



How Poliomyelitis Eradication Interventions Have Affected the Knowledge, Attitudes and Uptake of Polio Vaccines among Nigerian Women

Ali Johnson Onoja ^{a*}, James Dele Babarinde ^b, Felix Olaniyi Sanni ^c,
Modupe Tabitha Babarinde ^b and Sheila Iye Onoja ^a

^a Research Department, African Health Project, Abuja, Nigeria.

^b Ibolda Health International Abuja, Abuja, Nigeria.

^c Research and Development Department, Fescos of Data Solutions, Ogun State, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Immunization has been shown to be an effective technique for managing and eliminating life-threatening infectious diseases, averting about two million deaths per year. This study aims to assess the knowledge, attitudes, and uptake of polio vaccines among Nigerian women.

Study Design: Cross-sectional descriptive design that involved applying an interviewer-administered questionnaire.

Place of study: The impact assessment was conducted in the 11 National Stop Transmission of Poliomyelitis Program (NSTOP) intervention states in two geopolitical zones of Northern Nigeria, Northwest and Northeast.

Methodology: A total of 2592 caregivers/mothers were interviewed from 262 households in the states. Data collections were done at households in all the intervention states in the two geopolitical zones. The data were analyzed with IBM-SPSS version 25.0.

Results: Mothers/caregivers showed high awareness of poliomyelitis vaccines (>99%). A significantly higher proportion (58.4%) of mothers from intervention states said the recent routine immunization session was less than a month ago than 45.7% of women in non-intervention states

*Corresponding author: E-mail: onojaali@yahoo.com;

($P < .05$). Mothers/caregivers' attitude to immunization was excellent as 98.8% said all children be fully vaccinated at 12 months. A higher proportion (96.6%) of women from the intervention regions said the time spent on vaccination is worth it than 93.8% of those without the interventions ($P = .05$). More mothers (95.5%) from the intervention areas have immunized their children within the last years than 91.7% of non-intervention mothers ($P < .05$). A significantly higher proportion of mothers from intervention regions (96.1%) said their children were immunized as scheduled than 94.4% of those from non-intervention areas ($P < .05$).

Conclusion: Given its success thus far, it is recommended that the NSTOP program be sustained and, if possible, expanded geographically to cover the entire country when resources permit. This step will help keep polio permanently out of the country and reduce mortality among under-five children.

Keywords: Poliomyelitis; immunization; vaccination; Northeast; Northwest.

1. INTRODUCTION

Poliomyelitis is a viral disease spread through contaminated food, water, or faeces [1]. It targets the neurological system in its most severe form, resulting in paralysis [1]. Vaccination is a critical tool for disease prevention and control, but its use has been fraught with controversy worldwide [2,3]. Vaccination is primarily accomplished by preventing infections during childhood, a comprehensive course of injections delivered to infants shortly after birth. Immunization has been shown to be an effective technique for managing and eliminating life-threatening infectious diseases, averting about two million deaths per year [4]. It is one of the most cost-effective health expenditures available, with proven tactics that make it accessible to even the most vulnerable and difficult-to-reach groups^[5]. Vaccine-preventable diseases continue to be a leading cause of sickness and mortality among children in Nigeria [4]. Nigeria is one of the few remaining endemic countries globally; although routine immunization coverage in the country has increased since 2003, it remains one of the lowest globally [4]. Nigeria was once responsible for half of Africa's Measles mortality, has an enormous prevalence of circulating wild poliovirus globally, and was one of ten nations worldwide with vaccine coverage rates below 50%, consistently below 40% since 1997 [5]. However, Nigeria has experienced an enviable feat in the fight against wild poliovirus, particularly since the National Stop Transmission of Poliomyelitis Program (NSTOP) began in 2012 with the collaboration of the Nigeria government and other donors such as the Global Polio Eradication Initiative (GPEI), Rotary International; the US Centers for Disease Control (CDC); Bill and Melinda Gates Foundation and the Global Alliance for Vaccines and Immunization (GAVI). On August 25, 2020, the world health organization (WHO) and the United Nations

Children's Fund (*UNICEF*) congratulated Nigeria for being freed from wild poliovirus [6]. However, the country was advised to ensure that all children under five are fully vaccinated to prevent mortality from vaccine-preventable diseases among this group.

