

Original article



Socio-demographic Determinants of Routine Immunization Uptake among Children Aged 24-59 Months in Kwara State, North-Central Nigeria: A Mother/Caregiver-based Study

Musbau Adekunle Yahaya¹, Mary Athanasius Udoh^{2*}

1,2 University of Port Harcourt School of Public Health, University of Port Harcourt, Choba, Port Harcourt, Rivers, Nigeria.

1 World Health Organization, Kwara/Zamfara State Zone office, Nigeria.

Corresponding author: Mary Athanasius Udoh | **Email:** maryathanasius@gmail.com | **ORCID:** <https://orcid.org/0009-0007-2309-9233> | **Phone:** +2348068301261

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ABSTRACT

Background: Immunization is a core public health tool for controlling vaccine-preventable diseases through pathogen exposure by vaccination, allowing individuals to develop immunity via antibody production. Despite widespread availability, vaccination coverage in Nigeria remains suboptimal. This study specifically focuses on children aged 24-59 months in Kwara State, North-Central Nigeria, a demographic often overlooked compared to infants, to determine how mothers/caregivers' socio-demographic characteristics influence uptake of routine immunization.

Methods: Questionnaires were administered to 400 mothers/caregivers of children aged 24-59 months across 12 communities (Idofian, Amoyo, Oremeji, Isale Ore, Amule, Idi Ape, Okelele, Alagbado, Tepatan, Elekoyangan, Oju Oja, Idikko) using multistage sampling. Data were analysed via chi-square. Significance was set at $p < 0.05$.

Results: Overall immunization uptake varied significantly based on maternal and caregivers' socio-demographics. Complete or near-complete immunization utilization was significantly higher among Nupe mothers/caregivers, single/divorced mothers/caregivers, and those in the 19-29, 50-59 and 60-69 age brackets. High utilization also correlated with Christian and Islamic faiths, as well as secondary or tertiary educational attainment. Conversely, urban residents and mothers/caregivers employed as farmers or traders demonstrated lower immunization uptake rates.

Conclusion: Socio-demographic factors, particularly religion, education, and occupation, strongly influence immunization uptake. A major barrier is the lack of awareness regarding the need for continued vaccination beyond infancy, driven by religious beliefs, doubts, and misinformation. Targeted health education and localized immunization campaigns are essential to improve coverage and child survival in the region.

Keywords: Routine Immunization, Vaccine Uptake, Infectious Diseases, Socio-Demographic Factors, Child Survival, Kwara State

Introduction

World Health Organisation (WHO) defines immunization to be a controlled vaccine administration which makes individuals develop immunity by becoming resistant to targeted infectious diseases agents (pathogens or immunogen).^{1,2} Immunization is a core intervention in infectious disease prevention. In preventive medicine, vaccination gives susceptible individuals protection from a large range of vaccine preventable diseases (VPD) leading to the reduction in morbidity and mortality due to infectious diseases.^{1,2,3,4} Immunization does not only protect children against deadly diseases, but also help in developing their immune system. Immunization can be done using various standard procedures, and vaccination is the commonly used procedure to stimulate the individuals' immune system.¹

This is achieved by administering a modified or attenuated infectious agent(s) to the individuals. This has led to the global prevention of about 3.5 to 5 million VPDS such as diphtheria, tetanus, pertussis, influenza, and measles' mortality annually.¹ Over the years, several immunization programs have been made with several progresses achieved, but unfortunately coverage still remains a challenge in some regions in developing countries, especially in Africa. In Nigeria, immunization successes have been recorded. Although a less-than-optimal immunization coverage and utilization uptake is still being experienced.^{5,6,7}

This led to the Expanded Program on Immunization (EPI) being adopted by the World Health Organization (WHO). The programme's target was the reduction, elimination, and finally the eradication of childhood infectious killer diseases targeted by the EPI, as well as ensure the security of vaccines in Nigeria. In Nigeria, VPDs are one of the leading causes of high infants and under five year's children morbidity and mortality, as well as in many other developing countries. Immunization if optimally utilized, is a power tool in the control and eradication of several childhood diseases, especially infectious diseases.^{1,4} Due to this understanding, in Nigeria and other countries various programmes have been set up to help in the eradication of childhood infectious diseases.

