

RESEARCH ARTICLE

OPEN ACCESS

# Knowledge, Attitude and Uptake of Vaccination among Under-Five Children in a Semi-urban Community in Ekiti State, Nigeria.

Adeniyi IO<sup>1</sup>[ID](#), Adeniran MA<sup>1</sup>, Adegbamigbe AB<sup>1</sup>[ID](#), Adebajo TI<sup>1</sup>, Adeyemi FO<sup>1</sup>[ID](#), Adimula QT<sup>1</sup>[ID](#), Afolabi AA<sup>1</sup>[ID](#), Adediran FD<sup>1</sup>[ID](#), Abiwo OG<sup>1</sup>, Adeniyi OC<sup>1</sup>, Ipinnimo TM<sup>2</sup>[ID](#), Adeosun MO<sup>2</sup>, Kunle-Olowu AO<sup>3</sup>

<sup>1</sup> Afe Babalola University, Ado-Ekiti, Ekiti State

<sup>2</sup> Department of Community Medicine, Federal Teaching Hospital, Ido-Ekiti, Ekiti State

<sup>3</sup> College of Postgraduate Studies, Afe Babalola University, Ado-Ekiti, Ekiti State

Submitted: 9<sup>th</sup> March 2023

Accepted: 2<sup>nd</sup> May 2023

Published: [REDACTED]

[ID](#): Orcid ID

## Abstract

**Objective:** Nigeria at large has a high burden of infant mortality and under-five deaths. Some of these deaths are caused by vaccine-preventable diseases. This research aimed to assess the knowledge and attitude of mothers on childhood vaccination and also determine the uptake of vaccination among their under-five children.

**Methods:** A cross-sectional study was conducted amongst 440 women of reproductive age who had under-five children living in Ido-Ekiti, Ekiti State. They were selected via a multi-stage sampling technique and data was obtained with the aid of a pre-tested interviewer-administered, structured questionnaire. The child's vaccination card was also assessed. Data were analyzed using the computer software IBM SPSS version 21.0.

**Results:** Almost all (432, 98.2%) of the respondents were aware of childhood vaccination. A little over half (238, 54.0%) were knowledgeable that vaccinations should begin from the first day of life, however, most were informed that vaccines prevent infectious diseases (426, 96.8%) and reduce the rate of death and disabilities (421, 95.7%). A large number (431, 98.0%) thought that distance, timing of the clinic, travel and waiting time, as well as cost, should not prevent the vaccination of a child. The majority (409, 93.0%) of the children were adequately vaccinated for age, however, only one-third (132, 30.0%) of the respondents had their vaccination cards available for sighting.

**Conclusion:** Most of the mothers were knowledgeable and had a positive attitude towards vaccination with a high vaccination uptake, however, the card retention rate was very low.

**Keywords:** Attitude, Ekiti, Vaccination, Knowledge, Under-five children, Uptake

## Plain English Summary

Nigeria has a lot of deaths occurring among children below five years of age and some of the causes of these deaths can be prevented by vaccination. The purpose of this research was to assess the knowledge and attitudes of mothers towards immunizing their children and also to estimate the proportion of these children that were fully vaccinated. Many of the mothers were knowledgeable with a good disposition towards vaccination. A large proportion of the children were fully vaccinated but most couldn't find their vaccination card as evidence for vaccination.

Correspondence:

Ipinnimo Tope M

Department of Community Medicine, Federal Teaching Hospital,

Ido-Ekiti, Ekiti State,

+234 806 220 1903, [abbeymagnus@yahoo.com](mailto:abbeymagnus@yahoo.com)

## Introduction

Nigeria has a high burden of infant and under-five mortality and some of these deaths are due to vaccine-preventable diseases (1). Successive governments have put various measures in place to increase the coverage of vaccination in the country. With a population of approximately 210 million people of which children under five make up about one-fifth, vaccine-preventable diseases account for about 22% of child deaths, amounting to over 200,000 deaths per year (2).

Routine vaccination is a key component of child survival strategies and is among the most cost-effective public health tools for disease control worldwide (3). A successful vaccination programme anywhere in the world is rewarded with a reduction in childhood morbidity and mortality (4). Children by the age of 15 months should have completed their routine vaccination according to the National Programme on Immunization (NPI) current schedule in Nigeria (5).