Certain factors, including the mothers' educational background, age, marital status, socioeconomic level, and religious background, all influence the effective use of childhood immunization, particularly in the north, where women have less autonomy [7]. Several studies have reported how northern Nigeria's Muslim religious and political leaders halted the polio vaccination campaign, citing worries that vaccinations had been purposefully laced with anti-fertility chemicals and HIV [1,4,8]. While developed countries have a more systematic vaccination program, the situation is dire in the world's most populous countries [8].

As a result, it may appear as though national immunization efforts have been harmed, if not reversed, due to superstitions, misinformation, community rumours, uninformed leadership, and improper interpretation of cultural and religious norms. The majority can be described as a problem at the intersection of science, religion, and culture. This study aimed to assess how polio eradication interventions have significantly contributed to the current milestone of eradicating poliovirus in Nigeria. To achieve this objective, the study assessed women's knowledge, attitudes, and uptake of the polio vaccine in the northeast and northwest regions of the country.

2. METHODOLOGY

2.1 Study Design

The study was a cross-sectional descriptive design that involved applying an interviewer-

administered questionnaire to mothers/caregivers of children at community levels. The assessment adopted a theory of change that centred on the Intervention (Case)/Non-intervention (control) study design principles to measure impacts.

2.2 Study Location

The impact assessment was conducted in the 11 NSTOP intervention states in two geopolitical zones of Northern Nigeria, Northwest (Kaduna, Jigawa, Zamfara, Kano, Katsina, and Sokoto) and Northeast (Bauchi, Borno, Yobe, Adamawa, and Taraba). The sample size for this approach was drawn from the 262 intervention, and non-intervention LGAs across the 11 NSTOP supported states. Data collected during the assessment in 2019 in these LGAs were used for comparison. Differences (gaps) between the intervention and non-intervention LGAs across selected indicators were used to infer impact.

2.3 Sample Size Determination

The sample size required for this evaluation was to determine if the change in key indicators over the five years is statistically significant [9]. It also aimed at detecting the significant difference in key indicators between intervention and control groups from the selected LGAs. In calculating the sample size, it was assumed that the proportion of fully immunized children to be interviewed (P) is 50%. Consequently, we used the sample size expression below to determine the minimum interview sample in each selected LGAs. The sample size expression used was:

$$n = \frac{P(1 - P)Z^2}{ME^2}$$

Where: n = Sample size, P = Assumed proportion of fully immunized children and it is assumed to be 50%, ME = Margin of error = 2.5% and Z = Z score corresponding to confidence level of 95% and 5% significant level = 1.96. This calculation gives sample size of about 40 households per LGA. The children were interviewed by proxy through the mothers/caregivers identified within households; hence this was a guide in the number of Households randomly sampled in the selected LGAs and eventually the state.

2.4 Data Collection Methods

Data collections were done at households in all the intervention states in the two geopolitical

zones. Data at the households were electronically collected by trained research assistants using Android Telephone devices.

2.5 Data Processing and Analysis

The data was downloaded from the server; the downloaded data was exported to IBM-SPSS version 25.0, where data cleaning was done in preparation for the data analysis. Ethical approval number NHREC/01/01/2007 – 9/03/2018 was obtained from the Federal Ministry of health research ethics committee.

3. RESULTS

3.1 Socio-Demographic Characteristics of Respondents

A total of 2592 caregivers/mothers were interviewed. 46.6% were aged 25-34 years, 93.7% were married, and 39.8% had qur'anic education as their highest educational level. Islam's predominant religion (88.1%), while about 45.4% did not have any occupation (Table 1).

