Introduction

With an estimated 570,000 cases and 311,000 deaths in 2018 worldwide, cervical cancer ranks as the fourth most frequently diagnosed cancer and the fourth leading cause of cancer death in women worldwide.[1] The highest regional incidences and mortality rates for cervical cancer are seen in Africa.[1]

In Nigeria, cervical cancer is the most common female reproductive tract cancer and is only second to breast cancer as the most common cancer in women the country.[2] In 2018, there were 14,983 new cases representing 21% of all female cancers and 10,403 died from the disease in the country.[2]

Cervical cancer is caused by human papillomavirus (HPV) and HPV 16 and 18 are the high-risk strains, which are responsible for over 70% of cervical cancer.[5,6] Besides cervical cancer, HPV can also lead to cancer of the vulvar, penis, anus and oropharynx as well as genital warts.[7]

Background and Aims: Human papillomavirus (HPV) vaccination is recommended for adolescent girls and would offer a long-term solution to cervical cancer especially in developing countries. However, parental perception and acceptance is a critical success factor. This study examined the degree of parental acceptance of HPV vaccination for adolescent secondary-school girls in Lagos, Nigeria.

Materials and Methods: A descriptive cross-sectional survey of adolescent girls’ parents was undertaken in two urban and two rural secondary schools in Lagos. Univariate and multivariate analysis were carried out using logistic regression to determine correlates of parental acceptance of HPV vaccine. Results: Of the 318 respondents, 45.9% had poor knowledge of cervical cancer and HPV infection, whereas 29.6% had good knowledge. Majority (54.7%) also had poor knowledge of HPV vaccine, whereas 26.7% had good knowledge. Most (72%) would vaccinate their daughters if vaccines were free, whereas only 35.5% would, if not free. Poor knowledge of cervical cancer and HPV infection significantly reduced the likelihood of vaccination even if free (adjusted odds ratio [OR] =0.48; 95% confidence interval [CI] =0.24–0.94; \( P = 0.0325 \)), whereas good knowledge of HPV vaccines (adjusted OR = 6.11; 95% CI = 1.37–27.34; \( P = 0.018 \)) and tertiary education in the mother (adjusted OR = 29.17; 95% CI = 3.98–214.08; \( P = 0.0009 \)) increased the likelihood, if not free. Conclusion: HPV vaccination was acceptable to most parents only if offered free. Poor knowledge of cervical cancer, HPV infection, and vaccine may hinder acceptability. It is recommended that HPV vaccination is offered free through the National Programme on Immunization in Nigeria.

Keywords: Adolescents, cervical cancer, human papillomavirus vaccine, Nigeria, parental acceptance
Approved HPV vaccines protect against cervical cancer and are recommended for adolescent girls before sexual debut. Three vaccines that prevent infection with diseases-causing are available: Cervarix, Gardasil, and Gardasil 9. All three vaccines prevent infection with HPV types 16 and 18. Gardasil also prevents infection with HPV types 6 and 11, which causes 90% of genital warts. Gardasil 9 prevents infection with the same four HPV types plus five additional cancer-causing types (31, 33, 45, 52, and 58) that together account for 10%–20% of cervical cancers. Developing countries that have high cervical rates yet lack comprehensive screening may benefit from the vaccines. In Nigeria, only Cervarix and Gardasil are available for the prevention of cervical cancer.

Decision about children's treatment and preventive health care are largely made by their parents. In a study examining perception of the HPV vaccination among female university students in Hong Kong, parents are noted to be decisive in preventing young women from receiving the vaccination.

Acceptance of childhood vaccination by parents is critical. Although HPV vaccination is acceptable to most people surveyed, most acceptability data have emanated from North America and Europe, which may not be applicable elsewhere. There is paucity of data regarding parental acceptance of HPV vaccination in developing countries.

