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Predictors of Hesitancy in Childhood Vaccination Uptake Post-Covid-19 in Bayelsa State, Nigeria

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Abstract

The COVID-19 pandemic disrupted routine immunization services worldwide, including in Bayelsa State, Nigeria. This study aims to identify the predictors of childhood vaccination uptake post-COVID-19 and understand the factors associated with vaccine hesitancy in this region. A cross-sectional study was conducted involving 810 parents and caregivers of children eligible for vaccination in Bayelsa State. Data on demographic characteristics, attitudes towards vaccination, and vaccination uptake were collected using structured questionnaires. Logistic regression analysis was performed to identify significant predictors of vaccine hesitancy. The study found that female participation in child healthcare was significantly higher (78%), with most participants being married (60.2%) and having secondary education (55.1%). Positive attitudes towards childhood immunization were associated with higher vaccination uptake (88.9%). Significant predictors of vaccine hesitancy included self-employment (aOR 1.3), rural residence (aOR 1.8), not believing in mandatory immunization (aOR 5.1), not advising other parents to immunize (aOR 4.1), never taking children for scheduled immunizations (aOR 8.4), and not participating in community programs (aOR 3.1). The study highlights the importance of parental education, occupation, area of residence, and attitudes towards immunization in determining childhood vaccination uptake. Targeted interventions addressing these factors, promoting positive attitudes, and enhancing community engagement are essential to improve vaccination rates and reduce vaccine hesitancy in Bayelsa State.

Keywords: *Bayelsa State, Childhood Vaccination, COVID-19, Nigeria, Predictors, Vaccine Hesitancy.*

Introduction

The global rollout of COVID-19 vaccines marked a turning point in the fight against the pandemic. However, the success of vaccination campaigns varies significantly across regions, influenced by factors such as vaccine availability, socioeconomic status, healthcare infrastructure, and individual behaviors [1, 2]. The COVID-19 pandemic has significantly impacted healthcare systems worldwide, including vaccination programs essential for preventing childhood diseases [3, 4]. In Nigeria, the pandemic disrupted routine immunization services, leading to concerns about decreased vaccination coverage and increased susceptibility to vaccine-preventable diseases among children [5, 6]. Bayelsa State, like many regions, faced challenges such as restricted movement, reduced access to healthcare, and heightened fear of virus transmission, which may have influenced parents' and caregivers' decisions about childhood vaccinations [7, 8].

Child vaccinations are the administration of vaccines to protect children from infectious diseases. These vaccines stimulate the immune system to recognize and fight specific pathogens, thereby preventing illnesses such as measles, polio, diphtheria, and tuberculosis. Vaccination is one of the most effective public

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health interventions, significantly reducing morbidity and mortality from infectious diseases [9, 10].

The public health importance of childhood vaccinations cannot be overstated. They not only protect individual children from potentially severe illnesses but also contribute to herd immunity, which helps prevent the spread of diseases within communities [11]. High vaccination coverage is crucial for maintaining disease eradication and controlling outbreaks, particularly in regions with limited healthcare resources [12].

Vaccination behavior is a complex phenomenon influenced by a myriad of factors. Sociodemographic characteristics, such as age, gender, education level, and income, often play a crucial role [13, 14]. Behavioral and psychological factors, including perceived susceptibility to disease, trust in healthcare systems, and vaccine confidence, also significantly impact decision-making [15, 16]. Furthermore, structural barriers, such as limited access to healthcare facilities and challenges in vaccine distribution, can hinder vaccine uptake, particularly in rural and underserved areas like Bayelsa State [8, 17].

In the post-COVID-19 era, understanding the predictors of vaccination uptake has become more urgent. The pandemic exposed vulnerabilities in healthcare systems and revealed widespread misinformation and vaccine hesitancy [13, 18]. In Bayelsa State, these issues are compounded by a history of distrust in government-led health initiatives and the influence of religious and cultural beliefs. Identifying the specific predictors of vaccination uptake in this context is critical for developing targeted interventions that address the unique challenges faced by the population. This study aims to provide an evidence-based understanding of the factors influencing vaccination uptake post-COVID-19 in Bayelsa State. By identifying key predictors, the research seeks to guide policymakers, healthcare providers, and public health practitioners in designing tailored strategies to improve vaccine acceptance and coverage, ultimately contributing to better health outcomes in the region.