Mothers/caregivers displayed a high level of awareness of poliomyelitis vaccines in both control and interventions areas (>99%). The mothers (96.9%) acknowledged that there had been a regular immunization session in the settlement/village in the last six months. A significantly higher proportion (58.4%) of mothers from intervention states said the recent routine immunization session was less than a month ago than 45.7% of women in non-intervention states ($P < .001$). When asked if aware of the immunization focal person in the settlement/village, (69.2%) of those in the non-intervention LGA said yes, than 63.8% of intervention LGA responded ($P = .05$) – (Table 2).

Mothers/caregivers' attitude to the Polio vaccine was generally excellent, with mother/caregivers (98.8%) in both intervention and non-intervention LGA agreeing that it is expected that all children be fully vaccinated by 12 months of age. A high proportion (98.7%) agreed to advise others to get their children immunized, and (95.8%) said the time spent on immunization is worth it. However, a higher proportion (96.6%) of women from the intervention regions said the time spent on vaccination is worth it than 93.8% of those without the interventions ($P = .05$) – (Table 3).

Table 1. Socioeconomic characteristics of respondents of community assessment Characteristics

Characteristics	Control No. (%) n=717	Intervention No. (%); n = 1875	Total
Status			
Mother	614 (85.6)	1733 (92.4)	2347 (90.5)
Others	103 (14.4)	142 (7.6)	245 (9.5)
Age group			
15-24 years	241 (33.6)	613 (32.7)	854 (32.9)
25-34 years	310 (43.2)	897 (47.8)	1207 (46.6)
35-44 years	137 (19.1)	300 (16.0)	437 (16.9)
45-54 years	27 (3.8)	57 (3.0)	84 (3.2)
>54 years	2 (0.3)	8 (0.4)	10 (0.4)
Marital Status			
Divorced	9 (1.3)	27 (1.4)	36 (1.4)
Married	684 (95.4)	1745 (93.1)	2429 (93.7)
Separated	8 (1.1)	19 (1.0)	27 (1.0)
Single	10 (1.4)	40 (2.1)	50 (1.9)
Widowed	6 (0.8)	44 (2.3)	50 (1.9)
Highest Education Completed			
None	7 (1)	39 (2.1)	46 (1.8)
Primary	177 (24.7)	510 (27.2)	687 (26.5)
Quranic Education	300 (41.8)	732 (39.0)	1032 (39.8)
Secondary	197 (27.5)	493 (26.3)	690 (26.6)
Tertiary	36 (5)	101 (5.4)	137 (5.3)
Religion			
Christianity	174 (24.3)	134 (7.1)	308 (11.9)
Islam	543 (75.7)	1741 (92.9)	2284 (88.1)
Occupation			
Farming	136 (19)	333 (17.8)	469 (18.1)
Not working	318 (44.4)	860 (45.9)	1178 (45.4)
Other Specify	76 (10.6)	155 (8.3)	231 (8.9)
Professional	21 (2.9)	80 (4.3)	101 (3.9)
Trading	166 (23.2)	447 (23.8)	613 (23.6)

