

Determinants of uptake of routine immunization among mothers of under five children in rural areas of North-Eastern Nigeria

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Abstract

Background: Immunization against the vaccine preventable diseases is one of components of Primary Health Care and the most cost-effective public health intervention in the history of mankind: but it has failed to meet the health needs of the majority of the people particularly in underdeveloped countries.

Method: this was a cross-sectional descriptive study that utilized interviewer administered questionnaire to 313 participants through multistage sampling. Data was analyzed using SPSS and a p-value of <0.05 was considered statistically significant.

Results: about half (50.5%) of the study participants had good level of aggregate knowledge scores, nearly one-third (34.2%) had positive attitude, and about one quarter (25.9%) had good uptake/practice of routine immunization. After adjusting for the confounding effects using logistic regression analysis; educational status of secondary school (AOR=1.99, 95% CI=1.43 – 33.65) and tertiary (AOR=4.04, 95% CI=3.25 – 15.75), number of ANC visit of > 4 times (AOR=3.02, 95% CI= 1.76 – 41.45) monthly income of >N70,000.00 (AOR=5.01, 95% CI=3.25 – 35.77), good aggregate knowledge scores of routine immunization (AOR=4.06 95% CI=2.99-13.89), and positive aggregate scores on attitudes of routine immunization (AOR=5.03, 95% CI= 5.13-27.33) remained significant predictors of uptake/practices of routine immunization among the study participants.

Conclusions: most of the study participants had negative attitude on routine immunization that led to low uptake. It was recommended that more strategies that will ensure increase in uptake like health education and provision of adequate vaccine should be employed by the state government.

Keywords: Knowledge; Attitude; Uptake; Determinants; Routine immunization

1. Introduction

Immunization is one of the most cost-effective public health interventions ever known in the history of mankind.¹ In 1979, Nigeria launched expanded program on immunization (EPI) with emphasis on reduction of morbidity and mortality arising from vaccine preventable diseases.² But due to poor national immunization coverage and minimal impact on vaccine preventable target diseases, it was re-launched in 1984.² In spite of this, not much was achieved until Nigeria became a signatory to the declaration of the Survival, Protection and Development of children which was articulated at the 49th World Health Assembly in 1988. This was further reinforced by the World Summit for children

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held in New York in 1990. This Declaration established challenges for global immunization.² Therefore, in 1988, the Federal Ministry of Health (FMOH) with the assistance of United Nations, International and National Agencies, introduced the concept of mass campaign as a means to boost immunization coverage nationwide. With this Nigeria reported immunization coverage of 60% by 1989, and attained the Universal Child Immunization (UCI) target coverage of 80% by 1990.² This land mark achievement of 80% coverage was made possible by the government and health personnel commitment, intensive social mobilization, involvement of the private sector and intersectoral collaboration with Ministries of Agriculture, Education, and Information as well as police and the military (NPI 2004-2008). Furthermore, between 1993-1998 however, National Immunization Coverage reports showed a decline ranging between 20-46% for DPT3; this was due to inadequate service delivery, funding, low political will, low social support, poor community involvement and participation with resultant shortage in vaccines, unavailability of syringes and needles, monopolization of vaccine storage, and attendant poor distribution and none maintenance of cold chain as well as limited number of health facilities conducting routine immunization services.³

Before the introduction of global immunization, of the estimated 125 million children born worldwide every year, approximately 12 million or approximately 10% die before the age of one, 97% of the deaths happening in developing countries.⁴ It was also estimated that 67 million cases of measles occurred yearly in developing countries causing over 2 million deaths.⁵⁻⁶ Individuals who have been immunized serve as a protective barrier for other individuals who have not been immunized, provided that the number immunized has reached a certain level; reaching and maintaining that level which varies by vaccine preventable infectious diseases, provide, “herd immunity” to un-immunized individuals.⁵ Bauchi state is one of the northern states that have lowest immunization coverage. As evidence with only 11.7% of under five children were fully immunized as compared to Lagos state with 56.2% of children who are fully immunized.⁷ There were about 10 million children in the developing countries that die annually for lack of access to effective public health interventions.⁸ Most of these deaths are caused by 9 vaccine preventable infectious diseases.⁹ Incomplete (partial) and non-vaccinations (unimmunized) are impediments to raising immunization coverage which are the major factors; causing recurrences of childhood vaccine preventable infectious diseases, high infant mortality rates and regular health facility admissions and amplified demand on available health facilities.¹⁰ Globally, immunization prevents an estimated 2–3 million deaths among under-5 children, yet in Nigeria, only 25% of children ages 12–23 months are fully immunized. There are also marked inequalities in the uptake of immunizations, largely attributable to the context within which families live and seek health care.¹¹⁻¹³ In Nigeria, vaccine preventable infectious diseases currently account for 22% of deaths for under-five years children (U-5).¹⁴