Since the introduction of Cervarix and Gardasil in Nigeria in 2011, the federal government is yet to adopt a national strategy that will ensure equitable access to HPV vaccination. Few studies in the country have assessed parental willingness toward HPV vaccination. No published studies however have used a representative sample of parents from a whole state. This study was therefore carried out to determine factors affecting parental acceptance of HPV vaccination for adolescent secondary-school girls in Lagos State, Nigeria.

We hope that the information obtained will drive public health response most especially at the primary care facilities, which are usually the first facilities visited by patients in the formal health sector and are responsible for implementation of immunization programs in the country. The public health department works with primary care providers at the local government levels to ensure adequate access to vaccines and provision of qualitative preventive health-care services to the community.

Subjects and Methods

Design
This was a descriptive cross-sectional survey.

Study area
The study was carried out in Lagos State, Nigeria with an estimated population of 22,883,047 inhabitants in 2013. The state has 20 local government areas (LGAs) or zones, 12 of which are urban and 8 rural. The state has 328 public junior secondary schools and 313 public senior secondary schools as at 2013 and these and these are fairly evenly distributed across the local governments. The state also has many privately owned junior and senior secondary schools.

Sampling technique
The list of all secondary schools in Lagos State was obtained from the ministry of education. The 20 LGAs were divided into the urban group and the rural group. Two LGAs were then chosen from each group by simple random sampling (balloting). A school was then chosen from each of the four chosen LGAs by balloting. In total, two urban and two rural secondary schools were chosen.

Data collection
The instrument for data collection was a pretested questionnaire put together based on adaptation and literature review on the subject. The questionnaire included questions concerning the sociodemographic characteristics of the respondents, their knowledge of HPV, cervical cancer and HPV vaccines, and their willingness to vaccinate their daughters. The selected schools were visited during the parent–teachers association meetings. The purpose of the study was explained to the parents and those who gave their consent were given the questionnaire to study and fill.

After completing the questionnaire, the respondents were educated about cervical cancer, HPV infection, and its prevention by vaccination and the available vaccines. Confidentiality was maintained by not including their names in the questionnaire in order to elicit the correct responses. The questionnaires were retrieved on the same day.

Data processing and analysis
The authors appraised the responses and categorized the open-ended questions and answers. They were specifically assessed to determine their knowledge of cervical cancer, HPV infection, and HPV vaccination.

The data were entered into the computer and analyzed using the Epi-Info 3.5.3 statistical software of the Centre for Disease Control and Prevention, Atlanta, Georgia, USA to generate descriptive statistics. Crude odds ratio (cOR) and 95% confidence interval (CI) for hypothesized factors affecting willingness of parents to vaccinate their daughters were determined using logistic regression. Variables that were significant at P value <0.05 were then considered for the multivariate logistic regression mode to determine adjusted OR and independent factors determining willingness of parents to vaccinate their daughters.

Ethics
The Lagos State University Teaching Hospital Research and Ethics Committee gave approval for the study.
Results

The sociodemographic characteristics of the respondents are shown in Table 1. Of the 318 parents surveyed, 20.1% were males and 79.9% were females.

Parental knowledge of cervical cancer and HPV infection is depicted in Table 2. Approximately half (45.9%) had poor knowledge of cervical cancer and HPV infection, whereas 78 (24.5%) and 94 (29.6%) had fair and good knowledge, respectively.

Table 3 assesses the respondent’s knowledge of HPV vaccine. The majority (54.7%) had poor knowledge, whereas 18.6% and 26.7% had fair and good knowledge, respectively.

Two hundred and twenty-nine (72%) expressed willingness to vaccinate their daughters if the vaccine were free, whereas 89 (28%) will not vaccinate their daughters even if the vaccines were offered free.

Only 113 (35.5%) of the respondents were willing to vaccinate their daughters if the vaccine comes at a cost, whereas 205 (64.5%) were not willing.