The National Programme on Immunization (NPI) is one of such programmes in Nigeria whose responsibility is to provide protection against diseases such as tuberculosis,

diphtheria, pertussis, measles, hepatitis B, tetanus, yellow fever, and invasive *Haemophilus influenza* type B.⁸ In Nigeria, effective immunization implementation and coverage is said to have been achieved when a child in Nigeria have visited a health service facility or primary health centres (PHCs) five times to receive vaccines. This is because receipt of vaccines at recommended ages and intervals will ensure that the child is protected adequately at all times from target diseases. In Nigeria, some children have continually missed opportunities for immunization, either partially or completely as reported in MICS/NICS 2021.⁹

Missed opportunities for immunization (MOI) is recorded to have occurred, if any child that is eligible for immunization, had visited a health service facility, but did not receive all the recommended vaccines, even with no contraindication to required vaccine(s). MOI is known to greatly influence low immunization coverage.⁹ The health care provider's failure to assess the child's immunization status have also been known to result in MOI. Immunization coverage rates in Nigeria are great concern, as it is recorded to be among nations with low performance.⁶ Nigeria is known to utilize the EPI immunization schedule which recommends five health facility visits to receive one dose of *Bacillus Calmette-Guerin* (BCG), four doses of oral polio vaccine, three doses of pentavalent vaccine, and one dose of measles vaccine.

Additional vaccines were; three doses of hepatitis B at birth, at six weeks of age, and at 14 weeks of age, yellow fever at nine months of age, along with measles vaccine.⁴ Therefore, missing any visit would have led to missing an important vaccine. WHO10, reported a slight immunization coverage increase (68%) in Nigeria in 2010 but it is still less than the WHO 90% target at national level. In 2012, it was reported by United Nations International Children's Emergency Fund (UNICEF) that more than 50% of the global polio cases was from Nigeria. The Nigerian government, alongside her international donors, partners, and several non-governmental organizations (NGOs) has continually been engaged in the fight to eliminate the Wild Polio Virus in Nigeria.^{11,12,13}

Some researchers^{14,15,16} reported that the persistent low immunization coverage in Nigeria is known to be driven by a complex interplay of socioeconomic, geographic, and health-system factors. Whereas, Oladepo et al.¹⁷ are of the

opinion that caregivers' religion, education, geographic are strong predictor of complete immunization. Additionally, it has been noted that children from wealthier households and those born in health facilities are usually significantly more likely to be fully vaccinated. In Nigeria, according to Olaniyan et al.¹⁸ socio-cultural and religious influences such as cultural and religious beliefs, and in particular vaccination misperceptions and adverse events following immunization, are known historically to hinder vaccine acceptance. Sabo et al.¹⁹ and Sanni et al.¹⁶ on the other hand are of the opinion that distrust of citizens in government initiatives and vaccine safety misconceptions also fuel hesitancy.

Hence, routine immunization should always be of paramount concern to the Nigerian government and her partners. This is due to the threats continually posed by VPDs on unimmunized or under immunized individuals, especially children. Therefore, for optimal utilization of immunization protection in any nation, a 95% consistent immunization coverage is paramount for VPDs control or eradication. This study was necessitated due to paucity of data which extensively studied the influence of mothers/caregivers' socio-demographic characteristics, especially religion and socio-economic factors on uptake of routine childhood immunization for children aged 24-59 months in Kwara State, North-Central State of Nigeria. It was also important in order to help improve immunization coverage and uptake in Kwara State, and other regions in Nigeria.

Materials and methods

Study Design and Location

This study was a descriptive cross-sectional study of four hundred mothers/caregivers of children aged 24-59 months in Idofian, Amoyo, Oremeji, Isale Ore, Amule, Idi Ape, Okelele, Alagbado, Tepatan, Elekoyangan, Oju Oja, Idikko communities in Kwara State, North-Central Nigeria. Kwara State is an agricultural and ecological transitional state in West-Central/North-Central Nigeria, serving as the "gateway" between the country's northern and southern regions. It is bounded by latitudes 8° 30' and 10° 00' North and longitudes 3° 00' and 6° 00' East. Kwara State is bordered to the north by Niger State, east by Kogi State, and south by Ekiti, Osun, and Oyo states, with its western border

serving as an international boundary with the Republic of Benin.