Methods

Study Population

The study included 810 parents or primary caregivers of children aged 0 to 5 years residing in Bayelsa State, Nigeria. This age group was selected because it aligns with the period when children typically receive early childhood immunizations as outlined in the national immunization schedule.

Study Procedure

Quantitative data were collected using a structured questionnaire (Appendix I) administered to parents and caregivers. The questionnaire captured demographic details, perceptions of childhood immunization, fears and attitudes toward vaccines, and knowledge of immunization schedules. Attitudes toward vaccination were categorized using Bloom's Taxonomy into two groups: Poor (Likert scale average < 2.5) and Good (Likert scale average $\geqslant 2.5$) [14]. Data collection was conducted at community centers and healthcare facilities to maximize accessibility and participation

Data Analysis

The quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were employed to summarize respondents' socio-demographic characteristics and their perceptions of immunization. Inferential statistical methods, such as chi-square tests and logistic regression, were used to explore the relationships between independent variables (parental characteristics, perceptions, fears, and attitudes) and the dependent variable (immunization uptake).

Results

Table 1 summarizes the demographic information of the study participants. The majority of participants were aged 30-39 years (34.3%), followed by 19-29 years (29.9%), 40-49 years (23%), and 50+ years (12.8%). A higher proportion of participants were female (78%) compared to male (22%). Most participants were married (60.2%), with singles (27.2%), divorced/separated (9.4%), and widowed (3.2%) making up the rest. The largest group had secondary education (55.1%), followed by tertiary education (28.9%), no formal education (8.4%), and primary education (7.7%). Self-employed participants formed the largest group (40.2%), followed by those unemployed (18.5%), employed in the private sector (23.2%), employed in the government sector (17.3%), and students (0.7%). A significant majority (84.4%) resided in rural areas, while a smaller proportion (15.6%) lived in urban areas. Most participants identified with Christianity (93.3%), with smaller percentages identifying with Islam (3.2%) and traditional beliefs (3.5%).

Table 1. Demographic distribution of Study Participants

Demographic Variable	**Frequency (n=810)**	**Percent (%)**
Age groups		
19 - 29	242	29.9
30 - 39	278	34.3
40 - 49	186	23
50 and above	104	12.8
Gender		
Female	632	78
Male	178	22
Marital Status		
Single	220	27.2
Married	488	60.2
Divorced/Separated	76	9.4
Widowed	26	3.2
Highest level of education		
No formal education	68	8.4
Primary education	62	7.7
Secondary education	446	55.1
Tertiary education	234	28.9
Occupation		
Unemployed	150	18.5
Self-employed	326	40.2
Employed (private sector)	188	23.2
Employed (government sector)	140	17.3
Student	6	0.7
Area of Residence		

Urban	126	15.6
Rural	684	84.4
Religious affiliation		
Christianity	756	93.3
Islam	26	3.2
Traditional beliefs	28	3.5

Figure 1 shows that 518 respondents (63.95%) reported their children had received all vaccinations as scheduled, while 292 (36.05%) said they had not.