Routine immunization studies to assess the coverage rates are important in public health as it informs stakeholders on whether trends in uptake are improving, declining or stable. Based on the findings, stakeholders and policy makers can develop strategies designated to accelerate or maintain immunization uptake and ensure that enough children are protected against VPDs to maintain herd immunity.

In Bauchi state despite the fact that majority of the health facilities (89.9%) surveyed in 2010 offered routine immunization (RI) services with 84.5% found to be providing full range of immunization the proportion of fully vaccinated children age 12-23 months was far below the national average of 25% as reported by the NDHS 2013.¹⁴⁻¹⁵

2. Material and Methods

2.1. Study Area

The study was conducted in the rural areas of Itas Gadau Local Government of Bauchi North Senatorial District, Bauchi State Nigeria.

2.2. Study Design

This was a community-based cross-sectional descriptive study.

2.3. Study Population

The study population were mothers/caregivers of children below the age of five years in rural areas of Bauchi State.

2.4. Inclusion Criteria

- Mothers/caregivers of children below the age of five years who were permanent residents in the study area
- Selected study participants who agreed to sign an informed consent
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2.5. Exclusion Criteria

- Mothers/Caregivers of children below the age of five who were not present at the time of the study
- Study participants who declined to participate after signing the informed consent

2.6. Sample Size Determination

The minimum sample size for the study was estimated using an appropriate formula for calculating sample size for cross-sectional studies.¹⁶

$$n = Z^2 pq / d^2$$

Where:

n = minimum sample size required

Z_{α} = Reliability coefficient at 95% confidence level i.e the standard normal deviate corresponding to 5% level of significance =1.96;

p= 77% or 0.77 proportion of fully immunized children from the previous studies;

q= the complementary probability to p₁ i.e 1-0.77, which equaled 0.23;

d²=precision or margin of error, that is assumed to be 5%=0.05

By substituting the values obtained into the formula,

$$n = 1.96^2 \times 0.77 \times 0.23 / 0.05^2$$

$$n=272.134$$

$$n=272.134 + 15\% \text{ (to take care for non-response and incomplete questionnaire)}$$

$$n = 272 + 40.8$$

$$n=312.8$$

The total sample size used was approximated to three hundred and thirteen

2.7. Sampling Techniques

Multistage sampling techniques was used as follows:

2.7.1. Stage 1: Selection of Senatorial District from the three Zones

A Senatorial District was selected out of the three Senatorial District (Bauchi Central, Bauchi South and Bauchi North). Bauchi North Senatorial District was selected using simple random sampling through balloting.

2.7.2. Stage 2: Selection of Local Government Area

One Local Government Area was selected out of the seven LGAs (Gamawa, Zaki, Katagum, Jama'are, Shira, Itas-Gadau, Giade) within Bauchi North Senatorial District was selected using simple random sampling through balloting

2.7.3. Stage 3: Selection of Wards

Three wards were selected out of the eleven wards under Itas-Gadau LGA using simple random sampling by balloting. The selected wards were Mashema, Zubuki and Kashuri wards.

2.7.4. Stage 4: Selection of study participants

Each ward was divided into clusters out of which participants were selected based on probability proportionate to size

2.8. Variables

2.8.1. Dependent Variable

Knowledge, attitude practice and determinants of uptake of routine immunization

2.8.2. Independent Variables

Socio-demographics characteristics such as age, marital status, monthly income, educational status.

