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EFFECT OF AN EDUCATIONAL INTERVENTION ON AWARENESS, KNOWLEDGE, PERCEPTION AND INTENTION TO UPTAKE HPV VACCINATION AMONG FEMALE IN-SCHOOL ADOLESCENTS IN IBADAN, OYO STATE, NIGERIA

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Abstract:
Background: Globally, cervical cancer is considered to be a serious public health concern and is the second most prevalent cancer afflicting women in Nigeria. The primary protection provided by the HPV vaccination would be the most effective prevention strategy for adolescent females between the ages of 9 and 15. Adolescents constitute a significant proportion of the population of Nigeria and they are particularly vulnerable to cervical cancer due to several factors, but educational interventions among this population are sub-optimal. This study investigated the effect of an educational intervention on the awareness, knowledge and intention to take HPV vaccination among adolescent female students in secondary schools in Ibadan, Nigeria. **Methods:** The intervention study was conducted in two randomly selected public and private secondary schools located in a randomly selected Local Government Area (LGA) of Ibadan, Oyo State, Nigeria. Female students (277 vs 267) between ages 10 and 18 years in randomly selected classes were selected from each school to participate in the study. A 44-item structured questionnaire was administered at baseline and immediately post-intervention. Descriptive and inferential analyses were carried out at p-value <0.05. **Results:** The mean age of the respondents was 14.1 ± 1.4. Awareness of cervical cancer was low before the intervention but increased significantly after the intervention (35.2% to 94%, p<0.001). Paired t-test analysis results showed a statistically significant difference in knowledge, perception, and intention means scores between baseline and immediate post-intervention (p-value<0.001). **Conclusion:** Educational interventions among secondary school adolescents can significantly enhance the knowledge, perception and intention to uptake the HPV vaccination.

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Keywords: cervical cancer, human papillomavirus (HPV) vaccination, educational intervention, knowledge, perception

1. Introduction and Literature Review

Globally, cervical cancer is considered to be of serious public health concern. Every year, over 274,000 women die from cervical cancer, which affects about 500,000 women worldwide (Begum, 2020). With more than 80% of the disease occurring in developing and impoverished countries, where there are ineffective control measures, cervical cancer is the second most common cancer in women worldwide and the most prevalent among women (Kamanga, Zhang, and Stones, 2023).

Each year, a high number of cervical cancer deaths are reported in Africa. In 2020, there were 110,000 new instances of cervical cancer and 72,000 fatalities in Africa (Sung, Ferlay, Siegel, Laversanne and Soerjomataram, 2021). These are because of the lack of optimal access to prevention, screening and treatment services and late presentation of cervical cancer cases; these have a negative impact on the outcome of treatments, survival rates, and fatality rates in Africa (Matovu, Wagner, Juncker, Namisango and Bouskill, 2023). Cervical cancer is the second most prevalent cancer afflicting women in Nigeria, with a high mortality rate, with over 10,000 women receiving a diagnosis each year. Additionally, about 8,000 women die from it, making the incidence rate of cervical cancer in Nigeria 25/1,000,000 (Agboeze,, Ezeani,, Nwali,, Ukaegbe and Mu'awiyyiah-Babale, 2022).

The World Health Organization reports that cervical cancer is one of the foremost causes of mortality among middle-aged women in poor nations, despite the fact that it is almost totally preventable based on early detection and prompt treatment of precancerous lesions (Owolabi and Adejumo, 2021). Countries with well-developed screening programs have experienced a decreased incidence rate of cervical cancer (Qiu, Cao and Xu, 2021). However, a lack of knowledge, affordability of screening, attitude of health care workers, cultural challenges around cervical cancer screening and late reporting of cases are all key variables impacting disease control in Nigeria (John-Akinola, Ndikom, Oluwasanu, Adebisi and Odukoya, 2022).

Sexually transmitted infections (STDs) are on the rise, and they pose serious health risks, particularly for adolescents and young adults. The three most prevalent STDs in America are HPV infection, Chlamydia, and Herpes, affecting people between the ages of 15 and 24 at a rate of 48% (Otu, Danhoundo, Toskin, Govender and Yaya, 2021). However, because the majority of HPV infections do not create any symptoms, most adolescents would not know until they develop pre-cancerous lesions. The primary protectionn provided by the HPV vaccination would be the most effective cervical cancer prevention strategy for adolescent females between the ages of 9 and 15; when administered prior to exposure to high-risk oncogenic HPV strains 16 and 18, the vaccinations are very effective in preventing cervical cancer (Okunade *et al.*, 2020).

