

Routine Immunization Uptake and Knowledge of Caregivers in Selected Rural Communities in Northwestern Nigeria

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Abstract

Context: Childhood immunization remains a public health problem in Nigeria, as the status did not improve substantially during the last two decades, especially in northern Nigeria. Understanding the level of routine immunization uptake of children among caregivers is important if a healthy community is to be maintained. **Aim:** This study aimed to investigate the knowledge and level of routine immunization uptake among caregivers in Bukkuyum Local Government of Zamfara State, Nigeria. **Settings and Design:** A descriptive cross-sectional study involving 320 caregivers selected using a multistage sampling technique was conducted. **Materials and Methods:** Sociodemographics, vaccination details, and knowledge were obtained via a semi-structured interviewer-administered questionnaire. **Statistical Analysis Used:** Data collected was analyzed using Statistical Package for Social Sciences (SPSS) statistics for Windows, version 21.0. **Results:** Findings show abysmally low levels of uptake of routine immunization antigens, namely, Bacille Calmette- Guérin (BCG) (26.1%), Oral Polio Vaccine LGAs= Local Government Areas (OPV) (42.5%), pentavalent vaccine (18.9%), and measles (13.0%). Only 80 (25.0%) children were fully immunized, 93 (29.0%) partially immunized, and 147 (46.0%) nonimmunized. Most respondents had poor knowledge (308 (96.2%)) and poor attitudinal disposition (173 (54.1%)) toward routine immunization. **Conclusion:** The vaccination uptake and knowledge of immunization among caregivers in the study area are poor. Caregivers' continual health education and a step-up of mobile health education activities by healthcare providers are crucial to improve routine immunization uptake in the study area.

Keywords: Caregivers' knowledge, Northwestern Nigeria, routine immunization, vaccine uptake

INTRODUCTION

One of the most beneficial and cost-effective public health mediations globally is immunization, preventing a lot of serious childhood diseases. Childhood immunization is the initiation of immunity through the application of vaccines. Every year, immunization programs prevent over two to three million deaths^[1] that could have resulted from vaccine-preventable diseases (VPDs), making it essential for improving childhood survival. Worldwide, 19.4 million children missed out on essential vaccination in 2015.^[2] More than 10 million children in developing countries die annually due to their inability to access effective interventions such as immunization that could combat common and preventable childhood illnesses; most of these occur in sub-Saharan Africa and South Asia.^[3] Nigeria's childhood immunization coverage has remained stunted over the past decade, and this has been identified to be associated with a lot of factors, including weak health structures and

systems, inadequate government funding, overdependence on donor funds, and lack of community ownership.^[4]

The Expanded Programme on Immunization (EPI), introduced in 1979 to provide routine immunization to children less than the age of 2 years, recorded initial but intermittent successes. The optimum level was recorded by the early 1990s, with the country achieving universal childhood immunization of 81.5% coverage,^[5,6] but since that period of success, Nigeria has witnessed gradual but consistent setbacks, leading to a

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reduction in immunization coverage. By 1996, the Nigerian Demographic and Health Survey (NDHS) showed less than 30% coverage for all antigens, declining to 16.8% in 1999 and 12.9% in 2003.^[7] The current national figure (21%) is among the lowest globally and explains the poor health status of children in the country.^[8]

Nigeria currently utilizes the National Programme on Immunization, which is a mirror image of the EPI. A child is considered fully immunized if he or she had received one BCG vaccine against tuberculosis at birth; three doses of vaccine to prevent diphtheria, pertussis, and tetanus; at least three doses of polio vaccine; and one dose of measles vaccine. According to the World Health Organization (WHO) standards, all these vaccines should be received within the first year of life.

According to the NHDS 2018, only 25% of children aged 12–23 months had received all of the recommended vaccinations before their first birthday in Nigeria. This is a far cry from the WHO target of 80%. The state of affairs is worse in rural areas where children are twice as less likely to receive full basic immunization.^[9,10] The northern part of Nigeria in which there is a lot of civil unrest is highly predisposed to possible poor vaccination coverage for the children eligible for vaccination with resultant poorer health outcomes.

