



Determinants of Caregivers' Knowledge of Childhood Vaccination in Calabar South Local Government Area, Cross River State, Nigeria

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Abstract

Background: Caregivers' knowledge of childhood vaccination, including vaccine schedules, doses, and disease prevention, varies widely across settings. In Calabar, there is limited evidence assessing caregivers' knowledge of childhood vaccination.

Objectives: This study assessed knowledge of childhood vaccination and its determinants among caregivers in Calabar South Local Government Area.

Methods: A community-based cross-sectional study was conducted among caregivers of children aged 12–23 months in Calabar South LGA using a multistage sampling technique. Data were analyzed with SPSS version 25.0. Descriptive and inferential statistics were applied. Factors associated with caregivers' knowledge were assessed using multivariate binary logistic regression, with statistical significance set at $p < 0.05$. Ethical approval was obtained from the Cross River State Health Research Ethics Committee (CRSMOH/RP/HRE/2023/401).

Results: A total of 460 caregivers participated in the study out of which 395 (85.9%) were females while 65 (14.1%) were males. Overall, caregivers' knowledge of vaccine-preventable diseases was poor. Knowledge of diseases prevented by BCG, OPV, yellow fever, and pentavalent vaccines was 28.5%, 20.9%, 14.4%, and 8.2%, respectively. Health facilities were the main source of vaccine information (29.1%), followed by radio (17.9%) and home visits (14.3%). Caregivers' age, relationship with the child, education, and occupation were significantly associated with knowledge. Vaccine timeliness, educational level, and means of transport to health facilities were significant predictors of knowledge of childhood vaccination.

Conclusion: Caregivers' knowledge of childhood vaccination was poor. Strengthened health education campaigns are needed to improve awareness and support for childhood vaccination.

Keywords: Determinants, Caregivers', Knowledge, Childhood Vaccination, Calabar South

Introduction

Vaccination programmes aim not only to achieve high population coverage but also to ensure timely

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administration of vaccines in order to optimize immune protection and prevent outbreaks of vaccine-preventable diseases.¹ Mass childhood vaccination remains one of the most successful public health interventions globally, contributing substantially to reductions in childhood morbidity and mortality and improving overall child survival.²

⁴ Despite these gains, several challenges continue to undermine optimal vaccination uptake, particularly in low- and middle-income countries. One major barrier to effective vaccination is inadequate caregiver knowledge and perceptions regarding vaccines, schedules, and vaccine-preventable diseases.⁵⁻⁶ Studies have demonstrated considerable variability in caregivers' understanding of vaccination requirements, age-appropriate doses, and the specific diseases targeted by different vaccines. Although general awareness of the importance of vaccination is often high, significant knowledge gaps persist, especially concerning the number of clinic visits required for complete vaccination and the specific diseases prevented by certain vaccines. These gaps have been consistently reported across different settings. Studies conducted in Lagos State⁷ and Eastern Ethiopia⁸ similarly documented incomplete caregiver knowledge of vaccination schedules and disease prevention, suggesting persistent and widespread challenges in understanding detailed vaccination information. Such variations may reflect differences in health education strategies, emphasis on specific vaccines, or region-specific communication approaches. A community-based cross-sectional study in the Somali region of Eastern Ethiopia assessed full vaccination and associated factors among children aged 12–23 months and reported that only 39.5% of caregivers demonstrated good knowledge of vaccination.⁸ However, the specific criteria used to define “good knowledge” were not clearly described, limiting interpretability and comparison with other studies. In another study assessing caregiver knowledge, vaccination coverage, and determinants of vaccination status among children aged 12–23 months in rural and urban settings, most mothers were knowledgeable about vaccination and its benefits; nonetheless, full vaccination coverage remained low.⁹ This disconnect suggests that knowledge alone may not always translate into optimal vaccination practices. Additionally, a study examining caregivers' knowledge, attitudes, and practices identified factors promoting vaccine hesitancy, including time constraints and forgetfulness, highlighting practical barriers to complete vaccination.¹⁰

In Calabar, however, there is a paucity of

documented evidence assessing caregivers' knowledge and attitudes toward childhood vaccination. This study was therefore conducted to evaluate caregivers' knowledge and attitudes regarding childhood vaccination in Calabar and to identify factors influencing them.

