ISSN NO. 2320-5407

*Journal homepage: http://www.journalijar.com*

*INTERNATIONAL JOURNAL OF ADVANCED RESEARCH*

**RESEARCH ARTICLE**

# Knowledge and Acceptability of Human Papillomavirus (HPV) Vaccine among University Students in South West, Nigeria

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## *Manuscript Info*

***Manuscript History:***

Received: 15 September 2015
Final Accepted: 26 October 2015
Published Online: November 2015

***Key words:***

Acceptability, barriers, cervical cancer, HPV vaccine, University students

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## *Abstract*

**Background**

Availability of effective vaccine against cervical cancer is not synonymous with effective control program. Awareness and knowledge of the vaccine is pertinent to its uptake. It is important to identify possible barriers to successful HPV vaccination program among young people.

**Materials and Methods**

A cross-sectional study of 572 female students selected by probability sampling technique from two Universities in South West, Nigeria was carried with the use of self-administered questionnaire.

**Results**

The proportion of respondents who were able to correctly identify risk factors for cervical cancer ranged from 14.3% (increasing age) to 53.5% (Chlamydia infection). Less than 50% of the participants were found to be knowledgeable about all the knowledge themes except the preventable nature of cervical cancer of which 62.9% were knowledgeable. The commonest sources of information were health care providers and seminars (44.1% each). Three hundred and forty-six (60.5%) respondents were willing to receive the vaccine. Age, faculty, age at menarche, awareness of HPV infection and cervical cancer; and all the knowledge themes except the need for male vaccination shows statistically significant relationship with acceptability of HPV vaccine ($p < 0.05$). Possible barrier to successful implementation of HPV vaccination program among young people in Nigeria were also identified. Inadequate information was thought to be the major barrier (68.9%). The other barriers were cost (38.1%), worry about possible complications (15.0%) and vaccine efficacy (13.3%); and lack of parental consent for vaccination (12.9%).

**Conclusion**

Knowledge of HPV vaccine is poor but its acceptability is high. Successful HPV vaccination program will depend on innovative and multi-pronged campaign that addresses various misconceptions about the vaccine. Economic accessibility of the vaccines also needs to be enhanced.

# INTRODUCTION

Human Papillomavirus (HPV) infection is one of the commonest sexually transmitted infections in the world. It is strongly linked to cancers of the anogenital tract and their precursors among men and women (Vamos CA 2015). HPV is the primary cause of almost all invasive cervical cancers in the world (Walboomers JM 1999, Bosch FX 2002). In Nigeria about 40.43 million women who are aged 15 years and older are at risk of developing cervical cancer. Currently, it is estimated that about 14,550 women are diagnosed with cervical cancer and 9,659 die from the disease yearly. It ranks as the second commonest cancer among women in Nigeria. About 23.7% of women in the general population are thought to harbour cervical HPV infection at a given time (WHO/ICO 2010).

The development of safe and clinically effective vaccines against HPV opens up exciting new possibilities for the control of the infection; and for lowering of the rates of anogenital cancers especially cervical cancer (Pandey D 2012, Li J 2009). Vaccination against HPV could prevent an estimated annual 240,000 cervical cancer deaths among women in resource-poor settings (WHO 2007). Vaccination against cervical cancer is a relatively new concept. Hence, awareness and knowledge enhancement has important roles in the implementation of HPV vaccination programs. It important to understand that mere availability of effective vaccines is not synonymous with an effective prevention program (Pandey D 2012, Li J 2009).

Previous studies on the knowledge of HPV infection and vaccines; and acceptability of HPV vaccines among health care providers and the public have shown varied results (Makwe CC 2011, Jain N 2009, Dursun P 2009, Christian WJ 2009, Klug SJ 2008, Riedesel JM 2005, Daley MF 2006, Songthap A 2009, Kwan TT 2009, Jones M 2008) (Tozzi AE 2009). Majority of these studies are however from developed countries. A study among Nurses in Lagos, Nigeria, showed high level of awareness of HPV. The level of awareness of HPV vaccine was low and only a few of those who were aware knew that the vaccine could prevent cervical cancer (Makwe CC 2011).

It is critical that health workers are aware of HPV and its causal role in cancers. They should also have good knowledge about HPV vaccines. Health workers are often sought after as the first line of information and play a key role in disseminating information among a range of population (Pandey D 2012). They play important roles in immunization programs via education; advocacy and community mobilization, and by prescription and administration of vaccines. University students, clinical and non clinical, are at increased risk of acquisition of HPV infection and they are in the age group for which HPV vaccine is recommended. Besides, as future health workers, clinical students will become the source of information and major stakeholders in the success of HPV immunization programmes in the nearest future. Therefore, the awareness, and knowledge of HPV infection and the attitude toward HPV vaccines among University students is pertinent to the success of HPV immunization program. Their knowledge and attitude are crucial for promotion of HPV vaccination. Although a few studies examine the subject among medical students, we are not aware of any among population of general University students in Nigeria.

This study was based on the hypothesis that awareness programmes that address specific issues are pertinent to the successful implementation of HPV vaccination in Nigeria and other parts of sub-Saharan Africa.

The aim of this study was to assess awareness and knowledge of HPV infection and vaccines and to assess attitude toward these vaccines among students in Universities in south-west Nigeria. The findings may serve as a policy advocacy tool for HPV vaccine awareness programmes among young people.