Consequently, it is crucial to identify key reasons for caregivers' misconception about childhood immunization and assess their primary sources of vaccination information in very high-risk (VHR) LGAs, such as Bukkuyum. Such surveys will assist health decision-makers in planning intervention programs that will help improve childhood routine immunization performance and reduce associated health problems. Therefore, this study was conducted to determine the perception and level of routine immunization uptake among caregivers of 12- to 23-month-old children in Bukkuyum LGA of Zamfara State, Nigeria.

MATERIALS AND METHODS

Study setting

Bukkuyum is one of the 14 LGAs of Zamfara State, and its headquarters is located in the town of Bukkuyum. The LGA has an area of 3,214 km², 717 settlements, and 10 political wards, including Bukkuyum, Kyeram, Yashi, Zarummai, Zauma Masama, Ruwan-Jema, Nasarawa, Gwashi, and Adabka wards. As at the time of this survey (November 2018), the LGA had an estimated population of 280,726 based on the 2006 census and a growth rate of 3.2%. The target population of children under 5 years was 56,145, while that of children under 1 year was 11,229.^[11] Bukkuyum LGA is one of the four VHR LGAs in Zamfara State, the others being Gummi, Talata Mafara, and Tsafe. Each has only 2% of fully vaccinated eligible children.^[12]

Study design and population

The research study design was descriptive cross-sectional. The study population comprised mothers or caregivers of all children aged 12–23 months, residents, and those available

during the survey, while indisposed caregivers and those with sick babies during the survey were excluded. Fisher's formula ($n = Z^2 pq/d^2$)^[13] was used to calculate the sample size using a prevalence of 25.4%,^[14] and a sample size of 320 was arrived at after adjusting for a 10% nonresponse. A multistage sampling technique was used for the study. The selection of wards was made using a simple random sampling technique by balloting. Houses were selected by a systematic sampling technique. A sampling frame consisting of all the houses in the community was obtained from the LGA. Where the list of all the houses was not available, we numbered all the houses and listed all households in the selected communities. These households form our sampling units. The sampling interval was calculated in each selected community and followed until the desired sample size was reached. For every household visited, the caregiver who satisfied the inclusion criteria was interviewed. In a situation where in a household, more than one caregivers were eligible, one respondent was selected using simple random sampling. In cases where a respondent in a selected household was not eligible or declined consent, we moved to the following house while still maintaining the sample sampling interval until the required sample size was reached.

Data collection

A pretested semi-structured interviewer-administered questionnaire was used to collect data. The questionnaire had sections on sociodemographic information of child–mother pair, caregiver's awareness, knowledge and attitude toward immunization, and their routine immunization uptake. The data were collected using a modified questionnaire designed by WHO, the National Primary Health Care Development Agency (NPHCDA), and NDHS, where relevant sections on childhood immunization were extracted. The knowledge on immunization uptake was scored and graded as “poor knowledge” (0–7 points) and “good knowledge” (8–15 points). The attitude of caregivers toward immunization was scored and graded as “Good attitude” (2–4 points) and “Poor attitude” (0–1 points).

Data processing and analysis

The questionnaire was collated, checked for errors, and entered into a personal computer. Data analysis was performed using IBM Statistical Package for Social Sciences (SPSS) version 21.0. Data were presented in tables, charts, and graphs. Chi-square test statistics was used to ascertain the significance level between the proportions. A *P*-value less than 0.05 was considered significant at the 95% confidence limit.

Ethical consideration

Approval to conduct the study was sought from the University of Ilorin Ethics Review Committee with approval code (UERC/ASN/2019/1466). The LGA Chairman and the Community Leaders were informed of the survey's objectives, and we also obtained their permission. Before questionnaire administration, written informed consents of the caregivers who participated were also sought.