2.9. Data Collection

Data was collected with the aid of semi-structured interviewer administered questionnaire, consisting of 5 sections. Data was summarized and presented using tables and summary indices. The level of knowledge, attitude and uptake of routine immunization was assessed using univariate analysis. While the relationships between sociodemographic characteristics and other determinants of uptake of routine immunization were evaluated using bivariate and multivariate analyses. A p-value of <0.05 was considered as significant. Multivariate (logistic regression) analysis was used to determine the predictors of uptake of routine immunization among the study participants.

2.10. Ethical Considerations

Approval was obtained from Department of Public Health of Bauchi State University Gadau that the study will be beneficial and will not cause any harmful effect;

An informed consent from the study participants was obtained;

For justice, the participants were given the right to voluntarily accept or reject to participate and also to skip any questions that appears distressing or too personal, if they wish.

Limitations

- A large sample size could have been used, but there were financial constraints
- Translation of the questionnaire in to local language could have led to interviewer bias.

3. Results

The mean and standard deviation of age of the study participants was 29.9 ± 7.3 years. More than three-quarter (78.4%) were married. Only 11.3% of the study participants had educational attainment of secondary and university level. More than three-quarter (77.1%) had a monthly income of less than seventy thousand Naira (N70,000.00). About two-third (67.1%) were mothers or caregivers of infants i.e children below the age of one year. About one quarter (21.3%) have household size of more than five people, while more than three-quarter (82.7%) had between one to five dependents in the household as shown in Table 1.

Table 1 Distribution of respondents according to socio-demographic characteristics

Variables	Frequency (n)	Percentage (%)
Age (years)		
15 – 24	73	24.3
25 – 34	142	47.2
35 – 44	86	28.5
Mean $\pm$ SD	29.0 ± 7.3	
Marital Status		
Married	236	78.4
Others	65	21.6
Educational Status		
Non-formal	146	48.5
Primary	120	39.9
Secondary	26	8.6
Tertiary	9	3.0

No of ANC visit		
<4	185	61.5
>=4	116	38.5
Monthly Income		
< or = N70,000.00	232	77.1
> N70,000.00	69	22.9
Age of Index Child (months)		
<12	202	67.1
13 – 24	65	21.6
>24	34	11.3
Number of people in the household		
1-5	237	78.7
>5	64	21.3
Number of dependent		
1-5	249	82.7
>5	52	17.3

About half (50.5%) of the study participants had good level of aggregate knowledge scores as indicated in Table 2. While, only about one-third (34.2%) had positive attitude on routine immunization (Table 3). Nearly, about one quarter (25.9%) had good uptake/practice of routine immunization among the study participants (Table 4).

Table 2 Aggregate knowledge score of mothers/caregivers of under five children on routine immunization

Knowledge	Frequency	Percentage (%)
Good	152	50.5
Poor	149	49.5
Total	301	100.0

Table 3 Aggregate scores of attitudes of mothers/caregivers on routine immunization

Attitude	Frequency (n)	Percentage (%)
Positive	103	34.2
Negative	198	65.8
Total	301	100.0

Table 4 Aggregate scores of uptake/practices of routine immunization among mothers/caregivers of under five children

Uptake and Practice	Frequency	Percentage (%)
Good	78	25.9
Poor	223	74.1
Total	301	100.0

There was statistically significant association between educational status, number of ANC visit (>4), monthly income, age of index child, number of people in the household, number of dependents and aggregate knowledge score of routine immunization among the study participants (Table 5).

Table 5 Bivariate analysis on association between socio-demographic variables and aggregate scores on knowledge of routine immunization among the study participants

	Aggregate knowledge score		X ²	p-Value
Variables	Good	Poor		
Age (years)				
15 – 24	37	36	0.012	0.9940
25 – 34	72	70		
35 – 44	43	43		
Marital Status				
Married	126	110	3.6552	0.0559
Others	26	39		
Educational Status				
Non-formal	45	101	45.1036	<0.05*
Primary	80	40		
Secondary	20	6		
Tertiary	7	2		
No of ANC visit				
<4	72	113	25.7488	<0.05*
>=4	80	36		
Monthly Income				
< or = N70,000.00	128	104	8.845	<0.05*
> N70,000.00	24	45		
Age of Index Child (months)				
<12	109	93	7.8509	<0.05*
13 – 24	23	42		
>24	20	14		
Number of people in the household				
1-5	127	110	4.2524	<0.05*
>5	25	39		
Number of dependent				
1-5	133	116	4.9005	<0.05*
>5	19	33		

*Statistically significant difference

There was statistically significant association between educational status, monthly income, age of index child and aggregate scores on attitudes of routine immunization among the study participants (Table 6).

