



Knowledge, attitudes and practices of immunization among mothers of children aged 24 to 59 months in Kwara state, North-central Nigeria

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Abstract

Context: Immunization and vaccination are controlled processes in which individuals are exposed to target pathogens to ensure that they develop immunity against the pathogens targeted. In infectious disease control, immunization and vaccination are core interventions which help reduce disease rates and death toll of many infectious diseases. This study evaluated the knowledge, attitudes, and practices of immunization among mothers in Kwara State, North-Central Nigeria.

Materials and Methods: Semi-structured questionnaires were administered to 400 eligible mothers selected using multistage sampling technique in 12 selected communities in Kwara State, Nigeria whose children were aged 24 to 59 months. Categorical data were summarised using frequency and percentages while quantitative normally distributed data were summarised as means and standard deviation. Chi-square was used to test for association between knowledge of mothers and uptake of routine immunization at level of significance of p-value <0.05.

Results: Over 70 percent of the study respondents had good knowledge of immunization schedule and its importance. A smaller fraction of respondents (25%), agreed strongly that uptake of immunization and vaccination is greatly influenced by parents' perception on the matter. About 20% of children aged 24 to 59 months in this study were not immunized/vaccinated.

Conclusion: A small fraction of parents of children in this study had doubts, and/or lacked understanding of immunization schedule and its importance. This led to less-than-optimal rates of children being immunized or vaccinated in the study region. Therefore, continuous health education programs on immunizations and vaccinations should be done. In rural areas, messages should also be given in local dialects. Respected members of the communities who can interact fluently in the local dialects should be engaged in the awareness program to improve parents' understanding and acceptance.

Key words: Immunization, Vaccination, Pathogens, Immunity, Knowledge, Practice, Perception, Attitude

Introduction

Immunization according to World Health Organisation,¹ is the process through which an individual

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becomes immune or resistant to an infectious disease agent (immunogen) through vaccine administration. It is also known to be an important aspect of preventive medicine that gives individuals that are susceptible protection from vaccine preventable infectious diseases, through the administration of the modified infectious agent to him/her.² Therefore, immunization is one of the

most powerful tools known for infectious diseases prevention.¹ The administered modified infectious agent is usually a suspension of a killed organism, or it could be an inactive product of the agent. Immunization/vaccination involves individuals being exposed to disease causing organisms in a controlled manner to ensure that their body produces antibodies against the introduced pathogens.²

The process involves the inoculation (introduction) of the disease causative organism into a living body. This stimulates the production of antibodies by the individual's immune system. Thereby causing the vaccinated individual to develop immunity against the targeted disease. This has subsequently led to the decrease in morbidity and mortality rates due to infectious diseases. The success of immunization led to the World Health Organization (WHO) adopting the Expanded Program on Immunization (EPI). This programme aimed at reducing, eliminating, and ultimately completely eradicating EPI targeted childhood infectious killer diseases, and assuring vaccine security in Nigeria.^{3,4,5} Immunization is carried out using different standard procedures. The most common one is through vaccination (the act of using vaccines to stimulate the immune system).⁶

Various vaccines against pathogens (disease causing microorganisms) help prepare the body's immune system for any possible attack by the targeted pathogen.¹ This is because the antibodies produced through vaccination (initial inoculation of attenuated pathogens) help prevent and/or fight an infection. This is due to the fact that the human body's own immune system is stimulated against subsequent infection or disease.^{1,7} This has been recorded to be one of the eight public health major successes of the twentieth century. One of the most important immunizations successes is in the eradication of some diseases like smallpox, or in the control of infections such as polio, measles, diphtheria, and tetanus. Vaccine preventable diseases form a major health burden.⁶

Vaccine preventable diseases (VPDs) are known to cause high morbidity and mortality rates in infants and children under five years in Nigeria and many other developing countries. Immunization has been proven to be a cost-effective strategy which is important in the control and eradication of several

childhood diseases.¹ Several programs are charged with the responsibility of eradicating and controlling infectious diseases, especially in children. The National Programme on Immunization (NPI) in Nigeria for example, provides protection against several diseases. Diseases such as pertussis, tuberculosis, hepatitis B, diphtheria, yellow fever, tetanus, measles, and invasive *Haemophilus influenza* type B are targeted in the nationwide immunization campaigns.^{8,9}

