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Research Article

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Human Papillomavirus Prevention; Challenges for Mothers in Rural Areas in the Uptake of HPV Vaccines among Their Children in a Developing Country

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Abstract

Background: *The Human Papillomavirus (HPV) poses a significant challenge to global public health due to its association with various cancers and genital warts. The global burden of HPV-related diseases disproportionately affects developing countries. Despite high HPV prevalence, its association with cervical cancer remains low; and vaccination stands as a key preventive tool. The study aims to explore mothers' knowledge and attitudes regarding HPV and its vaccine and also, to identify factors influencing vaccine uptake among their children in a rural community.*

Methods: *A community-based cross-sectional analytical design using cluster sampling technique to enrol 430 mothers from a rural community in Imo State, Nigeria from 5th November to 10th December 2022. A structured questionnaire was used and bivariate and multivariate analyses were performed at a significance level, $p \leq 0.05$.*

Results: *HPV vaccine uptake was 11% with the majority of the mothers exhibiting poor knowledge (73%) and inappropriate attitude (42%) towards HPV and its vaccines. Nevertheless, more than one third of the mothers displayed a high level of willingness to administer the HPV vaccine to their children (37%). However, vaccine uptake appeared to be significantly associated with the mother's level of knowledge, attitude and willingness to administer the vaccine ($p<0.001$). Similarly, vaccine uptake appeared to be significantly associated with the mother's age group ($p<0.001$), the mother's religion ($p=0.008$), the mother's educational level ($p<0.001$) and the mother's monthly income ($p=0.01$). Similarly, their husband's educational level ($p<0.001$) and Occupation ($p=0.001$) also appeared to be significantly associated with HPV vaccine uptake. Furthermore, mothers between the ages of 19-34 years (aOR: 5.99; $p=0.002$), catholic (aOR: 2.66; $p=0.009$), earning a higher income (aOR: 2.37; $p=0.029$) and whose husbands were civil servants (aOR: 5.96; $p=0.025$) were significantly more likely to have administered HPV vaccine to their children.*

Conclusion: *The study underscores the urgency for tailored interventions to improve HPV vaccination uptake. The interventions should address knowledge gaps, promote positive attitudes, dispel misconceptions, and overcome barriers hindering vaccination. These interventions should encompass more than focusing solely on mothers; they should involve broader engagement with families and communities, where mothers play a central and anchoring role.*

Keywords: HPV, Vaccine Uptake, Mothers, Rural, Nigeria

Abbreviations

HPV: Human Papilloma Virus
WTP: Willingness to pay
WHO: World Health Organization
LGA: Local Government Area
aOR: Adjusted Odds Ratio

1. Introduction

The Human Papillomavirus (HPV), a sexually transmitted virus, poses a significant challenge to global public health due to its association with various cancers and genital warts. Notably, cervical cancer, strongly linked to HPV infection, ranks as the fourth most prevalent cancer among women worldwide. In 2020, it accounted for an estimated 604,000 new cases and 342,000 deaths [1,2].

The global burden of HPV-related diseases disproportionately affects developing countries, with approximately 90% of new cases and deaths in 2020, having occurred in low- and middle-income countries [1,2]. Globally, HPV contributes to 56% of all cancer cases caused by infectious agents in women. Notably, in West Africa, the prevalence of HPV-induced cancers is significantly higher, accounting for about 78% [3]. Moreover, the impact of HPV extends beyond cervical cancer to various other cancers affecting areas such as the anus, oropharynx, penis, vagina, and vulva [1].

Studies conducted in Nigeria have revealed high prevalence rates of HPV, reaching up to 65%, varying based on the region and the detection method used [4]. Despite this high prevalence, awareness of HPV and its association with cervical cancer remains low in Nigeria [5,6]. Cervical cancer ranks as the second most common cancer among women in Nigeria, with approximately 12,000 new cases and 8,000 deaths reported annually [7].