Table 4 shows univariate analysis of the factors affecting willingness to vaccinate daughters if the vaccine is offered free. Gender of parents, age of parents, educational status of father, occupational status of father, and location of school were not significant factors affecting willingness to vaccinate if free. Tertiary level of education in mother (cOR = 8.31; 95% CI = 3.39–20.38; P = 0.0000), skilled occupational status in the mother (cOR = 8.99; 95% CI = 3.20–25.22; P = 0.0000), good knowledge of cervical cancer and HPV (cOR = 6.14; 95% CI = 2.18–17.27; P = 0.0006) and good knowledge of HPV vaccine (cOR = 3.80; 95% CI = 1.44–10.02; P = 0.0070) significantly increased the likelihood to vaccinate if offered free. Poor Knowledge of cervical cancer and HPV (cOR = 0.44; 95% CI = 0.24–0.81; P = 0.0081) reduced the likelihood if offered free.

Table 5 shows the univariate analysis of factors affecting willingness to vaccinate daughters if vaccine is not free. Tertiary level of education in the mother (cOR = 67.41; 95% CI = 15.25–297.97; P = 0.0000), skilled occupation in the mother (cOR = 11.55; 95% CI = 5.55–24.04; P = 0.0000), skilled occupation in the father (cOR = 4.10; 95% CI = 2.31–7.28; P = 0.0000), Urban setting (cOR = 4.48; 95% CI = 2.73–7.37; P = 0.0000), good knowledge of cervical cancer and HPV (cOR = 19.82; 95% CI = 8.99–43.70; P = 0.0000) and good knowledge of HPV vaccine (cOR = 20.31; 95% CI = 7.18–57.2; P = 0.0000) increased the likelihood for vaccination. Factors that decreased the likelihood of vaccination if the vaccine is not free are poor knowledge of cervical cancer and HPV (cOR = 0.24; 95% CI = 0.11–0.53; P = 0.0000) and poor knowledge of the HPV vaccine (cOR = 0.05; 95% CI = 0.02–1.13; P = 0.0000). After entering the factors significant at a P value of <0.05 into a multiple logistic regression model for multivariate analysis [Table 6], the only factor that remained that remained significant as an independent determinant of willingness to vaccinate when vaccine is free is poor knowledge of cervical cancer and HPV.

### Table 1: Demographic characteristics of respondents

| Characteristics          | Frequency | Percentage |
|--------------------------|-----------|------------|
| Gender of parents        |           |            |
| Female                   | 254       | 79.1       |
| Male                     | 64        | 20.1       |
| Age of parents in years  |           |            |
| 30-39                    | 242       | 76.1       |
| 40-49                    | 57        | 17.9       |
| 50-59                    | 19        | 6.0        |
| Educational status of mother |       |            |
| None                     | 37        | 11.6       |
| Primary                  | 51        | 16.0       |
| Secondary                | 99        | 31.1       |
| Tertiary                 | 131       | 41.2       |
| Educational status of father |       |            |
| None                     | 4         | 1.3        |
| Primary                  | 14        | 4.1        |
| Secondary                | 133       | 42.9       |
| Tertiary                 | 151       | 48.7       |
| Occupational status of mother |       |            |
| Skilled                  | 101       | 31.8       |
| Semi-skilled             | 69        | 21.7       |
| Unskilled                | 148       | 46.5       |
| Occupational status of father |       |            |
| Skilled                  | 75        | 24.1       |
| Semi-skilled             | 172       | 55.3       |
| Unskilled                | 64        | 20.6       |
| Location of school       |           |            |
| Rural                    | 210       | 66.0       |
| Urban                    | 108       | 34.0       |

### Table 2: Parental knowledge of cervical cancer and HPV infection

| Question                                                                 | Yes (%) | No (%) |
|--------------------------------------------------------------------------|---------|--------|
| Able to explain what cervical cancer is                                  | 129 (40.5) | 189 (59.5) |
| Knows that cervical cancer is the most common                             | 40 (12.5)  | 278 (87.5) |
| Knows that cervical cancer can be prevented by Pap smear                  | 75 (23.6)  | 243 (76.4) |
| Knows that cervical cancer can be prevented by vaccination                | 75 (23.6)  | 243 (76.4) |
| Knows how HPV can be prevented                                            | 119 (37.3) | 199 (62.7) |
| Knows mode of transmission of HPV                                         | 114 (35.9) | 204 (64.1) |