## Materials and methods

### Study design and population

This cross-sectional, descriptive study was conducted in two Universities in south-west Nigeria; one each in Lagos and Ogun State between May 1, 2015 and June 30, 2015. One of the Universities is state-owned while the other is privately owned. The schools had some medically related faculties' namely clinical sciences, Public and Allied health, Basic Medical Sciences. They serve as referral centre for Lagos, Ogun State and their environs with a catchment population of more than 20 million people.

### Sample

The sample was drawn from the population of all duly registered female undergraduates for the 2014/2015 academic sessions. Sample size was calculated using the formula for finite population. The aim was to achieve results at 95% confidence interval, 80% power and a desired degree of accuracy of 0.05. This was based on an estimated proportion of 23.5% which was the proportion of nurses who were aware of HPV vaccine in Lagos, Nigeria (Makwe CC 2011). A sample size of 276 was derived. Six hundred and fifty female students were selected to take part in the study. Proportionate allocation was used to distribute the sample size between the Universities.

Systematic random sampling was used to select the sample from gender disaggregated list of the students obtained from the departments of student's affairs. All duly registered female students for the 2014/2015 academic sessions were included in the study. The only exclusion criterion was unwillingness to participate in the study.

**Data collection**

This was a questionnaire based survey. The questionnaire was hand delivered to participants by the investigators during working hours and was collected immediately after completion. The objectives and procedure of the study were explained to the students and their signed consents were obtained. They were anonymously given the questionnaire for self administration. After completion, participants were educated on the subject and encouraged to ask question which were answered by the investigators.

The study instrument consisted of a 40 item structured questionnaire with both open and closed ended questions. The questionnaire was adapted from similar studies investigating the knowledge of HPV and attitude towards HPV vaccine (Pandey D 2012, Makwe CC 2011). The questionnaire obtained information on respondents' socio-demographic characteristics, on awareness and knowledge of HPV infection and its complications; on awareness and attitude towards HPV vaccines, and its acceptability. The questionnaire was designed in English, which is the official language in Nigeria. Construct and content validity of the instrument was tested by review by three independent reproductive health specialists. There was 90% agreement on the questions and their wordings. The questionnaire was pretested among 60 female students at another University in Benin, south-south Nigeria. Face validity was thus established as the questions were found to be generally acceptable and the wordings well understood by the participants. A few adjustments needed to made and this was done accordingly. Cronbach alpha for the scale was 0.782.

**Measurement**

Fifteen items were used to assess 7 knowledge themes HPV vaccine. The themes were adapted from 8 of the themes in previous study (Pandey D 2012). Responses to the questions were scored 0 to 2. Reponses that were either totally wrong or considered to have negative effect were scored 0. When respondents admitted that they didn't know, they were scored 1 in the hope that the realization and acceptance that they didn't know would make them seek relevant knowledge. The correct responses were scored 2. The themes were:

1. Cause of cervical cancer; assessed by one item asking for the type of organism that is implicated in most cases of cervical cancer. Respondents with a score of 2 were regarded as knowledgeable.
2. Prevention of cervical cancer: assessed by two items asking if all cancers are preventable and if cervical cancer is preventable. Respondents with total score of 3 or more were regarded as knowledgeable.
3. Availability of vaccine: assessed by two items asking if vaccine against cervical cancer exists and if the vaccine is available in Nigeria. Respondents with total score of 3 or more were regarded as knowledgeable.
4. Target population for vaccination: assessed by two items asking about the age group and category of women with respect to sexual debut who are targets for vaccination. Respondents with total scores of 3 or more were regarded as knowledgeable.
5. Male vaccination: assessed by one item asking if males could also benefit from the vaccine. Respondents with a score of 2 were regarded as knowledgeable.
6. HPV Vaccination catch-up program: assessed by 3 items asking if sexually active girls can have the vaccine; if cervical screening is required before vaccinating them; and if women with HPV infection can receive the vaccine. Respondents with total scores of 4 or more were regarded as knowledgeable.
7. Vaccine Protection: Knowledge about protection offered by the vaccine was assessed with 4 items namely; vaccine efficacy, safety of having multiple sexual partner or having sex without using condoms and whether vaccinated women required cervical screening. Respondents with total scores of 6 or more were regarded as knowledgeable.

Acceptability of HPV vaccine was assessed by asking if the respondent were willing to receive the vaccine. Those who answered 'yes' were regarded to accept the vaccine, while those who answered 'no' or 'don't know' were regarded not to have accepted the vaccine. In order to explore for related factors, the respondents' characteristics were dichotomized.

**Data analysis**

Data entry and analysis was performed using SPSS software version 17. Data was checked for completeness and consistency. Data cleaning and editing also took place. Descriptive statistics were derived and data summarized as a mean or median for continuous variables and as a percentage for variables that were categorical. Comparisons of categorical variables were done with $\chi^2$-test. To measure internal consistency, reliability analysis was done. *P*-value <0.05 was considered to be statistically significant.

**Ethical consideration**

Ethical approval to conduct the study was obtained. The objective and procedure of the study was explained to the participants. The participants were free to decline or withdraw their participation at any stage during the interview. The participants were allowed to ask questions which were answered after questionnaire administration. Signed consent was obtained from each participant separately to avoid. Anonymity and confidentiality of the participants was thus guaranteed.