Vaccination stands as a key preventive tool against HPV, specifically targeting the prevention of cervical cancer. The prophylactic HPV vaccination plays a foundational role in the WHO Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Issue. This strategy's implementation is estimated to prevent around 60 million cases of cervical cancer and avert approximately 45 million associated deaths over the next century [8].

Four vaccines have attained prequalification, each targeting the predominant oncogenic strains of HPV types 16 and 18, responsible for approximately 70% of global cervical cancers [2]. Among these prequalified vaccines, the 9-valent vaccine expands its protective coverage by incorporating an additional five oncogenic HPV types, which collectively contribute to an extra 20% of cervical cancers. Furthermore, two of these vaccines offer defense against HPV types 6 and 11, recognized for causing anogenital warts [2].

So, to significantly reduce the burden of cervical cancer and ultimately eradicate the disease, an effective approach to increasing HPV vaccine uptake is crucial. Rural communities encounter notable challenges, particularly concerning the adoption of HPV vaccines among children, influenced by factors like knowledge, attitudes, and cultural influences, primarily guided by mothers' decisions and perspectives. Mothers play a pivotal role in this context, as their understanding and beliefs about HPV and its vaccines significantly impact the vaccination choices for their children. However, despite instances where there's a strong willingness to vaccinate, the actual uptake of the HPV vaccine often remains low [9].

The uptake of the HPV vaccine has been impeded by various barriers, including lack of awareness, limited accessibility, fear, cost, and absence of healthcare provider recommendations [6,10]. Moreover, these challenges are complicated by inadequate health facilities, restricted vaccine availability, and insufficient community sensitization efforts. In contrast, countries with established national HPV vaccination programs have shown significant reductions in HPV prevalence, persistent infections, and related conditions like genital warts and cervical intraepithelial neoplasia [11]. These successful outcomes are often attributed to structured national vaccination campaigns that target young adolescent girls.

The importance of accurate knowledge and positive attitudes towards HPV particularly in an environment with inadequate health facilities and resources cannot be overstated, especially for women residing in rural areas. These women often adhere to cultural and traditional practices and encounter restricted access to basic services, which can impede their vaccine uptake behavior. Furthermore, gender inequality persists in Nigeria and other developing countries, where rural areas additionally, face substantial socioeconomic disparities that can further impact vaccine uptake. The influence of male spouses in vaccination decision-making cannot be overlooked as a potential barrier to uptake [12,13].

Therefore, the present study aims to investigate the knowledge and attitudes towards HPV and its vaccine among mothers residing in rural areas. Additionally, the study seeks to identify the associated factors and predictors of vaccine uptake among their children in a rural community located in Imo State, Nigeria.

2. Method

2.1 Study Area

The study was carried out in Umuna, Orlu in Imo State. Orlu is located in Imo West Senatorial zone, one of the three senatorial zones of Imo State. Imo State is located in the South-Eastern part of Nigeria within longitude 5˚29'06"N and latitude 7˚02'06"E occupying an area between the lower River Niger and the upper and middle Imo River [14]. Orlu Local Government Area is one of the 12 LGAs that comprise Imo West Senatorial zone, and it occupies an area of 132.95 km2 with a population density of about 1,074 persons/km2 according to the 2006 census [15]. Umuna is one of the 13 wards in Orlu Local Government Area and has 4

villages; Amoji, Ebenato, Umuokware-ikuku and Umusasa, and their main occupation is trading/business.

2.2 Study Population/Study Design

The study population comprise mothers residing in Umuna, Orlu. The study design was a community-based cross-sectional analytical survey.

2.3 Selection Criteria

The inclusion criteria included mothers who were 18 years and above and were permanent residents of Umuna who had given an informed consent.

2.4 Sample Size Estimation

The minimum sample size was calculated using the Cochrane formula [16]. When n=minimum sample size, Z=Standard normal deviate corresponding to 5% significant level, p= 0.34 (proportion of women that were positive for high-risk HPV as reported in a previous study) and d=tolerable error of margin set at 0.05 [17]. Therefore, Z=1.96, p=0.34, q=0.66 and the minimum sample size (n) was calculated as 345. However, the sample size used for the survey was 432 taking into account any incomplete or non-responses.