RESULTS

The mean (standard deviation (SD)) age of the children was 16.79 ± 3.42 months. More than half of the children (55.9%) were females, and most of the respondents interviewed (89.4%) were mothers of the children. The respondents' mean (SD) age was 27.98 ± 6.18 years. There was a female preponderance as up to 289 (90.3%) respondents were females. The majority were Muslims (304 (95%)), while 155 (48.4%) had no formal education [Table 1]. Almost all the respondents (311 (97.0%)) were married, while four were divorced, three were single, and two were separated. Trading was the predominant occupation (106) practiced by most respondents, 88 were self-employed, 66 were farmers, and 19 were unemployed. The remainder were artisans (35), teachers (4), and civil servants (2).

The majority of the respondents (237, 74.1%) were aware of the vaccines for immunization services, of which 188 (79.3%) believed every child needed immunization. Only 10.1% of the respondents admitted that a child could get a disease if unvaccinated [Table 2]. Concerning the sources of immunization information, more than half of the respondents (171 (53.4%)) got information from the health facility and 28.4% from the radio, while the least common source of information (0.3%) was from newspapers [Table 2].

The polio vaccine was the most common immunization vaccine known to most respondents, followed closely by the measles vaccine, while the respondents' least known vaccine was the yellow fever vaccine. Among those aware of immunization services, 15.2% of respondents identified administration of BCG at birth, 12.2% identified OPV was administered at 6 weeks of life, and 5.9% and 7.6% of them identified measles and yellow fever vaccines should be administered at 14 weeks of life and 9 months after birth, respectively.

Figure 1 shows that more than half of the respondents (173 (54.1%)) admitted that their children have been vaccinated, while 42 (13.1%) were unsure of their children's vaccination status.

Of the respondents who took their children for vaccination, 60 (34.8%) agreed that the child missed an immunization appointment, and 91 (52.8%) of the respondents had an

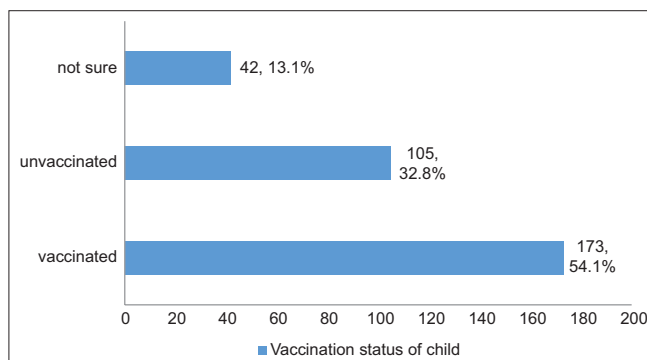


Figure 1: Bar chart showing the proportion of caregivers with awareness of the child's vaccination status

immunization card for their child and were available during the study [Table 3].

The majority (147 (46.0%)) of the sampled children were unimmunized, while 80 (25.0%) were fully immunized [Figure 2].

Table 1: Sociodemographic characteristics of caregiver-child pairs

Variables	Frequency (n=320)	Percentage
Age of child (months)		
12–15	131	40.9
16–19	108	33.8
20–23	81	25.3
Gender of child		
Male	141	44.1
Female	179	55.9
Relationship of respondents to child		
Father	18	5.6
Grandmothers	13	4.1
Mothers	286	89.4
Stepmother	3	0.9
Age of caregiver or parent (years)		
≤20	51	15.9
21–25	65	20.3
26–30	99	30.9
31–35	68	21.3
36–≥40	37	11.6
Gender		
Male	31	9.7
Female	289	90.3
Ability to read and write		
Yes	131	40.9
No	189	59.1
Level of education		
Primary	24	7.5
Secondary	16	5.0
Others	125	39.1
No formal education	155	48.4

Table 2: Awareness of vaccines or immunization services

Variables	Frequency	Percentage (n=304)
Awareness of vaccine or immunization services n=304		
Yes	237	74.1
No	83	25.9
Sources of information (n=237)		
Radio	91	28.4
Television	4	1.3
Newspaper	1	0.3
Health facility	171	53.4
Family, friends, and neighbors	107	33.4
Child school	24	7.5
During home visits by health workers	30	9.4
Community meeting	11	3.4