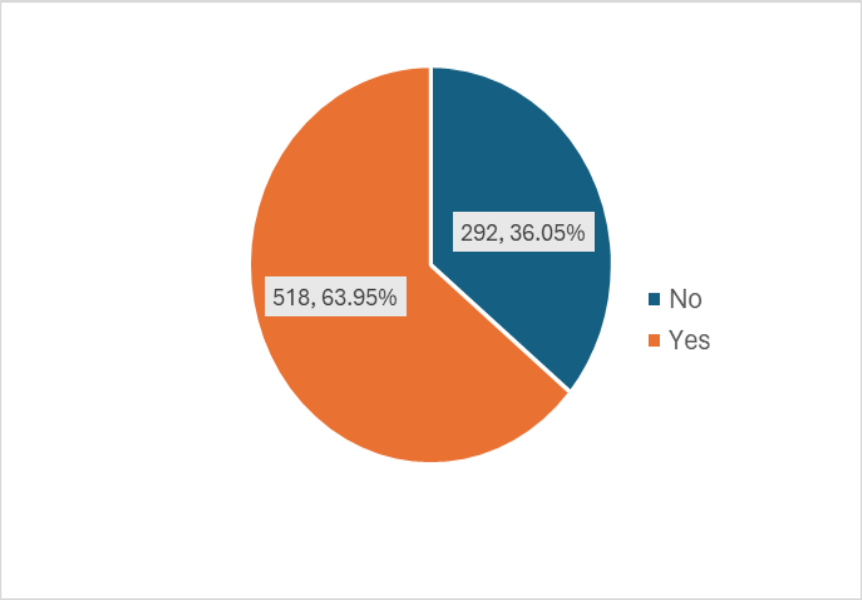

Figure 1. Distribution of Children that have Received all Vaccinations as Scheduled

The results from Table 2 show a strong association between parents' attitudes towards vaccination and child vaccination uptake. Parents with a strongly positive attitude towards childhood immunization had the highest vaccination rate (88.9%). In contrast, those with a strongly negative attitude had none of their children fully vaccinated. Similarly, parents who believed that immunization should be mandatory or would advise other parents to immunize their children had higher vaccination rates for their children (78.2% and 76.0%, respectively). In terms of adherence to scheduled immunizations, children whose parents always took them on time had the highest full vaccination rate (94.6%). Public health centers were the most common vaccination sites, with 65.0% of children receiving all required vaccinations there. Participation in community programs aimed at increasing immunization awareness also correlated with higher vaccination rates: 76.5% of children whose parents participated in such programs were fully vaccinated. The chi-square test results for these associations were statistically significant, indicating a strong relationship between parents' positive attitudes and higher vaccination uptake.

Table 2. Association of Parent's Attitudes towards Vaccination and Child Vaccination Uptake

Attitudes	**Child Received all Vaccination Required**			**Chi-square (p-value)**
	No n, (%)	**Yes n, (%)**	**Total n, (%)**	
How would you describe your attitude toward childhood immunization?				
Strongly positive	14(11.1)	112(88.9)	**126(100.0)**	*129.36 (0.001)**
Positive	128(28.6)	320(71.4)	**448(100.0)**	
Neutral	106(60.2)	70(39.8)	**176(100.0)**	
Negative	34(68.0)	16(32.0)	**50(100.0)**	
Strongly negative	10(100.0)	0(0.0)	**10(100.0)**	
Do you believe that immunization should be mandatory for all children?				
No	188(56.3)	146(43.7)	**334(100.0)**	*100.9 (0.0001)**
Yes	104(21.8)	372(78.2)	**476(100.0)**	
Would you advise other parents to immunize their children?				
No	164(59.4)	112(40.6)	**276(100.0)**	*99.18 (0.0001)**
Yes	128(24.0)	406(76.0)	**534(100.0)**	
How often do you take your child for scheduled immunizations?				
Always on time	12(5.4)	212(94.6)	**224(100.0)**	*200.70 (0.0001)**
Sometimes on time	122(34.7)	230(65.3)	**352(100.0)**	
Rarely on time	120(63.2)	70(36.8)	**190(100.0)**	
Never	38(86.4)	6(13.6)	**44(100.0)**	
Where do you typically take your child for vaccinations?				
public health centre	254(35.0)	472(65.0)	**726(100.0)**	*Fischer's Exact= 0.0001**
Private clinic	22(32.4)	46(67.6)	**68(100.0)**	
Don't believe in immunization	4(100.0)	0(0.0)	**4(100.0)**	
Don't go to clinic	2(100.0)	0(0.0)	**2(100.0)**	
No go to Hospital	2(100.0)	0(0.0)	**2(100.0)**	
No visit	2(100.0)	0(0.0)	**2(100.0)**	
None	6(100.0)	0(0.0)	**6(100.0)**	
Would you participate in community programs aimed at increasing awareness about immunization?				
No	198(48.3)	212(51.7)	**410(100.0)**	*53.98 (0.0001)**
Yes	94(23.5)	306(76.5)	**400(100.0)**	

