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Original Research

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Effect of a Community-Based Nurse-Led Educational Intervention on Facilitating Factors for Human Papillomavirus Vaccine Uptake: Quasi-Experimental Study

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Abstract

Background: Understanding factors that facilitate parents' decisions to vaccinate their adolescents against human papillomavirus (HPV) is essential for improving vaccination coverage, particularly in low-resource settings where uptake remains low. **Aims:** This study aimed to determine facilitators of HPV vaccine uptake among parents of adolescents in Kaduna North Senatorial District, Nigeria, and evaluate the effect of a community-based nurse-led health education intervention. **Methods:** A quasi-experimental pretest–posttest study with intervention and control groups was conducted among 204 parents. The intervention group received structured community-based nursing health education, while the control group received routine information. Data were collected at baseline and 3 months (12 weeks) post-intervention using a structured questionnaire. Within-group changes were analyzed using McNemar tests and paired t-tests, while between-group comparisons used independent t-tests. **Results:** Significant improvements were observed in the intervention group in healthcare provider recommendation, perceived vaccine importance, access to reliable information, knowledge of HPV, perceived benefits, trust in the vaccine, and peer influence ($p < .05$). Mean facilitator scores increased significantly in the intervention group (7.41 ± 1.60 to 8.94 ± 2.20; $p < .001$), with no significant change in the control group. **Conclusion:** Community-based nurse-led health education strengthened key facilitators of HPV vaccine uptake among parents, and integrating structured HPV education into community nursing practice may enhance vaccination acceptance in underserved populations.

Keywords: Community health nursing; Health education; HPV vaccination; Nigeria; Parents; Quasi-experimental study

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Introduction

Human papillomavirus (HPV) infection remains a major global public health concern and is a leading cause of cervical cancer and other HPV-related diseases (World Health Organization, 2023). Although effective vaccines are available and can prevent the majority of HPV infections, routine vaccination is recommended for adolescents to ensure early protection (Centers for

Disease Control and Prevention, 2022). However, vaccine uptake remains suboptimal in many low- and middle-income countries, including Nigeria (Bruni et al., 2021; Gallagher et al., 2018). Increasing vaccination coverage requires a comprehensive understanding not only of barriers but also of factors that facilitate parents' decisions to vaccinate their adolescents (Dubé et al., 2015; Gilkey et al., 2016; Brewer et al., 2017). Identifying and strengthening these facilitators is particularly important in community settings where nurses play a central role in health promotion and disease prevention (Stanhope & Lancaster, 2020; World Health Organization, 2021).

The Health Belief Model provides a useful framework for understanding vaccination behavior, emphasizing how individuals' perceptions of benefits, cues to action, and confidence in preventive measures influence health decisions. In the context of HPV vaccination, facilitators such as healthcare provider recommendation, access to accurate information, trust in vaccines, perceived benefits, and supportive social environments can act as cues that motivate parents to adopt protective behaviors.

Studies have consistently shown that when parents receive clear and culturally appropriate information from trusted healthcare professionals, they are more likely to accept vaccination for their children. In Nigeria, caregiver awareness, convenience of vaccine delivery, and trusted communication channels have been identified as key influences on vaccination decisions (Talabi et al., 2023). Similarly, community engagement and educational level have been associated with improved uptake among caregivers of adolescents, highlighting the importance of targeted health education strategies (Philemon et al., 2025). Evidence from international studies further underscores the role of knowledge, perceived benefits, and social influence in shaping vaccination behavior. A scoping review examining parental decision-making reported that perceived protection against disease and positive recommendations from healthcare providers were among the most important facilitators of HPV vaccination (Seo et al., 2025). Likewise, systematic reviews have identified trust in vaccine effectiveness, strong provider endorsement, and reduced perceived barriers as critical drivers of uptake across diverse populations (Zheng et al., 2021). These findings suggest that strengthening informational and relational components of care may enhance acceptance of HPV vaccination.

Community-based interventions led by healthcare professionals have shown promise in improving vaccine uptake by addressing knowledge gaps and building trust. Research conducted in African settings has demonstrated that positive interactions with healthcare workers and increased awareness through educational programs significantly influence caregivers' willingness to vaccinate their children (Ogolla et al., 2025). Reviews of HPV vaccination programs have similarly highlighted physician recommendations, school-based education, and community campaigns as effective strategies for increasing acceptance (Saran & Gada, 2025). In resource-limited settings, caregivers often rely on healthcare providers as primary sources of information, emphasizing the importance of strengthening communication within primary care and community health services (Zhang et al., 2025).