*Overall knowledge of cervical cancer and HPV infection*

| Characteristics          | Frequency | Percentage |
|--------------------------|-----------|------------|
| Good                      | 94        | 29.6       |
| Fair                      | 78        | 24.5       |
| Poor                      | 146       | 45.9       |

*A total of nine effects were scored. Knowledge of 0–3 = poor knowledge; 4–6 = fair knowledge; 7–9 = good knowledge*
which reduced the likelihood of accepting vaccination by almost half (aOR = 0.47; 95% CI = 0.24–0.94; P = 0.0325). Concerning willingness to vaccinate if the vaccine comes at a cost, tertiary level of education in the mother increased the likelihood about 29 fold (aOR = 29.17; 95% CI = 3.98–214.08; P = 0.0009), whereas good knowledge of HPV vaccine increased the likelihood of acceptance about 6 fold (aOR = 6.11; 95% CI = 1.36–27.43; P = 0.0180). Poor knowledge of HPV vaccine decreased the likelihood of vaccination if the vaccine comes at a cost (aOR = 0.13; 95% CI = 0.03–0.48; P = 0.0022).

### Discussion

To better understand how HPV vaccination may be implemented in Nigeria, we wanted to investigate parental acceptance toward HPV vaccination and as HPV vaccine was not included in the national vaccination program when the study was conducted, we wanted to explore not only the willingness to vaccinate, but also the willingness to pay for the vaccine.

Nigeria has one of the highest cervical cancer incidences worldwide.[14] A study in Ghana, Nigeria, and South Africa

| Table 3: Knowledge of HPV vaccine |
|----------------------------------|
| Question                        | Yes (%) | No (%) |
| Knows at least one type of HPV vaccine | 80 (25.1) | 238 (74.9) |
| Knows the recommended age for vaccination | 94 (29.6) | 224 (70.4) |
| Knows when HPV vaccine is most effective | 99 (31.1) | 219 (68.9) |

*Overall knowledge of HPV vaccine

| Characteristic | Frequency | Percentage |
|----------------|-----------|------------|
| Good          | 85        | 26.7       |
| Fair          | 59        | 18.6       |
| Poor          | 174       | 54.7       |

*Knowledge of 0=poor knowledge, knowledge of 2=fair knowledge, knowledge od 3=good knowledge

