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Maternal and child's characteristics associated with immunization status of children in a rural community of Rivers State Nigeria

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ABSTRACT

Background: Maternal and child characteristics have been reported to be associated with the complete immunization of children. This study aimed to assess maternal and child characteristics associated with the immunization status of children in a rural community in Rivers State.
Methods: A descriptive cross-sectional study was conducted among 410 mothers with children ranging in age from 9 to 23 months residing in Rumuji town between October and December 2022. Semi-structured, interviewer-administered questionnaires with open- and closed-ended questions were used for data collection. The immunization cards of the children were used to determine their immunization status, and IBM SPSS version 25 was used for data analysis.
Results: 238 mothers (54.8%) were mainly between the ages of 21 and 30, with a mean age of 28.20 ± 6.90 years. 315 (83.3%) of the children were females between the ages of 14 and 18 months, with a mean age of 15.70 ±7.42 months. The maternal and child factors associated with up-to-date immunization in the study were: mothers aged 21 to 30 years, married, had secondary education, were unemployed, had 1 to 3 children, attended an antenatal clinic in a health facility, delivered at home, had a childbirth order of 1st and 2nd, and had female children. 295 (72.0%) of the children were up-to-date immunized, 84 (20.5%) were partially immunized, and 31 (7.6%) were not immunized.
Conclusion: The proportion of children with up-to-date immunization was high, although it was not up to the recommended 80% district coverage by the World Health Organization. There is a need to intensify routine and outreach immunization services, especially in the rural communities of Rivers State.

INTRODUCTION

Two to three million child fatalities from diseases that can be prevented by vaccines each year are prevented due to vaccination, which is a cost-effective public health strategy for child survival. Sub-Saharan Africa is where many of these deaths occur [1,2]. Ten low- and middle-income countries, including Angola, Brazil, the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Myanmar, Nigeria, Pakistan, and the Philippines, are home to more than 60% of these newborns [3]. The third dose of diphtheria, tetanus toxoid, and pertussis-containing antigens (DTP3) was also reportedly missed by an estimated 187 million kids, while the measles vaccine was reportedly missed by roughly 201 million children [4].

According to the 2018 National Demographic and Health Survey (NDHS) in Nigeria, 31% of children had received all the recommended vaccines, while 19% had not.

Information on the maternal and child attributes that are linked to children's immunization status in remote Rivers State communities is limited. Therefore, the purpose of this research was to assess maternal and child variables related to children's immunization status in a rural Rivers State community.

METHODOLOGY

Study Areas. The study was carried out in Rumuji in Emohua Local Government Area, which is one of the rural local government areas of Rivers State. Rivers State is one of the thirty-six (36) states of the Federal Republic of Nigeria located in the south-south geopolitical region of the country.

Research Design. Between October and December 2022, a descriptive cross-sectional study of women in Rumuji who had children between the ages of 9 and 23 months was carried out.

Sample size: The study's minimum sample size "n" was calculated using Fisher's formula for sample size determination for cross-sectional studies[5], $n = z^2pq/d^2$. The confidence interval (C.I.) was set at 95% normal deviation z = 1.96, d = 0.05, p = prevalence (coverage) of 39.2% [6]. Q = 1-p. With a 10% non-responder rate, the calculated minimum sample size was 407, but 410 was used.

Sampling Method: A multi-stage sampling technique was used to select the participants. The community was divided into five zones using a sketch map of the community. 82 mothers were selected from each zone. The sampling started from the household of the leader in charge of each zone, which was purposefully selected. Thereafter, every fourth household to the right of the household of the leader was selected. If the selected household did not have any eligible child, the immediate household to its right was selected. This was done until the sample size of 410 was obtained.

Data collection instrument. The tool for data collection was a pre-tested, interviewer-administered semi-structured questionnaire with open-and closed-ended questions adapted from another study[7]. The immunization cards of the children were used to determine their immunization status.