For effective immunization implementation and coverage, a child in Nigeria is expected to have five visits to a health service facility or primary health centres (PHCs) to receive vaccines. Children at their fifth vaccination schedule are considered as their last.¹⁰ Hence, they are known to have completed their routine immunization schedule. Although immunization has proven effective in the reduction of childhood infectious diseases burden (especially vaccine preventable diseases (VPDs)), its coverage still remains low. Missed opportunities for immunization (MOI) has been reported to greatly influence the low coverage of immunization witnessed.¹⁰ Missed opportunities for immunization (MOI) is said to have occurred, if a child who is eligible for immunization, visits a health service facility, but do not receive all the vaccines recommended, even when there is no contraindication to the vaccine.

Failure of health care provider to assess the child's immunization status could also result in MOI. World Health Organization¹⁴ affirmed that of the 2.1 million deaths, 1.4 million were under five aged children. The high death toll heightens global concern on neonatal and maternal health. In Nigeria, immunization coverage rates have been recorded to be among the low performing nations.⁶ In the global wild poliovirus cases in 2005, Nigeria accounted for approximately 41%. Whereas Nigeria in 2009 was reported to have the highest incidence of poliovirus cases among the countries in the world.¹¹ Nigeria is said to be among the three countries where polio is endemic.¹² It is believed that the continuous presence of the polio virus in Nigeria has greatly jeopardized the worldwide efforts on eradicating polio.¹³

It was documented by WHO,¹⁴ that Nigeria's Polio and other VPDs coverage on routine immunizations were below 90% that was targeted at the national

level. In 2010 a 68% coverage was documented, which remained below the WHO 90% target at the national level. Sadly in 2012, Nigeria accounted for above 50% of the global polio cases, which UNICEF¹⁵ affirmed to have followed an unforeseen hike in new cases. Several efforts have been reported to have been made by the Nigeria's government, as well as her international donors, partners, and some non-governmental organizations to help eliminate the Wild Polio Virus.^{16,17} In 1978, the Expanded Programme on Immunization (EPI) was given the responsibility of providing children less than two years routine immunization. The program initially recorded successes, especially in the early 1990s. During this time 81.5% universal childhood immunization coverage was achieved in Nigeria.

Afterwards, Nigeria has gradually had an immunization coverage reduction. The national data in Nigeria in 1996 reported a lower than 30%, and 12.9% in 2003 in immunization coverage for all antigens.¹⁸ This low value for immunization coverage is known to be among the world's lowest coverage. This is witnessed in the poor health status of many Nigerian children. It was documented that a worst scenario was found in West African sub-region (except Sierra Leone). Also noted was that Nigeria polio epidemic was the worst in the African region, which was believed to threaten other countries.¹⁹ A Circulating Derived Polio virus II (cVDPV type 2) case in 2018 which led to the death of a child was reported in Baruten. Kaiama local government in Ilorin West and Ilorin East in 2019 reported a case of cVDPV type 2.

Routine immunization should remain a paramount concern to the Nigerian government and her partners due to the threat posed by VPDs on unimmunized or under immunized individuals. Therefore, a 95% consistent immunization coverage is a necessity for vaccine preventable diseases control.¹ This study was aimed at determining the routine immunization uptake status in Kwara State, Nigeria. It was also intended to study past challenges posed to help in proactively channelling current and future efforts for a better immunization coverage and uptake in Kwara, and in extension other states in Nigeria. This study was also necessitated due to the paucity of studies that critically examined the relationship between

mother's knowledge and perception on uptake of the routine immunization, especially on the need for children's continued vaccination beyond infancy.

Materials and methods

Study Design and Location

This study was a descriptive cross-sectional study of 400 mothers of children aged 24 to 59 months in 12 selected communities (Amoyo, Idofian, Isale Ore, Oremeji, Idi Ape, Amule, Alagbado, Okelele, Elekoyangan, Tepatan, Idikko, Oju Oja) in Kwara state, Nigeria. Kwara State is located in North-Central Nigeria, and lies between latitude 7° 45' N and 9° 30' N, and longitudes 2° 30' E and 6° 25' E. It is bordered to the north by the River Niger, to the east by Kogi State, to the south by Ekiti, Osun, and Oyo states, and to the west by the Republic of Benin. Its capital city is Ilorin, which is located in the south-eastern part of the state, and houses over a third of the state's total urban and peri-urban population. The state has an estimated population of approximately 3.3 to 3.5 million residents, and it serves as an important site for ecological, agricultural, and socio-demographic research.