2.5 Sampling Technique

All the four villages in Umuna were selected and each village was allocated a sample size of 108 participants. Starting from a central location (market square) in each village and moving in a clockwise direction, every woman that was met on the way was selected and enrolled after satisfying the selection criteria. This process continued until the allocated sample size was attained.

2.6 Data Collection and Analysis

The data was collected using a structured questionnaire from November 5th to December 10th, 2022. The questionnaire was primarily self-administered; however, in instances of low literacy, it was administered by interviewers. The questionnaire was developed by the researchers and pretested among a group of 15 women selected from the neighbouring community (Amaifeke) to establish reliability and face validity of the questionnaire. The reliability was assessed within a 2- week interval using a test-retest method and the Pearson Correlation Coefficient (r) was 0.88 and the internal consistency measure with a Cronbach's alpha coefficient of 0.78. The face validity was assessed using their feedback and suggestions regarding the clarity and comprehensibility of the questionnaire items and thereafter, the questionnaire was refined and improved.

The questionnaire comprised four sections; Section One: Socio-demographic characteristics, Section Two: Knowledge of HPV infection and Vaccination, Section Three: Attitude towards HPV infection and Vaccination, Section Four: HPV vaccine uptake willingness.

The level of knowledge was determined by scoring the questions that assessed knowledge. For a correct answer, a score of 2 was given, a wrong answer a score of 0 and a “Don’t Know” answer a score of 1 was given. The aggregate score for each respondent’s level of knowledge was compared to a range, 0-13: poor knowledge, 14-18: moderate knowledge and 19-24: good knowledge. The level of attitude was determined by scoring the questions that assessed attitude. For an appropriate response, a score of 2 was given, an inappropriate response, a score of 0 and a “Not Sure” response a score of 1 was given. The aggregate score for each respondent’s level of attitude was compared to a range, 0-7: inappropriate attitude, 8-10: fairly appropriate attitude and 11-14: appropriate attitude. The level of willingness was determined by scoring the questions that assessed willingness to HPV uptake. For a willing response, a score of 2 was given, an unwilling response, a score of 0 and a “Not Sure” response a score of 1 was given. The aggregate score for each respondent’s level of willingness was compared to a range, 0-7: low level of willingness, 8-9: moderate level of willingness and 10-12: high level of willingness.

Data was cleaned and validated manually, and analysed using IBM-SPSS version 22. Descriptive statistics (frequency tables and summary indices) were generated. Chi Square test was used to determine associations between HPV vaccine uptake and the socio-demographic and other factors. A logistic regression model was developed using statistically significant factors from the chi square analysis. The level of significance was set at $p \leq 0•05$ with a 95% confidence interval.

2.7 Study Limitation

The sampling technique used in this study may have introduced bias because the central starting point for the selection and enrollment of the study participants was not randomly selected. Also, the reliance on self-reported data could be a source of potential bias.

2.8 Ethical Consideration

Ethical clearance was given by the ethical committee of Imo State University teaching hospital and community entry permission was sought from the traditional ruler. Informed consent was given by the participants. All authors hereby declare that the study was performed in accordance with international ethical standards.

3. Results

Four hundred and thirty-two copies of the questionnaire were distributed but 430 copies were completely filled and returned.

