ORIGINALARTICLE

Maternal Characteristics and Immunization Status of Children Among Rural Ihotu Women Cooperative Society at Eke, Okpokwu Local Government Area, Benue State, Nigeria

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ABSTRACT

Background: Nigeria is one of the countries that have the least routine immunization coverage in the world. Morbidity and mortality caused by vaccine preventable diseases are very high in Nigeria. Immunization could be routine or supplemental campaigns. Routine immunization refers to the nationally scheduled regular administration of vaccine dosages to infants at specified ages. Children are usually taken to the health facility by their parents or care givers to receive age-appropriate doses of antigens. **Objective**s: The aim of this study was to assess maternal characteristics such as knowledge, perception and practice and the immunization status of their children 0 to 5 years. **Methods:** This was a cross- sectional study of rural cooperative women who had an index child of less than five years and were eligible. The 252 respondents were selected using computer generated numbers. A questionnaire was used to collect information on demography, knowledge, perception and practice of immunization. **Results**: The mean age of the respondents was 27.98±6.45 and over 59% of the children were between 0-6 months. Over 86% had formal education, 96.0% were aware of routine immunization and 94.0% believed vaccines could prevent diseases. Eight-five percent took their children for immunization and 92.0% immunized their children at appropriate age. Awareness of routine immunization and took child for immunization all had statistically significant association with mothers' education ($p \leq 0.05$). **Conclusion:** Routine immunization coverage in Nigeria is low. The results of this study had shown that mothers in Nigeria had improved in taking their children for immunization. This indicated that immunization uptake had also improved compared to previous reports.

Keywords: Children, diseases, education, immunization, prevention, Nigeria

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Introduction

Immunization has been shown to be the most successful and cost effective public health intervention in the 20th century.[1] In the developing world like Africa, it does not only prevent about three million child deaths annually, but also has the potential to avert additional two million deaths if immunization programs are expanded and fully implemented.[2] It has been reported that childhood immunization has indirectly prevent infectious diseases in adults through herd immunity.[3] They noted that the use of the pneumococcal protein conjugate vaccine (PCV) among children reduced the total number of invasive pneumococcal disease (IPD) cases and resulted in a 38% decrease in the rate of IPD among non-vaccinated elderly adults through herd immunity.[3] Immunization could be routine or supplemental campaigns. Routine immunization refers to the nationally scheduled regular administration of vaccine dosages to infants

at specified ages. Children are usually taken to the health facility by their parents or care givers to receive age-appropriate doses of antigens. In most developing countries, this is only done on specific days of the week to reduce vaccine wastage since the vaccines are supplied in multi-dose vials to reduce costs.[4] The main aim of routine immunization is to deliver the complete number of doses of patent vaccines in a timely, safe and effective way to all children, ultimately inducing immunity against targeted diseases.[5] If implemented, the result is a drastic reduction in the burden of childhood vaccine preventable diseases.[6] On the other hand, supplemented immunization- also known as immunization campaign- is organized occasionally by governments for the purposes of catch up immunization, disease eradication/elimination and to avert epidemics. Immunization campaigns became more frequent in the last two decades when World Health Organization (WHO) launched the polio eradication programme. Immunization campaigns against polio and measles have yielded tremendous results globally and in Nigeria. This has reduced global polio cases from 350,000 in 1988 to 1643 in 2009 (>99% reduction) and measles from 871,000 in 1999 to 454,000 in 2004 (48%).[7,8]

Vaccine preventable diseases are known to account for approximately 22% of child deaths in Nigeria, amounting to over 200,000 deaths per year.[9,10] However, in Nigeria as in some other third world countries, immunization coverage is low.[10,11] In 1999 the government substituted the Expanded Programme on Immunization (EPI) program with the National Programme on Immunization (NPI) in the bid to re-energize immunization programme in the country. Immunization coverage in Nigeria increased from 12.9% in 2003 to 16.4% in 2007 and to 17% in 2013, a level too low to control the targeted diseases.[12,13,14]