Study Population

The study involved mothers with children aged 24 to 59 months in 12 selected communities (Amoyo, Idofian, Isale Ore, Oremeji, Idi Ape, Amule, Alagbado, Okelele, Elekoyangan, Tepatan, Idikko, Oju Oja) in Kwara state, Nigeria.

Selection of respondents: Eligibility/Inclusion and Exclusion Criteria

Eligibility/Inclusion Criteria: Mothers of children aged 24 to 59 months residing in the 12 selected communities (Amoyo, Idofian, Isale Ore, Oremeji, Idi Ape, Amule, Alagbado, Okelele, Elekoyangan, Tepatan, Idikko, Oju Oja) in Kwara state, Nigeria.

Exclusion Criteria: Sick mothers, and mothers that were absent during data administration were excluded from participating in the study.

Sample Size Determination: The sample size was calculated using a prevalence rate of 25% of fully immunization children aged 12 to 23 from a related study by Olorunsaiye and Degge.²⁰ The minimum

sample size was calculated using Fischer's formula for population greater than 10,000 sample size:

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

$$n = (1.962 \times 0.25 \times 0.75) / 0.052$$

$$n = 288.12$$

$$n \approx 288 \text{ samples}$$

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

Due to the possibility of non-response, 10% of the original size ($0.1 \times 288 = 28.8, \approx 29$) was added to get; $288 + 29 = 317$ samples

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

Sampling Technique

The multistage sampling technique was used for this study. A total number of 400 respondents were selected based on Local Government Areas (LGAs), wards, communities, houses and respondents.

Stage 1: Selection of Local Government Areas (LGAs)

One LGA was selected by simple random sampling technique by balloting from each senatorial district in Kwara State to make a total number of three LGAs (1. Ifelodun LGA, 2. Ilorin East LGA, and 3. Moro LGA). Kwara State is divided into 3 senatorial districts, and 16 Local Government Areas (LGAs); Kwara Central Senatorial District with 4 LGAs (Asa, Ilorin East, Ilorin South, and Ilorin West), Kwara North Senatorial District with 5 LGAs (Baruten, Edu, Kaiama, Moro and Patigi), and Kwara South Senatorial District with 7 LGAs (Ekiti, Ifelodun, Irepodun, Isin, Oke-Ero, Oyun, and Offa).

Stage 2: Selection of wards

Two wards were selected by simple random sampling by balloting among the 3 selected LGAs to make a total of six wards across the LGAs. Ifelodun LGA (Idofian II and Igbaja I wards), Ilorin East LGA (Are I and Ibagun wards), Moro LGA (Abati Alara, Shao wards)

Stage 3: Selection of communities

A total of twelve (12) communities were selected by simple random sampling by balloting from the six (6) selected wards (two communities from each ward).

S/N	LGA	Ward	Settlement/Community
1	Ifelodun	Idofian II	Amoyo
2			Idofian
3		Igbaja I	Isale Ore
4			Oremeji
5	Ilorin East	Are I	Idi Ape
6			Amule
7		Ibagun	Alagbado
8			Okelele
9	Moro	Abati Alara	Elekoyangan
10			Tepatan
11		Shao	Idikko
12			Oju Oja

Stage 4: Selection and number of respondents

The number of respondents to be selected from each community was calculated using proportionate allocation. The number of women of reproductive age in each community were sourced from the LGA's Primary Health Care (PHC) and Kwara State Primary Healthcare Development Agency (SPHCDA). The fraction of the sample size to be allotted to each community was based on the number of women of reproductive age in each community.

The formula below was used:

$$NS = (TN \times SS) / TNB$$

Where;

NS = number of respondents to be selected in a community

TN = Total number of women of reproductive age in a selected community

SS = Sample size

TNB = Total number of women of reproductive age in the selected twelve communities that were eligible for the study

Stage 5: Selection of Houses

Houses were selected using systematic sampling technique; samples were obtained in a systematic way at regular sampling interval. The sampling frame consisted of all houses in the communities. This was obtained from each Local Government Areas' Town Planning and Works Departments; Department of Works, Housing, and Transport, and the Physical Planning Development. The sampling interval was calculated and followed until the desired sample size was obtained.

$$\text{Sampling interval} = \text{Sampling frame} / \text{Sample size}$$

Where the houses were not numbered, the grid method was used, and starting from the house the spun bottle is pointing at, all consecutive houses in the selected community were used until the desired sample size for that community was obtained.