Variable	Frequency (N=430)	Per cent
Mother's Age (Years)		
19-34	108	25.1
35-49	238	55.3
50 and above	84	19.5
Mean: 40.6 ± 9.8		
Marital Status		
Married	387	90.0
Single	27	6.3
Divorced/Separated	16	3.7
Mother's Religion		
Catholic	249	57.9
Anglican	97	22.6
Pentecostal	83	19.3
Muslim	1	0.2
Mother's Educational Level		
None	45	10.5
Primary	59	13.7
Secondary	143	33.3
Tertiary	183	42.6
Mother's Occupation		
None	64	14.9
Trading/Business	221	51.4
Farmer	45	10.5
Civil servant	86	20.0
Others	14	3.3
Mother's Monthly Income		
Less than N10,000	103	24.0
N10,000 -N20,000	145	33.7
N21,000 -N50,000	99	23.0
Above N50,000	83	19.3
Total children		
0-1	44	10.2
2-3	99	23.0
4-5	186	43.3
More than 5	101	23.5
Child Routine Immunization Status		
None	28	6.5
Incomplete	57	13.3
Complete	345	80.2
Husband's Education Level		
None	53	12.3
Primary	56	13.0
Secondary	125	29.1
Tertiary	196	45.6
Husband's Occupation		
None	54	12.6
Trading/Business	204	47.4
Farmer	34	7.9
Civil servant	119	27.7
Others	19	4.4

Table 1: Sociodemographic Characteristics of the mothers residing in Umuna

According to Table 1, the majority of the mothers in the study fell within the age range of 35 to 49 years (55%). Furthermore, a significant portion were married (90%) and were of the Catholic Faith (58%). Despite a majority of the mothers having received a tertiary education (43%), a large proportion were primarily engaged in trading or business activities (51%), earning a monthly income equivalent to $50 or less (81%), and were responsible for families with four or more children (67%). Notably, 80% of these families had completed routine childhood immunizations for their children. Likewise, a substantial number of the mothers had husbands who had also attained tertiary education (46%) and were mainly involved in trading and business activities (47%).

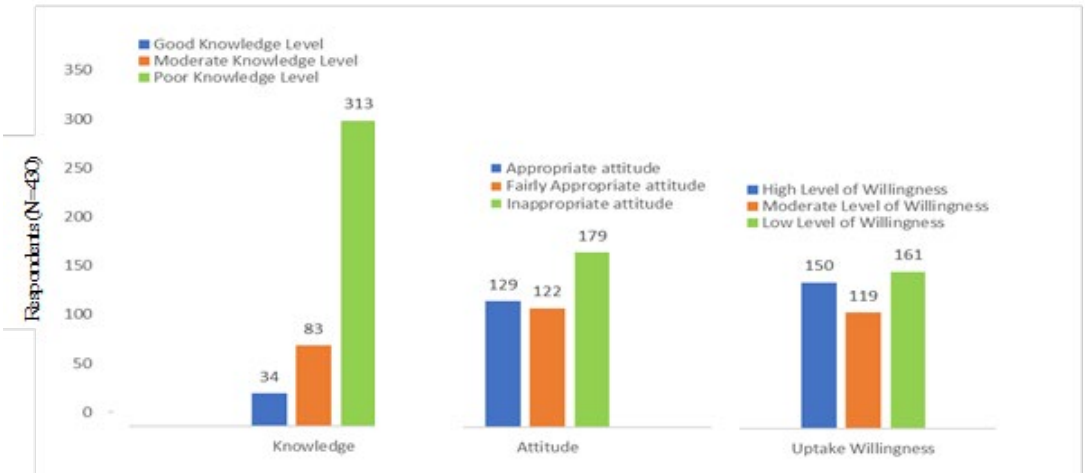

Figure 1: Level of HPV Knowledge, Attitude and Vaccine Uptake Willingness among mothers in Umuna

According to Figure 1, the majority of the mothers exhibited a poor knowledge level (73%) and an inappropriate attitude (42%) towards HPV and its vaccines. Nevertheless, it also showed that more than one third of the mothers displayed a high level of willingness to administer their children the HPV vaccine (37%).