## Results

**Socio-demographic characteristics**

A total of 572 duly filled questionnaires were returned. This gave a response rate of 88%. Table 1 shows the socio-demographic characteristics of the respondents. About three-fifth (61.5%) of them were less than 20 years old. The mean age of the respondents was 19.35 years with a standard deviation of 2.32 years. The youngest and oldest respondents were aged 16 and 30 years respectively. The respondents were predominantly single (97.2%) and Christians (91.3%). About a quarter of them were in clinical faculties while the others were not. The mean age at menarche was 12.00 years with a standard deviation of 1.52 years and ranged from 9 to 18 years. About a third (31.8%) of the respondents had ever had sex. Among those who have ever had sex, 44% had more than one lifetime sexual partner. The mean number of lifetime sexual partner was 1.77 with a mean of 1.34 and ranged from 1 to 10 partners.

**Awareness and knowledge of cervical cancer**

Table 2 shows the awareness of respondents and their knowledge of risk factors for cervical cancer. While about three quarters were aware of cervical cancer, only about half of the respondents had ever heard of HPV infection. The proportion of respondents who were able to correctly identify risk factors for cervical cancer ranged from 14.3% (increasing age) to 53.5% (Chlamydia infection). About half (48.3% of the respondents were able to associate HPV infection with cervical cancer. The respondents' knowledge of risk factors was generally poor.

**Knowledge about HPV vaccines**

Table 3 shows the respondents' knowledge of HPV vaccine themes and also compares knowledge of students in medical faculties with those who were not. Respondents were least knowledgeable about the fact that males could also receive HPV vaccines (17.5%), whereas, 62.9% were aware of the preventable nature of cervical cancer. Less than 50% of the participants were found to be knowledgeable about all the other knowledge themes. Statistically significant difference exist in all the knowledge themes except for knowledge of target population for HPV vaccination between students in medically oriented faculties and those who were not ($p < 0.05$). More medical students were more knowledgeable about the themes where statistical significance was demonstrated except in the knowledge that males could also be vaccinated against HPV. About one fifth (19.4%) of the non medical students, and 11.6% of medical students know that men could be vaccinated against HPV ($p = 0.037$).

**Sources of information**

Figure 4 is a bar chart showing the sources of information about cervical cancer and HPV vaccine among the respondents. The commonest sources of information were health care providers and seminars (44.1% each). Other sources were television (41.6%), books (39.5%), the internet (32.2%) and newspapers (29.7%).

**Acceptability of HPV vaccine**

Table 4 shows the relationship between respondents' characteristics and willingness to accept HPV vaccine. Three hundred and forty six (60.5%) respondents were willing to receive the vaccine while 226 (39.5%) were not. Age, faculty, age at menarche, awareness of HPV infection and cervical cancer; and all the knowledge themes except the need for male vaccination shows statistically significant relationship with acceptance of HPV vaccine ($p < 0.05$). A higher proportion of respondents less than 20 years, in medically related faculty, who attained menarche at 12 years and above, had heard about HPV infection and cervical cancer accepted HPV vaccine compared with those who were 20 year and above, in non medical faculties, attained menarche at less than 12 years and had not heard about HPV infection and cervical cancer. A higher proportion of respondents who were knowledgeable about the various knowledge themes of HPV vaccine accepted HPV vaccine compared to those who were not knowledgeable.

**Barriers to the implementation of HPV vaccination program**

Figure 2 shows the perception of the respondents about the possible barrier to successful implementation of HPV vaccination program among young people in Nigeria. Inadequate information was thought to be the major barrier (68.9%). The other barriers were cost (38.1%), worry about possible complications (15.0%) and vaccine efficacy (13.3%); and lack of parental consent for vaccination (12.9%).

**Table 1:** Socio-demographic characteristics (n = 572)

| Participant characteristics | Number | Percent |
|---|---|---|

| | | |
|---|---|---|
| **Age distribution (years)** | | |
| 16–19 | 352 | 61.5 |
| 20–23 | 194 | 33.9 |
| ≥ 24 | 26 | 4.5 |
| **Faculty** | | |
| Clinical | 138 | 24.1 |
| Non clinical | 434 | 75.9 |
| **Marital status** | | |
| Single | 556 | 97.2 |
| Married | 16 | 2.8 |
| **Religion** | | |
| Christian | 522 | 91.3 |
| Muslim | 42 | 7.3 |
| Others | 8 | 1.4 |
| **Residence** | | |
| Urban | 496 | 86.7 |
| Rural | 76 | 13.3 |
| **Age at menarche (in years)** | | |
| 9-11 | 224 | 39.2 |
| 12-14 | 314 | 54.9 |
| 15 and above | 34 | 5.9 |
| **Ever had Sex** | | |
| Yes | 182 | 31.8 |
| No | 390 | 68.2 |
| **Number of lifetime sexual partner*** | | |
| 1 | 102 | 56.0 |
| 2 | 54 | 29.7 |
| 3 | 12 | 6.6 |
| ≥ 4 | 14 | 7.7 |

**Table 2:** Awareness and knowledge of cervical cancer (n = 572)

| **Awareness** | **Yes** | |
|---|---|---|
| | **n** | **%** |
| Ever heard of cervical cancer? | 430 | 75.2 |
| Ever heard of HPV infection? | 312 | 54.5 |
| **Knowledge of risk factors for cervical cancer** | **Correct response** | |
| | **n** | **%** |
| Cervical cancer is common among Nigerian women | 306 | 53.5 |
| Increased in those with previous family history | 158 | 27.6 |
| Increases with age | 82 | 14.3 |
| Early sexual debut increases risk | 178 | 31.1 |

| | | |
|---|---|---|
| Risk increased in those with multiple sexual partners | 270 | 47.2 |
| Risk increases with multiparity | 122 | 22.7 |
| Associated with HPV infection | 276 | 48.3 |
| Risk increased by cigarette smoking | 162 | 28.3 |
| Increased risk in immune-compromised | 298 | 52.1 |
| Long term use of oral contraceptive pills increases risk | 238 | 41.6 |
| Chlamydia infection increases risk | 306 | 53.5 |
| Increased risk is associated with uncircumcised male partners | 130 | 22.7 |