Social and peer influences also play a significant role in shaping health behaviors. Studies exploring vaccination attitudes among young adults and caregivers have shown that peer support, perceived social norms, and health literacy contribute to positive vaccination decisions (Malik et al., 2024). Qualitative research among mothers has further revealed that trust in health systems, recommendations from healthcare workers, and information shared within social networks can facilitate acceptance of HPV vaccination (Netfa et al., 2023). Within the Nigerian context, community health nurses are uniquely positioned to influence parental decision-making through education, counseling, and outreach activities. Nurse-led health education interventions can provide accurate information, address misconceptions, and foster supportive environments that encourage preventive health behaviors. However, limited evidence exists regarding the effectiveness of structured community-based nursing interventions in strengthening facilitators of HPV vaccine uptake among parents in northern Nigeria, where cultural, informational, and health system factors may influence vaccination decisions.

Therefore, this study aimed to determine the facilitators of HPV vaccine uptake among parents of adolescents in Kaduna North Senatorial District and to evaluate the effect of a community-based nursing health education intervention. Understanding how targeted education influences facilitating factors will provide evidence to inform community health nursing practice and guide strategies to improve HPV vaccination coverage in similar settings.

Methods

Study design

A quasi-experimental pretest–posttest design with intervention and control groups was employed to examine the effect of a community-based nurse-led educational intervention on factors facilitating human papillomavirus (HPV) vaccine uptake among parents of adolescents. Data were collected between May and November 2025.

Study setting

The study was conducted in selected communities within Kaduna North Senatorial District, Kaduna State,

Nigeria. The area comprises predominantly Hausa/Fulani populations and includes semi-urban and rural communities with varying levels of access to primary healthcare services.

Study population

The study population consisted of primary caregivers (biological parents or legal guardians) of adolescents aged 9–14 years residing in the selected communities. Participants were eligible if they had lived in the community for at least 12 months and provided informed consent. Parents who were severely ill or unavailable during the study period were excluded.

Sample size and sampling technique

The sample size was determined using the formula for comparing two proportions as described by Robert (1997), based on a baseline HPV vaccine uptake rate of 11% and an expected post-intervention improvement. After adjusting for potential attrition, 208 participants were recruited, of whom 204 completed the study (102 in the intervention group and 102 in the control group). A multistage sampling technique was used. Four Local Government Areas (Zaria, Sabon Gari, Makarfi, and Soba) were randomly selected from the eight LGAs within Kaduna North Senatorial District. Thirty percent of wards and communities were subsequently selected through simple random sampling, followed by systematic sampling of households with eligible participants. Where more than one eligible parent was present, one participant was selected using simple random sampling.

Data collection instrument

Data were collected using a structured interviewer-administered questionnaire developed from existing literature on HPV vaccination facilitators. The instrument included sections on socio-demographic characteristics and perceived facilitating factors such as healthcare provider recommendation, knowledge, trust, perceived benefits, peer influence, and access to vaccination services. Facilitator items were coded dichotomously (Yes = 1, No = 0), baseline and post-intervention, and composite scores were computed, with higher scores indicating stronger facilitating influences.

Validity and reliability

Content and face validity were established through expert review by specialists in public health nursing, community medicine, statistics, and obstetrics and gynaecology. The instrument was pretested among 10% of the sample in communities outside the study area. Internal consistency reliability was confirmed with a Cronbach's alpha coefficient of 0.872, indicating good reliability.

Intervention procedure

The study was conducted in three phases: baseline assessment, intervention, and post-intervention evaluation. Baseline data were collected from both groups using the structured questionnaire. The intervention group received a structured community-based nurse-led educational programme delivered by trained community health nurses through face-to-face sessions lasting approximately 40 minutes. The educational content focused on strengthening facilitators of HPV vaccination, including improving knowledge about HPV infection, emphasizing vaccine benefits and safety, reinforcing healthcare provider recommendations, building trust, and encouraging community support. Interactive discussions, visual aids, and question-and-answer sessions were used to enhance participant engagement and ensure consistency in delivery. The control group received routine health information without structured HPV education. Post-intervention data were collected 3 months (12 weeks) after the intervention to assess changes in facilitating factors.

Data analysis

Data were analysed using IBM SPSS Statistics version 25. Descriptive statistics were used to summarise participant characteristics and facilitating factors. McNemar tests were used to assess within-group changes in categorical variables, while paired t-tests evaluated changes in mean facilitator scores. Independent t-tests and chi-square tests were used for between-group comparisons. Statistical significance was set at $p < .05$.

