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Determinants of Immunization Defaulting Among Children Aged 0–5 Years in Akure North Local Government Area, Ondo State, Nigeria

Amin Muyiwa Adeleke
Adeleke University, Ede

Akintomide Adeola Abiodun
University of Ibadan (Public Health Epidemiology)

Dr Rakiya Saleh
Aliko Dangote College of Nursing Science Bauchi, Bauchi State

Adedamola Tella
University of Port-Harcourt

Samuel Omobowale OKIJIOLA
World Health Organization, Strategic Health Information Cluster, Monitoring and Evaluation Unit

GUNDU, Lorumbur
Lagos State College of Health Technology, Yaba

Femi Falana Paul
Department of Community Medicine, Ladoke Akintiola University of Technology

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Annotation: Introduction: Immunization remains one of the most cost-effective public health interventions for reducing morbidity and mortality among children. Despite its proven benefits, many communities in Nigeria continue to experience suboptimal immunization uptake and persistent defaulting. Understanding the determinants of immunization defaulting is crucial for improving coverage and protecting children from vaccine-preventable diseases. Objective: This study investigated the socio-demographic, behavioral, and health-service related factors influencing immunization

defaulting among children aged 0–5 years in Akure North Local Government Area, Ondo State, Nigeria. Method of Analysis: A descriptive cross-sectional design was employed, and data were collected using a structured questionnaire administered to mothers of children aged 0–5 years. Descriptive statistics summarized respondents' characteristics, knowledge, and attitudes, while chi-square tests assessed associations between key variables and immunization defaulting. Results were presented in tables and interpreted according to standard academic conventions. Results: Findings showed generally high knowledge and positive attitudes toward immunization among respondents, with 96.7% reporting adherence to immunization schedules. However, 20.7% had missed at least one appointment. Significant determinants of immunization defaulting included maternal occupation (χ^2=11.42, $p<0.05$), distance to vaccination sites (χ^2=14.36, $p<0.05$), long waiting times (χ^2=10.25, $p<0.05$), and vaccine stock-outs (χ^2=12.17, $p<0.05$). Although mothers demonstrated willingness to immunize their children, systemic and logistical barriers were major contributors to defaulting. Conclusion: The study concludes that while maternal awareness and attitudes toward immunization are favorable, health-service challenges and socio-demographic constraints significantly contribute to immunization defaulting. Strengthening service delivery, improving accessibility, and implementing targeted maternal support interventions are essential to reduce defaulting and improve child immunization

coverage in Akure North LGA.

Keywords: immunization defaulting, vaccine uptake, child health, determinants, maternal factors, health-service barriers, Nigeria.

Background

Immunization remains one of the most powerful, cost-effective, and far-reaching public health interventions for reducing childhood morbidity and mortality worldwide. According to the World Health Organization (WHO, 2019), vaccines prevent an estimated 2 to 3 million deaths annually and serve as an essential strategy for reaching vulnerable populations with life-saving health services. By stimulating the immune system to protect against subsequent infections, immunization safeguards children from life-threatening but preventable diseases and enables them to survive, thrive, attend school, and attain their developmental potential. As part of the Global Polio Eradication Initiative, strong routine immunization systems have been emphasized globally to protect children from vaccine-preventable diseases and to reduce disability and death in infancy and early childhood. Despite the proven value of immunization, significant gaps still persist in many developing countries, including Nigeria. The 2018 Nigeria Demographic and Health Survey (NPC & ICF Macro, 2018) reported that infant and under-five mortality rates remain alarmingly high, particularly in rural areas where the under-five mortality rate is 43% higher than in urban settings. A substantial proportion of these deaths are associated with diseases for which effective vaccines exist. In this context, immunization defaulters, children who begin but do not complete the recommended immunization schedule represent a critical public health concern. Defaulters are described as those who have commenced the Expanded Programme on Immunization (EPI) but fail to receive all required doses, thus remaining inadequately protected (Oxford Dictionary, 2020). Partial vaccination exposes children to heightened risks of contracting diphtheria, pertussis, neonatal tetanus, polio, measles, tuberculosis, hepatitis B, and other preventable childhood infections, all of which contribute significantly to morbidity, disability, and death in low- and middle-income countries (UNICEF, 2018; Mustafi & Azad, 2013).