Please note, for this study, "mothers/caregivers of children" comprises of biological mothers of children, and adult female guardians or foster mothers of children in the study population.

Study Population

This study involved mothers/caregivers whose children were aged 24-59 months in Idofian, Amoyo, Oremeji, Isale Ore, Amule, Idi Ape, Okelele, Alagbado, Tepatan, Elekoyangan, Oju Oja, Idikko communities in Kwara State, North-Central Nigeria.

Selection of respondents: Eligibility/Inclusion and Exclusion Criteria

Eligibility/Inclusion Criteria

Mothers/caregivers whose children were aged 24-59 months and resided in Idofian, Amoyo, Oremeji, Isale Ore, Amule, Idi Ape, Okelele, Alagbado, Tepatan, Elekoyangan, Oju Oja, Idikko communities in Kwara State, North-Central Nigeria.

Exclusion Criteria

Sick mothers/caregivers, and mothers/caregivers that were absent during administration of data.

Sample Size Determination

Sample size was calculated for this study using the prevalence rate of 25% from a related study by Olorunsaiye and Degge²⁰ for fully immunized children aged 12 to 23. The minimum sample size was then calculated using the Fischer's formula for population greater than 10,000 sample size:

$$n = (Z^2pq)/d^2 \quad n = (1.96^2 \times 0.25 \times 0.75) / 0.05^2 \quad n = 288.12 \quad n \approx 288 \text{ samples}$$

Where, d = degree of accuracy (0.05), z = 1.96 (z value for 95% confidence level), P = Prevalence from previous similar study by Olorunsaiye and Degge²⁰ (25% (0.25), q = 1-p.

For non-response possibility, a 10% of the original size (0.1 × 288 = 28.8, ≈ 29) was added to arrive at; 288 + 29 = 317 samples

However, a total final sample size of 400 was used for this study.

Sampling Technique

The sampling technique that was used for this study was the multistage sampling technique. The sum of four hundred (400) respondents was selected at various stages based on their local government areas (LGAs), wards, communities, houses and respondents' consents.

Methods and Instruments of Data Collection and Processing

Oladebo¹⁷ questionnaire on "Nigerian rural mothers' knowledge of routine childhood immunizations and attitudes" was adapted and used for this study. The questionnaire was divided into sections A, B, C, and D. In Section A, 10 questions were asked on Sociodemographic data and family information (1-10), Section B had 21 questions on knowledge (11-31), Section C consisted of 17 questions on attitude and perception (32-48), religious beliefs inclusive, and Section D comprised of 11 questions on uptake and challenges (49-60). This study's questionnaires were interviewer-administered after careful explanation of the study purpose to respondents by four highly trained research assistants, after each respondent's informed consent has been obtained. The confidentiality of the data collected from respondents were treated with utmost privacy, as they were assured of it during and after their data collection.

Pre-testing the study questionnaires were done among consented mothers/caregivers in Osun state. Ten percent (10%) of the study sample size was used. The pre-testing was done to ensure clarity, consistency, and acceptability of each question by respondents, and this also helped to validate the tool to guaranty that it measures what it is meant to measure.

To assess each parameter in the questionnaire, for every correct response, 1 point was given and 0 was given for an incorrect answer. The total mark was added, and any individual with more than the average score was described as being above average for the assessed parameter while any individual with a score lower than the average was termed as being below average for the assessed parameter.

Statistical Analysis

Statistical analysis was done using the version 25 of the Statistical Package for Social Sciences (SPSS). The statistics summary was presented in frequency tables and charts. Chi-squared test was then used for inferential statistics in order to test for associations between categorical variables for qualitative variables. The statistical significance level used was $p < 0.05$ at a 95% confidence level for all inferential analysis.

Ethical Approval

The ethical approval was sought and obtained from the University of Ilorin Ethical Review Committee, Ilorin before commencement of this study. Respondents' consents were sought and received, with their written consents collected before questionnaire administration.

Result

This section presents results from the questionnaires administered to mothers/caregivers whose children were aged 24-59 months in Idofian, Amoyo, Oremeji, Isale Ore, Amule, Idi Ape, Okelele, Alagbado, Tepatan, Elekoyangan, Oju Oja, Idikko communities in Kwara State, North-Central of Nigeria. The socio-demographic characteristics of the study's respondents are presented in Table 1. The routine immunization challenges and its determinants, as well as the relationship between the socio-demographic characteristics of the respondents and status of uptake of routine immunization are analysed and presented here.