Stage 6: Selection of respondents

Where there are more than one household in a house, one household was selected using simple random sampling by balloting.

Where a selected household or the respondent in the household does not fulfil the inclusion criteria or decline consent, the next household was selected.

Where there are two or more women in a selected household, one woman was selected using simple random sampling by balloting.

Methods and Instruments of Data Collection and Processing

A questionnaire by Oladepo,²¹ on Nigerian rural mothers' knowledge of routine childhood immunizations and attitudes was adapted for this study. The questionnaire had four sections (Sections A, B, C, and D). Section A consisted of 10 questions on Sociodemographic data and family information (1-10), Section B answered 21 questions on knowledge (11-31), Section C contained 17 questions on attitude and perception (32-48), and Section D was made up of 11 questions to answer uptake and challenges questions (49-60). The questionnaires were interviewer-administered by four trained research assistants, with informed consents obtained from each respondent. The respondents were reassured of the confidentiality of the data collected.

The pre-testing of the study questionnaires were done among mothers in Osun state. This was done using 10% of the study sample size. Pre-testing was carried out to ensure that there are clarity, consistency, and acceptability of the questions by respondents, and to validate the tool to ensure it measures what it is intended to measure.

To assess knowledge, for every correct response, 1 point was given and 0 was given for an incorrect answer. The total mark for knowledge was added and any individual with more than the average score was described as having good knowledge, any individual with an average score was described as having fair knowledge, while any individual with a

score lower than the average was termed as having poor knowledge.

To determine the attitude, for every positive attitude, 1 point was given and 0 was given for negative attitude. The total mark for attitude was added and any individual with more than the average score was described as having a positive attitude while any individual with a score lower than the average was termed as having a negative attitude.

Perception was graded thus; 5 points for Strongly Agree, 4 points for Agree, 3 points for Neutral, 2 points for Disagree and 1 point for strongly disagree. The total mark for perception was added and any individual with more than the average score was described as having a positive perception while any individual with a score lower than the average was termed as having a negative perception.

For uptake, 0 points was assigned to No, while 1 point to Yes. The total mark for uptake was added and any individual with more than the average score was described as having a good uptake while any individual with a score lower than the average was termed as having a poor uptake.

Study Variables: Types of Immunization Status

Unimmunized status: A child is said to be non-immunized if he or she has not received any of the prescribed routine childhood immunization from birth.

Partially immunized status: A child is said to be partially immunized, if he or she has only received some of the prescribed routine childhood immunization.

Fully immunized status: A child is said to be fully immunized, if he or she has received all the prescribed routine childhood immunization.

Statistical Analysis

The Statistical Package for Social Sciences (SPSS) version 25 was used for the analysis of this study. The summary of categorical data was frequency and percentages in tables and charts. Inferential statistics to test for associations between categorical variables was done using Chi-squared test. Multivariate logistic regression analysis was done to identify independent factors that predicted routine immunization. The level of statistical significance was set at $p < 0.05$ at confidence level of 95% for all inferential analysis.

Ethical Approval: The ethical approval for this study was sought and obtained from the University of Ilorin Ethical Review Committee, Ilorin. The study's respondents were not forced to give responses, but rather they took part after the researchers sought and obtained their written consents.

Results

This segment presents results from the interviewer-administered questionnaires that was conducted among 400 mothers of children aged 24 to 59 months in the 12 communities (Amoyo, Idofian, Isale Ore, Oremeji, Idi Ape, Amule, Alagbado, Okelele, Elekoyangan, Tepatan, Idikko, Oju Oja) in Kwara state, Nigeria. It outlines the knowledge, perception, and uptake of routine immunization by mothers of children aged 24 to 59 months, the challenges of routine immunization, the relationship of the level of maternal knowledge and the status of uptake of routine immunization. Assessing the knowledge of respondents on immunization; a total of 382 (95.5%) respondents had heard about routine immunization, 327 (81.8%) of the respondents agreed that routine immunization help prevent infectious diseases in children (Table 1).