Table 2. Assessment of mothers/caregivers knowledge on polio vaccine, 2019

Characteristics	Non-intervention LGAs n (%)	Intervention LGAs n (%)	Total n (%)	P-value
Have you ever heard of immunization?				
No	6 (0.8)	13 (0.7)	19 (0.7)	.70
Yes	711 (99.2)	1862 (99.3)	2573 (99.3)	
Total	717 (100)	1875 (100)	2592 (100)	
Has there been any RI session in the settlement/village in the last 6 months?				
No	28 (3.9)	53 (2.8)	81 (3.1)	.34
Yes	683 (96.1)	1809 (97.2)	2492 (96.9)	
Total	711 (100)	1862 (100)	2573 (100)	
When was the last RI session in this settlement/village?				
<1 month	332 (45.7)	1088 (58.4)	1420 (55.2)	< 0.001*
1-3 months	252 (35.4)	615 (33.0)	867 (33.7)	
4-6 months	80 (11.3)	81 (4.4)	161 (6.3)	
>6 months or never	0 (0.0)	39 (2.1)	39 (1.5)	
Don't know	47 (6.6)	39 (2.1)	86 (3.3)	
Total	711 (100)	1862 (100)	2573 (100)	
Immunization can prevent childhood diseases				
No	2 (0.3)	8 (0.4)	10 (0.4)	0.803
Yes	709 (99.7)	1854 (99.6)	2563 (99.6)	
Total	711 (100)	1862 (100)	2573 (100)	
Are you aware if there is a person who lives in the village/settlement that is a focal person for RI in your village/settlement?				
No	221 (30.8)	498 (36.2)	719 (27.7)	.008*
Yes	496 (69.2)	1377 (63.8)	1873 (72.3)	
Total	717 (100)	1875 (100)	2592 (100)	

*P-value < 0.05 indicates significance

The table below shows that (94.5%) of the mothers/caregivers have immunized their children within the last years but higher among women from intervention areas (95.5%) than 91.7% of non-intervention mothers ($P < .001$). However, while 99.3% of women without intervention have immunized all their children, 98.4% of those with intervention had. A significantly higher proportion of mothers from intervention regions (96.1%) said their children were immunized as scheduled than 94.4% of

those from non-intervention areas ($P = .05$) – (Table 4).

The primary source of information on routine immunization amongst mothers and caregivers in intervention states were health facilities and family members (Fig. 1). However, intervention activities created awareness among 33.4% of intervention LGAs compared to 13.1% of non-intervention.

Table 3. Assessment of mothers/caregivers attitude towards polio vaccine, 2019

Characteristics	Non-intervention LGAs n (%)	Intervention LGAs n (%)	Total n (%)	P-value
It is expected that all children be fully vaccinated by 12 months of age				
No	9 (1.3)	22 (1.2)	31 (1.2)	.915
Yes	702 (98.7)	1840 (98.8)	2542 (98.8)	
Total	711 (100)	1862 (100)	2573 (100)	
Would you advise others to get their children immunized?				
No	11 (1.5)	22 (1.2)	33 (1.3)	.708
Yes	700 (98.5)	1840 (98.8)	2540 (98.7)	
Total	711 (100)	1862 (100)	2573 (100)	
Time spent on immunization is worth it				
No	44 (6.2)	63 (3.4)	107 (4.2)	.006*
Yes	667 (93.8)	1799 (96.6)	2466 (95.8)	
Total	711 (100)	1862 (100)	2573 (100)	