Ethical considerations

Ethical approval was obtained from a recognized institution (ABUTH-HREC/ABUTHZ/HREC/C47/2025). Permission was obtained from relevant authorities and community leaders. Written informed consent was obtained from all participants, and confidentiality, anonymity, and voluntary participation were ensured throughout the study.

Reporting guideline

The study was conducted and reported in accordance with the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement.

Results

A total of 204 parents participated in the study, with 102 in the intervention group and 102 in the control group. The mean age of participants was 34.78 ± 4.78

years in the intervention group and 33.34 ± 4.77 years in the control group, with no statistically significant difference between groups. Most respondents in both groups were female and married, and Islam was the predominant religion. Significant differences were observed between groups in educational level and occupation: the intervention group had a higher proportion of participants with tertiary education, whereas the control group had a higher proportion without formal education. Ethnicity also differed significantly, with a higher proportion of Hausa/Fulani participants in the control group. Other socio-demographic variables, including marital status, family type, number of female adolescents, and length of residence in the community, were comparable between groups (Table 1).

Table 1. Distribution of Participants According to Socio-demographic Characteristics (n=204)

Variable	Category	Intervention (N = 102) n (%)	Control (N=102) n (%)	p-value
Age group (years)	20–24	1 (1.0)	3 (2.9)	0.180
	25-29	10 (9.8)	13 (12.7)	
	30-34	48 (47.1)	57 (55.9)	
	≥35	43 (42.2)	29 (28.4)	
Sex	Male	12 (11.8)	11 (10.8)	0.825
	Female	90 (88.2)	91 (89.2)	
Religion	Islam	90 (88.2)	98 (96.1)	0.037
	Christianity	12 (11.8)	4 (3.9)	
Education	No formal	12 (11.8)	26 (25.5)	0.016
	Primary	15 (14.7)	18 (17.6)	
	Qur'anic	36 (35.3)	38 (37.3)	
	Secondary	17 (16.7)	11 (10.8)	
	Tertiary	22 (21.6)	9 (8.8)	
Occupation	Housewife	53 (52.0)	51 (50.0)	0.036
	Petty trader	23 (22.5)	13 (12.7)	
	Civil servant	15 (14.7)	7 (6.9)	
	Farmer	3 (2.9)	9 (8.8)	
	Student	8 (7.8)	2 (2.0)	
Marital status	Married	99 (97.1)	98 (96.1)	0.903
	Divorced	1 (1.0)	1 (1.0)	
	Widowed	2 (2.0)	3 (2.9)	
Family type	Monogamous	35 (34.3)	39 (38.2)	0.560
	Polygamous	67 (65.7)	63 (61.8)	
Female adolescents	1	77 (75.5)	66 (64.7)	0.425
	2	15 (14.7)	23 (22.5)	
	3	6 (5.9)	10 (9.8)	
	4	2 (2.0)	2 (2.0)	
	≥5	2 (2.0)	1 (1.0)	
Ethnicity	Hausa/Fulani	68 (66.7)	95 (93.1)	0.001
	Yoruba	18 (17.6)	2 (2.0)	
	Igbo	1 (1.0)	0 (0.0)	
	Others	15 (14.7)	5 (4.9)	
Length of stay	1-2 years	10 (9.8)	5 (4.9)	.313
	3-4 years	21 (20.6)	18 (17.6)	
	≥5 years	71 (69.6)	79 (77.5)	

χ^2 test used for categorical variables. Significance set at $p < .05$. Mean age: Intervention = 34.78 ± 4.78 years; Control = 33.34 ± 4.77 years.

Following the nurse-led educational intervention, the intervention group demonstrated statistically significant improvements in several facilitating factors, including healthcare provider recommendation, belief in the importance of HPV vaccination, access to reliable information, knowledge about HPV, perceived benefits of vaccination, trust in the vaccine, and peer or community influence ($p < .05$). No significant changes were observed in perceived access to vaccination services or vaccine availability. A reduction was observed in discussions about HPV vaccination with children. In contrast, the control group showed no statistically significant changes across most facilitating factors over the study period (Table 2).

Table 2. Within-group Changes in Facilitating Factors Before and After the Intervention

Facilitating factor	Intervention Before n	Intervention After n	χ^2	p-values	Control Before n	Control After n	χ^2	p-values
Healthcare provider recommendation	56	89	26.256	0.001	99	97	0.083	0.727
Belief in vaccine importance	75	94	12.000	0.001	98	93	1.230	0.267
Receiving reliable information	65	92	20.485	0.001	93	85	2.470	0.115
Knowledge of HPV	71	93	16.962	0.001	85	86	0.001	1.000
Perceived benefits	72	96	17.633	0.001	81	83	0.029	0.864
Trust in the vaccine	79	94	8.900	0.003	80	81	0.001	1.000
Peer influence	70	102	30.031	0.001	89	82	1.440	0.230
Access to vaccination services	91	94	0.210	0.648	88	80	1.750	0.186
HPV vaccine availability	91	85	0.346	0.556	88	82	0.893	0.345
Discussion with the child about the HPV vaccine	88	73	5.297	0.021	65	77	3.025	0.082

Values represent the number of participants reporting "Yes". The McNemar test is used for within-group comparisons.