Multiple responses apply

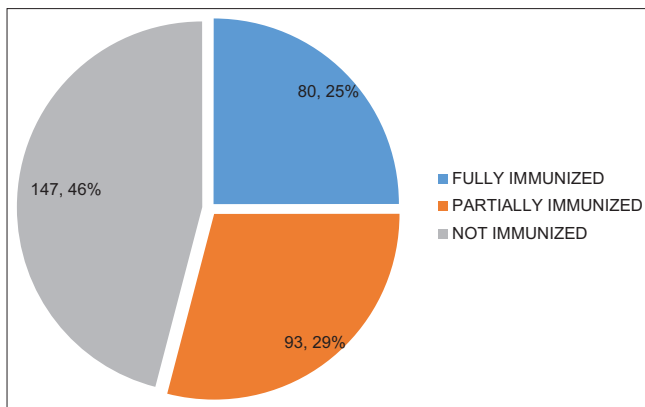


Figure 2: Pie chart showing the immunization status of children of respondents

A majority (96.2%) of the caregivers had poor knowledge of routine immunization, and only 12 (3.8%) had good knowledge of routine immunization. Also, less than half of the respondents (45.9%) had good attitudinal disposition toward routine immunization. The level of education of respondents showed a significant relationship with knowledge on immunization among respondents as more educated respondents had better knowledge ($P = 0.035$) of immunization [Table 4]. Also, the ability of respondents to read and write influenced the knowledge of immunization among respondents ($P = 0.002$).

DISCUSSION

Routine screening of immunization coverage rates is vital in public health as it informs stakeholders on whether trends in uptake are improving, declining, or stable. Based on the evaluation findings, stakeholders and policymakers can develop strategies to accelerate or maintain immunization uptake to ensure that children are protected against VPDs to maintain herd immunity. In this study, the majority of the respondents (98.4%) were in the age range of 20 to 40 years, implying that this age range may be the most active group in which women in Bukkuyum LGA give birth. This finding agrees with the findings by Abdulraheem *et al.*^[15] wherein the majority of caregiver (90.5%) ages was 18 to 39 years. The results showed a high proportion of married respondents in the LGA. This finding may be due to Islam, which allows for more than one wife, as the predominant religion in the LGA. Nearly half of the respondents (48.4%) had no formal education, which contrasts with a study conducted in Tamale, Ghana, where the majority (73.4%) of the respondents had one or the other educational qualifications.^[16]

Most of the respondents (95.0%) knew information on immunization, with the primary source of awareness being health facilities. Prior studies have shown that improving a caregivers' health literacy and knowledge about the benefits of vaccination was associated with an overall increase in full vaccination coverage.^[17] These earlier reports corroborate the current study findings as most respondents (90.3%) took their

Table 3: Respondents' immunization experience

Variables	Frequency (n=173)	Percentage
Means of transportation to the health facility		
Walking	139	80.6
Bicycle	28	16.0
Motor cycle	4	2.3
Car	2	1.1
Travel time to the clinic (minutes)		
≤30	152	87.3
>30	21	12.7
Decision-maker on vaccination		
Father	74	42.7
Mothers	15	8.7
Other relatives	2	1.2
Consensus of father and mother	80	46.2
Others	2	1.2
Child missed immunization		
Yes	60	34.8
No	26	14.6
Not sure	87	50.6
Child has an immunization card		
Yes and with respondents	91	52.8
Yes but not with respondents	33	19.0
No	49	28.2

Table 4: Association between the sociodemographic characteristics of respondents and their knowledge of immunization