**Table 3:** Knowledge about HPV vaccines (n = 572)

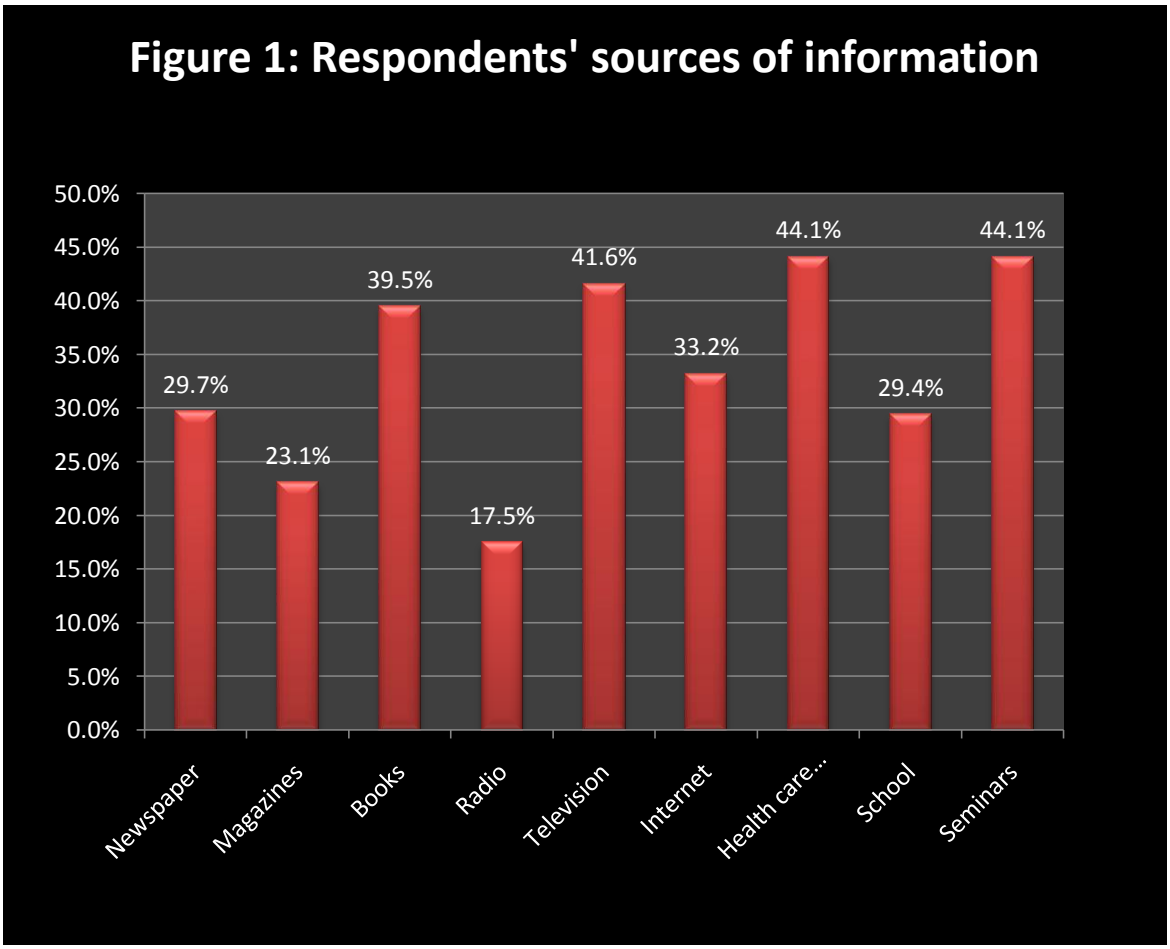
| Knowledge themes | Knowledgeable | | | |
|---|---|---|---|---|
| | Total | Clinical students | Non clinical students | p value |
| | n (%) | n (%) | n (%) | |
| 1. Cause of cervical cancer | 266 (46.5) | 88 (63.8) | 178 (41.0) | 0.000* |
| 2. Prevention of cervical cancer | 360 (62.9) | 100 (72.5) | 260 (59.9) | 0.008* |
| 3. Availability of vaccine | 219 (38.3) | 69 (50.0) | 150 (34.6) | 0.001* |
| 4. Target population for vaccination | 210 (36.7) | 44 (31.9) | 166 (38.2) | 0.177 |
| 5. Male vaccination | 100 (17.5) | 16 (11.6) | 84 (19.4) | 0.037* |
| 6. HPV vaccination catch up program | 184 (32.2) | 66 (47.8) | 118 (27.2) | 0.000* |
| 7. Vaccine protection | 192 (33.6) | 56 (40.6) | 136 (31.3) | 0.045* |