Data Management: Manual sorting of the data was done, and the data were validated by checking for inconsistencies and inaccuracies and asking questions in more than one way. The data were then entered into Microsoft Excel 2019 (Microsoft, Redmond, Washington, DC, USA), cleaned, and transferred to IBM SPSS Version 25.0 (IBM, Armonk, New York, USA), where they were revalidated with the in-built validation functions of IBM SPSS Version 25. Using another study, a child was fully immunized if he or she had taken a dosage of the BCG, hepatitis B, measles, and yellow fever vaccines, as well as four doses of the oral polio vaccine and three doses of the pentavalent vaccine. This gives a total of eleven doses[8]. A child who had taken one or more vaccination doses but fewer than eleven doses was considered partially immunized, and any child who had not yet received any of the eleven doses was considered unvaccinated [8].

The data were analyzed with IBM SPSS Statistics Version 25. Univariate analysis was performed, and the data were presented as frequency tables. Categorical variables were expressed in percentages, while continuous variables were expressed as the mean and standard deviation. The Pearson Chi-square (χ^2) test was used for the test of associations between the independent and dependent variables. A p-value less than 0.05 was considered statistically significant at a 95% confidence interval.

Ethical approval: Ethical approval was obtained from the Rivers State Primary HealthCare Management Board, Port Harcourt. Permission was obtained from the chiefs, heads of households, and other community opinion leaders. Informed consent was obtained from the mothers. Verbal consent was obtained where written consent was not possible.

RESULTS

Sociodemographic characteristics of the respondents

Table 1 shows the sociodemographic characteristics of the respondents.

Many mothers, 238 (54.4%), were aged 21 to 30 years with a mean age of 28.2 6.9 years; Christians,

324 (83.7%); married, 204 (54.9%); and had secondary education, 205 (50.0%).

Table 1 Sociodemographic characteristics of the respondents

Characteristics	Intervention LGA N =410	
	Freq (n)	Percent (%)
Age		
≤20	16	7.07
21-30	238	54.35
31-40	94	29.35
41-50	42	7.07
≥51	20	2.17
Mean (SD)	28.20 ± 6.90	
Sex		
Female	315	83.15
Male	95	16.85
Age of the child's last birthday (months)		
9-13	79	6.52
14-18	264	39.13
19-23	67	33.15
Mean (SD)	15.70 ± 7.42	
Sex of child		
Female	286	27.72
Male	124	72.28
Religion		
Christian	324	83.70
Muslim	74	9.24
Traditional	12	7.07
Marital status		
Married	204	54.89
Single	127	25.54
Co-Habiting	48	11.41
Separated	17	4.89
Widowed	10	2.17
Divorced	4	1.09

Educational Status		
None	57	13.90
Primary	132	32.20
Secondary	205	50.00
Post-Secondary	16	3.90
Occupation		
Trader/Farmer	128	31.22
Housewife	104	25.37
Unemployed	138	33.66
Civil servant	23	5.61
Professional	11	2.68
Traditional healer	6	1.46
Place of birth		
Home	293	71.46
Health Facility	117	28.54
Number of children		
1-3	243	59.27
4-6	106	25.85
>6	61	14.88
Mother attending Antenatal care		
Yes	280	68.29
No	130	31.71
Place of antenatal clinic (n=536)		
Health facility	85	15.86
TBA	250	46.64
Maternity home	106	19.78
Church	95	17.72
Position of the child in the family		
1st-2nd	165	40.24
3rd-4th	156	38.05
5th-8th	89	21.71

Table 2 shows the immunization status of the children. 295 of the children (72%) were up-to-date immunized.

Table 2 Immunization status of children aged 9 to 23 months.

Immunization Status	**Intervention group n=410**	
	Freq (n)	**Percent (%)**
Up to date	295	71.95
Partially vaccinated	84	20.49
Not vaccinated	31	7.56

Table 3 shows the association between maternal and child characteristics and the immunization status of children aged 9 months to 23 months.

Table 3 Association between maternal and child characteristics and immunization status of children aged 9 months to 23 months.