Variables	Knowledge		χ^2	P
	Poor (%)	Good (%)		
Age of caregiver or parent (years)			1.601 ^y	0.901
≤20	1 (2.0)	50 (98.0)		
21–25	2 (3.1)	63 (96.9)		
26–30	5 (5.1)	94 (94.9)		
31–35	4 (5.9)	64 (94.1)		
36–40	0 (0.0)	32 (100.0)		
≥41	0 (0.0)	5 (100.0)		
Gender			0.434 ^y	0.510
Male	0 (0.0)	31 (100.0)		
Female	12 (4.2)	277 (95.8)		
Marital status			4.740 ^y	0.192
Single	0 (0.0)	3 (100.0)		
Married	12 (3.9)	299 (96.1)		
Divorced	0 (0.0)	4 (100.0)		
Separated	0 (0.0)	2 (100.0)		
Can read or write			9.268	0.002
Yes	10 (7.6)	121 (92.4)		
No	2 (1.1)	187 (98.9)		
Level of education			8.636 ^y	0.035
Primary	2 (8.3)	22 (91.7)		
Secondary	3 (18.7)	13 (81.3)		
Others	5 (4.0)	120 (96.0)		
No formal education	2 (1.3)	153 (98.7)		

^y=Yates corrected Chi-square

children to a health facility, and 53.7% were for immunization purposes. Although childhood vaccinations are available free of cost and with growing awareness, the childhood immunization rate in Nigeria is not yet satisfactory. Children's immunization status against childhood diseases indicates how much priority is attached to the children's health in a country where routine immunization is the mainstay intervention for protecting children from life-threatening diseases.

The polio vaccine was the most well-known vaccine by respondents, followed by the measles vaccine, while the least known vaccine was the yellow fever vaccine in the current study, a finding earlier reported in other states in Nigeria.^[6] Both polio and measles are on the center stage of both national and global public health activities. While measles is targeted for global elimination in Nigeria, poliomyelitis is targeted for global eradication.^[18] Just as a vast population has been sensitized regarding poliomyelitis, other diseases should be given similar enlightenment. Such enlightenment is bound to urge mothers to present their wards for immunization. This approach requires health promotion in the form of health education and persuasive communication in passing the information in such a manner that the content would be comprehended and accepted by the people.

Almost all the respondents (79.3%) admitted that every child needs immunization. Some stated benefits of immunization include preventing disease, curing diseases, and enabling the child to grow healthy and strong. The main reason for receiving each immunization dose was to prevent illness or protect the child in the index study. This finding is an indication that caregivers in a rural area have a good knowledge of the importance of immunization, similarly reported in Taif, Saudi Arabia.^[19] The majority of parents (672 (91.9%)) knew the role of routine vaccination in protecting children from some infectious diseases and their complications.^[19] In another study conducted by Ahmed *et al.*, 635 (86.9%) parents knew the timing of the first dose in the vaccination schedule.^[20] Another study in Lagos, South West Nigeria, by Awodele *et al.*^[21] found that almost all (93.8%) of the respondents were aware of immunization and that immunization could prevent childhood illness (98.1%).

The geographical distance of most rural areas tends to influence the availability and effectiveness of immunization campaigns across the country. Also, accessibility to vaccination facilities, provision of childhood immunization services, and demand-related factors, such as mothers' knowledge and attitude, influence immunization uptake, especially in rural areas.^[22] Equally, parents or caregivers may not be willing to walk long distances due to the regular absence of health workers or the unavailability of vaccines at the health facility.^[23] These are in line with some of the main reasons respondents in this study proffered for the missed immunization doses, including "not in favor of vaccination" and that "hours of vaccination were not favorable" for the caregiver.

Factors determining childhood vaccination uptake are complex, being dependent on socioeconomic, demographic,

and supply and demand factors.^[24] Supply-related factors, though necessary, adequate supply of vaccines does not essentially translate into childhood immunization uptake. The most identified reasons that hinder immunization in this study include "decision-maker not in favor of vaccination," "vaccination site too far from residential homes," and "thought the child is not eligible for vaccination." Moreover, the side effects of previous vaccine doses on a child might hinder further immunization uptake by caregivers. Most caregivers also identified that missed immunization appointments could be due to fever, diarrhea, and other minor ailments.