| Table 4: Univariate analysis of factors affecting willingness to vaccinate daughters if vaccine is free |
|-------------------------------------------------|
| Characteristics                                  | Yes          | No           | cOR | 95% CI        | P     |
| Gender of parent                                 |              |              |     |               |       |
| Female                                          | 182 (71.7)   | 72 (28.3)    | 1.00| Reference     |       |
| Male                                            | 47 (73.4)    | 17 (26.6)    | 1.09| 0.59-2.03     | 0.7763|
| Age of parent                                   |              |              |     |               |       |
| 30-39                                           | 178 (73.6)   | 64 (26.4)    | 1.00| Reference     |       |
| 40-39                                           | 40 (70.2)    | 17 (29.8)    | 0.85| 0.45-1.60     | 0.6059|
| 50-59                                           | 11 (57.9)    | 8 (42.1)     | 0.50| 0.19-1.28     | 0.1480|
| Educational level of mother                     |              |              |     |               |       |
| None                                            | 21 (56.8)    | 16 (43.2)    | 1.00| Reference     |       |
| Primary                                         | 29 (56.9)    | 22 (43.1)    | 1.00| 0.42-2.36     | 0.9921|
| Secondary                                       | 59 (59.6)    | 40 (40.4)    | 1.12| 0.52-2.41     | 0.7647|
| Tertiary                                        | 120 (91.6)   | 11 (8.4)     | 8.31| 3.39-20.38    | 0.0000|
| Educational level of father                     |              |              |     |               |       |
| None                                            | 2 (50.0)     | 2 (50.0)     | 1.00| Reference     |       |
| Primary                                         | 12 (54.5)    | 10 (45.5)    | 1.20| 0.14-10.12    | 0.8669|
| Secondary                                       | 88 (66.2)    | 45 (33.8)    | 1.96| 0.27-14.34    | 0.5095|
| Tertiary                                        | 199 (78.8)   | 32 (21.2)    | 3.72| 0.50-27.44    | 0.1977|
| Occupational status of mother                   |              |              |     |               |       |
| Skilled                                         | 96 (95.0)    | 5 (5.0)      | 8.99| 3.20-25.22    | 0.0000|
| Semi-skilled                                    | 47 (68.1)    | 22 (31.9)    | 1.00| Reference     |       |
| Unskilled                                       | 86 (58.1)    | 62 (41.9)    | 0.65| 0.36-1.19     | 0.1600|
| Occupational status of father                   |              |              |     |               |       |
| Skilled                                         | 57 (76.0)    | 18 (24.0)    | 1.45| 0.78-2.70     | 0.2410|
| Semi-skilled                                    | 118 (68.6)   | 54 (31.4)    | 1.00| Reference     |       |
| Unskilled                                       | 47 (73.4)    | 17 (26.6)    | 1.27| 0.67-2.40     | 0.4723|
| Location of school                              |              |              |     |               |       |
| Rural                                           | 149 (71.0)   | 61 (29.0)    | 1.00| Reference     |       |
| Urban                                           | 80 (74.1)    | 28 (25.9)    | 1.17| 0.69-1.97     | 0.4723|
| Knowledge of cervical cancer and HPV             |              |              |     |               |       |
| Good                                            | 89 (94.7)    | 5 (5.3)      | 6.14| 2.18-17.27    | 0.0006|
| Fair                                            | 58 (74.4)    | 20 (25.6)    | 1.00| Reference     |       |
| Poor                                            | 82 (56.2)    | 64 (43.8)    | 0.44| 0.24-0.81     | 0.0081|
| Knowledge of HPV vaccine                         |              |              |     |               |       |
| Good                                            | 78 (91.8)    | 7 (8.2)      | 3.80| 1.44-10.02    | 0.0070|
| Fair                                            | 44 (74.6)    | 15 (25.4)    | 1.00| Reference     |       |
| Poor                                            | 107 (61.5)   | 67 (38.5)    | 0.54| 0.28-1.05     | 0.0713|
isolated HPV types 16 and 18 in 68.4% of women with invasive cervical cancer suggesting that HPV vaccine could have a large impact.\(^\text{[15]}\)

Many prior efforts at cervical cancer screening in Nigeria have largely been ineffective due to limited cytology and treatment services, lack of knowledge about cervical cancer and its screening and implementation and cost barriers. However, successful universal immunization programs do exist using various strategies such as the Expanded Programme for Immunization (EPI). HPV vaccination may thus be a uniquely effective intervention for the prevention of cervical cancer in the country.

Our study revealed that almost half of the participants had poor knowledge of cervical cancer and HPV, its causative agent with only 29.6% showing good knowledge. A study assessing mothers papillomavirus knowledge and willingness to vaccinate their adolescent daughters in Shomolu LGA of Lagos State, Nigeria reported that majority of the mothers were aware of cervical cancer, but only few were aware of HPV and had little knowledge of its link to cervical cancer.\(^\text{[16]}\) This poor knowledge of cervical cancer and its causative agent HPV is not surprising as most previous studies in the country have reported poor knowledge of cervical cancer. Only 25.3% of women attending anti-retroviral clinic in Lagos, Nigeria in 2011 had ever heard of cervical cancer.\(^\text{[17]}\) In 2004, also in Lagos, Nigeria, 81.7% of 139 patients with advanced cervical cancer had never heard of the disease.\(^\text{[18]}\)