Maternal biodata	Fully vaccinated N=295 %	Partially vaccinated. N=84 %	Unvaccinated N=31 %	χ^2	df	p-value Odds Ratio (OR)
Age						
≤20	8 (2.71)	6 (7.14)	2 (6.45)		4	**p=0.001***
21-30	157(53.22)	60 (71.43)	21 (67.74)	18.253		OR= 0.419; 95% C.I. = 0.274 to
>30	130(44.07)	18 (21.43)	8 (25.81)			0.638.
Marital status						**p= 0.255**
Married	156(52.88)	37 (44.05)	11 (35.48)			OR=1.441.
Single	87 (29.49)	27 (32.14)	13 (41.94)	5.335	4	95% C.I.=1.032 to 2.011.
Co-habiting/separated	52 (17.63)	20 (23.81)	7 (22.58)			
Educational Status						
None	39 (13.22)	18 (21.43)	0 (0.00)	36.660	6	**p= 0.000***
						OR = 0.651.
Primary	78 (26.44)	39 (46.43)	15 (48.39)			95% C.I. = 0.337 to 0.939.
Secondary	170(57.63)	22 (26.19)	13 (41.94)			
Post-secondary	8 (2.71)	5 (5.95)	3 (9.68)			
Occupation						
Unemployed& housewives	201(68.14)	34 (40.48)	7 (22.58)			
Professionals, traders/farmers, artisans, traditional healers	84 (28.47)	43 (51.19)	18 (58.06)	44.589	4	**P=0.000*** OR = 3.449. 95% C.I. =2.352 to 5.059.
Civil servants	10 (3.39)	7 (8.33)	6 (19.35)			
No of Children						
1-3	202(68.47)	34 (40.48)	7 (22.58)			
4-6	66 (22.37)	27 (32.14)	13 (41.94)	34.445	4	**P=0.000*** OR = 3.303.
>6	27 (9.15)	23 (27.38)	11 (35.48)			95% C.I. = 2.336 to 4.671.

Mother attending ANC						
Yes	236(80.00)	37(44.05)	7(22.58)	71.391	2	**P=0.000*** OR=6.032; 95% C.I.= 3.877 to 9.386.
No	59 (20.00)	47(55.95)	24 (77.42)			
Place of birth						
Home	227(76.95)	52(61.90)	14 (45.16)	18.633	2	**P=0.000***
Health Facility	68 (23.05)	32 (38.10)	17 (54.84)			OR= 2.433; 95% C.I.=1.590 to 3.722.
Birth order						
1st- 2nd	125(42.37)	32 (38.10)	8 (25.81)			
3rd – 4th	117(39.66)	28 (33.33)	11 (35.48)	10.634	4	**P=0.000*** OR = 1.535. 95% C.I. = 1.090 to 2.162.
>4th	53 (17.97)	24 (28.57)	12 (38.71)			
Sex of the child						
Female	219(74.24)	48 (57.14)	19 (61.29)	10.196	2	**P=0.006*** OR = 1.920. 95% C.I. =1.266 to 2.912.
Male	76 (25.76)	36 (42.86)	12 (38.71)			

DISCUSSION

The study showed that children who had up-to-date vaccinations were 295 (72.0%), partially vaccinated were 84 (20.5%), and not vaccinated were 31 (7.6%). The 72% up-to-date vaccination was similar to that of infants who were fully immunized in an urban area in Nigeria[9] and also a community-based study in Karachi, which is also a low-income, low-literacy setting in Pakistan [10]. The up-to-date coverage was not too different from the coverage of 69.4% in a study in the Demographic Republic of Congo[11]. The partial immunization coverage reported in this study (20.5%) was slightly lower than the reported 27.9% coverage in Ludhiana, India, while those that were unvaccinated (7.6%) in this study were slightly higher than the 3.3% reported in Ludhiana, India, in another study[12].

The findings of this study did not agree with those of another study in Cross Rivers State, Nigeria, which reported an up-to-date vaccination coverage of 52%, 48% partially vaccinated, and 5% unvaccinated[13]. The study findings did not agree with those of other similar study[7]. The study findings were also higher than the findings reported in other studies[14,15]. Generally, this study showed an improvement in the immunization status of children in rural communities of Rivers State from 39.2% of all basic vaccines to 72.0%, as reported in other similar studies[6,9,12].

Maternal age had a positive association with up-to-date immunization status. Many mothers in this study were in the age group 21–30 years, which was statistically significant with the up-to-date immunization status as reported in other similar studies[16,17]. This might be because older mothers are more familiar with the effect and significance of immunization on children than younger mothers. This finding was different from that of another study, which reported that incomplete immunization status of children was significantly associated with young mothers[18], and from another study, which reported that children whose mothers were between the ages of 35 and 49 years had 0.64 times lower odds of being fully vaccinated[19].