At baseline, several facilitating factors were reported more frequently in the control group, including healthcare provider recommendation, belief in vaccination, access to reliable information, knowledge about HPV, peer influence, and discussions with children. Following the intervention, the intervention group demonstrated significant improvements relative to the control group in perceived benefits, trust in the vaccine, peer influence, and perceived access to vaccination services, indicating a positive effect of the educational intervention. Differences in belief, reliable information, and knowledge were no longer statistically significant after the intervention, suggesting a reduction in baseline disparities between groups. No significant differences were observed in vaccine availability or discussions with children (Table 3).

Table 3. Between-group comparisons of facilitating factors before and after the intervention

Facilitating factor	Intervention Before %	Control Before %	χ^2	p-values	Intervention After %	Control After %	χ^2	p-values
Healthcare provider recommendation	54.9	97.1	49.664	0.001	87.3	95.1	3.900	0.048
Belief in vaccine importance	73.5	96.1	20.122	0.001	92.2	91.2	0.064	0.800
Receiving reliable information	63.7	91.2	22.006	0.001	90.2	83.3	2.092	0.148
Knowledge of HPV	69.6	83.3	5.340	0.021	91.2	84.3	2.234	0.135
Perceived benefits	70.6	79.4	2.118	0.146	94.1	81.4	7.704	0.006
Trust in the vaccine	77.5	78.4	0.029	0.866	92.2	79.4	6.793	0.009
Peer influence	68.6	87.3	10.293	0.001	100.0	80.4	22.174	0.001
Access to vaccination services	89.2	86.3	0.410	0.522	92.2	78.4	7.660	0.006
HPV vaccine availability	87.3	86.3	0.043	0.836	83.3	80.4	0.297	0.586
Discussion with the child about the HPV vaccine	86.3	63.7	13.830	0.001	71.6	75.5	0.403	0.526

Values represent the percentage of participants reporting "Yes". χ^2 = Pearson chi-square test.

Within-group analysis showed a significant increase in mean facilitating factor scores in the intervention group following the intervention, with a large effect size (Cohen's d = 0.78). No significant change was observed in the control group. Between-group analysis indicated that although the control group had higher baseline scores, the intervention group showed higher post-intervention mean scores, and the difference between groups was not statistically significant (Table 4).

Table 4. Changes in Mean Facilitating Factor Scores Within and Between Study Groups

Comparison	Mean ± SD Before	Mean ± SD After	Mean Difference	95% CI	t	df	p-values	Cohen's d
Within-group (paired t-test)								
Intervention	7.41 ± 1.60	8.94 ± 2.20	−1.53	−1.98 to −1.08	−6.79	101	0.001	0.78
Control	8.49 ± 1.74	8.29 ± 2.76	0.20	−0.42 to 0.82	0.64	101	0.523	0.08
Between-group (independent t-test)								
Before	7.41 ± 1.60 vs 8.49 ± 1.74		−1.08	−1.54 to −0.62	−4.61	202	0.001	0.63
After	8.94 ± 2.20 vs 8.29 ± 2.76		0.65	−0.04 to 1.34	1.85	202	0.066	0.27

Discussion

The findings of this study demonstrate that a community-based nurse-led educational intervention significantly strengthened parents' perceptions of factors facilitating HPV vaccine uptake, including healthcare provider recommendation, knowledge of HPV, perceived benefits, trust in the vaccine, and peer influence. These results highlight the critical role of community health nurses in influencing parental decision-making and promoting preventive health behaviors within community settings. These findings are consistent with the Health Belief Model, which suggests that cues to action, such as provider recommendations and perceived benefits, can influence preventive health behaviors (Rosenstock, 1974).

The significant improvement in healthcare provider recommendation observed in this study is consistent with previous research identifying provider endorsement as a strong predictor of HPV vaccination uptake (Gilkey et al., 2016; Brewer et al., 2017; Talabi et al., 2023). Effective communication from trusted healthcare professionals has been shown to enhance parental confidence and reduce uncertainty regarding vaccination decisions. The observed improvement following the nurse-led intervention suggests that structured education can reinforce healthcare providers' influence and strengthen trust in vaccination programs.