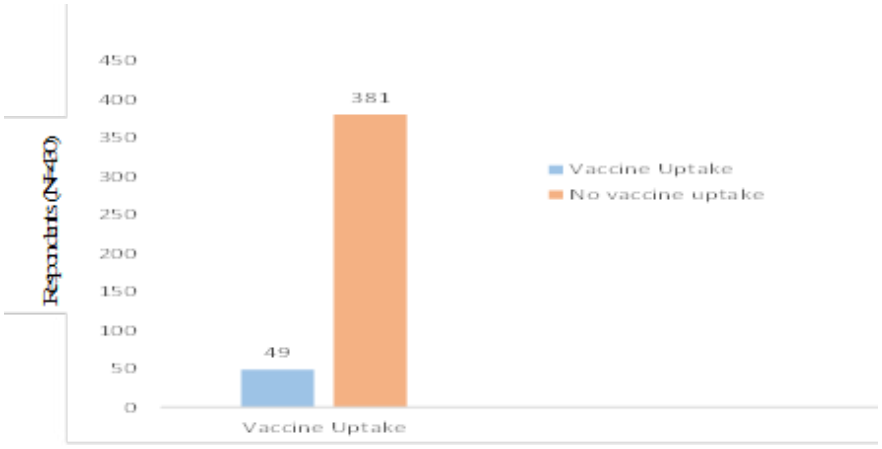

Figure 2: HPV Vaccine Uptake in children of mothers residing in Umuna

According to Figure 2, most of the mothers had not given any of their Children an HPV vaccine (89%).

Variable	HPC Vaccine Uptake		Total (%)	X^2	df	p-value
	Yes (%)	No (%)				
Mother's Age (Years)				20.546	2	<0.001*
19-34	25(23.1)	83(76.9)	108 (100.0)			
35-49	20(8.4)	218(91.6)	238(100.0)			
50 and above	4(4.8)	80(95.2)	84(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Mean Age: 40.6 ± 9.8 yrs						
Marital Status				2.152	1	0.142
Married	47(12.1)	340(87.9)	387(100.0)			
Single/Divorced/Separated	2(4.7)	41(95.3)	43(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Mother's Religion				7.030	1	0.008*
Catholic	37(14.9)	212(85.1)	249(100.0)			
Other religion	12(6.6)	169(93.4)	181(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Mother Educational Level				24.980	3	<0.001*
None	0(0.0)	45(100.0)	45(100.0)			
Primary	1(1.7)	58(98.3)	59(100.0)			
Secondary	12(8.4)	131(91.6)	143(100.0)			
Tertiary	36(19.7)	147(80.3)	183(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Mother Occupation				2.872	3	0.412
None	4(6.3)	60(93.8)	64(100.0)			
Trading/Business	25(11.3)	196(88.7)	221(100.0)			
Civil servant	13(15.1)	73(84.9)	86100.0)			
Others	7(11.9)	52(88.1)	59(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Mother's Monthly Income				9.271	2	0.01*
N20,000 or Less	19(7.7)	229(92.3)	248(100.0)			
N21,000 -N50,000	14(14.1)	85(85.9)	99(100.0)			
Above N50,000	16(19.3)	67(80.7)	83(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Total number of Children				0.551	3	0.908
0-1	6(13.6)	38(86.4)	44(100.0)			
2-3	12(12.1)	87(87.9)	99(100.0)			
4-5	19(10.2)	167(89.8)	186(100.0)			
More than 5	12(11.9)	89(88.1)	101(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Child Immunization Status				2.789	2	0.248
None	2(7.1)	26(92.9)	28(100.0)			
Incomplete	10(17.5)	47(82.5)	57(100.0)			
Complete	37(10.7)	308(89.3)	345(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Husband Education Level				25.285	3	<0.001*
None	0(0.0)	53(100.0)	53(100.0)			
Primary	0(0.0)	56(100.0)	56(100.0)			
Secondary	12(9.6)	113(90.4)	125(100.0)			
Tertiary	37(18.9)	159(81.1)	196(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			