Table 6 Bivariate analysis on association between socio-demographic variables and aggregate scores on attitude of routine immunization among the study participants

	Aggregate attitude score		χ^2	p-Value
Variables	Positive	Negative		
Age (years)				
15 – 24	25	48	0.0057	0.9971
25 – 34	48	94		
35 – 44	29	57		
Marital Status				
Married	77	159	0.0343	0.8530
Others	22	43		
Educational Status				
Non-formal	33	113	25.4887	<0.05**
Primary	45	75		
Secondary	18	8		
Tertiary	5	4		
No of ANC visit				
<4	62	123	0.0004	0.9847
>=4	39	77		
Monthly Income				
< or = N70,000.00	17	215	130.394	<0.05*
> N70,000.00	50	19		
Age of Index Child (months)				
<12	40	162	13.1585	<0.05*
13 – 24	21	45		
>24	16	18		
Number of people in the household				
1-5	59	178	0.0003	0.9862
>5	16	48		
Number of dependent				
1-5	62	187	0.3519	0.5530
>5	15	37		

*Statistically significant difference

There was statistically significant association between marital status, educational status, number of ANC visit (>4), age of index child and aggregate scores on uptake/utilization of routine immunization among the study participants (Table 7).

Table 7 Bivariate analysis on association between socio-demographic variables and aggregate scores of uptake/practices of routine immunization among the study participants

Variables	Aggregate attitude score		χ^2	p-Value
	Good	Poor		
Age (years)				
15 – 24	17	56	0.2796	0.8695
25 – 34	37	105		
35 – 44	23	63		
Marital Status				
Married	70	166	9.5543	<0.05**
Others	7	58		
Educational Status				
Non-formal	19	127	66.6108	<0.05*
Primary	30	90		
Secondary	21	5		
Tertiary	7	2		
No of ANC visit				
<4	38	147	6.4074	<0.05*
>=4	39	77		
Monthly Income				
< or = N70,000.00	78	154	0.002	0.9646
> N70,000.00	23	46		
Age of Index Child (months)				
<12	65	137	13.3232	<0.05*
13 – 24	15	50		
>24	21	13		
Number of people in the household				
1-5	79	158	0.0245	0.8756
>5	22	42		
Number of dependent				
1-5	83	166	0.0317	0.8587
>5	18	34		

*Statistically significant difference

After adjusting for the confounding effects using multivariate (logistic regression) analysis; educational status of secondary school (AOR=1.99, 95% CI=1.43 – 33.65) and tertiary (AOR=4.04, 95%CI=3.25 – 15.75), number of ANC visit of ≥ 4 times (AOR=3.02, 95%CI= 1.76 – 41.45) monthly income of >N70,000.00 (AOR=5.01, 95%CI=3.25 – 35.77), good aggregate knowledge scores of routine immunization (AOR=4.06 95%CI=2.99-13.89), and positive aggregate scores on attitudes of routine immunization (AOR=5.03, 95%CI= 5.13-27.33) remained significant predictors of uptake/practices of routine immunization as shown in Table 8.

Table 8 Multivariate analysis on predictors of good uptake/utilization of routine immunization among study participants

Predictor(s)	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Marital Status			
Married	Referent		
Others	2.22 (1.01 – 8.25)	2.09 (0.89 – 12.44)	0.4532
Educational status			
Non-formal	Referent		
Primary	0.86 (0.65 – 5.33)	1.25 (0.70 – 13.11)	0.1145
Secondary	2.57 (3.56 – 22.75)	1.99 (1.43 – 33.65)	<0.05*
Tertiary	4.11(3.76 – 17.76)	4.04 (3.25 – 15.75)	<0.05*
No of ANC visit			
<4	Referent		
≥4	3.45 (0.99 – 21.35)	3.02 (1.76 – 41.45)	<0.05*
Monthly Income			
≥N70,000.00	Referent		
> N70,000.00	5.33 (3.78 – 53.45)	5.01(3.25 – 35.77)	<0.05*
Aggregate knowledge score on routine immunization			
Poor	Referent		<0.05*
Good	4.98 (2.76 – 22.56)	4.06(2.99 – 13.89)	
Aggregate score of attitudes on routine immunization			
Negative	Referent		<0.05*
Positive	7.11 (0.78 – 37.66)	5.03(5.13 – 27.33)	