*P-value <0.05 indicates significance

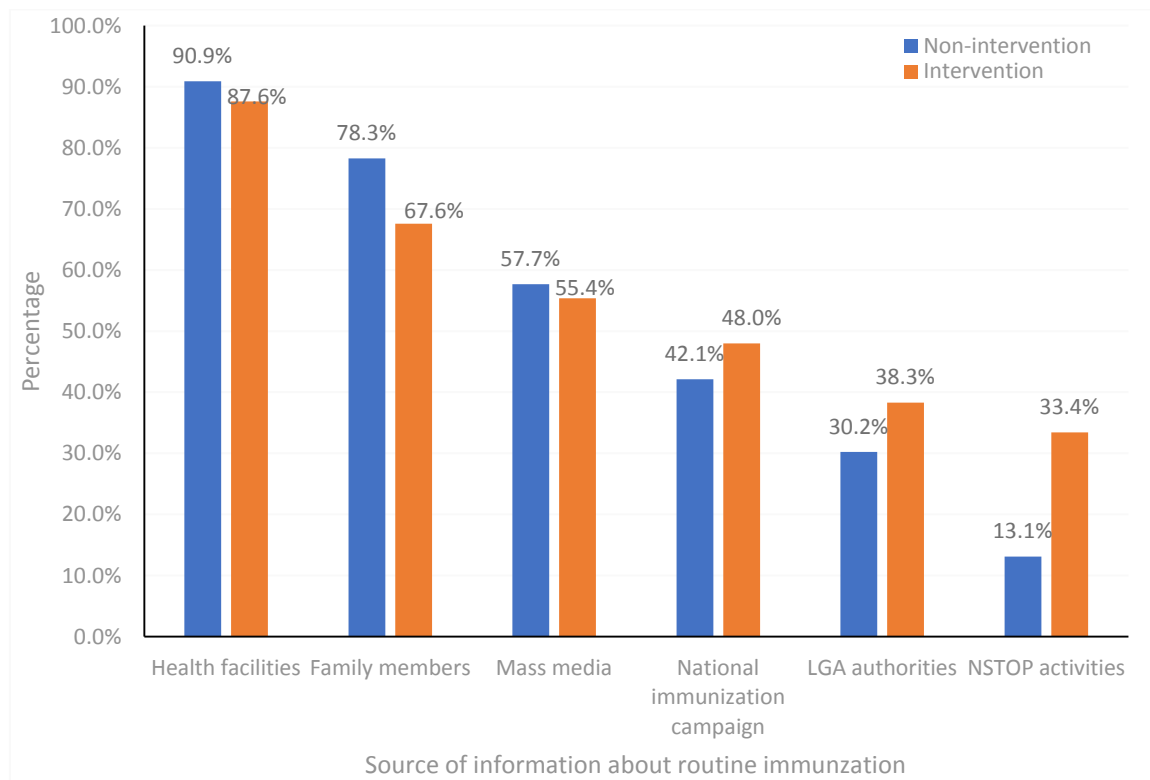


Fig. 1. Sources of information on routine immunization among mothers/caregivers in intervention and Non-intervention LGAs, 2019

Table 4. Assessment of mothers/caregivers uptake on polio vaccine, 2019

Characteristics	Non-intervention LGAs n (%)	Intervention LGAs n (%)	Total n (%)	P-value
I have immunized my children in the recent past (within the last years).				
No	59 (8.3)	83 (4.5)	142 (5.5)	.001*
Yes	652 (91.7)	1779 (95.5)	2431 (94.5)	
Total	711 (100)	1862 (100)	2573 (100)	
Have all your children been given vaccination?				
No	5 (0.7)	30 (1.6)	35 (1.4)	.075
Yes	712 (99.3)	1845 (98.4)	2557 (98.6)	
Total	717 (100)	1875 (100)	2592 (100)	
If yes, did they get all the immunizations as scheduled?				
No	40 (5.6)	72 (3.9)	112 (4.4)	.03*
Yes	672 (94.4)	1773 (96.1)	2445 (95.6)	
Total	712 (100)	1845 (100)	2557 (100)	

*P-value <0.05 indicates significance

4. DISCUSSION

The study reported a significant level of knowledge, good attitude, and high polio immunization uptake in non-intervention and intervention northern LGAs. Although the intervention LGAs were higher, which may show that the polio eradication intervention programs had a remarkable impact and made a substantial contribution to Nigeria's polio eradication that was achieved in 2020. Since 2012, NSTOP has assisted Nigeria by providing high-quality and culturally competent technical field support staff in high-risk areas, thereby addressing a critical gap identified in the 2012 survey for containing the spike in polio cases in Nigeria [10]. It is also possible that people from the intervention areas may have influenced the non-intervention LGAs residents because information tends to spread quickly among communities. The information from family members might have spread to the non-intervention regions, especially when positive, healthy, and factual, particular as the study findings showed that 78.3% of mothers from non-intervention LGAs heard about routine immunization from family members. The sufficient knowledge of routine vaccination in both intervention and non-intervention regions might also have been influenced by the activities of healthcare workers and information from mass media since 90.0% of women from the non-intervention regions heard about routine immunization from health facilities.