Husband's Occupation				16.605	3	0.001*
None	2(3.7)	52(96.3)	54(100.0)			
Trading/Business	16(7.8)	188(92.2)	204(100.0)			
Civil servant	25(21.0)	94(79.0)	119(100.0)			
Others	6(11.3)	47(88.7)	53(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			

*Significance

Table 2: Socio-demographic factors associated with HPV Vaccine Uptake in children among Mothers in Umuna

According to Table 2, HPV vaccine uptake appeared to be significantly associated with the mother's age group (p<0.001), the mother's religion (p=0.008), the mother's educational level (p<0.001) and the mother's monthly income (p=0.01). Similarly, their husband's educational level (p<0.001) and Occupation (p=0.001) also appeared to be significantly associated with HPV vaccine uptake.

Variable	HPC Vaccine Uptake		Total (%)	X^2	df	p-value
	Yes (%)	No (%)				
Knowledge				225.699	2	<0.001*
Good Knowledge	28(82.4)	6(17.6)	34(100.0)			
Moderate Knowledge	21(25.3)	62(74.7)	83(100.0)			
Poor Knowledge	0(0.0)	313(100.0)	313(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Attitude				107.887	2	<0.001*
Appropriate attitude	46(35.7)	83(64.3)	129(100.0)			
Fairly appropriate attitude	3(2.5)	119(97.5)	122(100.0)			
Inappropriate attitude	0(0.0)	179(100.0)	179(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			
Vaccine uptake willingness				53.449	2	<0.001*
High level	39(26.0)	111(74.0)	150(100.0)			
Moderate level	10(8.4)	109(91.6)	119(100.0)			
Low level	0(0.0)	161(100.0)	161(100.0)			
Total	49(11.4)	381(88.6)	430(100.0)			

*Significance

Table 3: Association between HPV vaccine uptake and Knowledge, Attitude and vaccine uptake willingness among mothers in Umuna

According to Table 3, HPV vaccine uptake appeared to be significantly associated with the level of mother's knowledge (p<0.001), attitude (p<0.001) towards HPV and its vaccine, as well as their willingness (p<0.001), to administer the HPV vaccine to their children.

Variable	aOR	95% CI	p-value
Mother's Age			
19-34 years	5.992	1.908 - 18.816	0.002*
35-49 years	1.536	0.489 - 4.825	0.463
50 years and above	1.000	------	-----
Mother's Religion			
Catholic Faith	2.664	1.283 - 5.530	0.009*
Other Religion	1.000	------	-----
Mother's Monthly Income			
Above N50,000	2.373	1.090 - 5.163	0.029*
N21,000-N50,000	1.805	0.825 - 3.947	0.139
N20,000 or less	1.000	------	-----

Husband's Occupation			
Civil servant	5.955	1.256 - 28.245	0.025*
Trading/Business	2.099	0.440 - 10.009	0.352
Others	3.016	0.538 - 16.903	0.209
None	1.000	------	------

*Significance

Table 4: Predictors of HPV vaccine uptake in children of mothers residing in Umuna

According to Table 4, mothers between the ages of 19-34 years were significantly more likely to have administered HPV vaccine to their children when compared to those aged 50 years and above (aOR: 5.99; p=0.002). Additionally, mothers practicing the Catholic Faith were significantly more likely to have administered HPV vaccine to their children when compared to those of other religions (aOR: 2.66; p=0.009). Moreover, mothers earning above the equivalent of $50 were significantly more likely to have administered HPV vaccine to their children when compared to those earning an equivalent of $20 or less (aOR: 2.37; p=0.029). Lastly, mothers, whose husbands were civil servants were significantly more likely to have administered HPV vaccine to their children when compared to those whose husbands had no occupation (aOR: 5.96; p=0.025).