Materials and Methods

Study area: The study was conducted in Calabar South, one of the Local Government Areas (LGAs) in Cross River State, Nigeria. Calabar South is characterized by a mix of urban and peri-urban communities with diverse socio-demographic profiles. The area has multiple healthcare facilities offering vaccination services.

Study population: The study population consisted of caregivers of children aged 12 to 23 months residing in Calabar South and their caregivers.

Study design: The study utilized a community-based descriptive cross-sectional design.

Data collection tool: A semi-structured pre-tested interviewer-administered questionnaire was used to obtain information on socio-demographic characteristics and knowledge of childhood vaccination from caregivers. Measurement of caregivers' knowledge was adopted from a previous study in which knowledge was evaluated using a structured questionnaire comprising 9 questions graded on a three-point Likert scale: ‘I do not know’, ‘No’, and ‘Yes’. The cumulative knowledge score ranged from 1 to 9. The threshold median score set at 7 for knowledge as benchmarks. A score of ≥ 7 denoted good knowledge.¹¹

Sample size calculation: The sample size of 460 caregivers was determined using Cochran's formula for estimating single proportions, considering an estimated prevalence of timely vaccination in the region based on previous studies. The Cochran formula¹²:

$n = Z^2 pq/d^2$ Where: n = required sample size; Z = Z-value (1.96 for 95% confidence level); p = estimated prevalence of timely vaccination; d = margin of error (5%)

Sampling technique: A multistage sampling technique was used to select study participants.

First Stage: Calabar South LGA is divided into 12 political wards namely wards 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. In this case, the clusters are the 12 wards in Calabar South LGA. A number was

assigned to each of the 12 wards in Calabar South LGA, written on equal-sized pieces of paper and put into an opaque bag. Simple random sampling technique by balloting was used to select five numbers blindly from the opaque bag. The corresponding wards to these numbers were then chosen for the study. A total of five (5) wards (4, 5, 8, 11, and 12) were selected from the cluster of 12 wards, where each ward was considered a primary sampling unit.

Second Stage: Within each of the selected five (5) wards, specific communities were identified. The communities within each ward represent the second stage of clustering. Each community is considered a secondary sampling unit. The selection of communities within each ward involved purposive selection to ensure spread. Within the selected wards, all households were visited. Caregivers of children aged 12 to 23 months permanently residing there and gave informed consent were interviewed for the study until the sample size proportionately allocated to the ward was reached. Households without children aged 12 to 23 months were skipped. On the other hand, where there were more than 1 caregiver per household, one of them was selected through simple random sampling by balloting.

Data analysis: Statistical Software for Social Sciences (SPSS Inc., Chicago, IL) version 25.0 software was used for data analysis. Data was cleaned and coded before analysis. Categorical data were summarized as frequencies and percentages while quantitative data were described as mean and standard deviation. Caregivers knowledge of vaccination and associated factors were analyzed using Chi square test statistics. Multivariate logistic regression analysis was carried out to determine predictors of knowledge of childhood vaccination among caregivers, at 95% Confidence Interval, and a p-value of < 0.05 was considered statistically significant for all comparisons.

Ethical consideration: Ethical approval was obtained from the Cross River State Health Research Ethics Committee (CRSMOH/RP/HRE/2023/401). Informed consent was obtained from each study participant prior to their inclusion into the study. Permission was also obtained from heads of wards and family heads in Calabar South LGA before the study began.

Results

Socio-demographic characteristics of caregivers: A total of 460 caregivers participated in the study out of which 65(14.1%) were males while 395(85.1%) were females. Table 1 shows that female caregivers (85.9%) form the largest category. The age group of 30-39 years among caregivers (42.8%) is the most prominent. Caregivers with secondary education (61.3%) constitute the highest category. Those involved in business (60.4%) represent the most significant category. Mothers (92.0%) hold the highest proportion in caregiving relationships.