**Table 4: Acceptability of HPV vaccine**

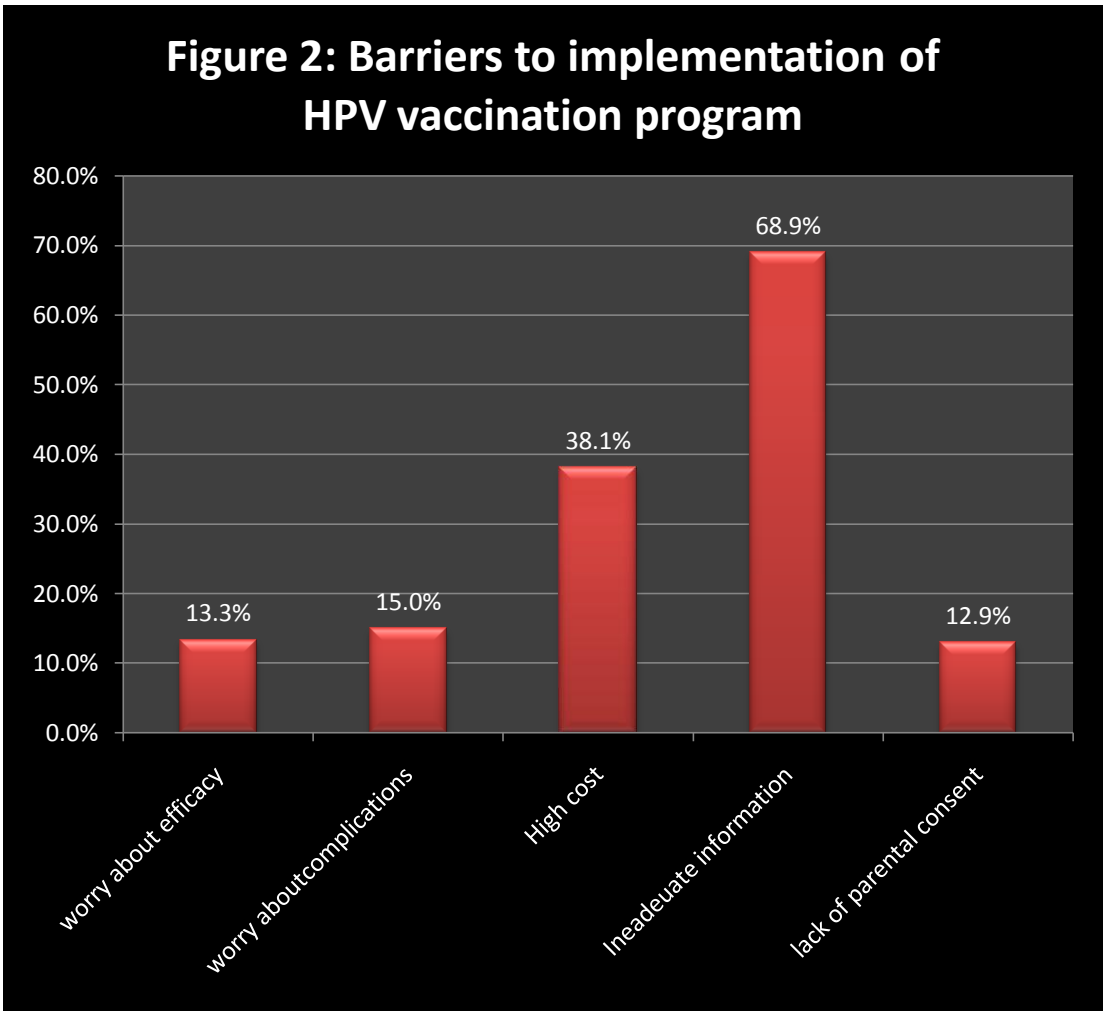
| **Characteristics** | **Willingness to receive HPV vaccine** | | $\chi^2$**-Test** | ***P*-value** |
|---|---|---|---|---|
| | **Yes** | **No** | | |
| | **n = 346 (60.5%)** | **n = 226 (39.5%)** | | |
| **Socio-demographic** | | | | |
| **Age distribution (years)** | | | | |
| < 20 | 228 (64.8) | 124 (35.2) | 7.025 | 0.08* |
| 20 and above | 118 (53.6) | 102 (46.4) | | |
| **Faculty** | | | | |
| Clinical | 98 (71.0) | 40 (29.0) | 8.430 | 0.04* |
| Non clinical | 248 (57.1) | 186 (42.9) | | |
| **Marital status** | | | | |
| Single | 336 (60.4) | 220 (39.6) | 0.028 | 0.867 |
| Married | 10 (62.5) | 6 (37.5) | | |
| **Religion** | | | | |
| Christian | 316 (60.5) | 206 (39.5) | 0.005 | 0.941 |
| Others | 30 (60.0) | 20 (40.0) | | |
| **Residence** | | | | |
| Urban | 302 (60.9) | 194 (39.1) | 0.247 | 0.619 |