Table 1: Knowledge of mothers of children aged 24 to 59 months on routine immunization

Questions	Response	Frequency	Percentage
Have you ever heard of routine immunization?	Yes	382	95.5
	No	18	4.5
Do child's routine immunization prevent infection?	Yes	327	81.8
	No	73	18.3
What is the time for immunization?	Morning	227	56.8
	Anytime	36	9.0
	I don't know	137	34.3
When is a child first dose?	At birth	382	95.5
	I don't know	18	4.5
Is multi dose of vaccine important?	Yes	273	68.3
	No	127	31.8
Should a child with mild illness be immunized?	Yes	180	45.0
	No	220	55.0
At what age is measles vaccine administered?	At birth	27	6.8
	10 weeks	46	11.5
	16 weeks	64	16.0
	9 months	263	65.8
At what age is yellow fever vaccine administered?	At birth	36	9.0
	10 weeks	66	16.5
	16 weeks	55	13.8
	9 months	243	60.8
Do you trust the safety of vaccine used in immunization?	Yes	346	86.5
	No	54	13.5

The total numbers of respondents who had good level of knowledge on routine immunization was 63 (15.8%), whereas 264 (66.0%) had fair level of knowledge, and 73 (18.3%) of the respondents had poor level of knowledge (Figure 1).

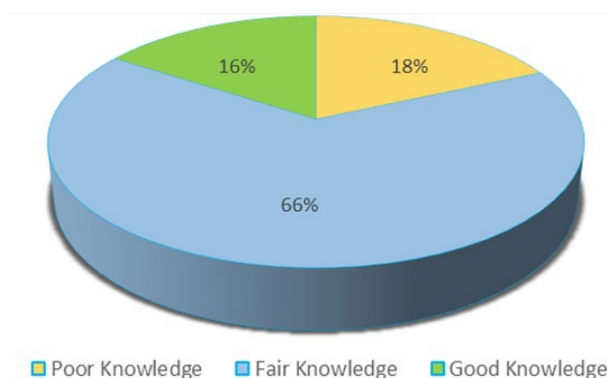


Figure 1: Level of mothers' knowledge on routine immunization

Table 2: Perception of mothers of children age 24 to 59 months on routine immunization

Variables	SA	A	N	D	SD
Complete immunization is important	226 (56.5%)	73 (18.3%)	65 (16.3%)	9 (2.3%)	27 (6.8%)
Lack of routine immunization uptake should be against the law	73 (18.3%)	64 (16.0%)	90 (22.5%)	137 (34.3%)	36 (9.0%)
There should be health education and counselling on routine immunization	226 (56.5%)	101 (25.3%)	46 (11.5%)	27 (6.8%)	0 (0.0%)
Children who receive routine immunization are protected against some diseases	180 (45.0%)	137 (34.3%)	47 (11.8%)	27 (6.8%)	9 (2.3%)
Local herb can equally prevent against vaccine preventable diseases	63 (15.8%)	136 (34.0%)	147 (36.8%)	36 (9.0%)	18 (4.5%)
Child will fall sick irrespective of their vaccination status	46 (11.5%)	82 (20.5%)	100 (25.0%)	127 (31.8%)	45 (11.3%)
Immunization is not necessary, prayer and faith protects against diseases	63 (15.8%)	73 (18.3%)	154 (38.5%)	101 (25.3%)	9 (2.3%)
Immunization makes children sick	82 (20.5%)	36 (9.0%)	28 (7.0%)	163 (40.8%)	91 (22.8%)
Fully immunized children are safe from vaccine preventable diseases	135 (33.8%)	154 (38.5%)	55 (13.8%)	29 (7.3%)	27 (6.8%)

Where; SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

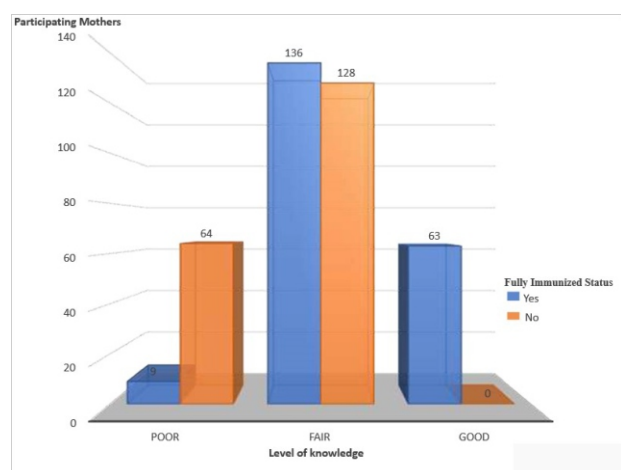
Table 3: Level of uptake of routine immunization among children