Table 1: Socio-demographic characteristics of caregivers of children aged 12 to 23 months

Variable	Frequency(n=460)	Percentage
Sex of caregivers		
Male	65	14.1
Female	395	85.9
Age of caregiver		
<20	49	10.7
20-29	149	32.4
30-39	197	42.8
40-49	35	7.5
≥ 50	30	6.5
Caregivers' highest level of education		
No formal education	85	18.5
Primary	73	15.9
Secondary	282	61.3
Tertiary	20	4.3
Occupation of caregivers		
Business	278	60.4
Civil servant	16	3.5
Farming	34	7.4
Housewife	115	25.0
Unemployed	17	3.7
Relationship of caregivers to children		
Father	7	1.5
Grandparent	26	5.7
Mother	423	92.0
Uncle/aunt	4	.9

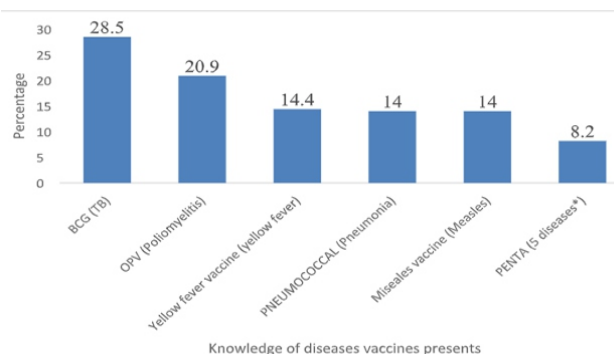


Figure 1: Knowledge of diseases childhood vaccines prevents among caregivers of children aged 12 to 23 months

Knowledge of childhood vaccination among caregivers of children aged 12 to 23 months

Figure 1 shows knowledge of caregivers regarding diseases childhood vaccines prevents. A little above a quarter had knowledge of the disease BCG prevents (28.5%), followed by OPV (20.9%), then yellow fever vaccine (14.4%). Only 8.2% had knowledge of the 5 diseases PENTA vaccine prevents. Others are as shown in figure 1.

Table 2: Knowledge of timing and total number of visits to complete routine vaccination among caregivers of children aged 12 to 23 months

Variable	Frequency	Percentage
Know vaccine child needs		
Yes	327	71.1
No	133	28.9
Knowledge of age for 2 nd dose of routine vaccination		
Correct	348	75.7
Not correct	112	24.3
Knowledge of age for last dose of routine vaccination		
Correct	301	65.4
Not correct	159	34.6
Knowledge of total number of visits for complete routine vaccination		
Correct	267	58.0
Not correct	193	42.0
Overall knowledge		
Good knowledge	239	52.0
Poor knowledge	221	48.0

Table 2 shows knowledge of caregivers regarding timing and total number of visits to complete routine vaccination regardless of their wards. A total of 327(71.1%) caregivers knows vaccines their children needs, 348(75.7%) caregivers had correct knowledge of age for 2nd dose of routine childhood vaccination, 301(65.4%) caregivers knew correct age for last dose of routine childhood vaccination, and 267(58.0%) caregivers had correct knowledge of total number of visits for complete routine vaccination.

Figure 2 shows that the knowledge of caregivers regarding timing and total number of visits to complete routine vaccination differed between vaccines and between study sites or wards.

Table 3 shows that there were statistically significant association between factors such as relationship with child, age, educational level, occupation of caregiver, and caregiver knowledge of childhood vaccination (P<0.05). Only relationship between missed opportunity for

vaccination and caregivers' knowledge was found not to be statistically significant (p=0.171).

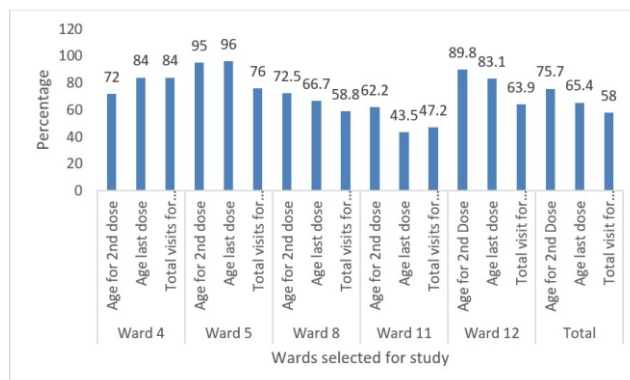


Figure 2: Knowledge of caregivers regarding timing and total number of visits to complete routine vaccination stratified by ward

Table 3: Factors associated with knowledge of childhood vaccination among caregivers of children aged 12 to 23 months (N=460)