Of the four hundred respondents in this study, 164 (41.0%) were in the age group 18-29 years. Islam was the most common religion, with Muslims representing 174 (43.5%) of the 400 respondents. The Yoruba constituted the predominant ethnic group and culture with 237 (59.3%) respondents. Main socio-economic factors among respondents were; 280 (70%) respondents were married, 228 (57.0%) had tertiary education, 126 (31.5%) business women were. Two hundred and fifty-three (63.3%) respondents resided in the urban areas, while 147 (36.7%) resided in the rural areas (Table 1).

Respondents with complete routine immunization utilization for their children were; those in age groups 18-29 years (164; 100%), 50-59 years (18; 100%), 60-69 years (9; 100%), those that practiced Christianity (162; 100%), and the Nupe ethnic group (37; 100%). In contrast, none of the

traditional worshippers utilized the routine immunization for their children. Lower routine immunization utilization for children was associated with respondents who lived in the rural areas (119; 33.6%), compared to the urban dwellers (28; 60.9%). Complete routine immunization utilization for children was reported for mothers/caregivers who were separated or divorced (46; 100%), whereas those who were widows declined (9; 100%) (Table 2).

Respondents with educational background that were associated with complete or nearly complete routine immunization utilization for their children were; Quranic 27 (75%), while tertiary 228 (100%), secondary 72 (88.9%), primary 18 (66.7%) and those with no formal education (67.9%) (Table 2). The distribution of educational background of participating mothers/caregivers are shown in Figure 1. Respondents with occupation that were associated

with complete or nearly complete routine immunization utilization for their children were; farmers 10 (100%), civil servants 37 (100%), bankers 9 (100%), business women 117 (90.7%), students 36 (100%), health workers 64 (100%), while those with no occupation 36 (100%) (Table 2).

The distribution of the participating mothers/caregiver's occupations is shown in Figure 2. Two hundred and one (50.3%) respondents utilized the routine immunization for their children due to nearest to health facility, whereas three hundred (75.0%) respondents did not utilize the routine immunization for their children due to the attitude of health worker. Two hundred and ninety-two (73.0%) respondents complained of limited information about the need for second or third dose of routine immunization for their children (Table 3).

Age Group	Frequency	Percentage
18 – 29	164	41.0
30 – 39	145	36.3
40 – 49	64	16.0
50 – 59	18	4.5
60 – 69	9	2.3
Mean + SD	32.58 + 9.720	
Religion		
Islam	174	43.5
Christianity	162	40.5
Traditionalist	9	2.3
Atheist	55	13.8
Ethnicity		
Hausa	45	11.3
Yoruba	237	59.3
Nupe	37	9.3
Igbo	81	20.3
Marital status		
Single	65	16.3
Married	280	70.0
Separated/divorce	46	11.5
Widow	9	2.3
Marriage type		
Not stated	10	2.5
Monogamy	263	65.8
Polygamy	127	31.8
Residence		
Rural	147	36.8
Urban	253	63.3

Table 1: Socio-demographic Characteristics of Respondents

Variables	Uptake Yes n (%)	Uptake No n (%)	X ²	P
Age groups				
18 – 29	164 (100)	0 (0)	50.891	<0.001
30 – 39	117 (80.7)	28 (19.3)		
40 – 49	46 (71.9)	18 (28.1)		
50 – 59	18 (100)	0 (0)		
60 – 69	9 (100)	0 (0)		
Religion				
Islam	156 (89.7)	18 (10.3)	119.241	<0.001
Christianity	162 (100)	0 (0)		
Traditionalist	0 (0)	9 (100)		
Atheist	36 (65.5)	19 (35.5)		
Residence				
Rural	119 (33.6)	235 (66.4)	13.009	<0.001
Urban	28 (60.9)	18 (39.1)		
Ethnicity				
Hausa	27 (60)	18 (40)	43.559	<0.001
Yoruba	218 (91.9)	19 (8.1)		
Nupe	37 (100)	0 (0)		
Igbo	72 (79.1)	19 (20.9)		
Marital status				
Single	65 (100)	0 (0)	84.493	<0.001
Married	243 (86.8)	37 (13.2)		
Separated/divorce	46 (100)	0 (0)		
Widow	0 (100)	9 (100)		
Education				
Quranic	27 (75)	9 (25)	136.113	<0.001
Tertiary	228 (100)	0 (0)		
Secondary	72 (88.9)	9 (11.1)		
Primary	18 (66.7)	9 (33.3)		
None	9 (32.1)	19 (67.9)		
Occupation				
Farmer	0 (0)	10 (100)	141.025	<0.001
Trader	54 (65.1)	29 (34.9)		
Civil servant	37 (100)	0 (0)		
Banker	9 (100)	0 (0)		