A study evaluating HPV vaccine acceptability among women in a semi-urban region of Kisumu, Kenya also reported that only 15% of the women had heard of cervical cancer.\(^\text{[19]}\) In Sakarya Province, Turkey, 88.1% of mothers had no information about HPV and 73.3% did not know how the infection was

### Table 5: Univariate analysis of factors affecting willingness to vaccinate daughters if vaccine is not free

| Characteristics                        | Yes  | Yes (%) | No  | No (%) | cOR  | 95% CI | P       |
|----------------------------------------|------|---------|-----|--------|------|--------|---------|
| Gender of parent                       |      |         |     |        |      |        |         |
| Female                                 | 94   | (37.0)  | 160 | (63.0) | 1.00 | Reference |        |
| Male                                   | 19   | (29.7)  | 17  | (26.6) | 0.72 | 0.40-1.30 | 0.2754 |
| Age of parent                          |      |         |     |        |      |        |         |
| 30-39                                  | 83   | (34.3)  | 159 | (65.7) | 1.00 | Reference |        |
| 40-39                                  | 26   | (45.6)  | 31  | (54.4) | 1.6  | 0.90-2.88 | 0.1121 |
| 50-59                                  | 14   | (21.1)  | 15  | (78.9) | 0.51 | 0.16-1.59 | 0.2455 |
| Educational level of mother            |      |         |     |        |      |        |         |
| None                                   | 2    | (5.4)   | 35  | (94.6) | 1.00 | Reference |        |
| Primary                                | 2    | (3.9)   | 49  | (96.1) | 0.71 | 0.10-5.51 | 0.7423 |
| Secondary                              | 5    | (5.1)   | 94  | (94.9) | 0.93 | 0.17-5.02 | 0.9336 |
| Tertiary                               | 104  | (79.4)  | 27  | (20.6) | 67.41 | 15.25-297 | 0.0000 |
| Educational level of father            |      |         |     |        |      |        |         |
| None                                   | 1    | (25.0)  | 3   | (75.0) | 1.00 | Reference |        |
| Primary                                | 4    | (18.2)  | 18  | (81.8) | 0.67 | 0.06-6.30 | 0.7515 |
| Secondary                              | 23   | (17.3)  | 110 | (82.7) | 0.63 | 0.06-6.30 | 0.6020 |
| Tertiary                               | 77   | (51.0)  | 74  | (49.0) | 3.12 | 0.32-30.69 | 0.3290 |
| Occupational status of mother          |      |         |     |        |      |        |         |
| Skilled                                | 77   | (76.2)  | 24  | (23.8) | 11.55 | 5.55-24.04 | 0.0000 |
| Semi-skilled                           | 15   | (21.7)  | 54  | (78.3) | 1.00 | Reference |        |
| Unskilled                              | 21   | (14.2)  | 127 | (85.8) | 0.60 | 0.29-1.24 | 0.1666 |
| Occupational status of father          |      |         |     |        |      |        |         |
| Skilled                                | 48   | (64.0)  | 27  | (36.0) | 4.10 | 2.31-7.28 | 0.0000 |
| Semi-skilled                           | 52   | (30.2)  | 120 | (69.8) | 1.00 | Reference |        |
| Unskilled                              | 6    | (9.4)   | 58  | (90.6) | 0.24 | 0.10-0.59 | 0.0018 |
| Location of school                     |      |         |     |        |      |        |         |
| Rural                                  | 50   | (23.8)  | 160 | (76.2) | 1.00 | Reference |        |
| Urban                                  | 63   | (58.3)  | 45  | (41.7) | 4.48 | 2.73-7.37 | 0.0000 |
| Knowledge of cervical cancer and HPV   |      |         |     |        |      |        |         |
| Good                                   | 82   | (87.2)  | 12  | (12.8) | 19.82 | 8.99-43.70 | 0.0000 |
| Fair                                   | 20   | (50.0)  | 20  | (50.0) | 1.00 | Reference |        |
| Poor                                   | 11   | (7.5)   | 135 | (92.5) | 0.24 | 0.11-0.53 | 0.0004 |
| Knowledge of HPV vaccine               |      |         |     |        |      |        |         |
| Good                                   | 80   | (94.1)  | 5   | (5.9)  | 20.31 | 7.18-54.42 | 0.0000 |
| Fair                                   | 26   | (44.1)  | 33  | (55.9) | 1.00 | Reference |        |
| Poor                                   | 7    | (40)    | 167 | (96.0) | 0.05 | 0.02-1.13 | 0.0000 |
In Nigeria, the HPV vaccine was launched and inaugurated by the federal government in 2011 and since then, has been administered by private facilities. The relatively poor knowledge of the vaccine in Nigeria since its inauguration shows that little has been carried out to create awareness about it and much work is needed in this area. Awareness can be created with the development of health promotion and educational strategies for the public especially through the primary health care facilities which are closer to the people in the community. Considering the high burden of cervical cancer in Nigeria, creating awareness on HPV vaccination will be a step in the right direction. Successful education of the general populace will require continued education about the preventable nature of cervical cancer, the need for continued screening despite vaccination, cost of vaccines and details of vaccine efficacy and its effects.