**Statistically significant (p<0.05)*

The results from Table 3 indicate associations between parent's demographic characteristics and child vaccination uptake. Age groups showed varied vaccination uptake, with parents aged 50 and above having the highest percentage of fully vaccinated children (69.2%). Gender did not show a significant difference in vaccination uptake, with similar percentages for female (63.6%) and male (65.2%) parents. Marital status also showed no significant difference, though married parents had slightly lower vaccination uptake (61.9%) than single (67.3%) and divorced/separated (68.4%) parents. Education level was significantly associated, with parents with tertiary education showing the highest vaccination uptake (70.9%) and those with no formal education showing the lowest (44.1%). Occupation also showed a significant association: parents employed in the

government sector had the highest vaccination uptake (75.7%), while those unemployed had a lower uptake (61.3%). Residence showed a significant difference, with urban residents having a higher vaccination uptake (76.2%) compared to rural residents (61.7%). Religious affiliation did not show a significant difference, though parents affiliated with traditional beliefs had slightly higher vaccination uptake (64.3%) than those affiliated with Christianity (64.6%) or Islam (46.2%). Statistically significant associations ($p<0.05$) were found for education level, occupation, and area of residence, highlighting their importance in predicting child vaccination uptake.

Table 3. Association of Parent's Demographic Characteristics and Child Vaccination Uptake

Demographic Variable	**Child Received all Vaccination Required**			**Chi-square (p-value)**
	No n,(%)	**Yes n,(%)**	**Total n,(%)**	
Age groups				
19 - 29	82(33.9)	160(66.1)	**242(100.0)**	3.94 (0.268)
30 - 39	112(40.3)	166(59.7)	**278(100.0)**	
40 - 49	66(35.5)	120(64.5)	**186(100.0)**	
50 and above	32(30.8)	72(69.2)	**104(100.0)**	
Gender				
Female	230(36.4)	402(63.6)	**632(100.0)**	0.14 (0.702)
Male	62(34.8)	116(65.2)	**178(100.0)**	
Marital Status				
Single	72(32.7)	148(67.3)	**220(100.0)**	2.68 (0.444)
Married	186(38.1)	302(61.9)	**488(100.0)**	
Divorced/Separated	24(31.6)	52(68.4)	**76(100.0)**	
Widowed	10(38.5)	16(61.5)	**26(100.0)**	
Highest level of education				
No formal education	38(55.9)	30(44.1)	**68(100.0)**	17.49 (0.001)*
Primary education	26(41.9)	36(58.1)	**62(100.0)**	
Secondary education	160(35.9)	286(64.1)	**446(100.0)**	
Tertiary education	68(29.1)	166(70.9)	**234(100.0)**	
Occupation				
Unemployed	58(38.7)	92(61.3)	**150(100.0)**	10.94 (0.027)*
Self-employed	130(39.9)	196(60.1)	**326(100.0)**	
Employed (private sector)	68(36.2)	120(63.8)	**188(100.0)**	
Employed (government sector)	34(24.3)	106(75.7)	**140(100.0)**	
Student	2(33.3)	4(66.7)	**6(100.0)**	
Area of Residence				
Urban	30(23.8)	96(76.2)	**126(100.0)**	9.69 (0.002)*
Rural	262(38.3)	422(61.7)	**684(100.0)**	
Religious affiliation				

Christianity	268(35.4)	488(64.6)	**756(100.0)**	3.69 (0.158)
Islam	14(53.8)	12(46.2)	**26(100.0)**	
Traditional beliefs	10(35.7)	18(64.3)	**28(100.0)**	