Variable	Caregiver's Knowledge of childhood vaccination			Chi square test	p-value
	Good 239 (52.0%)	Poor 221 (48.0%)	Total 460 (100.0%)		
Relation to child					
Father	0(0.0)	7(100.0)	7(100.0)	LLR,16.534	0.000*
Grandparents	13(50.0)	13(50.0)	26(100.0)		
Mother	226(53.4)	197(46.6)	423(100.0)		
Uncle/aunt	0(0.0)	4(100.0)	4(100.0)		
Age of caregiver/years					
<20	21(42.9)	28(57.1)	49(100.0)		
20-29	74(49.7)	75(50.3)	149(100.0)		
30-39	121(61.4)	76(38.6)	197(100.0)		
40-49	10(28.6)	25(71.4)	35(100.0)		
≥50	13(43.3)	17(56.7)	30(100.0)		
Caregiver's education				39.758	0.000*
Nil formal education	20(23.5)	65(76.5)	85(100.0)		
Primary	42(57.5)	31(42.5)	73(100.0)		
Secondary	160(56.7)	122(43.3)	282(100.0)		
Tertiary	17(85.0)	3(15.0)	20(100.0)		
Occupation of caregiver				11.213	0.029*
Business	153(55.0)	125(45.0)	278(100.0)		
Civil servant	12(75.0)	4(25.0)	16(100.0)		
Farming	15(44.1)	19(55.9)	34(100.0)		
Housewife	48(41.7)	67(58.3)	115(100.0)		
Unemployed	11(64.7)	6(35.3)	17(100.0)		
Means of transport to health facility				LLR,53.387	0.000*
Car/bus	3(100.0)	0(0.0)	3(100.0)		
Motorcycle/keke	84(57.5)	62(42.5)	146(100.0)		
Others**	0(0.0)	32(100.0)	32(100.0)		
Walk	152(54.5)	127(45.5)	279(100.0)		
Had missed opportunity				2.101	0.171
No	224(53.0)	199(47.0)	423(100.0)		
Yes	15(40.5)	22(59.5)	37(100.0)		
Attitude towards vaccination				96.534	0.000*
Good	235(63.0)	138(37.0)	373(100.0)		
Fair	4(5.4)	70(94.6)	74(100.0)		
Poor	0(0.0)	13(100.0)	13(100.0)		
Timely vaccination				58.735	0.000*
Yes	208(63.2)	121(36.8)	329(100.0)		
No	31(23.7)	100(76.3)	131(100.0)		

*=statistically significant; others** include

Independent determinants of knowledge of childhood vaccination among caregivers of children aged 12 to 23 months

As shown in table 4, multivariate binary logistic regression analysis of predictors of knowledge of childhood vaccination among caregivers, vaccine timeliness, educational level, and means of transport to the health facility were significant predictors. Caregivers who ensured timely vaccination of their children were significantly more likely to have good knowledge, with an odds ratio (OR) of 5.412 and a 95% confidence interval (CI) of 3.376 to 8.677 ($p = 0.000$). However, the relationship to the child was not significantly associated with knowledge (OR = 2.144; 95% CI: 0.737–6.239; $p = 0.162$), and age of the caregiver was also not a significant predictor (OR = 0.986; 95% CI: 0.944–1.030; $p = 0.529$).

Table 4: Multivariate binary logistic regression of predictors of knowledge of childhood vaccination among caregivers (N=460)

Variable	Adjusted odd ratio	95% Confidence interval		p-value
		Lower	Upper	
Relationship to child				
Mother/father	2.144	0.737	6.239	0.162
Grandparents/other relatives	1			
Education of caregiver				
Tertiary	4.439	1.241	15.875	0.022*
Secondary or below	1			
Means of transport to health facility				
Trekking	1.753	1.140	2.697	0.011*
Vehicle	1			
Vaccine timeliness				
Timely	5.412	3.376	8.677	0.000*
Not timely	1			
Age of caregiver/years	0.986	0.944	1.030	0.529

*=statistically significant predictors of knowledge of childhood vaccination among caregivers