Despite the poor knowledge of cervical cancer, HPV, and HPV vaccine, 72% of the parents were willing to vaccinate their daughters if the vaccine is offered free. This figure is less than those reported in some local studies. In Shomolu local government in Lagos, Nigeria, 88.9% of mothers were willing to vaccinate their daughters if the vaccine is offered free. This figure is less than those reported in some local studies. In Shomolu local government in Lagos, Nigeria, 88.9% of mothers were willing to vaccinate their adolescent daughters, whereas 88.6% of reproductive aged women in Ibadan, Southwestern Nigeria were willing to vaccinate their daughters.[16,22] A recent study from Abakaliki South-eastern Nigeria also reported that 89.1% of mothers were willing to vaccinate their adolescent daughters.[23] It is however worthy of note that higher acceptance rates were reported in some other African countries. A much higher rate of 94% was reported from Ghana, whereas 95% was reported from Kenya.[24] The observed difference may not be unconnected with the fact that these countries have better routine immunization coverage rates than Nigeria according to the Global Alliance for Vaccines and Immunization (GAVI) assessment indicators. The 2011 World Health Organization/UNICEF estimates for Diphtheria, Pertussis, and Tetanus-3 (DPT3) vaccination coverage showed that Ghana had a national coverage of 91%, whereas Kenya had a coverage of 88%. The reported coverage for Nigeria was 66%.[25]

It is imperative to note that that only 35.5% of the parents were willing to vaccinate their daughters if the vaccine came at a cost. This finding is similar to what was reported in Kenya, another developing country where only 25% of the parents were willing to pay more than 1.32 US dollar for the complete series.[26] In Sweden, up to 63% of parents were willing to vaccinate their Children even if the vaccine comes at a cost.[27] Also, in rural Central Java, Indonesia, most parents were supportive of vaccinating their children against HPV even at a fee.[28] This lack of willingness of most parents in Lagos, Nigeria to pay for the vaccine highlights the importance of international agencies in assisting with the cost of HPV vaccine in developing countries so that if possible, the vaccine can be offered free because sustaining free HPV vaccination by the governments might be a difficult policy to implement due to competing health challenges.[19]

Recently, the GAVI Alliance has offered a subsidy for developing countries that meets its eligibility criteria.[29] The GAVI Alliance uses two criteria to determine eligibility for vaccination support, including HPV vaccination: (1) a DPT3 threshold of 70% national coverage and (2) a pilot demonstration of the ability to deliver a complete multi‑dose series of vaccines to at least 50% of the target vaccination cohort in an average sized district in a county.[30] Nigeria does not meet the DPT3 threshold of 70% national coverage.[31] It is therefore important that policy makers and stake holders come together to fashion out feasible and sustainable policy to fund the vaccination program in the country.