In Nigeria, universal childhood routine immunization is provided free, however some mothers/fathers are known to accept routine immunization but reject campaigns while others reject both due to ignorance. Routine immunization is a key strategy in the polio eradication programme in Nigeria. Given the high burden of vaccine preventable diseases in Nigeria, assessing certain characteristics like mother's knowledge, perception and practice of routine childhood immunization and above all encouraging under-five mothers to utilized routine immunization will contribute in reducing under five mortality and accelerated progress towards the Sustainable Development Goals SDG.[15]

Northern Nigeria has one of the lowest immunization coverage in the country.[16] Immunization coverage is higher in southern Nigeria than in the North.[16] In Benue state immunization coverage is 75%.[17] Nigeria is ranked as the 12th highest under **five** mortality rate in the world with 143 deaths per 1,000 live births with an annual number of under five deaths of 861,000.[10,12] Due to the high under five mortality rate and large annual birth cohort of 332,000 children, Nigeria contributes disproportionately to the global burden of under-five deaths.[18] Vaccine preventable deaths constitute a good proportion of mortality among children under five deaths. Recent estimates from Child Health Epidemiological Reference Group found that pneumonia, diarrhea and meningitis preventable in part with newer vaccines led to nearly 300,000 annual death reduction in Nigeria in 2010, approximately a third of the country's under five mortality.[19]

About 130 million infants are born in the world each year. Protecting these newborns from vaccines preventable diseases require an organized, accessible and well-functioning immunization program.[20] Routine immunization provides a solution for childhood killer disease which are vaccine preventable. Immunization against the vaccine preventable diseases (Tuberculosis, poliomyelitis, measles, tetanus, diphtheria, pertussis and pneumonia) saves the lives of one million children in Nigeria.[14,16] With a view to improving child health, the Nigerian government introduced pentavalent vaccine into her routine immunization schedule in 2012. Pentavalent vaccine is a combination of five vaccines-in-one that prevents diphtheria, tetanus, pertussis, hepatitis B and Haemophilus influenza type B with about 27,000 lives saved annually in Nigeria.[21] The aim of this study is to assess mothers' knowledge, perception and practice of routine immunization against childhood killer diseases.

Methodology

Study Area

This study was carried out at Eke Olengbecho in Okpokwu Local Government Area of Benue State.

This is a rapidly developing multi-ethnic rural community with an estimated population of approximately 7,500 people. They are predominantly farmers. The Ihotu Women Cooperative Society was founded in1992 and currently has 1450 members spread all over the ward. They had various offices such as president, secretary, treasurer, auditor and public relations officer. Registration fee is 7,500 naira for new members. They are involved in many economic activities such as garri processing, buying and selling of agricultural produce, transport, money lending to members with interest and complete funding of burial arrangements for their members in the event of death.

Study Population and study design

The study population comprised all the registered members of the cooperative society**.** Eligibility was all the registered members of the cooperative society who had an index child of less than five years and consented were included while those who met the inclusion criteria but were absent during survey or were ill were excluded. Those who did not consent were also excluded. A cross sectional descriptive study design was employed for this study.

Sample size estimation and sampling technique.

The sample size for this study was determined using the formula (WW Daniel) ($n=Z^2P(1-p)/d^2$)[14]

Where n is the minimum sample size, Z is the standard normal deviate at 95% confidence interval (1.96), p is taken from a previous study from Nigeria (82%)[14] q is the complementary probabilities (1-0.82), and d is degree of precision desired (0.05) a sample size of 263 was obtained. Taking into account of the cooperative member's population of less than 10,000 and a dropout rate of 10%, the correction for infinite factor was made and the minimum sample was adjusted to 252.

From the list of the eligible members, the actual respondents were selected by computer generated numbers.