| | | | | |
|---|---|---|---|---|
| Rural | 44 (57.9) | 32 (42.1) | | |
| **Age at menarche (in years)** | | | | |
| < 12 | 120 (53.6) | 104 (46.4) | 7.373 | 0.007* |
| 12 and above | 226 (64.9) | 122 (35.1) | | |
| **Ever had Sex** | | | | |
| Yes | 116 (63.7) | 66 (36.3) | 1.177 | 0.278 |
| No | 230 (59.0) | 160 (41.0) | | |
| **Number of lifetime sexual partners[a]** | | | | |
| 1 | 60 (58.8) | 42 (41.2) | 2.423 | 0.120 |
| more than one | 56 (70.0) | 24 (30.0) | | |
| **Awareness of cervical cancer** | | | | |
| **Ever heard of HPV infection?** | | | | |
| Yes | 222 (71.2) | 90 (28.8) | 32.663 | 0.000* |
| No | 124 (47.7) | 136 (52.3) | | |
| **Ever heard of cervical cancer?** | | | | |
| Yes | 296 (68.8) | 134 (31.2) | 50.503 | 0.000* |
| No | 50 (35.2) | 92 (64.8) | | |
| **Knowledge of HPV vaccine** | | | | |
| **Cause of cervical cancer** | | | | |
| Knowledgeable | 188 (70.7) | 78 (29.3) | 21.591 | 0.000* |
| Not knowledgeable | 158 (51.6) | 148 (48.4) | | |
| **Prevention of cervical cancer** | | | | |
| Knowledgeable | 270 (75.0) | 90 (25.0) | 85.573 | 0.000* |
| Not knowledgeable | 76 (35.8) | 136 (64.2) | | |
| **Availability of vaccine** | | | | |
| Knowledgeable | 164 (74.9) | 55 (25.1) | 30.773 | 0.000* |
| Not knowledgeable | 182 (51.6) | 171 (48.4) | | |
| **Target population for vaccination** | | | | |
| Knowledgeable | 144 (68.6%) | 66 (31.4) | 9.069 | 0.003* |
| Not knowledgeable | 202 (55.8) | 160 (44.2) | | |
| **Male vaccination** | | | | |
| Knowledgeable | 66 (66.0) | 34 (34.0) | 1.540 | 0.215 |
| Not knowledgeable | 280 (59.3) | 192 (40.7) | | |
| **HPV vaccination catch up program** | | | | |
| Knowledgeable | 132 (71.7) | 52 (28.3) | 14.364 | 0.000* |
| Not knowledgeable | 214 (55.2) | 174 (44.8) | | |
| **Vaccine protection** | | | | |
| Knowledgeable | 142 (74.0) | 50 (26.0) | 21.937 | 0.000* |
| Not knowledgeable | 204 (53.7) | 176 (46.3) | | |

a only those who had ever had sex were included
*Statistically significant at p = 0.05




Respondents chose as many options as applied.




Respondents chose as many options as applied.

## Discussion

This study on the knowledge and acceptability of HPV vaccine in Nigeria was conducted among young, educated and somewhat sexually active population. To the best of our knowledge, this is the first study of this kind among University students in southern Nigeria. About three quarters of the students were aware of cervical cancer, while about half were aware of HPV infection. The knowledge of risk factors for cervical cancer is poor. Awareness and knowledge of the various themes around HPV vaccine was less than 50% except that about 70% of the students were aware of the preventable nature of cervical cancer. Although students in medical related disciplines had poor knowledge about HPV vaccine they were none the less more knowledgeable than those in other non-medically related faculties. About three out of every five students were willing to accept the vaccines. Students who were younger than 20 years, in medical faculties, aware of cervical cancer and HPV vaccine' and who attained menarche at the age of 12 years and above were more willing to accept the vaccine. Being knowledgeable was also related to willing to accept HPV vaccine.

The levels of awareness of HPV infection and cervical cancer in this study are high considering that similar levels of awareness were found among different health professionals (Makwe CC 2011, Christian WJ 2009, Jones M 2008, Tozzi AE 2009). However, it is expected that our findings will be higher than what obtains in the general young female population in Nigeria because our sample is highly educated relative to the general population. Lower levels of awareness has been reported in general population of women in Nigeria, Tunisia and China (Jain N 2009, Kwan TT 2009, Abiodun OA 2013) while Higher levels of awareness was reported in the USA (Dursun P 2009). A systematic review of 39 studies involving a total of 19,986 participants showed that the levels of awareness of HPV infection varied from 13% to 95% (Klug SJ 2008). Contrary to the high levels of awareness found in our study, the

knowledge of risk factors for cervical cancer is quite low. Poor overall general knowledge of women about HPV and cervical cancer has been consistently found to be low among different population groups (Klug SJ 2008, Perlman S 2014).

The poor knowledge about HPV vaccine in our study agrees with findings from other studies. In a study of Nigerian Nurses, only 25% were aware of the vaccine while adult women in China were found to have grossly inadequate knowledge (Makwe CC 2011, Kwan TT 2009). HPV vaccination is a relatively new concept in Nigeria. However, acceptability of the vaccine is high. High HPV vaccine acceptability rates have also been found among Nigerian Nurses, Tunisian women, Chinese women, Italian mothers and American Gynaecologists (Makwe CC 2011, Jain N 2009, Christian WJ 2009, Daley MF 2006, Jones M 2008, Tozzi AE 2009). The high level of acceptability in the light of poor knowledge about HPV vaccine creates window of opportunity for well coordinated, multi-faceted and innovative awareness and enlightenment campaigns. It is especially important to upgrade the curriculum of medical faculties in order to boost the knowledge of would be health workers who will soon be in the position to create awareness about and offer the vaccines to the public. School based strategies must be emphasized as this has proved to result in 71.6% to 93.2% vaccine uptake in Rwanda, South Africa, Tanzania and Uganda (W. C. Binagwaho A 2012, LaMontagne DS 2011). This should also be supported by health facility and community based strategies. It has been demonstrated that educational interventions have positive effect on immunization related practices (Gonik B 2001). Such educational interventions that are targeted at young people have a definitive role in promoting vaccine acceptance. Sensitization campaigns are veritable strategies for addressing various concerns that have led to rejection of HV vaccination programs elsewhere (Perlman S 2014).