Business	117 (90.7)	9 (9.3)
Student	36 (100)	0 (0)
Health worker	64 (100)	0 (0)
None	36 (100)	0 (0)

Table 2: Relationship between the Socio-demographic Characteristics on the Uptake of Routine Immunization

Level of significant at p-value <0.05

Variables	Yes (%)	No	Total
Lack of permission from husband	146 (36.5%)	254 (63.5%)	400
Financial constraint	117 (29.3%)	283 (70.8%)	400
Distance to nearest facility	201 (50.3%)	199 (49.8%)	400
Attitude of health worker	100 (25.0%)	300 (75.0%)	400
Religion	173 (43.3%)	227 (56.8%)	400
Lack of access to RI	145 (36.3%)	255 (63.8%)	400
Fear of potential side effect	164 (41.0%)	236 (59.0%)	400
Vaccine not available	111 (27.8%)	289 (72.3%)	400
Limited information about the need for second or third dose	108 (27.0%)	292 (73.0%)	400
Faith in immunization	290 (72.5%)	110 (27.5%)	400

Table 3: Reasons Associated with Routine Vaccine Uptake among Women with Children age 24-59 months.

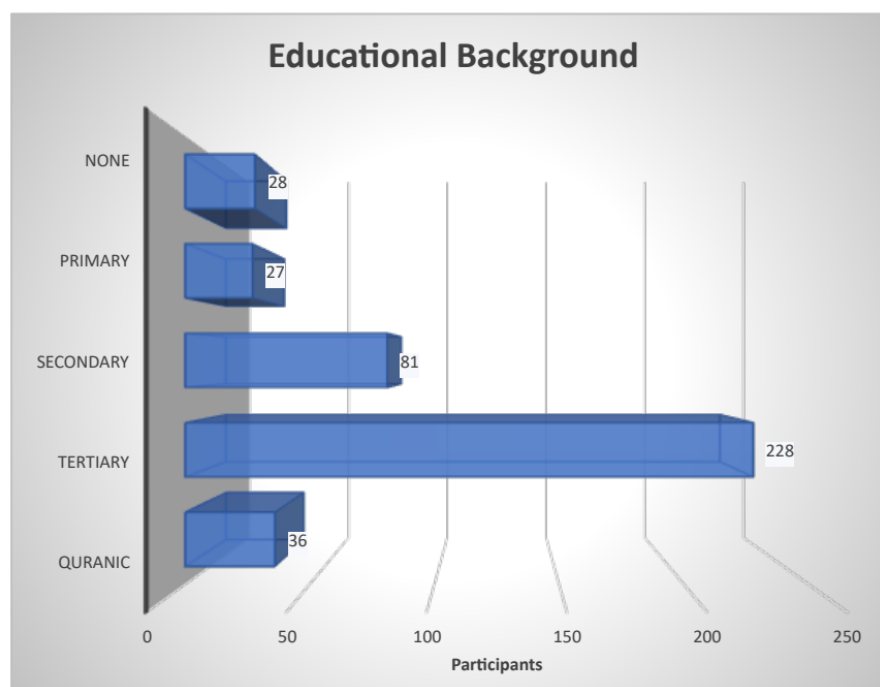


Figure 1: The Distribution of Educational Background of Participating Mothers/Caregivers