Nigeria has commenced the national roll-out of the HPV vaccination since October 2023 among female adolescents 9-14 years old; but there has emerged some challenges, including issues with parental consent, misinformation around vaccination, among others. Nevertheless, receiving an HPV vaccination and getting screened for precancerous changes are the World Health Organisation BEST BUYs ways to reduce the risk of cervical cancer. In addition, making lifestyle changes, such as reducing the number of partners and limiting early sexual activity, can reduce exposure to the Human Papilloma Virus (HPV), which is believed to be the cause of cervical cancer (Ogundipe and Obinna, 2008).

Adolescents constitute a significant proportion of the population of Nigeria and they are particularly vulnerable to cervical cancer due to several factors, including early sexual debut, multiple sexual partners and low level of awareness about the disease (Nejo, Olaleye, and Odaibo 2018). Adolescents also represent a key target population for cervical cancer awareness interventions due to their social and behavioural attributes. However, educational interventions among this population are sub-optimal. This study investigated the effect of an educational intervention at baseline and immediate post-intervention on the awareness, knowledge and intention to take the HPV vaccine among adolescent female students in secondary schools in Ibadan, Nigeria.

2. Materials and Methods

2.1 Setting, Participants and Sampling Method

The intervention study was conducted in two public and private secondary schools located in a randomly selected Local Government Area (LGA) of Ibadan, Oyo State, Nigeria. Schools in Nigeria are designated as public (government-owned and funded) or private (privately owned and funded) schools. Ibadan North LGA was randomly selected as the intervention location for this study. The secondary schools in the LGA were stratified into public and private, and two schools were randomly selected from each stratum, making a total of four schools. Female students between the ages of 10 and 18 years in randomly selected classes were selected from each school to participate in the study. Female students who did not consent did not participate in the intervention or completion of the questionnaire.

2.2 Study Instruments

A 44-item structured questionnaire that consisted of 5 sections on socio-demographic characteristics (with 9 question items), awareness (with 7 question items), knowledge (with 11 question items) and perception (with 8 question items) on cervical cancer, and intention to uptake HPV vaccination (with 9 question items). The questionnaire was pretested among 30 respondents in a secondary school with similar characteristics and the Cronbach's Alpha reliability test score for the questionnaire revealed a score of 0.7 for knowledge and perception and a score of 0.6 for intention.

2.3 Data Collection Procedure and Intervention

The questionnaire was administered to female students at baseline/pre-intervention and immediate post-intervention. The one-day intervention was conducted by a health professional with research experience in cervical cancer education. The educational intervention covered topics on the female reproductive organ, risk factors for cervical cancer, tips on recognition, prevention practices including cervical cancer screening and HPV vaccination information including required doses and age for vaccination. The educational intervention was delivered using a tailored manual. Training methodologies included both didactic and participatory components, during which students were allowed to ask questions, contribute their knowledge on the subject of discussion and were also asked questions for clarification; the students were allowed to contribute information they were aware of during the intervention session.

This baseline and immediate post-intervention study was part of a quasi-experimental project titled "Pilot study to determine the feasibility of a face-to-face approach to increase awareness, knowledge and intention to uptake of Human papillomavirus (HPV) vaccination among in-school adolescents in Ibadan, Oyo State, Nigeria". Immediately after the educational intervention, the students completed the same questionnaire as at pre-intervention. A total of 277 female students completed the questionnaire at pre-intervention/baseline, while 267 were taken through the intervention and completed the same questionnaire immediately post-intervention.

2.4 Ethical Consideration

Ethical clearance for the study was obtained from the Ethical Review Committee of the Ministry of Health, Oyo State, Nigeria (AD 13/479/610^{A}). Permission to conduct the study was obtained from the principal of each selected school. Consent and assent were obtained from parents/guardians and students, respectively. Confidentiality of responses was ensured throughout and after the data collection process, and study participants were informed of their right to withdraw from the study at any point without penalty.

2.5 Data Analysis

The data was entered directly into Statistical Package for Social Science (SPSS) version 22 software. Data was properly stored in a password-protected system. Descriptive and inferential analyses were carried out at p-value <0.05. The mean score of knowledge, perception and intention were compared for baseline and immediate post-intervention using paired t-test analysis.