In Nepal, one of the barriers against vaccination in children was the lack of correct information by the parents, which was associated with anxieties in the parents (6). It was revealed in Nigeria that a lack of maternal knowledge regarding vaccination plays a strong role in the uptake of vaccines in children (7). Another study found that childhood vaccination is affected by the level of education and respondents were willing to accept it as a means of protection from childhood illnesses (8).

A previous study in Ilejemeje local government area (LGA) of Ekiti State, Nigeria documented that 88.9% of the children were fully vaccinated while 7.8% were partially vaccinated (9). A high (90%) vaccination card retention rate was also recorded (9). However, another study in Abeokuta, Ogun State, Nigeria revealed a lower complete vaccination rate of 72.2% (10).

Knowledge and attitude of caregivers are influential to compliance with childhood vaccination and these factors were assessed in this research. Also, poverty has long been associated with poorer health-seeking behaviour and Ido-Ekiti where this study was conducted has most of her residents living below the poverty line (11) and despite this, it has the privilege of hosting a Federal Teaching Hospital and numerous primary health centres which provide vaccination services. However, over the last three years, the turnout of children being brought in for vaccination at the vaccination clinics has been steadily declining based on the vaccination records at the health facilities.

It is therefore very important to assess the vaccination uptake in this community considering the recent reduction in vaccination attendance at health facility clinics. More importantly, the findings of this study may aid policymakers and other stakeholders in childhood vaccination to plan and act appropriately. This study assessed the knowledge and attitude of mothers on childhood vaccination and also determined the uptake of vaccination among their under-five children in the semi-urban community of Ido-Ekiti, Ekiti State.

## Methodology

### Study Area

The study was conducted in 2019 in Ido-Ekiti, the headquarters of Ido-Osi local government area of Ekiti State, Nigeria. The 2019 projected population of Ido-Osi is 220,563 people with females constituting 108,268 (12, 13). According to the National Reproductive Health Policy and Strategy, 22.6% of this projection represents the population of women within the reproductive age (15 - 49 years) which is 49,847 women. The community has a Federal Teaching Hospital, private hospitals and primary health centres where routine vaccines are given to infants. The Ekiti State Ministry of Health in collaboration with the World Health Organization also conducts regular Supplemental Vaccination Activities on National Immunization Days for under-five children.

### Study Design

A descriptive cross-sectional study design was used.

### Study Population

The study population included women of reproductive age (15-49 years) who had children under the age of five years living in Ido-Ekiti. Those who gave their consent and have been residents in the community for a minimum period of 6 months were included in the study.

### Study Period

This study was carried out between June and August 2019.

### Sample Size Determination

The sample size for the study was calculated using Fisher's formula (14) for a cross-sectional qualitative outcome study for a population over 10,000 as follows, based on the prevalence rate of 22% for women of reproductive age group out of the entire female population.

$$n = z^2pq/d^2$$

n= sample size

z = standard normal deviate, 1.96

p = prevalence rate = the proportion of women of reproductive age = 22% = 0.22 (12).

q = 1 – p (1 - 0.22 = 0.78)

d = degree of accuracy desired = 0.05

$$n = 1.962 \times 0.22 \times 0.78 / 0.05^2$$

$$n = 3.849 \times 0.1716 / 0.0025 = 264.19$$

≈ 264 (sample size)

A response rate of 90% was anticipated,

$$N_s = n / 0.9 = 264 / 0.9 = 293.3$$

To adjust for a design effect, the sample size was multiplied by 1.5.

Thus,

$$293.3 \times 1.5 = 439.95 \approx 440$$

Thus, the final sample size was determined to be 440.

### Sampling Technique

A multi-stage sampling technique was used to select respondents for the study. Stage one involved simple random sampling by ballot of one ward (Ido Ward 2) from the two wards that made up Ido-Ekiti (Ido Ward 1 and 2). Stage two entailed the selection of one catchment area (Federal Teaching Hospital catchment area) from the two catchment areas (Comprehensive Health Centre and Federal Teaching Hospital catchment areas) using simple random sampling by ballot. The selected catchment area (Federal Teaching Hospital) comprises Alapo, Iyedi, Oke Barake and Isolo settlements for which each was considered to be a cluster. The distribution of questionnaires per settlement/cluster was achieved with a proportionate allocation. In stage three, households in settlements were selected

by systematic random sampling after house numbering was done to generate the list of all the households in each settlement. In cases where an eligible mother has more than one child that is under-five years of age, a simple random sampling by balloting was conducted to select the child to be recruited.