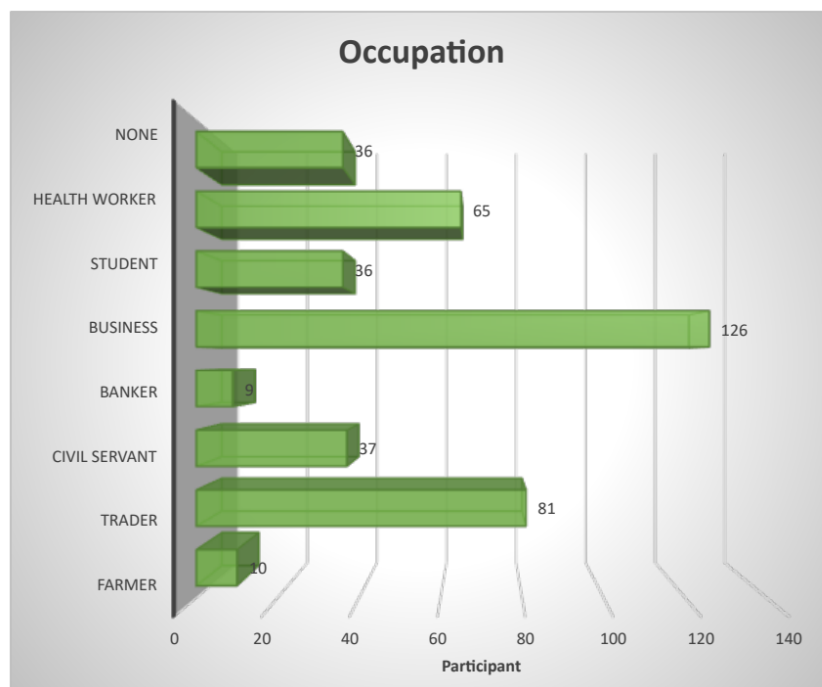


Figure 2: The Distribution of the Participating Mothers/Caregiver's Occupations

Discussion

This study on sociodemographic determinants of routine immunization has shown that a large number of mothers/caregivers of children aged 24-59 months were highly knowledgeable, and have basic knowledge on regular vaccination. The sociodemographic characteristics of the study participants are presented in Table 1. Tables 2 affirms that routine immunization is greatly influenced by the sociodemographic characteristics of the study participants. Age groups 18-29 years (164; 100%), 50-59 years (18; 100%), and 60-69 years (9; 100%) were more incline to vaccinating their children (Table 2). Routine immunization utilization for children was optimally utilized by mothers/caregivers who were separated or divorced (46; 100%), whereas those who were widows declined (9; 100%) (Table 2).

Out of the 400 mothers/caregivers in this study, 81 (20.25%) had completed high school, and 228 (57%) had completed college or university (Figure 1). Mothers/caregivers with complete routine immunization for their children were those that had completed college or university (228; 100%) (Table 2). The vast majority (290, 72.5%) of the mothers/caregivers in this research were aware of the benefits of immunizing

their children, and had faith in immunization (Table 3), especially mothers/caregivers with higher levels of education. Similar results were documented by Awosan et al.²¹ in Nigeria, Birhanu et al.²² in Addis Ababa, Lharbi 23 in Saudi Arabia, Qidwai et al.²⁴ in Pakistan, Mugada et al. 25, Sankar et al.²⁶, and Hedao et al.²⁷ in India.

Therefore, it is assumed that a population with a greater level of education would lead to a higher overall vaccination rate. This research² had 52.0% of children being completely vaccinated, whereas about 9.3% of these children had never had any vaccinations. In contrast, in Pilani, India literacy did not have a substantial effect on vaccination rates.²⁸ This research also used card evaluation to determine factors that affect vaccination coverage, as this improves the reliability of results as they do not depend entirely on mothers/caregivers' self-reports of vaccination status.

The majority of the mothers/caregivers in this study were professionals; civil servants (37; 100%), bankers (9; 100%), business women (117; 90.7%), health workers (64; 100%) (Table 2). This was a possible reason for the good vaccination knowledge and acceptance (Table 3). In contrast, in Ethiopia Birhanu et al.²² stated that vaccination

knowledge was low. The distribution of the participating mothers/caregiver's occupations is shown in Figure 2. Businesswomen and traders are assumed to have more time to take their children to vaccination centres than government workers because government workers would need time-off in order to do so. Although it is more likely that many government workers may be financially capable of handling all the cost associated with children immunization. Some studies had shown that a family's socioeconomic position is a strong predictor of vaccination rates.^{29,30,31,32} Gurmu and Etana,³³ reported that children of higher socioeconomic status are more likely to get vaccinated. Researchers found that in the research region, mothers' vaccination rates were negatively affected by indirect expenditures, such as the cost of transportation. However, identical results were found in studies conducted in Uganda and Ethiopia, showing that socioeconomic class was not a major predictor of whether or not a kid was fully vaccinated.^{34,35}