3. Results

3.1 Respondents' Sociodemographic Characteristics

The mean age of respondents was 14.1 ± 1.4. More than half were from public schools (56.7%; 55.8%). The majority were Christians (62.5%; 65.5%) and in the senior class (94.3%; 94.4%) (Table 1).

Table 1: Respondents' sociodemographic characteristics

Variables	Pre-intervention (N(%))	Post-intervention (N(%))
Age (mean (SD)	14.1 (1.4%)	
Age group (n=273 vs 261)		
≤14	166 (60.8%)	158 (60.5%)
>14	107 (39.2%)	103 (39.5%)
School setting (n= 277 vs 267)		
Private	120 (43.3%)	118 (44.2%)
Public	157 (56.7%)	149 (55.8%)
Religion (n=277 vs 267)		
Christianity	173 (62.5%)	175 (65.5%)
Islam	103 (37.2%)	91 (34.1%)
Traditional	1 (0.4%)	1 (0.4%)
Classes (n= 277 vs 267)		
Junior	16 (5.7%)	15 (5.6%)
Senior	261 (94.3%)	252 (94.4%)
Mother's level of education (n=268 vs 261)		
Primary	14 (5.2%)	10 (3.8%)
Secondary	115 (42.9%)	104 (39.8%)
Tertiary	136 (50.7%)	142 (54.4%)
No formal education	3 (1.1%)	5 (1.9%)

3.2 Awareness of cervical cancer, human papillomavirus and HPV vaccination

Awareness of cervical cancer was low before the intervention but increased significantly after the intervention (35.2% to 94%, $p<0.001$). Participants who had heard of Human

papillomavirus and HPV vaccine increased significantly after the intervention (19.1% to 92.9%, p<0.001) (Table 2).

Table 2: Awareness of cervical cancer, human papillomavirus and HPV vaccination

Variables	Pre-intervention (%)	Post-intervention (%)	P value
Ever heard of cervical cancer (277 vs 267)	35.2	94.0	<0.001
Ever heard of human papilloma virus (277 vs 267)	19.1	92.9	<0.001
Ever heard of HPV vaccination (277 vs 267)	19.1	92.9	<0.001

3.3 Sources of information for cervical cancer, human papillomavirus and HPV vaccination

The most common source of information for cervical cancer (38.3%; 84.5%), human papilloma virus (37.1%; 83.5%) and HPV vaccination (36.1%; 86.6%) before and after the intervention was health personnel.

3.4 Knowledge of cervical cancer, human papillomavirus and HPV vaccination

Overall, there was a significant increase in the knowledge of cervical cancer after the intervention. At post-intervention, the majority were aware that cervical cancer was an abnormal growth in the cervix (50.6% to 92.1%, p<0.001), was a terminal disease (55.4% to 82.8%, P<0.001), was curable if detected early (44.9% to 86.9%, p<0.001), and was caused by HPV (27% to 81.3%, p<0.001) (Table 3).

Overall, there was a statistically significant increase in the knowledge of the risk factors for cervical cancer after the intervention (p<0.001). A significant increase in the proportion of students who correctly identified multiple sexual partners (51.3% to 89.5%), early sexual initiation (41.6% to 83.9%), excessive smoking (27.7% to 41.6%), and long oral contraceptives (22.8% to 37.5 were reported (Table 3).

There was a statistically significant increase in the knowledge of cervical cancer prevention after the intervention [pap smear test (30.5% to 59.8%, p<0.001), use of condom (30.7% to 67.0%, p<0.001), abstinence (42.3% to 68.5%, p<0.001), avoiding multiple sexual partners (49.8% to 78.3%, p<0.0 01) and HPV vaccination (36.3% to 79%, p<0.001) (Table 3).