### Data collection

Data were obtained with the aid of a pre-tested interviewer-administered, structured questionnaire. There was also a sighting and observation of the child's vaccination card. The pretesting of the study instrument was carried out in Ifaki-Ekiti among 50 women of the reproductive age group who had a child(ren) under-five years. Data collection was carried out by the researchers.

### Data analysis

Data were analyzed using the computer software IBM SPSS version 21.0. Descriptive statistics such as frequency tables and percentages were used to summarize responses to the questions.

### Results

About one-third (135, 30.7%) of the participants were in the 30-34 years age group. More than one-third (169, 38.4%) of the participants were traders, 176 (40%) had attained at least a secondary level of education, over three-quarters (343, 78.0%) had an average monthly income of less than ₦50,000.00 (\$106), most practised Christianity (357, 81.1%), a good number were married (391, 88.9%) and of Yoruba ethnicity (384, 85.0%) as depicted in table 1.

**Table 1: Socio-demographic Characteristics of the Respondents (Mothers)**

Variable	Frequency Per cent	
	(n = 440)	(%)
<b>Age group (Years)</b>		
15-19	3	0.7
20-24	37	8.4
25-29	117	26.6
30-34	135	30.7
35-39	87	19.8
40-44	48	10.9
45-49	13	2.9
<b>Occupation</b>		
Trading	169	38.4
Business Woman	108	24.5
Civil Servant	94	21.4
Farming	30	6.8
Unemployed	21	4.8

Others	18	4.1
<b>Income (₦)</b>		
<50,000	343	78.0
50,000 - 99,999	61	13.9
≥100,000	36	8.1
<b>Religion</b>		
Christianity	357	81.1
Islam	80	18.2
Others (ATR, Budism)	3	0.7
<b>Ethnicity</b>		
Yoruba	374	85.0
Igbo	39	8.9
Hausa	13	2.9
Others (Tiv, Ebira, Urhobo)	14	3.2
<b>Marital Status</b>		
Married	391	88.9
Single	23	5.2
Widowed	17	3.9
Divorced	9	2.0
<b>Level of Education</b>		
No formal education	1	0.2
Primary	36	8.2
Secondary	176	40.0
Tertiary	227	51.6

ATR- African Traditional Religion

Many (288, 65.5%) of the children were between 12 to 59 months of age and 324 (73.7%) were in birth order 1 to 3. Most were delivered in the health centre (198, 45.0%) or hospital (189,

43.0%) while half (220, 50.0%) of them received healthcare at the health centre, as shown in table 2.

**Table 2: Socio-demographic Characteristics of the Children**

Variable	Frequency N = 440	Per cent (%)
<b>Age group (months)</b>		
0-11	152	34.5
12-59	288	65.5
<b>Birth order</b>		
1 <sup>st</sup> - 3 <sup>rd</sup>	324	73.7
4 <sup>th</sup> - 6 <sup>th</sup>	113	25.6
7 <sup>th</sup> +	3	0.7
<b>Place of delivery of the child</b>		
Health centre	198	45.0
Hospital	189	43.0
Traditional birth attendant	44	10.0
Home	9	2.0
<b>Child's regular point of healthcare</b>		
Health centre	220	50.0
Hospital	176	40.0
Home	44	10.0

Table 3 shows the awareness and knowledge of childhood vaccination among the respondents. The majority (432, 98.2%) of them were aware of childhood vaccination. A little over half (238,

54.0%) were knowledgeable that vaccinations should begin from the first day of life, however, most were informed that vaccines prevent infectious diseases (426, 96.8%) and reduce the

rate of death and disabilities (421, 95.7%). About two-thirds (134, 62.1%) admitted that vaccines could maintain the child's health.

The majority (396, 90.0%) accepted that non-febrile illness should not prevent a child from receiving vaccines when due and that healthy

children (431, 98.0%), as well as both sexes, need vaccination (420, 95.7%). About three-fifths of respondents (276, 62.7%) accepted that vaccines were associated with fever and pain while 145, 33.0% believed vaccines were dangerous to their children.