Improvements in parental belief in the importance of HPV vaccination and recognition of its benefits align with studies demonstrating that perceived benefits and positive attitudes are important determinants of vaccination behavior (Dubé et al., 2015; Zheng et al., 2021; Seo et al., 2025). Increased awareness and understanding following the intervention likely contributed to improved perceptions of vaccine effectiveness and safety, supporting evidence that educational interventions can enhance vaccine acceptance. The observed increase in access to reliable information and improved knowledge about HPV is consistent with studies indicating that knowledge plays a critical role in vaccination decisions, particularly in low- and middle-income countries where misinformation may influence health behaviors (Gallagher et al., 2018; Philemon et al., 2025; Zhang et al., 2025). These findings suggest that improving health literacy through targeted educational interventions can strengthen facilitating factors and support informed parental decision-making.

The substantial improvement in perceived peer and community support observed in this study supports research demonstrating that social norms and peer influence are important determinants of vaccination behavior (Malik et al., 2024; Netfa et al., 2023). Engagement with parents during the intervention may have contributed to the development of supportive social environments that encouraged positive attitudes toward HPV vaccination. The increase in trust in the HPV vaccine following the intervention is consistent with previous findings highlighting confidence in vaccine safety and trust in health systems as key drivers of vaccine uptake (Bruni et al., 2021; Zheng et al., 2021; Ogolla et al., 2025). Educational interventions that address concerns, provide accurate information, and encourage open dialogue may therefore play an important role in strengthening trust and promoting acceptance.

Although improvements were observed in most facilitating factors, changes in perceived access to vaccination services and vaccine availability were limited, suggesting that structural and health system barriers may require broader policy and service-level interventions. Similar findings have been reported in studies indicating that while education improves perceptions, logistical constraints must also be addressed to achieve sustained improvements in vaccination coverage (World Health Organization, 2023; Saran & Gada, 2025).

The findings contribute to existing literature by demonstrating that nurse-led community education can simultaneously strengthen multiple facilitators of HPV vaccine uptake in a resource-limited setting. By providing evidence from a quasi-experimental study conducted in northern Nigeria, this study highlights the potential of community health nursing interventions to support global efforts to improve HPV vaccination coverage and reduce

the burden of HPV-related diseases (World Health Organization, 2021; Talabi et al., 2023; Zheng et al., 2021).

Implications for community health nursing practice

Community health nurses play a central role in promoting HPV vaccination through education, counseling, and community engagement. The findings suggest that integrating structured HPV education into routine outreach activities may strengthen parental confidence and improve vaccine acceptance. Training programs that enhance nurses' communication skills and provide culturally appropriate educational resources may further support effective engagement with caregivers. In addition, collaboration with community leaders, schools, and local health authorities may help create supportive environments that encourage vaccination. Strengthening provider–parent communication and promoting peer support networks may enhance trust and address concerns related to vaccine safety and effectiveness.

Limitations

This study has several limitations that should be considered when interpreting the findings. The quasi-experimental design without randomization may introduce selection bias and limit causal inference. Although follow-up was conducted 3 months (12 weeks) after the intervention, this period may still be insufficient to assess the long-term sustainability of changes in perceptions and facilitating factors. Future studies employing randomized designs and longer follow-up periods are recommended to provide stronger evidence of intervention effectiveness.

Conclusion

Community-based nurse-led health education significantly improved parents' perceptions of factors facilitating HPV vaccine uptake, particularly regarding provider recommendation, knowledge, trust, and community support. These findings underscore the importance of empowering community health nurses to deliver targeted educational interventions that address informational and social determinants of vaccination. Strengthening community engagement and integrating HPV education into primary healthcare services may enhance vaccination coverage and contribute to the prevention of HPV-related diseases in underserved populations.

Declaration of Conflicting Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Author's Contribution

All authors meet the four authorship criteria according to the ICMJE recommendations. **S.I:** Conceptualization, study design, intervention development, data collection coordination, statistical analysis, manuscript drafting. **H.M.S:** Conceptualization, supervision, critical manuscript review. **H.I.G:** Study supervision, intellectual content review. **M.A.Y.L:** Supervision, oversight of data collection, and manuscript revision. **I.H:** Methodological review, critical manuscript revision for important intellectual content. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

Data Availability Statement

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Declaration of Use of AI in Academic Writing

The authors declare that artificial intelligence (AI) tools were used solely for language editing and grammar improvement during manuscript preparation. AI tools were not used for data analysis, interpretation, or generation of scientific conclusions. The authors take full responsibility for the integrity and accuracy of the content.

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