Table 3: Knowledge of cervical cancer detection, risk factors and prevention

Knowledge of cervical cancer (general knowledge/detected)	**Pre-intervention (%)**	**Post-intervention (%)**	**P value**
Cervical cancer is an abnormal growth in the cervix of a woman	50.6	92.1	<0.001
Cervical cancer can be terminal	55.4	82.8	<0.001
Cervical cancer can be detected in its earliest stages	36.0	87.6	<0.001
Cervical cancer is curable if detected early	44.9	86.9	<0.001
Cervical cancer is a genetic disease	25.1	57.3	<0.001
HPV is the causal agent for cervical cancer	27.0	81.3	<0.001
Knowledge of risk factors	**Pre-intervention (%)**	**Post-intervention (%)**	**P value**
Multiple sexual partners	51.3	89.5	<0.001
Early sexual exposure (sexual exposure at an early age)	41.6	83.9	<0.001
Excessive smoking	27.7	41.6	<0.001
Family history of cervical cancer	37.5	80.9	<0.001
Breastfeeding	39.0	79.8	<0.001
Uncircumcised male	37.1	67.8	<0.001
Low social economy factors (status)	12.0	12.7	0.90
Unhealthy diet	39.7	73.4	<0.001
Spiritual attack	44.2	79.4	<0.001
Poor hygiene	23.6	56.6	<0.001
Long-term oral contraceptive use	22.8	37.5	<0.001
Method of prevention	**Pre-intervention (%)**	**Post-intervention (%)**	**P value**
Pap smear test	30.5	59.8	<0.001
Use of condom	30.7	67.0	<0.001
Abstinence	42.3	68.5	<0.001
Avoiding risk factors like multiple sexual activity	49.8	78.3	<0.001
Eating healthy	25.8	59.9	<0.001
HPV vaccination before beginning sexual activity	38.6	71.2	<0.001
Does the HPV vaccine guarantee protection?	36.3	79.0	<0.001
Maintaining menstrual hygiene can prevent cervical cancer	44.9	55.4	0.02
Screening for early detection and treatment	49.1	84.3	<0.001

3.5 Perception towards cervical cancer, human papillomavirus and HPV vaccination

There was a statistically significant increase in the proportion of students who reported that HPV infection could cause cervical cancer after the intervention (46.4% to 83.9% $p < 0.001$) and those who reported that early sexual initiation could expose them to cervical cancer (45.7% to 58.4%, p<0.001) (Table 4).

Table 4: Perception towards cervical cancer, human papillomavirus and HPV vaccination

Perception Statements	Pre-intervention	Post-intervention	P value
HPV infection can cause cervical cancer	46.4%	83.9%	<0.001
I think I can be affected by cervical cancer in future	4.5%	11.2%	0.01
Cervical cancer can be prevented by the HPV vaccine	32.2%	68.2%	<0.001
I think early initiation of sex can expose me to cervical cancer	45.7%	58.4%	<0.001
My parents will allow me to take the HPV vaccine	41.2%	61.8%	<0.001
Protected sex can prevent cervical cancer	25.1%	75.7%	<0.001
HPV vaccine can protect me from HPV	63.3%	87.3%	<0.001
Both boys and girls should take the HPV vaccine	47.2%	62.5%	<0.001

3.6 Respondents' intention to take HPV vaccination

There was statistically significant increase in intention for HPV uptake between baseline and intervention (34.5% to 65.9%, p<0.001), and intention to take HPV vaccine if subsidized (33.7% to 58.4%, p<0.001), parents approve (58.4 to 80.5%, p<0.001), friends take it (15.4 to 31.5%, p<0.001), and available in health facilities around their home (47.2% to 67.8%, p<0.001) (Table 5).

Table 5: Respondents' intention to take HPV vaccination

Intention to take THE HPV vaccine	Pre-intervention (%)	Post-intervention (%)	P value
Do you intend to take the HPV vaccine?	34.5	65.9	<0.001
Will your parents allow you to take the vaccine if is the cost subsidized?	33.7	58.4	<0.001
Do you intend to take the vaccine if your parents give you approval?	58.4	80.5	<0.001
Do you intend to take the HPV vaccine if your friends also take it?	15.4	31.5	<0.001
Do you intend to take the HPV vaccine if your teachers advise you to?	24.7	46.1	<0.001
Will your parents allow you to take the HPV vaccine if they know its benefits?	71.5	83.1	<0.001
Will you take the HPV vaccine if it is available in health facilities around your home?	47.2	67.8	<0.001
Will you take the HPV vaccine if your family doctor prescribes it?	66.3	76.4	0.014
Will you take the vaccine if your peers in your religious organizations take it?	19.1	39.3	<0.001

3.7 Difference in knowledge, perception and intention means between baseline and post-intervention

Findings showed that there were statistically significant differences in the mean of cervical cancer knowledge, perception and intention between baseline and post-intervention ($p<0.001$).