**Table 3: Awareness and Knowledge of Childhood Vaccination among Respondents**

Variable	Frequency (N= 440)	Per cent (%)
Have you heard of childhood vaccination?		
Yes	432	98.2
No	8	1.8
From what day should the vaccine be given to the child?		
1 <sup>st</sup> day of life	238	54.0
Any day	185	42.0
No response	17	4.0
Does vaccination prevent infectious disease?		
Yes	426	96.8
No	14	3.2
Does vaccination decrease the rates of death and disabilities?		
Yes	421	95.7
No	19	4.3
Could vaccine maintain the child's health		
Yes	134	62.1
No	220	37.9
Do you think a child's non-febrile illness should prevent the child from receiving a vaccine when due?		
Yes	44	10.0
No	396	90.0
Do you think vaccination is associated with fever and pain?		
Yes	276	62.7
No	164	37.3
Do you think vaccines can be dangerous?		
Yes	145	33.0
No	295	67.0
If the respondent thinks healthy children need vaccination		
Yes	431	98.0
No	9	2.0
Knowledge of the respondent about who they think need vaccination more		
Male	4	0.9
Female	5	1.1
Both	420	95.7
Neither	10	2.3
Why the respondent feels a gender needs vaccination more (n=9)		
Boys are fragile	4	44.4
Girls are fragile	5	55.6

All (100.0%) of the respondents agreed that neither their religion nor culture recommends

against vaccines nor that the community refused to accept vaccines. Almost all (431, 98.0%)

agreed that sex, religion and ethnicity of the person administering vaccination should not influence the refusal of vaccine and that (431, 98.0%) distance, the timing of the clinic, travel and waiting time, as well as cost, should not prevent vaccination of a child. Less than half (177, 40.2%) of respondents were willing to spend 2 to 4 hours waiting to obtain a vaccine for

their children. None of the respondents admitted to any events that diminished their trust in vaccines, with nearly all (439, 99.8%) claiming they will advise their relatives/friends to immunize their children and A greater proportion (434, 98.6%) agreed that vaccines are beneficial as shown in Table 4.

**Table 4: Attitude Towards Childhood Vaccination among Respondents**

Variable	Frequency (N= 440)	Per cent (%)
If the respondent's religion/culture recommends against vaccination		
Yes	0	0.0
No	440	100.0
Can the sex, religion and ethnic affiliation of the person administering the vaccination influence the refusal of the vaccine		
Yes	0	0.0
No	431	98.0
No response	9	2.0
Has distance, the timing of clinic, the time needed to get to the clinic or wait at the clinic and or cost prevented the respondent from getting her child vaccinated		
Yes	0	0.0
No	431	98.0
No response	9	2.0
The maximum amount of time a respondent would be able or willing to spend to get a vaccine for her child		
Indefinite	6	1.4
8-10 hours	49	11.1
5-7 hours	161	36.6
2-4 hours	177	40.2
Less than 2 hours	38	8.6
No response	9	2.1
Has the respondent's community in the past refused to accept vaccines		
Yes	0	0.0
No	440	100.0
Past or present events that diminished trust in vaccines		
Yes	0	0.0
No	440	100.0
Advise relatives/friends to immunize their children		
Yes	439	99.8
No	1	0.2
Vaccines are beneficial		
Yes	434	98.6
No	6	1.4

The majority (418, 95.0%) of the respondents' children had been vaccinated, however, only about one-third (132, 30.0%) had their vaccination cards available for sighting. A larger percentage of the respondents (409, 93.0%)

however mentioned that their child was adequately vaccinated for age but this could not be verified as a result of the unavailability of vaccination cards for sighting.

Over three-quarters (357, 85.5%) of those that had been vaccinated mentioned that vaccines were given on schedule and less than half (56, 13.4%) of them admitted that there were associated side effects such as pain, fever and rash. The

barriers to vaccination identified among the respondents were the fear of side effects (136, 31%) and unawareness of the need to return for other vaccines (61, 14.0%).