The majority of the caregivers identified walking as a means of transportation to the health facility, and a high percentage of them spent less than 30 minutes' travel time to the clinic. This finding conforms to one of the principles of Primary Health Care (PHC), which is to bring healthcare services close to where people live to enhance easy access and adequate utilization. Health care is within reachable distance if the facility is within 3–5 km in urban areas and 5–10 km for rural communities, or a travel (trekking) time of less than 1 hour and 1 to 2 hours, respectively.^[25] The vaccination card retention is a direct measurement of the quality of immunization services as the card provides details of the service given to the child. Slightly more than half of the caregivers (52.8%) had their children's immunization cards, 19.0% had misplaced them, and 28.2% had no cards.

Vaccine coverages for BCG (26.1%), OPV (42.5%), pentavalent (18.9%), and measles (13.0%) were lower than those obtained by Kabir *et al.*^[26] in Kano State, Nigeria, where BCG was 50%, OPV1 was 70%, and Diphtheria Pertussis and Tetanus (DPT) recorded 42%, but measles was comparable at 12.4%. Immunization uptake revealed missed opportunities, especially for vaccines administered concurrently. For instance, there was a discrepancy between the third polio dose (OPV3), which was 30.3%, and third dose of Pentavalent vaccine (Penta 3), which was 28.1%. These vaccines are administered together and should have similar coverage rates. The difference in uptake between the two vaccines could be due to stock-outs of either vaccine, leading to less availability. In addition, some healthcare workers may be unwilling to open new vaccine vials for fear of wastage, especially if the children to be vaccinated are few.

Findings from the study identified that 25.0% of the participants had their children fully immunized, 29.0% were partially immunized, and 46.0% of the children were unimmunized. The coverage for the fully immunized children was higher than that found in the NDHS of 2013 for Nasarawa State (20.1%). The proportion of fully immunized children is also higher than that obtained in Kano of 10.0%,^[26] and 12.0% reported from a survey in six Nigerian states.^[27] Equally, the United Children's Fund (UNICEF) documented that about three-quarters of the world's child population gets the required vaccines, but only half of the children in sub-Saharan Africa have access to basic immunization. This proportion is even worse in poorer

remote areas of developing countries, where only one in twenty children have access to vaccination.

Despite the high awareness of immunization among respondents, this study showed that only 3.8% of the respondents had good knowledge of routine immunization. This finding corroborates the findings from a study among the nomadic population in Akwanga Local Government Area, Nasarawa State, Nigeria, where only 10.0% of the respondents had good knowledge of routine immunization. The educational level of the caregiver was associated with knowledge of immunization uptake in the index study as those with greater than secondary school education were more likely to have fully immunized children than those with pre-secondary education level. The caregivers' higher education level, especially mothers, may be important in increasing awareness of the importance of immunization. Therefore, such mothers are likely to become autonomous and develop a demand for vaccination services.^[28] Educated caregivers can access information on the importance of immunization from the media, education workshops, and other forms. Vikram *et al.*^[29] propose four pathways through which maternal education can influence the immunization of the child. More so, a significant relationship was observed between the immunization status of respondents and knowledge of immunization of caregivers ($P = 0.019$); caregivers with fully immunized children have better knowledge of immunization uptake than the others. Most respondents (54.1%) had poor attitudinal disposition toward immunization. The study showed a high percentage of respondents with good knowledge but poor attitudinal disposition toward immunization uptake.

CONCLUSION

There is a need for health education among caregivers. Furthermore, the educational empowerment of mothers or caregivers is crucial as it has been identified as a predictor of complete immunization uptake. The enhancement of mass mobilization and sensitization is crucial to achieving the desired vaccination uptake.

Strength

We conducted a household survey of caregivers and this limits the selection bias greatly, unlike a hospital survey.

Limitation

This study was conducted in only LGA in Zamfara State, hence limiting the generalizability of the findings.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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