**Statistically significant (p<0.05)*

The logistic regression analysis from Table 4 reveals various factors associated with vaccine hesitancy. Education level shows no significant association, as parents with no formal education have an OR of 1.3 (p-value of 0.241) compared to those with at least primary education. The occupation analysis shows that being unemployed is not significantly associated with vaccine hesitancy (OR of 1.3, p-value of 0.104), whereas being self-employed is (OR of 1.4, p-value of 0.018), indicating that self-employed parents are more likely to exhibit vaccine hesitancy. Living in rural areas significantly increases vaccine hesitancy (OR of 1.9, p-value of 0.001). Attitudes towards immunization show no significant association for negative attitudes (OR of 0.2, p-value of 0.133). However, parents who do not believe immunization should be mandatory have a significantly higher likelihood of hesitancy (OR of 4.6, p-value of 0.0001), as do those who would not advise others to immunize their children (OR of 4.6, p-value of 0.0001). Parents who never take their children for scheduled immunizations are significantly more likely to be hesitant (OR of 12.7, p-value of 0.0001). Those who do not believe in vaccination or do not visit hospitals have the highest odds of hesitancy (OR of 29.7, p-value of 0.0001). Lastly, non-participation in community programs aimed at increasing awareness is significantly associated with vaccine hesitancy (OR of 3.0, p-value of 0.001).

Table 4. Logistic Regression of Factors Associated with Vaccine Hesitancy

Variable	**Child Received all Vaccination Required**			**Chi-square (p-value)**	**OR (95% CI)**
	No n,(%)	**Yes n,(%)**	**Total n,(%)**		
Highest level of education					
No formal education	38(55.9)	30(44.1)	**68(100.0)**	1.37 (0.241)	1.3 (0.8 – 2.2)
At least Primary Education	254(49.2)	262(50.8)	**516(100.0)**		
Occupation					
Unemployed	58(38.7)	92(61.3)	**150(100.0)**	2.63 (0.104)	1.3 (0.9 – 2.0)
Self-employed	130(39.9)	196(60.1)	**326(100.0)**	5.50 (0.018)*	1.4 (1.0 – 2.0)
Student's/Employed (Private/Government)^{R}	104(31.1)	230(68.9)	**334(100.0)**		
Area of Residence					
Rural	262(38.3)	422(61.7)	**684(100.0)**	9.69 (0.001)*	1.9 (1.2 – 3.1)
Urban	30(23.8)	96(76.2)	**126(100.0)**		
How would you describe your attitude toward childhood immunization?					
Negative	35(68.6)	16(31.4)	**51(100.0)**	2.25 (0.133)	0.2 (0.02 – 1.8)
Neutral/Positive^{R}	10(100.0)	0(0.0)	**10(100.0)**		
Do you believe that immunization should be mandatory for all children?					
No	188(56.3)	146(43.7)	**334(100.0)**	101.0 (0.0001)*	4.6 (3.3 – 6.2)
Yes^{R}	104(21.8)	372(78.2)	**476(100.0)**		
Would you advise other parents to immunize their children?					

No	164(59.4)	112(40.6)	**276(100.0)**	99.1 (0.0001)*	4.6 (3.4 – 6.3)
Yes[R]	128(24.0)	406(76.0)	**534(100.0)**		
How often do you take your child for scheduled immunizations?					
Never	38(86.4)	6(13.6)	**44(100.0)**	51.1 (0.0001)*	12.7 (5.3 – 30.6)
Always/Rarely/Sometimes[R]	254(33.2)	512(66.8)	**766(100.0)**		
Where do you typically take your child for vaccinations?					
Don't believe in immunization/No hospital visit	16(100.0)	0(0.0)	**16(100.0)**	25.11 (0.0001)*	29.7 (3.9 – 225.6)
public health centre/private clinic[R]	254(35.0)	472(65.0)	**726(100.0)**		
Would you participate in community programs aimed at increasing awareness about immunization?					
No	198(48.3)	212(51.7)	**410(100.0)**	53.98 (0.001)*	3.0 (2.2 – 4.1)
Yes[R]	94(23.5)	306(76.5)	**400(100.0)**		