4. Discussion

The demographic profile of the participating mothers in our study provided insights into the socio-economic context that shapes healthcare practices within the community. The average age of these mothers, which stood at 41 years, indicated a predominantly mature group, largely married and affiliated with the Catholic faith. An intriguing observation was the prevalence of involvement in trading or business activities despite many having attained tertiary education. Surprisingly, this educational achievement did not shield them from financial constraints, as reflected by their modest monthly incomes, further burdened by larger family sizes. Despite these challenges, a commendable 80% of these mothers prioritized routine childhood immunizations, demonstrating a strong commitment to safeguarding their children's health. Additionally, it was notable that a significant number of their husbands shared similar educational backgrounds and were also actively involved in trading or business activities, potentially contributing to the family's economic stability.

In our present study, where 73% of the mothers exhibited a poor level of knowledge, the assessment of the mothers' knowledge about HPV and its vaccines indicated a significant knowledge gap, alongside inappropriate attitudes toward HPV vaccination where 42% exhibited attitudes that were inappropriate. Encouragingly, more than a third expressed a high level of willingness to receive the HPV vaccine but despite this, the data revealed a stark reality regarding HPV vaccine uptake as these positive attitudes did not translate into adequate vaccination rates which stood at 11%.

Our study's findings on knowledge resonated with previous research, revealing the concerning gap in knowledge about Human Papillomavirus (HPV) and HPV vaccines across different population segments. In Nigeria, these gaps were observed among high school students, men, women residing in urban slums, urban and rural areas [6,9,10,18,19]. This widespread lack of awareness and inadequate knowledge across diverse groups calls for concerted efforts to bridge the informational gap across population groups.

This convergence of socio-economic factors among mothers, despite their educational achievements, signifies the complex interplay between knowledge, accessibility, and healthcare practices within the community. While these mothers demonstrate a commitment to their children's health through routine immunizations, the existing gaps in understanding HPV and its vaccination indicate the pressing need for targeted and culturally sensitive health education interventions. Efforts should be directed towards bridging these gaps by providing accurate information about HPV, dispelling misconceptions, and advocating for the significance of vaccination, thereby empowering mothers and families to make informed healthcare decisions.

Moreover, considering the shared educational backgrounds and economic activities of both mothers and their husbands, interventions should extend beyond solely targeting mothers. Involving families and communities in the comprehensive health education programs can potentially enhance awareness, create a supportive environment for vaccination, and ultimately contribute to improved vaccination rates against HPV.

As observed in our present study, the majority of mothers had not administered the HPV vaccine to any of their children. This was similarly observed in studies conducted across different cultural environments from Ghana to Austria [20,21]. This low uptake, accompanied by prevailing misconceptions, concerns about side effects, and misinformation, underscores the challenges in promoting vaccine uptake. The low uptake is concerning, given the potential benefits of vaccination in preventing HPV-related diseases.

In addition, the findings of our study highlight the relationship between mothers' knowledge, attitudes, willingness, and the actual uptake of the HPV vaccine among their children. It was evident that mothers who possessed better knowledge, embraced positive attitudes, and exhibited a higher willingness toward HPV vaccination were significantly more inclined to have their children vaccinated against HPV. This emphasizes the pivotal role mothers having informed attitudes and comprehensive knowledge play in

influencing vaccination behaviour and decisions.

The study by Bisi-Onyemaechi et al. similarly emphasized the critical impact of awareness and accessibility as factors influencing HPV vaccine uptake among caregivers [6]. Lack of access, particularly driven by financial constraints within households could be a significant barrier to vaccination. In our study, despite mothers' willingness to give the HPV vaccine to their children, the limited accessibility arising from financial constraints may have also contributed to the observed low uptake. This is further supported by the study conducted by Umeh and colleagues, which researched into mothers' willingness to pay (WTP) for HPV vaccination in Nigeria [18]. The study revealed that the amount mothers were willing to pay fell below the estimated costs required for vaccinating a pre-adolescent girl. This emphasizes the economic barriers that impede vaccine accessibility and acceptance.

Furthermore, findings from the study conducted in Ghana by Asare et al. highlighted the influence of perceived beliefs as significant predictors affecting the likelihood of HPV vaccination [20]. This suggests that attitudes toward vaccination were influenced by certain beliefs, even in scenarios where adequate knowledge was lacking.