Our study went on to explore factors influencing willingness of parents to vaccinate their daughters if the vaccine is offered free and also when it comes at a cost. Most previous studies did not investigate association between cervical cancer and HPV knowledge and parental acceptance for HPV vaccination. Our study however showed that knowledge of cervical cancer and HPV is a significant correlate for HPV vaccine acceptance with poor knowledge reducing the probability of vaccine acceptance by almost 50%. Also, in Ibadan, South West Nigeria, knowing

Table 6: Multivariate logistic regression analysis of significant factors affecting willingness to vaccinate daughters

| Characteristics                                    | aOR   | 95% CI     | P     |
|----------------------------------------------------|-------|------------|-------|
| Willingness to vaccinate if free                    |       |            |       |
| Tertiary level of education in mother               | 2.40  | 0.69-8.34  | 0.1679|
| Skilled occupation in mother                        | 2.83  | 0.76-10.51 | 0.2104|
| Good knowledge of cervical cancer and HPV           | 2.97  | 0.81-10.81 | 0.0995|
| Poor knowledge of cervical cancer and HPV           | 0.47  | 0.24-0.94  | 0.0325*|
| Good knowledge of HPV vaccine                       | 0.53  | 0.13-2.17  | 0.3824|
| Willingness to vaccinate if not free                |       |            |       |
| Tertiary level of education in mother               | 29.17 | 3.98-214.08| 0.0009*|
| Skilled occupation in mother                        | 0.30  | 0.05-1.71  | 0.1743|
| Skilled occupation in father                        | 2.76  | 0.87-8.69  | 0.0838|
| Urban location of school                            | 0.42  | 0.11-1.65  | 0.2144|
| Good knowledge of cervical cancer and HPV           | 4.66  | 0.97-22.41 | 0.0545|
| Poor knowledge of cervical cancer and HPV           | 0.89  | 0.21-3.80  | 0.8698|
| Good knowledge of HPV vaccine                       | 6.11  | 1.36-27.34 | 0.0180*|
| Poor knowledge of the HPV vaccine                   | 0.13  | 0.03-0.48  | 0.0022*|

*Significant factors
that cervical cancer is preventable is significantly associated with willingness to allow HPV vaccination to children.\(^{[26,30]}\)

Our study also revealed that tertiary level of education in the mother increased the probability of vaccine acceptance almost 30-fold. It is likely that these women with tertiary level of education have better knowledge of cervical cancer and its prevention than those who are less well educated. A study in Israel showed that the more aware an individual is about the dangers in contracting HPV, the higher the interest shown in preventive measures.\(^{[29]}\)

Several studies have also shown that parents who knew that vaccination was a safe and effective way to prevent disease were more likely to vaccinate their children against HPV.\(^{[26,30]}\) It was therefore not surprising that this study showed that parents who had good knowledge of HPV vaccine were more likely to vaccinate their daughters even when they have to pay for it, whereas poor knowledge decreased the probability.

The study was limited by the fact that there might have been some recall bias in answering some of the questions by the respondents. The study however showed that HPV vaccination for adolescent secondary school girls was acceptable to most parents in Lagos, Nigeria only if offered free as majority were not willing to pay for the vaccine and this is not likely to be different in other parts of the country.

Poor knowledge of cervical cancer, HPV infection and HPV vaccines may hinder acceptability. Educational programs to improve parental knowledge are required. It is imperative that policy makers and stake holders in the country come together to fashion out feasible and sustainable policy to fund HPV vaccination in the country so that it can be incorporated free into the National Programme on Immunization.

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**Conflicts of interest**

There are no conflicts of interest.

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