Data collection instruments

An adapted semi-structured interviewer administered questionnaire was used for data collection.[9] The data collection instrument had 4 sections. The first section was used to collect information on socio-demographic characteristics, the second section on knowledge of immunization, third on perception and the last section on practice. Three research assistants were trained on the content and method of administration of questionnaires prior to the commencement of the study by the research team lead. The research collection instrument was pretested among Ugbokolo Anya Olelonye Cooperative Society, which is 15 kilometers from Eke. Ethical clearance was obtained from Benue State University Teaching Hospital institutional health research ethical committee. Verbal informed consent was obtained from all the respondents for the study.

Grading of Response

A total of 5 steam questions were used to assess the respondents' knowledge on immunization with maximum possible responses of 14 out of which 10 were correct. One mark was allocated to every correct response while zero mark to the incorrect ones giving a maximum attainable score of 10 marks. A percentile graph was then applied to the scores of the respondents and scores corresponding to the 50th percentile and above were graded as good knowledge while those below the 50th percentile as poor knowledge. The practice of immunization among the respondents was graded as good if the respondents gave favourable responses such as immunized children at appropriate ages and distance from health facility (> 5kilometers).

Results

TABLE 1: Socio demographic Characteristics of Under Five Mothers

Variable	Frequency (n=252)	Percentage
Mother's age		
18-29	163	64.7
30-39	74	29.3
40-49	15	6.0
Marital status of mother		
Single	23	9.1
Married	193	76.6

	10	4.0
Divorced		
Others	26	10.3
Family type		
Monogamy	167	66.3
Polygamy	64	25.4
Others	21	8.6
Gender of Child		
Male	121	48.0
Female	131	52.0
Child's Age		
0-6 months	149	59.1
7-11 months	69	27.4
1-2 years	32	12.7
3-5 years	2	0.8
No of respondent's Child < 5 years		
1	102	40.5
2	111	44.0
3	35	13.9
4	3	1.2
5	1	0.4
Language Spoken		
Tiv	135	53.6
Idoma	41	16.3
Igede	14	5.6
Other	62	24.6
Religion		
Christianity	206	81.7
Islam	43	17.1
Others	3	1.2
Educational Attainment of mother		
No formal Education	33	13.1
Primary	86	34.1
Secondary	100	39.7
Tertiary	33	13.1
Occupation of mother		
House Wife	99	39.3
Farming	60	23.8
Trading	48	19.0
Civil Servant	40	15.9
Others	5	2.0

Annual Income(Naira)		
Less than 20,000	55	20.5
20,001-40,000	120	60.2
40,000-60,000	45	13.4
60,000 and above	32	5.9
	Mean age of mother = 27.98	**SD = 6.45**

Table 1 showed socio- demographic characteristics of respondents. About two thirds of the mothers were between the most active reproductive age group (18-29years) with a mean age of 27.98 ± 6.45; married women constituted 76.7%, and 66.0% were married in a monogamous setting. Female children were slightly more than males 52.0% and 48.0% respectively. Almost 60.0% were aged between 0-6 months and most of the respondents had two children below 5 years of age. Majority of the respondents of the respondents were from Tiv ethnic group and Christians 82.5%, half of the respondents had at least secondary education whereas 13.1% had no formal education. Also, about a third of the respondents were housewife, 24.0% were farmers, and 19.0% were traders while only 16.0% of the respondents were civil servants. Over 60% had annual income of between 20,000 and 40, 000 naira

TABLE 2: Mothers Knowledge of Routine Immunizations

Variable	Frequency (n=252)	Percentage
Aware of routine Immunizations		
Yes	242	96.0
No	10	4.0
Knowledge of diseases that are preventable		
Yes	237	94.0
No	15	6.0
Childhood killer Diseases		
Tuberculosis	31	12.3
Polio	76	30.2
Measles	36	14.3
Diphtheria	4	1.6
Tetanus	11	4.4
Pertussis	2	0.8
Pneumonia	8	3.2
2 or more diseases	70	27.8
Don't know	14	5.6
Vaccines used in preventing childhood killer diseases		
BCG	43	17.1
OPV	49	19.4
Pentavaccine	35	13.9
PCV	2	0.8
Measles	4	1.6