Table 6: Difference in knowledge, perception and Intention to take HPV vaccine means between baseline and post-intervention

Variables	Mean (SD) (N(%))	Paired T-test	Df	P value
Knowledge				
Baseline knowledge	8.33 (4.49)	-20.67	266	<0.001
Post intervention	15.96 (3.63)			
Perception				
Baseline perception	16.91 (2.20)	-13.30	266	<0.001
Post intervention perception	19.35 (2.22)			
Intention				
Baseline intention	3.71 (2.58)	-7.76	266	<0.001
Post intervention intention	5.49 (2.62)			

4. Discussion

The findings of this study showed that face-to-face educational intervention was effective in increasing female adolescents' cervical cancer knowledge, perception and intention to uptake HPV vaccination.

4.1 Awareness and knowledge of cervical cancer and HPV vaccination

There was a statistically significant increase in the proportion of respondents' awareness of cervical cancer, HPV AND HPV vaccination after the educational intervention, and an increase in the knowledge of detection, risk factors and prevention of cervical cancer were reported. This increase highlights the importance of health education in promoting awareness and knowledge regarding public health issues, which has the potential to translate into positive behaviour adoption. A recent meta-analysis of studies in sub-Saharan Africa showed that knowledge of cervical cancer brought about five times increase in uptake of cervical cancer screening (Yimer *et al.*, 2021). Another systematic review of studies done in Nigeria reported knowledge of cervical cancer as one of the predictors of cervical cancer screening (Mafiana *et al.*, 2022).

Despite the high proportion of the respondents' increase in knowledge of cervical cancer after the educational intervention, few respondents incorrectly reported about cervical cancer, for example, 'cervical cancer is a genetic disease'; this underscores the need for continued health education among adolescents about cervical cancer and its prevention.

4.2 Perception towards cervical cancer and HPV vaccination

Study findings reported an increase in the female respondents' perception towards cervical cancer and HPV vaccination after the intervention. Perceived susceptibility to a disease condition is considered a predictor of preventive behaviour. For example, susceptibility to cervical cancer has been reported as a predictor for cervical screening in a meta-analysis carried out in sub-Saharan (Yimer *et al.*, 2021). A qualitative study among women in Lagos, Nigeria, reported that health education can help improve susceptibility among women (Olubodun *et al.*, 2022). Educational interventions to promote positive perceptions are encouraged among adolescents for the adoption of positive health behaviours.

Perceptions of both boys and girls being vaccinated with the HPV vaccine increased after the educational intervention. This was good to encourage the inclusion of boys in the HPV vaccination, as males are the main carriers.

4.3 Intention to uptake HPV vaccination

The results showed that there was a statistically significant increase in respondents' intention to uptake the HPV vaccination after the educational intervention. These results seemingly emphasizes that educational interventions are necessary to increase uptake of the HPV vaccination, especially in the light of the national roll-out of the HPV vaccination in Nigeria. It is important that adolescents know why HPV vaccination is important in order to boost the vaccination process.

The findings also highlight the role of significant others (parents, peers, health care providers) in supporting adolescents' decisions/intentions to uptake the HPV vaccination. The roles that significant others can play in promoting a willingness to uptake the HPV vaccination shows that a holistic approach to educating others, including parents, teachers and peers, could contribute to increased uptake of HPV vaccination among adolescents. A qualitative study conducted among adolescent girls in rural Uganda showed that the position of peers was a key barrier to HPV vaccination (Rujumba *et al.*, 2021).

This study was unique in that it was conducted at a time when the HPV vaccination is now free for adolescents between 9-14 years in Nigeria. The educational intervention provided was essential before, during and after the current vaccination exercise in Nigeria. Although this intervention was carried out in a school setting, it could be extended to other adolescents outside the school setting.

5. Recommendations

The study findings highlight a need to regularly educate and re-educate adolescents on cervical cancer, human papillomavirus and HPV vaccination to ensure long-term retention of knowledge and eventual uptake of the vaccination when necessary; inclusion as part of the curriculum for sexual education is suggested. This study was limited to intervention among female adolescents because that is the main target population of the HPV vaccination roll-out in Nigeria. Including boys, and also in the national vaccination programmes to support the child rights conventions is encouraged. In addition, the study was conducted among in-school female adolescents; extension to out-of-school female adolescents will be beneficial.

6. Conclusion

A face-to-face educational intervention among secondary schools can foster the intention to uptake the HPV vaccination through increased knowledge and perception relating to cervical cancer and HPV vaccination.

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Conflict of Interest Statement
The authors declare no conflicts of interest.

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