Waziri [10] described how the NSTOP interventions aided in the achievement of high routine immunization coverage, National Immunization Days (NIDs), Acute flaccid paralysis surveillance (AFP), and 'Mop-up' campaigns for polio eradication at all levels of the

health system, which may have contributed to the study's significant uptake. Nigeria was experiencing one of its highest polio transmission peaks (122 cases) in 2012 when NSTOP was founded to enhance its eradication efforts [11]. Gidado et al. [12] and Michael et al. [13] documented how NSTOP's impact began with significant contributions at its inception, identifying, enumerating, and vaccinating a highly mobile population (nomads) implicated in the epidemiology of polio at international and interstate borders during that period. This particular activity enabled increased outreach vaccination, increased uptake of routine immunization among nomadic populations (which are prevalent in northern Nigeria), and improved herd immunity, resulting in a steady decline in wild poliovirus cases from 122 in 2012 to 53 in 2013 to 0 for the last three consecutive years [10]. The high uptake and polio eradication may be attributed to the high level of awareness among the women.

This study also demonstrated the significance of health facilities as a source of information on routine immunization, which may be related to the NSTOP program's impact. Michael et al. [13] described how NSTOP was at the vanguard of training and capacity building for frontline health workers across a range of theme areas, including surveillance, polio outreach, District Health Information Software 2 (DHIS2), and monitoring and evaluation. These training sessions benefited health personnel by enabling them to conduct their job-related tasks more efficiently. Numerous studies have demonstrated how the NSTOP intervention resulted in a considerable improvement in coverage, service delivery, immunization staff capability, and coordination [10,13].

Despite eradicating wild poliovirus in Nigeria, the study still recorded low immunization uptake among some women, insignificant individually but significant when aggregated. This result may still be due to some misconceptions, religious beliefs, and inaccessibility, as some of these factors have halted the uptake of the polio immunization vaccine in northern Nigeria, as previously reported [1,14,15]. A previous study has shown that the poliomyelitis vaccine, particularly doses administered during supplemental immunization activities, is particularly despised due to the widespread belief that it is a ploy by outsiders (enemies of Islam) to reduce the Muslim population by fortifying the vaccine with contraceptives [14]. Yahya [1] also observed various misconceptions concerning polio vaccines, with some Muslims using them to express their anti-western sentiments, believing that their objective is to transmit HIV, which respondents claimed is another method of decreasing the Muslim population. The absence of a defined perspective on vaccination in Islam did not assist matters. Another reason for anti-vaccine sentiments, notably against polio immunization, is an apparent disconnect between the perceived requirements of the populace and the health care system Adekeye et al. [15] continue by stating that respondents believed that remedies to malaria, acute respiratory infections, and other visually more widespread ailments, such as malnutrition, should be sought rather than focusing exclusively on poliomyelitis. Other explanations suggested include adverse reactions to previous immunizations. Also, in most areas of northern Nigeria, women lack autonomy, making it difficult for them to make decisions on particular issues. Jegede [8] reported how husbands refused their wives from taking the vaccines for their children, which shows the male dominance in decision-making in most northern families. All of these made the complete vaccination against polio in the northern states challenging. However, with the NSTOP intervention program, which enlightened most of the residents and assisted in correcting some of these religious misconceptions, this study was able to record significant knowledge, attitude, and uptake of the polio immunization.

5. CONCLUSION

The National Stop Transmission of Polio program was established in 2012 to provide Nigeria with high-quality, culturally competent technical field support staff to implement the national polio

eradication emergency plan (NPEEP) and PEI accountability framework, as well as to build local capacity to improve maternal and child health indices. The study discovered that the intervention program has aided in achieving a considerable increase in polio vaccination uptake, knowledge, and attitude, which may have spread to non-intervention LGAs. Given its success thus far, it is recommended that the NSTOP program be sustained and, if possible, expanded geographically to cover the entire country when resources permit. This step will help keep polio permanently out of the country and reduce mortality among under-five children.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

ETHICAL APPROVAL

Ethical approval number NHREC/01/01/2007 – 9/03/2018 was obtained from the Federal Ministry of health research ethics committee.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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