Variables	Responses		Total
	Yes (%)	No (%)	
Do you allow your child to receive routine immunization?	354(88.5%)	46(11.5%)	400(100.0)
Is your child fully immunized? (fully immunized Status)	208(52.0%)	192(48.0%)	400(100.0)
Is your child partially immunized? (partially immunized Status)	155(38.8%)	245(61.3%)	400(100.0)
Is your child unimmunized? (unimmunized Status)	37(9.3%)	363(90.8%)	400(100.0)

Table 4: Relationship between knowledge of mothers and the uptake of routine immunization

Variables (Uptake of vaccine during immunization)	Poor (n=73) n(%)	Knowledge Fair (n=264) n (%)	Good (n=63) n (%)	Chi-Square Value (X ²)	Fisher's Exact (P-Value)
Allow routine immunization	Yes 36 (49.3)	255 (96.6)	63 (100)	135.301	<0.001
Fully immunized status	No 37 (50.7)	9 (3.4)	0 (0)		
	Yes 9 (12.3)	136 (51.5)	63 (100)	104.208	<0.001
Partially immunized status	No 64 (87.7)	128 (48.5)	0 (0)		
	Yes 36 (49.3)	119 (45.1)	0 (0)	47.741	<0.001
Unimmunized status	No 37 (50.7)	145 (54.9)	63 (100)		
	Yes 28 (38.4)	9 (3.4)	0 (0)	90.823	<0.001
	No 45 (61.6)	255 (96.6)	63 (100)		

P-value <0.05 is statistically significant. Fisher's Exact test is reported due to cell counts of zero.

**Figure 2: The level of knowledge of mothers and their children's fully immunized status**

For perception, majority of the mothers had good perception on routine immunization and its benefits or consequences. The perception of mothers of children aged 24 to 59 months on routine immunization are presented in Table 2. Table 3 shows the level of uptake of routine immunization

among children aged 24 to 59 months. The total number of respondents who allowed their children to receive routine immunization were 354 (88.5%), while 46 (11.5%) did not allow their children to receive routine immunization. Two hundred and eight (52.0%) of these respondents' children were fully immunized, whereas 192 (48.0%) were not fully immunized. Figure 2 shows the relationship between the level of knowledge of mothers and their children's fully immunized status. The relationship between knowledge of mothers and the uptake of routine immunization are presented in Table 4.

Discussion

The EPI targeted childhood infectious killer diseases are also known as vaccine preventable diseases (VPDS). A vast number of the VPDS susceptible children are found in developing countries. A vast number of mothers (382, 95.5%) in this study were familiar with regular vaccination and its benefits (Table 1 and Figure 1), whereas in Ambo, Ethiopia,⁵ mothers vaccination knowledge was reported to be low. Mothers that had in-depth knowledge on vaccination were more inclined to bringing their children to the health clinics for vaccinations at stipulated time. In this study mothers highly knowledgeable on the importance of immunization (63, 15.8%) had their children fully immunized (Figure 2), just as presented in a similar study.²² Similar research outcome were also found in Addis Ababa,²³ Nigeria,²⁴ Saudi Arabia,^{25,26} Pakistan,²⁷ India,^{28,29} amongst others. Table 4 shows the relationship between knowledge of mothers and the uptake of routine immunization in this study.

In contrast, in Pilani, India, mothers' literacy or knowledge on immunization had little effect on vaccination rates.³⁰ In this study, the high level of immunization knowledge was mostly due to the close rapport that the health care providers had developed with the family before and after their children's birth. This made it easy for them to educate the families more on immunization, persuade many in bringing their newborn to be immunized, as well as give them constant reminders on immunization dates. About 81.8% (Table 1) of this study's respondents were convinced that routine immunization help protect children from numerous infectious diseases.