**Statistically significant (p<0.05) R Reference Variable OR: Odds Ratio*

Table 5 identifies key predictors of vaccine hesitancy, highlighting significant factors and their adjusted odds ratios (aOR). Self-employment is a significant predictor, with an aOR of 1.3 (p-value = 0.018), indicating that self-employed parents are more likely to exhibit vaccine hesitancy than employed parents in other sectors. Rural residence is another significant predictor, with an aOR of 1.8 (p-value = 0.001), suggesting that parents in rural areas are more hesitant about vaccines than those in urban areas. Not believing in mandatory immunization is strongly associated with vaccine hesitancy, with an aOR of 5.1 (p-value of 0.0001). Parents who oppose mandatory vaccination are more likely to be hesitant. Similarly, not advising other parents to immunize their children is a significant predictor, with an aOR of 4.1 (p-value of 0.0001), indicating that these parents are more likely to be hesitant. Never taking children for scheduled immunizations is a significant predictor, with an aOR of 8.4 (p-value of 0.0001). Parents who do not adhere to immunization schedules are more likely to exhibit hesitancy. Not believing in immunization or not visiting hospitals is also strongly associated with vaccine hesitancy, with an aOR of 10.1 (p-value = 0.0001). Finally, not participating in community programs aimed at increasing immunization awareness is a significant predictor, with an aOR of 3.1 (p-value = 0.001). Parents who do not engage in these programs are more likely to be hesitant. These findings underscore the importance of addressing these factors to reduce vaccine hesitancy among parents.

Table 5. Predictors of Vaccine Hesitancy

Variable	**OR (95% CI)**	**aOR (95% CI)**	**p-value**
Occupation			
a. Unemployed	1.3 (0.9 – 2.0)	1.1 (0.6 – 1.9)	0.104
b. Self-employed	1.4 (1.0 – 2.0)	1.3 (1.0 – 2.1)	0.018*
Student's/Employed (Private/Government)[R]			
Area of Residence			

b. Rural	1.9 (1.2 – 3.1)	1.8 (1.2 – 3.6)	0.001*
a. Urban			
Do you believe that immunization should be mandatory for all children?			
No	4.6 (3.3 – 6.2)	5.1 (2.6 – 7.1)	0.0001*
Yes[R]			
Would you advise other parents to immunize their children?			
No	4.6 (3.4 – 6.3)	4.1 (3.1 – 7.1)	0.0001*
Yes[R]			
How often do you take your child for scheduled immunizations?			
d. Never	12.7 (5.3 – 30.6)	8.4 (4.1 – 16.1)	0.0001*
Always/Rarely/Sometimes[R]			
Where do you typically take your child for vaccinations?			
Don't believe in immunization/No hospital visit	29.7 (3.9 – 225.6)	10.1 (5.1 – 16.8)	0.0001*
a. public health centre/private clinic[R]			
Would you participate in community programs aimed at increasing awareness about immunization?			
No	3.0 (2.2 – 4.1)	3.1 (2.2 – 6.1)	0.001*
Yes[R]			

**Statistically significant (p<0.05) R Reference Variable; OR: Odds Ratio aOR: Adjusted Odds Ratio*

Discussion

The demographic distribution of study participants showed a higher proportion of females (78%) compared to males (22%). This is consistent with other studies that have found women to be more involved in child healthcare decisions [19, 20]. The majority of participants were married (60.2%), which is often associated with greater stability and support systems for child healthcare. The largest group had secondary education (55.1%), followed by tertiary education (28.9%), indicating a relatively educated population. This is significant as higher educational levels are generally associated with better healthcare practices, including vaccination uptake. The results of this study align with several other studies that have explored factors influencing vaccination uptake and hesitancy. For example, the significant impact of parental education and urban residency on vaccination rates is well-documented in literature [21, 22].

Self-employment (40.2%) and rural residence (84.4%) were prominent among participants. The high rural population reflects the state's geographical characteristics. Rural residence has been associated with lower vaccination rates due to limited healthcare access, as corroborated by studies such as [23] and [24], which found that rural dwellers in Nigeria are less likely to fully vaccinate their children.