**Table 5: Uptake of childhood vaccination**

Variable	Frequency (N = 440)	Per cent (%)
The child has received a vaccine		
Yes	418	95.0
No	22	5.0
Vaccination card sighted		
Yes	132	30.0
No	308	70.0
The child is adequately vaccinated for age		
Yes	409	93.0
No	31	7.0
Vaccines were given on schedule (n=418)		
Yes	357	85.5
No	61	14.5
Side effects following vaccination such as pain, fever, and rash (n=418)		
Yes	56	13.4
No	362	86.6
Barriers to vaccination (multiple responses)		
Vaccine not available	46	10.4
Place of vaccination too far	44	10.0
Child's illness	44	10.0
Long waiting time	53	12.0
Unawareness of the need to return for other vaccines	61	14.0
Fear of side effects	136	31.0

## Discussion

In assessing the knowledge and awareness of mothers about vaccination, most of them were aware of the subject matter as the research showed that over 98% of the respondents were aware of vaccination in children which is considerably higher than 80.6% and 65.7% awareness seen in research conducted in an urban and a rural area in Northern Nigeria (15). This was not surprising since Ido-Ekiti is a town with a Federal Teaching Hospital which carries out regular vaccination visits and outreaches for the populace. Additionally, it has been documented that children in Southern Nigeria have more than twice the chance of receiving full immunization than their counterparts in Northern Nigeria (16) and this may also reflect the regional difference in awareness.

In this study, the majority (over 90%) of the mothers were informed that vaccines prevent infectious diseases, reduce the rate of death and disabilities and that the health status (such as the presence of a non-febrile illness or even when in

good health) and sex of a child should not prevent a child from receiving vaccines. This level of knowledge about vaccination and its importance could be attributed to the fact that a larger population of respondents (about 92%) had a level of education at least in secondary school. The literature revealed that higher education attainment is associated with awareness and good knowledge about vaccination (15). These findings about the knowledge of vaccination are also comparable with findings in a rural community in Edo State, Nigeria (99.9%) (17), in a facility-based study in urban Lagos, Nigeria (93.8%) (18), in Kinshasa, Democratic Republic of Congo (99.8%) (19) and in Ethiopia (96%) (20). The result of the study showed that 93% of the children were fully vaccinated for age. This finding is higher than the finding by Adeyinka et al who found a vaccination rate of 76.9% in Igbo-Ora, Oyo State, Nigeria (21), and Adediran et al who found a complete vaccination rate of 72.2% in Abeokuta, Nigeria in 2014 (10). A lower vaccination rate of 62.8% was found among the

last children in Moniya Community, Ibadan, Nigeria in 2013 (22). The high vaccination rate in this study may be due to the high awareness and knowledge. This study was conducted in 2019 and the campaign for childhood vaccination as a means of protection from child morbidity and mortality has increased over the last decade and this may have been reflected in the findings of this present study. Only 30% of the respondents in this study were able to provide their vaccination cards, this is very low when compared to another study by Sanni *et al* in Ekiti State, Nigeria which reported a card retention rate of 90% (9). The low card retention rate in this study may be because of the age group of children involved. The mothers are more likely to lose their cards for the older children who are no longer taking routine vaccination compared to the study by Sanni *et al* that was among infants who were still attending routine vaccination clinics and actively using their cards.

Respondents agreed that house distance to the clinic, time spent at the clinic, the timing of the clinic or the cost involved do not prevent them from getting their children vaccinated. Nonetheless, fear of side effects and unawareness of the need to return for other vaccines appeared to be the leading reasons possibly preventing the respondents from getting their children vaccinated. Some stated that they were unaware they were to return for other vaccines as well as non-availability of vaccines was their reason. This finding is not consistent with that of another study conducted in a rural area of Ogun State, Nigeria which showed that the commonest reason given by mothers for failure to vaccinate their children was the mother's illness (10). In Igbo-Ora, Oyo State, it was documented that the commonest reason for failure to immunize was long waiting queues (46.1%) followed by payment in private clinics (20.2%) and distance (17.7%) (21). In Ibadan, Nigeria, the commonest reason for missing vaccination was the illness of the child at the time of vaccination as stated by 65.4% of the respondents (22) which is unlike the findings in this present study, where only 10% of the identified child's illness as a barrier to vaccination.