A larger number of the mothers/caregivers in this study practiced Christianity (162; 100%), and they fully utilized the routine childhood immunization for their children, compared to other religion. The Nupe ethnic group (37; 100%) was amongst the groups that had fully utilized the immunization services. This shows that participants' religion and culture influences immunization uptake. It was noted that parents and communities are greatly influenced by religious and cultural beliefs, and may see the death of their child from an infectious disease preventable illness as God's will. Uptake of children immunizations in Nigeria is negatively impacted by cultural attitudes against them as reported by Kio et al.³⁶ and Duru et al.³⁷

In Mozambique, religious belief was a great determinant, as women who did not see vaccination as religiously undesirable utilized the service.³⁸ This may be attributable to the spread of untruths about vaccinations via social and religious networks, as well as the failure to get consent from fathers before vaccinating their children (Table 3). It was observed that about half of the respondents (201; 50.3%) who utilized the routine immunization for their children, said it was due to nearest to health facility. This led to lower routine immunization utilization for children of respondents who lived in the rural areas (119; 33.6%), compared to the urban dwellers (28; 60.9%). Bbaale³⁵ had shown that the proximity of a person's home to a health care facility that provides regular immunizations is an important factor of

vaccination coverage in various regions of Nigeria and much of sub-Saharan Africa. Fatiregun et al.³⁹ were of the opinion that the place of delivery was rather linked to higher rates of vaccination.

Some respondents (300; 75.0%) who did not utilize the routine immunization for their children, complained that it was due to the attitude of health workers. Whereas 292 (73.0%) respondents complained of limited information about the need for second or third dose of routine immunization for their children (Table 3). This study showed that the strength of the connection between the vaccination supplier (health workers) and customer (mothers/caregivers of children) relationship was a determinant of mothers/caregivers' decision to immunize their children (Table 3). Chambongo et al.⁴⁰ were of similar opinion, as they point out that vaccine providers' attitudes and actions might encourage or discourage mothers from vaccinating their children.

Another contributing factor for vaccination coverage being lower than expected for this study² was the unavailability of vaccines and irregular vaccine services in some designated health centres. Despite the consequences of unimmunized status of children, few children in this study² had never been vaccinated. Mothers/caregivers may have had to pay a hefty sum of money more than once to get medical attention due to this. Duru et al.³⁷ added that irregular vaccine services may make mothers/caregivers disillusioned, and would lead to their children not being immunized or having incomplete immunization.

Conclusion

Immunization has undeniably had a major effect on public health across the world. However, for optimal effectiveness, vaccination coverage must meet certain thresholds for various illnesses. Therefore, to achieve this, the intended population must be made to make optimal use of the immunization services provided for them. Children under the age of five are the primary focus of childhood vaccination, thus it is crucial that their mothers have a solid understanding of the services and advantages that comes with immunization. A basic degree of literacy is required for access to these resources and services.

The vast majority of mothers/caregivers had a significant degree of information about regular vaccination;

nonetheless, mothers/caregivers' sociodemographic characteristics, misconceptions, religious views, and religious support greatly determined uptake rate of routine immunization. Religious and traditional leaders enjoy widespread acclaim and acceptance as the trusted keepers of precious cultural relics and sources of moral direction for their communities. Members of the community would value their input on a variety of issues, their participation in vaccination programs will likely boost vaccine acceptability and uptake. Therefore, the religious views, religious community's support and cultural beliefs of respondents are usually seen as major obstacles to vaccination programs.

Continuous health education programs should be held regularly in communities and religious gathering. The traditional and religious heads should be enlightened on the negative consequences of no or in-complete immunization, and solicit their support in enlightening and encouraging other members. This will ensure that children of required ages partake fully in immunization. The government should incorporate continuous health education programs, including immunizations programs in local dialects into the compulsory basic education program, especially for the adult literacy schools. It should also create empowerment programmes for her citizens from low-income background. This will ensure better understanding and acceptance of routine immunization in Kwara State, and Nigeria as a whole.

STATEMENTS AND DECLARATIONS

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