The introduction of the HPV vaccine though welcome, offers enormous challenges due to the low level of awareness and poor knowledge about cervical cancer, concerns about its safety and efficacy (Perlman S 2014, Anorlu 2008). Cameroon and Rwanda are typical examples of Sub-Saharan that have experienced immense difficulties due to some of these reasons while attempting to scale up HPV vaccination nationally (W. C. Binagwaho A 2011, Ouedraogo N 2011, Ebosse 2010). In fact, concerns about side effect engendered so much public distrust that HPV vaccination program had to be suspended in India and Japan (Gilmour S 2013, Larson HJ 2010). Nurses in Nigeria identified the fact that HPV vaccination would promote promiscuity as a possible barrier (Makwe CC 2011). Some Tanzanian teachers did not permit vaccination of students because of fear of negative feedback from parents (Watson-Jones D 2012). These factors have also been identified by our study as barriers to successful vaccination program among University students. In addition to these, our study also identifies cost as a possible barrier. This is not the case in many other countries in Sub Saharan Africa because of the support of the Global alliance for Vaccine Initiative (GAVI). The GAVI has two criteria for eligibility to receive support for HPV vaccination namely; achievement of 70% coverage of DPT3 vaccine and Pilot demonstration of vaccine delivery. While six Sub Saharan African countries have fully met the two criteria and therefore receive GAVI support; a systematic review of 13 countries showed 12 had met the DPT3 coverage criteria. Nigeria is the only country that had failed to meet the criteria. Indeed, Nigeria is yet to meet any of the two criteria (Perlman S 2014). The implication of this is that HPV vaccination is quite expensive costing more than 120 USD to fully one girl in a country where more than 70% of people live below the poverty line as opposed to 22.50 USD in GAVI supported countries (Youngblood 2013). This is especially important considering the facts that countries receiving the GAVI support are noted to have HPV high vaccination coverage compared to others (Perlman S 2014). Efforts at ensuring HPV vaccination may not be adequate if appropriate means of funding are not devised. The various challenges to achieving 70% DPT3 vaccine coverage needs to be tackled through continuous public education and vaccine advocacy in order to build trust and mitigate resistance (Machingaidze S 2013).

This study has some limitations which should be considered when interpreting the findings. It has a cross-sectional design; hence, causality cannot be established. Self-reported data is used therefore recall bias, self presentation and confidentiality concerns could affect the reliability and validity of the findings. In order to mitigate this, participants were assured full confidentiality and the survey was conducted in a private environment.

## Conclusion

Knowledge of HPV vaccine is poor but its acceptability is high. The barriers to successful HPV vaccination campaign include lack of information, worry about efficacy and safety, parental non consent and cost. Successful HPV vaccination will depend on multi-dimensional, innovative and widespread campaign that addresses various misconceptions about the vaccine. Appropriate strategies to facilitate the availability of vaccine at an affordable cost to the individuals, their family and the country at large should be devised and implemented.

## Author Contributions

OA conceived and designed the study, analyzed the data and wrote the manuscript. JS participated in the study design, data collection and analysis. FA participated in the study design, data collection and revision of the manuscript. OO participated in data collection, data entry and drafting of the manuscript. All authors have approved the final manuscript.

**Funding:** Authors have no support or funding to report.

**Competing interests:** Authors declare no competing interests.

## References

Abiodun OA, Fatungase OK, Olu-Abiodun OO, Idowu-Ajiboye BA, Awosile JO. "An assessment of women's awareness and knowledge about cervical cancer and screening and the barriers to cervical screening in Ogun State, Nigeria." *IOSR JDMS* 10, no. 3 (2013): 52-58.

Anorlu, RI. "Cervical cancer: the sub-Saharan African perspective." *Reprod Health Matters* 16 (2008): 41-49.

Binagwaho A, Wagner CM, Gatera M, Karema C, Nutt CT, Ngabo F. "Achieving high coverage in Rwanda's national human papillomavirus vaccination programme." *Bulletin of the World Health Organization.* 90 (2012): 623-628.

Binagwaho A, Wagner CM, Nutt CT. "HPV vaccine in Rwanda: different disease, same double standard." *The Lancet* 378 (2011): 1916.

Bosch FX, Lorincz A, Munoz N, Meijer CJ, Shah KV. "The causal relation between human papillomavirus and cervical cancer." *J Clin Pathol* 55, no. 4 (2002): 244-265.

Christian WJ, Christian A, Hopenhayn C. "Acceptance of the HPV vaccine for adolescent girls: analysis of state-added questions from the BRFSS." *J Adolesc Health* 44, no. 5 (2009): 437-445.

Daley MF, Liddon N, Crane LA, Beaty BL, Barrow J, Babbel C, Markowitz LE, Dunne EF, Stokley S, Dickinson LM, Berman S, Kempe A. "A national survey of paediatrician knowledge and attitudes regarding human papillomavirus vaccination." *Pediatrics* 118, no. 6 (2006): 2280-2289.

Dursun P, Altuntas B, Kuscu E, Ayhan A. "Women's knowledge about human papillomavirus and their acceptance of HPV vaccine." *Aust N Z J Obstet Gynaecol* 49, no. 2 (2009): 202-206.

Ebosse, Y. *Mama Fouda authorizes a vaccine that kills.* Yaounde: Le Soir Hebd, 2010.