The strength of the study lies in the fact that it was community-based, therefore bias that may result from sampling respondents from health facilities was eliminated. However, since mothers were asked about the vaccination history of their children, recall bias may not be ruled out. We tried to minimize recall bias by asking for the

vaccination card, but the retention rate of vaccination cards was also low in the study.

### Conclusion

Many of the mothers were knowledgeable and had a positive attitude towards vaccination and most (93%) of the under-five children in this study had been vaccinated for age. The barriers to vaccination identified among the respondents included the fear of side effects and unawareness of the need to return for other vaccines. Also, the card retention rate of 30% among respondents is low and may not be too good for data gathering.

Therefore, we recommend reminding mothers and caregivers of their child's vaccination appointments, also, home visits by community health extension workers, especially for children who have missed/postponed vaccines. Providing accurate vaccination records such as vaccination cards could be made mandatory for school entry as this will help know and follow up with the child for the remaining vaccines yet to be received as well as aid retention rate. Health facilities or clinics should establish electronic vaccination registries for all children to be readily accessible to healthcare providers as this will help with tracking and data collection.

### List of abbreviations

LGA: Local government area

NPI: National Population on Immunization

### Declarations

Ethics approval, and Consent to Participate  
Ethical approval (Protocol number ERC/2019/06/19/250B) was obtained from the Ethics and Research Review Committee of the Federal Teaching Hospital, Ido-Ekiti. Permission was also gotten from the Medical Officer of Health in Ido-Osi Local Government as well as the King of Ido-Ekiti. Informed consent was obtained from the participants after the objectives and the nature of the research was adequately explained to them. It was explained that the study was voluntary and the confidentiality of their responses was assured.

### Consent for publication

All the authors gave consent for the publication of the work under the creative commons Attribution-Non-Commercial 4.0 license.

### Availability of data and materials

The datasets are not publicly available but are available from the corresponding author upon reasonable request.



#### Competing interests

All authors do not have any competing interests.

#### Funding

The authors provided the funding for this study.

#### Authors' contributions

Concept and design: All Authors  
Literature search: IOA, MAA, ABA, TIA  
Data collection: All Authors  
Data analysis: TMI, FOA, QTA  
Manuscript Preparation: AAA, FDA, OGA  
Manuscript Editing: OCA, TMI, IOA  
Manuscript Review: MOA, AOK, TMI  
All authors read and approved the final draft of the manuscript.

#### Acknowledgement

We express gratitude to all the participants of this study.