*Statistically significant difference

4. Discussions

Immunization is one of the most cost-effective public health interventions introduced in the history of mankind. Several studies have documented the knowledge, attitude, practice and predictors of routine immunization services around the world, particularly in developing countries where uptake has been very low. This study was carried out among mothers and caregivers of children below the age of five years in rural areas of Bauchi State, Northern-Nigeria. More than half (50.5%) of the study participants had good level of aggregate knowledge scores on routine immunization. This was almost similar to finding by Odusanya et al who reported that about 55% of the study participants were knowledgeable of routine immunization in rural areas of south-western Nigeria.¹⁷ This finding was lower than of Otubor et al in Jos, who reported that about 89.6% had good knowledge of routine immunization.¹⁸ Adedire et al also reported that 76% of the study participants had good knowledge of routine immunization and vaccine preventable diseases.¹⁹ but, study by Raji et al reported that the knowledge of RI among fathers was poor. Though, their study population is different from all of the above studies mentioned.²⁰

Regarding the attitude of mothers of under-five children towards the uptake of routine immunization, it was found that, only about one third of the mothers have good attitude towards routine immunization. This contrasts the finding by Adedire et al who reported that majority of the study participants had positive attitude towards routine immunization services.¹⁹ Bernsen et al also reported that about 93% of the study in the United Arab Emirates had positive attitudes on routine immunization.²¹

However, on the practice of routine immunization amongst mothers/caregivers of under five children showed that only about one quarter of the study participants had good practice. This low practice might be due to high level of negative attitudes on routine immunization among the study participants. This is lower than findings by Adenike et al who reported that about 59.7% of the study participants had good practice of routine immunization among the study participants in rural areas.²² this disparity could be attributed to the fact that only zero to twelve months (neonates and infants) were included in their study.²²

The determinants of uptake of routine immunization in this study were educational status of secondary school and tertiary, number of ANC visit of ≥ 4 times, monthly income of $>N70,000.00$, good aggregate knowledge scores of routine immunizations, and positive aggregate scores on attitudes of routine immunization. Adenike et al also found out that respondents age, employment status, mothers' educational status and the child's immunization status ($P < 0.05$) were the predictors of uptake of routine immunization among mothers in north central Nigeria.²² But, Adedire et al reported that Antenatal care (ANC) attendance [OR 3.7; 95% CI (2.0 - 6.7)] health facility delivery [OR 1.7 (1.2 - 2.7)]; higher level of education [OR 1.9; 95% CI (1.4 - 2.5)], and mothers' tetanus toxoid immunization status [OR 4.0 (2.3 - 7.2)] were significantly associated with having good knowledge of the RI program.¹⁹

5. Conclusion

Only about half of the study participants had good knowledge of routine immunization among the study participants. Nearly one-third of them had a positive attitude on routine immunization but only about one quarter had good practice/uptake of routine immunization services among the study participants. While, the determinants of uptake of routine immunization in this study were educational status of secondary school and tertiary, number of ANC visit of ≥ 4 times, monthly income of $>N70,000.00$, good aggregate knowledge scores of routine immunizations, and positive aggregate scores on attitudes of routine immunization. It was recommended that the state government should employ strategies of improving the RI uptake like provision of sufficient vaccines via establishment of mobile RI services post which could also help in addressing some of the barriers to accessing the services both financially and distance wise as established in this study. Also, to develop strategies of poverty alleviation among women in the rural settlements which can be achieved through establishment of skills acquisition centers specifically for them so as to acquire necessary skills and engage in economic productivity with the aim of improving their financial capability which may help them to overcome barriers to accessing the RI services financially.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding publication of this research paper.

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