Discussion

This study assessed caregivers' knowledge of childhood vaccination and its predictors among children aged 12–23 months in Calabar South Local Government Area, Cross River State. Overall, just over half of the caregivers (52.0%) demonstrated good knowledge of childhood vaccination. However, knowledge of specific vaccine-preventable diseases was low. Only 28.5% correctly

identified the disease prevented by BCG, 20.9% by OPV, and 14.4% by the yellow fever vaccine, while knowledge of the five diseases prevented by the pentavalent vaccine was particularly poor (8.2%). These findings contrast with reports from other regions where polio was the most commonly recognized vaccine, followed by measles, with yellow fever being the least known.^{13,14} This disparity may reflect differences in local health education emphasis and communication strategies. Consistent with previous studies, caregivers' knowledge of vaccination requirements, age-appropriate dosing, and disease prevention varied widely. Although general awareness of vaccination as a preventive health measure was evident, notable gaps remained regarding vaccination schedules and the specific diseases prevented by individual vaccines. Similar gaps have been reported in Lagos State and Eastern Ethiopia, where incomplete caregiver knowledge of immunization schedules and disease prevention was documented.^{7,8} Caregivers generally recognized vaccination as essential for protecting children from infectious diseases, reducing disease severity, and preventing transmission. Nonetheless, such broad understanding did not extend to detailed vaccine-specific knowledge. While one study reported good overall knowledge of vaccination among up to 98% of caregivers, it did not assess knowledge of specific vaccines or their disease targets.¹⁵ Although good knowledge has been shown to correlate positively with vaccine utilization,¹⁵ other studies have demonstrated that adequate knowledge does not always translate into complete vaccination.⁹

This study further demonstrated significant associations between caregivers' knowledge of childhood vaccination and socio-demographic factors including relationship with the child, age, educational level, and occupation. These findings are consistent with reports from other settings identifying caregiver age, educational attainment, employment status, and antenatal clinic attendance as significant determinants of vaccination knowledge.^{15,17-19} Multivariate analysis identified vaccine timeliness, educational level, and means of transport to health facilities as independent predictors of caregivers' knowledge. Maternal education, in particular, has been repeatedly linked with improved vaccination knowledge. In Ilorin,

mothers with at least secondary education were significantly more likely to demonstrate good knowledge of routine immunization, as were caregivers aged over 30 years and those who attended antenatal clinics.²⁰ Similar associations between higher maternal education and increased vaccination knowledge and acceptance have been reported in Enugu.²¹ Marital structure has also been shown to influence vaccination knowledge. Studies comparing monogamous and polygamous households reported better vaccination knowledge among caregivers in monogamous unions.²² consistent with findings from Nnewi.¹⁹ Additional factors such as paternal education and shared parental decision-making have been identified as important determinants. A national-level study demonstrated that higher paternal education and joint decision-making significantly increased the likelihood of full childhood vaccination, independent of maternal education.²³ Wealth and community literacy levels also influenced vaccination outcomes.²³ In Sokoto, poor paternal knowledge and lack of formal education were significantly associated with inadequate understanding of vaccination schedules and benefits.²⁴ Overall, the consistency of findings across diverse Nigerian settings suggests that limited parental education, suboptimal antenatal care utilization, and structural household factors contribute to persistent gaps in caregivers' knowledge of childhood vaccination. These gaps may lead to delayed or incomplete immunization. Targeted caregiver education, strengthened antenatal services, improved access to health facilities, and community-based sensitization programmes are therefore essential to enhance caregivers' knowledge and improve childhood vaccination outcomes.

Conclusion

Caregivers' knowledge of childhood vaccination in Calabar South was suboptimal, with significant gaps particularly in understanding vaccine-preventable diseases and immunization schedules. Educational level, vaccine timeliness, and access to health facilities emerged as key determinants of knowledge. These findings highlight the need for targeted, context-specific health education interventions and improved access to vaccination

services to enhance caregiver knowledge and ultimately improve childhood immunization outcomes.

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Authors' contributions:

1. Iwasam Eleme Agbor: Conceptualization of study, study design, data analysis and reporting.
2. Toochi Oliver Nwoye: Manuscript development and literature review
3. Dr Ugochi Ogu Eyong: Proof-reading of manuscript to ensure it aligns with study objectives, editing of manuscript
4. Ogbodum Effa-Obazi Uno: Methodological design, proof-reading and editing of manuscript.
5. Emmanuel A. Ugwa: Manuscript development, literature review and overall oversight of the research work.

Conflict of interests: The authors declare no conflict of interest.

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