The study revealed a significant association between parents' attitudes towards vaccination and child vaccination uptake. Strongly positive attitudes towards childhood immunization were associated with a high percentage of children receiving all required vaccinations (88.9%). In contrast, strongly negative attitudes resulted in none of the children being fully vaccinated. This aligns with findings by [25], who reported that positive parental attitudes significantly

improve vaccination rates. Belief in mandatory immunization showed that parents who opposed it were more likely to exhibit vaccine hesitancy (OR = 4.6). This is consistent with previous research [15, 26, 27] that highlighted the impact of mandatory vaccination policies on improving immunization rates. The association between positive parental attitudes and higher vaccination uptake has been emphasized in multiple studies, including [28] and [24]. These studies highlight the importance of educational interventions to improve parental attitudes towards vaccination.

Education level was a significant predictor of child vaccination uptake, with parents having tertiary education showing the highest vaccination uptake (70.9%). This finding is consistent with earlier studies, such as [29] which identified parental education as a critical factor in improving vaccination coverage. Occupation also played a role, with government sector employees having the highest vaccination uptake (75.7%), likely due to better access to healthcare services and information. Area of residence was another significant factor, with urban residents having higher vaccination uptake (76.2%) than rural residents (61.7%). This finding is in line with studies [29-31] that reported that urban dwellers have better access to vaccination services, leading to higher vaccination coverage.

The logistic regression analysis identified self-employment, rural residence, not believing in mandatory immunization, not advising other parents to immunize, never taking children for scheduled immunizations, and not participating in community programs as significant predictors of vaccine hesitancy. Self-employed parents were more likely to exhibit vaccine hesitancy (aOR of 1.3), possibly due to irregular income and a lack of employer-provided healthcare benefits, as suggested by studies such as [31]. Living in rural areas significantly increased vaccine hesitancy (aOR of 1.8), aligning with research by [30] that found rural residents face more barriers to accessing vaccination services. The belief that immunization should not be mandatory was a strong predictor of hesitancy (aOR of 5.1), consistent with findings by [21] which emphasized the role of perceived autonomy in vaccination decisions.

Parents who never took their children for scheduled immunizations were significantly more likely to be hesitant (aOR of 8.4). This is supported by findings from [23], which highlighted the importance of routine healthcare practices in ensuring complete vaccination. Not participating in community programs aimed at increasing immunization awareness was also a significant predictor of vaccine hesitancy (aOR of 3.1), underscoring the importance of community engagement in improving vaccination rates, as noted in previous studies [22, 23].

Conclusion

The study highlights significant predictors of childhood vaccination uptake and vaccine hesitancy in Bayelsa State, Nigeria. Factors such as parental education, occupation, area of residence, and attitudes towards immunization play crucial roles in determining vaccination coverage. The findings emphasize the importance of positive parental attitudes, support for mandatory vaccination, timely adherence to immunization schedules, and participation in community awareness programs. These elements are essential for improving vaccination rates and reducing vaccine hesitancy. Based on these findings, it is recommended that targeted interventions be designed to address the specific barriers faced by self-employed and rural-dwelling parents. Efforts should be made to enhance educational programs that promote the benefits of immunization and address misconceptions about vaccines. Community engagement initiatives should be strengthened to increase participation in awareness programs. Additionally, policies that support mandatory immunization and improve access to

vaccination services in rural areas are essential. By implementing these recommendations, it is possible to enhance childhood vaccination uptake and protect children from preventable diseases, ultimately contributing to better public health outcomes in the region.

Ethical Considerations

Ethical approval for the study was obtained from the Research and Ethics Committee of the Bayelsa State Primary Healthcare Board. Participants were fully informed about the study's objectives and procedures before participation. A comprehensive explanation of their rights, including the voluntary nature of participation and their ability to withdraw at any time without penalty, was provided. Informed consent, either written or verbal, was obtained from all participants before data collection. Confidentiality was maintained by assigning unique study IDs to anonymize participants' personal information, preventing data from being traced back to individuals.

Conflict of Interest

The authors declare that there is no conflict of interest for this study.

Acknowledgement

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