On the other hand, above 50% of parents of children

in this study agreed that morning is the ideal time for immunization (Table 1). Other findings with similar view on immunization routine were; Adebayo et al.,³¹ Sebahat et al.,³² amongst others. Two hundred and seventy-three respondents (68.3%) were of the opinion that spreading out vaccinations over time for a child is important for their health, as documented in Table 1. The responses obtained from most of the study's respondents showed high level of intelligence, which was also attributed to their educational background and exposure. Their responses were used in grading their knowledge on immunization (Figure 1). The perception of the mothers in this study was examined (Table 2), and it was shown to have a significant impact on the number of children vaccinated in the study population.

A great number of these mothers had good perception on immunization after the health talk on immunization was given. This is evident in their responses documented in Tables 2 and 3. Whereas Odusanya et al.,¹⁰ had just 45% of respondents with strong information on regular immunizations or vaccines. Similar results were found in other regions of Ethiopia.³³ For immunization uptake (Table 3), most mothers had a good idea of when their children should get each vaccination. Therefore, over 70% of the children in this study had the first and final doses right. A small percent of the mothers in this study had some level of misinformation and misunderstanding about vaccination, and this had a direct impact on their attitude about immunizing their children. About 20.5% of respondents strongly agreed that parents' perceptions on vaccination being an elimination option for disease-causing agent, influenced their use of the service.

This led to less-than-optimal rates of immunization among children. Despite vaccination benefits to the health and development of a child, few parents are still not in support of immunizing their children, while some partially immunize their children (Figure 2). Whereas most doses of vaccines given to children during immunization, need to be administered two or more times. This is to ensure that the required long-lasting antibody response is met. Therefore, parents who give their children less than the required three doses of vaccines, especially for diphtheria, tetanus, and polio do so, because they do not know the long-term health implication of

such act. Another contributing factor for vaccination coverage being lower than expected for this study was the unavailability of vaccines in some designated health centres.

Despite the consequences of unimmunized status of children, few children in this study had never been vaccinated. A large number of the respondents in this study reported that their children had achieved the complete vaccines (Figure 2). Recall that immunization has undeniably major effect on public health across the world, and should be treated as important as it is. However, for immunization to yield optimal effectiveness, vaccination coverage ought to meet standard thresholds for different illnesses. Therefore, to achieve this, the intended population must be made to make optimal use of the immunization services provided for them. Therefore, impactful health education programs/sensitizations, immunization drives, and other interventions strategies that can motivate mothers and enhance vaccination rates in Kwara State, and Nigeria as a whole, should be strongly explored.

Conclusion

This study on immunization has shown that a large number of mothers of children aged 24 to 59 months were highly knowledgeable on regular vaccination. Similarly, a large number of parents had good perception on immunization. Mothers' high knowledge on regular vaccination had significant impact on their children fully immunized status. Therefore, uptake is significantly influenced by knowledge and attitudes of mothers. Poor immunization knowledge by some parents resulted in a sizeable number of children of the study group not to have ever received any of the recommended vaccinations, or not to have received all.

Therefore, maternal level of understanding and knowledge as a factor of vaccination acceptance has to be considered for children's vaccination programs development. As this had greatly influenced the outcome of this study. Hence, varieties of initiatives, such as; educating parents more on importance of childhood immunization, adult literacy programs for parents that are not literate, regular health education campaigns on routine childhood immunization, and more enhanced techniques for routine childhood

immunization delivery should be put in place. This will likely lead to a better understanding of childhood immunization by mothers of the study population, as well as other mothers/parents, thereby leading to more acceptance of routine childhood immunization and uptake.

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Declarations

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Conflict of Interests: None declared.

Ethical Approval: the ethical approval for this study was sought and obtained from the University of Ilorin Ethical Review Committee, Ilorin. The study's respondents were not forced to give responses, but rather they took part after the researchers sought their consents.

Confidentiality: no respondent names were written on the questionnaire.

Authors' Roles/Participation in the Authorship of the Manuscript:

- i. **Musbau Adekunle Yahaya:** substantial contributions to the conception and design of the work, patients' selection, acquisition of data, analysis and interpretation of data, final approval of the version to be published.
- ii. **Mary Athanasius Udoh (Corresponding Author):** patients' selection, acquisition of data, analysis and interpretation of data, drafting the work, final approval of the version to be published.

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