Mothers Knowledge of Routine Immunizations		
Yellow Fever	3	1.2
2 Diseases	102	40.5
Don't Know	14	5.6
Sources of information		
Ante Natal Care	182	72.2
Friends	23	15.9
Radio and Television	18	11.9

Table 2 showed mothers knowledge on routine immunization. About 96.0% of the respondents were aware of routine immunization, 30.0% knew poliomyelitis as childhood killer diseases, and 27.8% knew more than two childhood killer diseases whereas only 0.80% knew pertussis. More than a quarter of mothers knew more than one vaccine used in preventing childhood killer diseases, however, only 0.80% knew pneumococcal cognate vaccine (PCV) as a vaccine used in preventing childhood killer diseases.

Table 3: Mothers Perception About Routine Immunization

Variable	Frequency (n=252)	Percentage
Wrong notion about immunization		
Yes	39	15.5
No	213	84.5
Believed that vaccines offer protections against diseases		
Yes	215	85.3
No	37	14.7
Believed that immunization helps children grow		
Yes	220	87.3
No	32	12.7
Believed that Immunization can be used to treat all diseases		
Yes	195	77.4
No	57	22.6
Feelings about vaccine safety		
Safe	212	84.0
Not safe	18	7.0
Reduced fertility	22	9.0

Table 3 showed mothers perception about routine immunization. Eighty-five percent of mothers had correct notion about routine immunization. Majority 85.3% of the respondents agreed to the fact that vaccines offer protection against childhood killer diseases. A high proportion of mothers believed that immunizations could help child to grow well and healthy. Slightly above 22% of the respondents did believe that immunizations were used to treat all childhood killer diseases while 7.0% felt that vaccines were not safe and 9.0% believed it reduced fertility.

Table 4: Mothers Practice of Routine Immunization

Variable	Frequency (n=252)	Percentage
Nearness to Health Facility (about 5 km)		
Yes	90	35.7
No	162	64.3
Mothers took children to Clinic		
Yes	214	84.9

Mothers Practice of Routine Immunization		
No	38	15.1
Reason Why Mothers do take children for immunization		
Too far (5km)	9	3.6
No incentives given	16	6.3
No reason given	11	4.4
Others	2	0.8
Undecided	214	84.9
Immunized all children at appropriate ages		
Yes	232	92.1
No	20	7.9

Table 4 showed mothers' practice of routine immunization. About one- third of the respondents said that health facility was far from their residence. Most of the respondents 85% always took their children to health facility for routine immunization. Out of the 15.1% others that did not take their children for immunization, 6.3% said no incentives were given. However, 92% of the respondents immunized all their children at appropriate ages.

Table 5 (A): Association Between Mothers Educational Level And Other Variables Of Immunization

Variables	No Formal Education	Primary	≥ Secondary Education	Chi-square	p-value
Awareness of Immunization					
Yes	29	82	131	88.242	0.041
No	4	4	2		
Notion of Immunization					
Yes	11	13	15	10.758	0.013
No	22	73	118		
Took child for Immunization					
Yes	28	71	115	11.403	0.012
No	5	15	18		

Table 5(B): Association Between Mother's Occupation and Age-Appropriate Immunization

Variables	House Wife	Farming	Trading	Civil	Others	Chi-square	p-value
Appropriate immunization							
Yes	91	51	46	40	4	9.478	0.05
No	8	9	2	0	1		

Table 5(a) showed association between mother's educational level and other variables of immunization and table 5(b) showed association between mother's occupation and age-appropriate immunization. Variables such as awareness of immunization, notion of immunization, took child for immunization all had signification associations with mother's educational levels. Furthermore, mother's occupation and age appropriate for immunization had statistically significant associations.

Discussion

This study assessed maternal characteristics such as knowledge, perception and practice of immunization and immunization status of under five children in a rural cooperative society in Okpokwu local government area of Benue State. The mean age of the mothers in this study was lower than a study done in Nasarawa State, North Central Nigeria. The difference may be because the Nassarawa State study was conducted in an urban setting.

