~~tudents~~ at public schools therefore~~ benefit more from free vaccines than their colleagues in private schools. HPVa~~A~~wareness ~~of HPV~~ (just having heard of HPV) is not enough, as more detailed information is necessary to achieve the behavioural changes ~~necessary~~ requiredto reduce HPV transmission and increase~~ the~~vaccineuptake~~ of its vaccine.~~ ~~This knowledge gap needs to be closed.~~

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Our study also shows that religion is ~~an important factor~~essential regarding HPV vaccination ~~as~~ . Christians were over ~~8~~ eighttimes more likely to take the HPV vaccine than Muslims. The predominantlyPort Harcourt metropolis Christian population ~~of Port Harcourt metropolis~~ may have contributed to this; however, it is widely reported ~~that~~that religion is a healthcare acceptance~~well-recognized~~ determinant ~~of healthcare acceptance~~well-recognized[~~(~~34,35],~~)~~ and so~~,~~ the approach to HPV vaccination campaigns among young girls and the general population must take into cognis~~z~~ance, possible language, cultural and religious barriers while designing ~~effective~~ adequate enlightenment and behavioural change communication materials. Religious settings could be exploited to disseminate HPV preventioninformation ~~on HPV prevention~~.

4. FINDINGS'IMPLICATIONS. ~~OF THE FINDINGS:~~ PROPOSED URGENT INTERVENTIONS

~~The formation of~~ Forming formidable cross-sectorial alliances and collaboration to ~~push~~ propelthe vaccination agenda, e.g., ~~between~~ among~~the~~ health workers, pharmaceuticals, women affairs, school proprietors and educationists, is urgently required. Vaccines could be procured and made available at subsidis~~z~~ed rates or offered at no cost to those who cannot afford ~~it~~them. School health clubs can be supported financially and with skilled ~~manpower~~ human resources to train peer educators who would, in turn, educate the entire student population.Social mobilization and advocacy at state and national levels~~,as a route~~ to improve HPV vaccine availability and affordability must be explored extensively by the M~~m~~inistries of Health and other stakeholders in the health sector. Social media drives showcasing vaccinated girls and women as models/influencers would significantly ~~go a long way to~~ raise awareness and increase vaccine uptake.

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5. CONCLUSION

The ~~level of~~ knowledge and uptake of the Human Papillomavirus vaccines ~~is~~aredeficient~~very poor~~. ~~The~~ An average Nigerian family,~~in the~~ middle or /lower class,~~would~~ couldnot be able to afford tovaccinate~~tionof multiple~~several children, given the status nation's~~our~~ current ~~realities in terms of the~~ cost and economic realities~~state of the nation;~~ ~~.~~therefore,t~~T~~he government must ~~therefore~~ rise to the challenge and include HPV vaccination ~~in the~~as part of the national immunis~~z~~ation schedule to help reduce HPV infection and ~~thereby,~~ the unacceptably cervical cancer incidence high ~~cervical cancer incidence~~ rate ~~in Nigeria~~. A school-based approach to HPV vaccination programmes~~, particularly~~ mainlyfocused on ~~upper~~ primary and ~~and~~ seniorsecondary schoolsis ~~quite~~ promising and ~~so~~ should be maximis~~z~~ed.

CONSENT

Written assent and informed consent were obtained from the participants and their parents/legal guardians, respectively. No personal identifiers of the participants were collected to ensure confidentiality.

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ETHICAL APPROVAL

Ethical approval (UPH/CEREMAD/REC/MM74/057) and permission were obtained from the state M~~m~~inistry of E~~e~~ducation ~~as well as~~andselected schools'authorities~~ of selected schools~~.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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