Collectively, these findings highlight the dynamics and multifactorial nature of the factors influencing HPV vaccine uptake among mothers. While comprehensive knowledge, positive attitudes, and willingness toward vaccination emerge as key influencers, barriers such as lack of awareness, constrained accessibility due to financial limitations, and the influence of certain beliefs pose challenges to a mother's practice, thereby impacting the actual uptake of the HPV vaccine among their children.

Our study, also looked into the complex interplay of socio-demographic factors that influence the uptake of the HPV vaccine among mothers. Notably, various demographic factors, including age group, religious affiliation, educational level, monthly income, as well as husbands' educational levels and occupation, were found to be significantly associated with the administration of the HPV vaccine to their children. These findings underscore the complexity of socio-economic and familial dynamics that play important roles in making vaccination decisions.

One of the key findings of our study revealed that mothers within the age bracket of 19 to 34 years were six times more likely to have administered the HPV vaccine to their children compared to those aged 50 years and above. This age-based variation illuminates potential generational differences in vaccine uptake tendencies among mothers.

Religious affiliation emerged as another influential factor, with mothers practicing the Catholic faith being three times more likely to have administered the HPV vaccine to their children compared to those belonging to other religions. This finding underscores the influence of religious affiliations on vaccination behaviours within specific cultural contexts. Economic factors also emerged as a significant factor affecting vaccine uptake. Mothers earning higher incomes (equivalent to $50 or more) were about twice as likely to administer the HPV vaccine to their children compared to those with lower incomes (equivalent to $20 or less). This highlights the impact of financial stability on vaccine accessibility and administration of the HPV vaccine to their children.

Additionally, the occupational status of husbands had a considerable influence, where mothers whose husbands were civil servants demonstrated a remarkable six-fold higher likelihood of administering the HPV vaccine to their children compared to those whose husbands had no occupation. This emphasizes the role of familial socio-economic conditions in shaping vaccination decisions.

Furthermore, our findings align with prior research, highlighting the multifaceted nature of socio-demographic factors influencing HPV vaccine uptake among mothers. Studies conducted elsewhere, such as Wemrell et al.'s study in Sweden, underscored the significance of factors like low education and income in relation to vaccination hesitancy among adult women [22]. Similarly, Okunowo et al.'s study in Lagos, Nigeria, highlighted employment status as a predictor of HPV vaccination uptake [10]. Additionally, Asare et al.'s research in Ghana among adolescents emphasized the association between age and the likelihood of receiving the first dose of HPV vaccination [20].

Lastly, our study provides some insights into the complex array of socio-demographic variables that shape HPV vaccination decisions among mothers. These insights serve as essential considerations for policymakers and public health practitioners aiming to enhance vaccine uptake and address disparities in immunization coverage.

5. Conclusion

Our study emphasizes the critical need for tailored interventions aimed at enhancing HPV vaccination uptake within the community. There is an urgent requirement for comprehensive strategies that involve a multifaceted approach to address existing knowledge gaps, foster positive attitudes, correct misconceptions, and overcome barriers hindering vaccination.

Tailored interventions should be developed while considering the nuanced interplay of sociodemographic factors and actively engaging the family and community. These interventions ought to be rooted in evidence-based information dissemination strategies, acknowledging the unique needs of specific demographic groups. While acknowledging the limitations inherent in our study, including potential biases in sampling techniques and reliance on self-reported data, future research endeavors using qualitative techniques could delve deeper into exploring the intricate factors influencing vaccination decisions, particularly in rural settings.

By addressing these limitations and leveraging qualitative exploration, subsequent studies can offer more nuanced and

context-specific interventions. These efforts will contribute to improved HPV vaccine uptake and, consequently, a reduction in HPV-related disease prevalence within the community.

Competing Interests

The authors declare that we have no competing interests

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