Gilmour S, Kanda M, Kusumi E, Tanimoto T, Kami M, Shibuya K. "HPV vaccination programme in Japan." *The Lancet* 382 (2013): 768.

Gonik B, Jones T, Fasano N, Contreras D, Roberts C. "Vaccine-preventable diseases (VPD): improving the obstetrician/gynecologist's knowledge and immunication practice patterns." *American Journal of Obstetrics and Gynecology* 185 (2001): S162.

Jain N, Euler GL, Shefer A, Lu P, Yankey D, Markowitz L. "Human papillomavirus (HPV) awareness and vaccination initiation among women in the United States, National Immunization Survey-Adult 2007." *Prev Med* 48, no. 5 (2009): 426-431.

Jones M, Cook R. "Intent to receive an HPV vaccine among university men and women and implications for vaccine administration." *J Am Coll Health* 57, no. 1 (2008): 23-32.

Klug SJ, Hukelmann M, Blettner M. "Knowledge about infection with human papillomavirus: a systematic review." *Prev Med* 46, no. 2 (2008): 87-98.

Kwan TT, Chan KK, Yip AM, Tam KF, Cheung AN, Lo SS, Lee PW, Ngan HY. "Acceptability of human papillomavirus vaccination among Chinese women: concerns and implications." *BJOG* 116, no. 4 (2009): 501-510.

LaMontagne DS, Barge S, Thi Le N, Mugisha E, Penny ME, Gandhi S, Janmohamed A, Kumakech E, Mosqueira NR, Nguyen NQ, Paul P, Tang Y, Minh TH, Uttekar BP, Jumaan AOl. "Human papillomavirus vaccine delivery strategies that achieved high coverage in low-and middle-income countries." *Bulletin of the World Health Organization* 89 (2011): 821-830.

Larson HJ, Brocard P, Garnett G. "The India HPV-vaccine suspension." *The Lancet* 376 (2010): 572-573.

Li J, Li LK, Ma JF, Wei LH, Niyazi M, Li CQ, Xu AD, Wang JB, Liang H, Belinson J, Qiao YL. "Knowledge and attitudes about human papillomavirus (HPV) and HPV vaccines among women living in metropolitan and rural regions of China. Vaccine." *Vaccine* 27, no. 8 (2009): 1210-1215.

Machingaidze S, Wiysonge CS, Hussey GD. "Strengthening the Expanded Programme on Immunization in Africa: Looking beyond 2015." *PLoS medicine* 10 (2013): e1001405.

Makwe CC, Anorlu RI. "Knowledge of and attitude toward human Papillomavirus infection and vaccines among female nurses at a tertiary hospital in Nigeria." *Int J Women's Health* 3 (2011): 313-331.

Ouedraogo N, Müller O, Jahn A, Gerhardus A. "Human papillomavirus vaccination in Africa." *The Lancet* 315-316 (2011): 378.

Pandey D, Vanya V, Bhagat S, Vs B, Shetty J. "Awareness and attitude towards human papillomavirus (HPV) vaccine among medical students in a premier medical school in India." *PLoS One.* 7, no. 7 (2012): e40619.

Perlman S, Wamai RG, Bain PA, Welty T, Welty E, Ogembo JG. "Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review." *PloS one* 9, no. 3 (2014): e90912.

Riedesel JM, Rosenthal SL, Zimet GD, Bernstein DI, Huang B, Lan D, Kahn JA. "Attitudes about human papillomavirus vaccine among family physicians." *J Pediatr Adolesc Gynecol* 18, no. 6 (2005): 391-398.

Songthap A, Pitisuttithum P, Kaewkungwal J, Fungladda W, Bussaratid V, Koonsaeng S. "Knowledge, attitudes, and acceptability of a human papillomavirus vaccine among healthcare providers." *Southeast Asian J Trop Med Public Health* 40, no. 5 (2009): 1048-1056.

Tozzi AE, Rava L, Stat D, Pandolfi E, Marino MG, Ugazio AG. "Attitudes towards HPV immunization of Italian mothers of adolescent girls and potential role of health professionals in the immunization program." *Vaccine* 27, no. 19 (2009): 2625-2629.

Vamos CA, Calvo AE, Daley EM, Guiliano AR, Lopez Castillo H. "Knowledge, behavioural, and socio-cultural factors related to human Papillomavirus infection and cervical cancer screening among inner-city women in Panama." *J Community Health. 2015 May 7*, 2015: [Epub ahead of print].

Walboomers JM, Jacobs MV, Manos MM, Bosch FX, Kummer JA, Shah KV, Snijders PJ, Peto J, Meijer CJ, Muñoz N. "Human papillomavirus is a necessary cause of invasive cervical cancer worldwide." *J.Pathol* 189, no. 1 (1999): 12-19.

Watson-Jones D, Baisley K, Ponsiano R, Lemme F, Remes P, Ross D, Kapiga S, Mayaud P, de Sanjosé S, Wight D, Changalucha J, Hayes R. "Human papillomavirus vaccination in Tanzanian schoolgirls: cluster-randomized trial comparing 2 vaccine-delivery strategies." *J Infect Dis* 206 (2012): 678-686.

WHO. *Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015.* Geneva: World Health Organization, 2007.

WHO/ICO. *Human Papillomavirus and Related Cancers in Nigeria. Summary Report.* Barcelona: WHO/ICO Information Centre on HPV and Cervical Cancer., 2010.

Youngblood, R. "GAVI injects new life into HPV vaccine rollout." *The Lancet* 381 (2013): 1688.