The study showed a significant association between married mothers and the up-to-date immunization of children, like the findings of other similar studies[19,20]. This may be because married mothers were more stable financially and more likely to address their children's health issues, including immunization[20]. Additionally, stigma, psychological trauma, and financial difficulties associated with being a single mother have a negative impact on access to healthcare and immunization[20]. This is, however, not in line with the findings of other study [21]. The study also showed a positive association between the educational status of the mothers and complete immunization. Many of the mothers had secondary education, which was also reported in other studies [22,23].

Education helps parents be more informed, particularly on health-related issues, and makes it easier for people to get immunization services, information, and the ability to communicate with health personnel and receive medical care [8,16,24,25]. However, a study reported that education was not significantly associated with full immunization[21], while another study reported a negative influence on secondary education[26]. Most of the mothers were unemployed. However, this was significantly associated with the child's up-to-date immunization. This may be due to the increased sensitization of the communities to immunization during immunization campaigns using town announcers, community leaders, the mass media, and other resource persons. There is also the rumor that the immunization card might be needed for school enrollment. The findings of this study do not agree with those of other studies [24,27]. A study reported that children with working mothers were 0.85 times more likely to have received all recommended vaccinations than those with jobless mothers[18]. Another indicator of complete immunization is the number of siblings per household. The study found that many of the mothers had 1-3 children, which was significantly associated with up-to-date immunization, as was also reported in other studies [25]. Compared to mothers with fewer than three children, mothers with more than four children were twice as likely to refuse to fully immunize their offspring. This has been seen as a reflection of the financial burden and the practical difficulty of having additional children at home to enable mothers to take up immunization services for the current child [28]. Most of the mothers had antenatal clinic (ANC) follow-ups in a healthcare facility, which was associated with up-to-date immunization. This agrees with the findings of other studies [22,24,25]. Mothers who had four or more ANC visits during pregnancy were 2.01 times more likely to fully immunize their children than mothers who did not have ANC visits during pregnancy [18,23-29]. The place of a child's birth was found to be one of the factors that influenced full immunization. Many mothers in this study delivered at home, which was significantly associated with up-to-date immunization. This finding is not in agreement with that of other studies that reported that a child born in a healthcare facility had a higher chance of receiving all recommended vaccinations than one born at home[18,22,24,25,27,28,30]. The high rate of delivery at home was also observed in another study, which reported that more children from rural areas were seen to be born at home and in traditional birth attendant (TBA) facilities than in healthcare facilities [31]. This finding is consistent with a previous study, which showed that pregnant women in rural areas continue to prefer TBAs to deliver their babies at home [32]. Pregnant women are predicted to deliver at home 40 to 45% of the time, according to a study on factors influencing birth location decisions in the Russian village of Jos North, Nigeria [33]. The most common justification for

choosing home birth with a TBA was poverty [34]. Many of the children are in birth order 1st and 2nd, which was associated with completion of immunization. This is similar to the strong link found between a child's birth order and the completion of childhood immunization in a cross-sectional community survey conducted in the Sinana district of Southeast Ethiopia to evaluate child immunization coverage and its determinants[35]. Compared to children with the third birth order, children with the first birth order had a lower likelihood of finishing their immunizations—less than 30% [35]. Most of the children with up-to-date immunizations were female, and this was statistically significant. The finding does not agree with that of another study, which reported that male children were found to be more likely to be fully immunized than female children [36]. A study, however, reported that the sex of the child was not significantly associated with full immunization [21].

CONCLUSION

Many of the children had up-to-date immunizations. The maternal and child factors associated with up-to-date immunization in the study were: mothers aged 21 to 30 years, married, had secondary education, were unemployed, had 1 to 3 children, attended an antenatal clinic in a health facility, delivered at home, had a childbirth order of 1st and 2nd, and had female children.

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Authors contributions

NCTB conceptualized and designed the study, supervised the data collection and collation, analyzed, and interpreted the data, and wrote the initial manuscript.
IAA developed the study instrument, conducted the literature review, and data entry, supervised the data collection and collation, and reviewed the manuscript.
All the authors read and approved the final manuscript.

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