Respondents' literacy level in this study was high. This finding of high literacy level was consistent with that observed in some studies done in Ethiopia, Benin City and Mozambique.[1,18,20] They reported that mother's education was a significant predictor of completeness of immunization because highly educated mother will be more aware of the importance of immunization.[22] Furthermore higher educational attainment was associated with good knowledge about immunization and a child been fully immunized.[23,24] This was comparable to some findings in a rural community based study in Edo State, Nigeria, a facility based study in urban Lagos and some studies in Papua New Guinea.[23,25,26]

Mother´s occupation was another factor that influenced vaccination uptake. Majority of the respondents in this study were full time housewives, however, this study observed and supported the findings by some authors that being employed was significantly associated with higher likelihood of the child being fully immunized.[18,26]

This study showed that majority of the respondents were from families where the monthly income was greater than N50, 000, indicating a middle-class standard of living.[11,13] Several studies had found a relationship between social status and vaccination status.[14,18] Children from wealthy households may be more likely to have their vaccination status checked and to receive missing doses of vaccines when attending a health care facility than children from poor households. Also, it could be because children who are from poor homes find it difficult to be reached by the health workers and also poor parents may encounter barriers to reach health facility compared to richer families.

Assessment of mothers' knowledge on importance of vaccination and vaccine preventable diseases was moderately high as observed in this study, this could account for the proportion of children who were fully immunized in the study. Other studies have also shown that a mother's knowledge of the importance of vaccination has a strong relationship with complete immunization status of children.[18,26] Other researchers have established that a mother's knowledge of the immunization schedule has a strong association with complete immunization status of children.[14,26] However, the mothers do not have satisfactory knowledge on newly introduced vaccines. This study also showed that the barriers of completion of child immunization especially in the rural area can be traceable to poor knowledge, attitude and perception of health facility support. This is consistent with the findings of some studies done in Haiti.[14,15] Furthermore, awareness of routine immunization of the respondents was high in this study; and majority obtained the information from health professionals. This was similar to a study done at Ibadan on the uptake of childhood immunization among mothers of under five children in South Western Nigeria where immunization was significantly associated with recommendations from health care professionals.[25,26]

A large percentage of the respondents said vaccines were not harmful, they had good knowledge of when a child should start and completes immunization, they also had good knowledge of disease being vaccinated against; and they knew the names of the vaccines.

The result of this study was similar to other findings in an Italian study, in which 57.8% of parents had adequate knowledge-attitude-practice (KAP), and was supported by a study in India, that found parental knowledge regarding vaccination

adequacy.[5,9,14,15] Also, this study observed that the age of the mother was significantly associated with the child's immunization status. This could be because older mothers know the effect and the importance of immunization on children than younger mothers. This finding is similar to the study conducted in Sudan and also in Nigeria.[12,14]

Travel time to health facility has been observed to be a barrier to delivery of vaccines in remote areas. This statement was supported by this study and several others.[16,23] Distance to primary health care facilities was significantly associated with immunization status of the children. This may be related to socioeconomic factors and cost of transportation for each immunization session especially if health care facilities were not in close proximity.

Conclusion

The results of this study had shown that mothers in Nigeria had improved in taken their children for immunization. This indicated that immunization uptake had also improved compared to previous reports. The challenge however is that children of women without education, that are poor in rural areas and in the middle class were not fully immunized.

Recommendation

Women empowerment intervention is recommended, for the poor women, as well as improved female literacy level as knowledgeable mothers utilize child health services better and had been linked positively with child survival practices. Appropriate information and education strategies should be put in place to further improve awareness about immunization. This will ensure that others, especially the uneducated and poor, immunize their children. Low coverage will always draw back the efforts of fighting vaccine preventable diseases.

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Authors' contributions: The different authors in this work contributed as follows:

OOG: Introduction, conceptual frame work and literature review.

JAJ, AJP, OOG: Methodology.

RG, OAF, JAJ: Results.

All authors were involved in the discussion.

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