#### References

1. HealthThink Analytics. Child Survival Strategies: Addressing under-5 Mortality in Nigeria. HealthThink Analytics. 2021. Available at: <https://healththink.org/child-survival-strategies-addressing-under-5-mortality-in-nigeria/> (Accessed 6<sup>th</sup> September 2022).
2. Chinawa J. Immunization dropout rates in Ihe, Awgu Local Government Area, Enugu State, South East Nigeria: a 1-year review. *Ann Med Health Sci Res.* 2014;4(4):642-646. <https://doi.org/10.4103/2141-9248.139360>
3. World Health Organization. Challenges in global vaccination and its global vaccination vision and strategy 2006-2015. *Weekly Epidemiol Rec.* 2006;81(19): 190-05.
4. Breiman RF, Streatfield PK, Phelan M, Shifa N, Rasid M, Yunus M. Effect of infant vaccination on childhood mortality in rural Bangladesh: Analysis of health and demographic surveillance data. *Lancet.* 2004; 364(9452):2204-11. [https://doi.org/10.1016/S0140-6736\(04\)17593-4](https://doi.org/10.1016/S0140-6736(04)17593-4)
5. World Health Organization. Vaccination Schedule for Nigeria. World Health Organization. 2022. Available at: <https://vaccinationdata.who.int/pages/schedule-by-country/nga.html> (Last accessed 8 October 2019).
6. Devkota S, Simikhada P, Van Teijlingen E, Rai LD. Parents' Knowledge and Practices to Childhood Immunisation in Nepal: Implications for Health Policy. *Health Science Journal* 2013;7(4):370-383.
7. Babalola S. Maternal reasons for non-immunisation and partial immunisation in northern Nigeria. *Journal of Paediatrics and child health.* 2011;47(5):276-281. <https://doi.org/10.1111/j.1440-1754.2010.01956.x>
8. Agboola SM, Busari OA, Segun-Agboola BT, Olajide TJ, Shabi OM, Elegbede OT. Knowledge, Attitude, Perceptions of Adult Males towards Childhood Vaccinations in Southwest Nigeria. *American Journal of Health Research.* 2015; 3(1):1-5. <https://doi.org/10.11648/j.ajhr.20150301.12>
9. Sanni T.A, Olasehinde O.K, Adeniyi M. A, Ipinimo T.M. Uptake Of Vaccination and Associated Factors among 0-11 months infants in a rural community of Ekiti State. *Nigerian Journal Of Medicine: Journal of the National Association of Resident Doctors of Nigeria.* 2019;28(4): 440 -450. <https://doi.org/10.4103/1115-2613.278636>
10. Adediran AS, Onyire NB, Guovoke VO, Obum E, Anyanwu OU. Vaccination Status of Under-5 Children in A Rural Community in Nigeria. *IOSR Journal of Dental and Medical Sciences.* 2017; 16(1): 126-130. <https://doi.org/10.9790/0853-160102126130>
11. Ipinimo TM, Durowade KA. Catastrophic Health Expenditure and Impoverishment from Non-Communicable Diseases: A Comparison of Private and Public Health Facilities in Ekiti State, Southwest Nigeria. *Ethiop J Health Sci.* 2022 Sep;32(5):993-1006.
12. Federal Republic of Nigeria. Federal Republic of Nigeria official Gazette of 2006. National population and housing census. The Federal Government Printer Lagos, Nigeria.
13. PopulationU. Population Formula. PopulationU. 2022. Available at: <https://www.populationu.com/gen/population-formula> (Last accessed 12th December 2022).
14. Bolarinwa OA. Sample size estimation for health and social science researchers: The principles and considerations for different study designs. *Niger Postgrad Med J.* 2020;27(2):67-75. [https://doi.org/10.4103/npmj.npmj\\_19\\_20](https://doi.org/10.4103/npmj.npmj_19_20)
15. Olugbenga-Bello A, Jimoh A, Oke O, Oladejo R. Maternal characteristics and vaccination status of children in North Central of Nigeria. *PanAfrican Med Journal.* 2017;26:159.

- <https://doi.org/10.11604/pamj.2017.26.159.11530>
16. Eboreime E, Abimbola S, Bozzani F. Access to Routine Immunization: A Comparative Analysis of Supply-Side Disparities between Northern and Southern Nigeria. *PLoS One*. 2015;10(12):e0144876. <https://doi.org/10.1371/journal.pone.0144876>
  17. Odusanya OO, Alufohai EF, Meurice FP, Ahonkai VI. Determinants of vaccination coverage in rural Nigeria. *BMC Public Health*. 2008; 8:381. <https://doi.org/10.1186/1471-2458-8-381>
  18. Awodele O, Oreagba IA, Akinyede A, Awodele DF, Dolapo DC. The knowledge and attitude towards childhood vaccination among mothers attending antenatal clinic in Lagos University Teaching Hospital Nigeria. *Tanzan J Health Res*. 2010;12(3):172–177. <https://doi.org/10.4314/thrb.v12i3.51112>
  19. Abdulraheem IS, Onajole AT, Jimoh AA, Oladipo AR. Reasons for incomplete vaccinations and factors for missed opportunities among rural Nigerian children. *J Public Health Epidemiol*. 2011;3(4):194–203
  20. Etana B, Deressa W. Factors associated with complete vaccination coverage in children aged 12-23 months in Ambo Woreda, Central Ethiopia. *BMC Public Health*. 2012;12:566. <https://doi.org/10.1186/1471-2458-12-566>
  21. Adeyinka D, Oladimeji O, Adeyinka F, Aimakhu C. Uptake of Childhood Vaccination Among Mothers of Under-Five In Southwestern Nigeria. *The internet journal of Epidemiology*. 2009;7(2): 1-13. <https://doi.org/10.5580/f4>
  22. Fatima RJ, Chizoma MN. Factors influencing compliance with vaccination regimen among mothers in Ibadan, Nigeria. *IOSR Journal of Nursing and Health Science*. 2013; 2:1-9. <https://doi.org/10.9790/1959-0220109>

ahead of time