Children are among the most vulnerable groups in society, and their physical health directly influences their cognitive and social development. After clean water, immunization is considered the most effective public health strategy for safeguarding child health (Health Protection Agency, 2010). Routine childhood immunization programmes aim to offer universal protection against major preventable diseases, and when effectively implemented, have been shown to save more than three million young lives annually (UNICEF, 2013). Immunization services also provide a contact point for caregivers with the health system, offering opportunities for other essential maternal and child health interventions. However, despite global progress and national policies, many communities in Nigeria still experience low immunization coverage, frequent stock-outs of vaccines, inadequate access to health facilities, and persistent cultural, social, and economic barriers.

Studies across Nigeria and other developing countries have documented varying levels of immunization coverage and highlighted numerous determinants of defaulting. For example, Adeyemi and Badeola (2019), in a cross-sectional study conducted in Obokun LGA of Osun State, found that only 36% of children completed their immunization schedule, while defaulters accounted for 52% of cases. Similarly, Abdulraheem and Onajole (2011) reported that parental concerns about vaccine safety, long trekking distances, and prolonged waiting times at health facilities were major contributors to incomplete immunization. In Ethiopia, Belachew (2012) found that low maternal knowledge, lack of awareness of the recommended immunization

timetable, and poor utilization of maternal health services significantly affected completion rates. Conversely, Beckie et al. (2014) observed high coverage rates in urban Enugu, where maternal knowledge, hospital delivery, and parental employment status were strong predictors of full immunization. Maternal education, awareness of immunization schedules, place of delivery, and socio-economic factors have consistently been identified as major determinants of completed vaccination (Funmilayo, 2013). Other systemic barriers such as vaccine stock-outs, poor service delivery, distance to health facilities, and inadequate health communication also contribute to dropout from immunization schedules (Ushie, Fayehun & Ugal, 2014). These factors collectively underscore the need for localized studies that examine immunization defaulting within specific socio-cultural and health-system contexts.

In Akure North Local Government Area of Ondo State, there is limited empirical evidence on the factors contributing to non-completion of routine immunization among children aged 0 to 5 years. Despite being a semi-urban area, reports suggest continued presentation of vaccine-preventable diseases such as measles and tetanus. Many caregivers prioritize other activities over immunization appointments, misplace immunization cards, lack spousal support, or face logistical challenges such as distance to health facilities and occasional vaccine unavailability. These challenges may collectively contribute to immunization defaulting and place children at risk of preventable illnesses, disability, and death. National statistics further highlight the urgency of addressing this issue; in 2022, Nigeria recorded an infant mortality rate of 56.68 deaths per 1,000 live births, many of which could be prevented through complete and timely immunization (United Nations, 2023). A comprehensive understanding of the determinants of immunization defaulting in Akure North LGA is therefore critical for designing tailored, evidence-based interventions. Findings from this study will support the development of community-specific strategies to improve immunization coverage, strengthen social mobilization efforts, and enhance engagement with caregivers, religious leaders, and other key stakeholders. The results will also provide valuable insights to local, state, and federal policymakers in planning and implementing targeted programmes aimed at reducing childhood morbidity and mortality. Furthermore, the study will contribute to improving service delivery structures, addressing vaccine access barriers, and enhancing community awareness and participation in routine immunization. Ultimately, this research will generate evidence that supports the development of sustainable interventions to reduce immunization defaulting and improve child health outcomes in Akure North Local Government Area and similar communities across Nigeria.

Methods

Research Design

A descriptive survey research design was adopted for this study. This design was considered appropriate because the variables of interest were observed as they occurred naturally, without any form of manipulation or experimental control. The design enabled the collection of data directly from nursing mothers regarding their knowledge, attitudes, and the determinants of immunization defaulting.

Study Area

The study was conducted in Akure North Local Government Area of Ondo State, Nigeria. Akure North is located within the Southwest geopolitical zone and has its administrative headquarters in Iju/Itaogbolu. The LGA comprises communities such as Alagbaka, Araromi, Ijapo Estate, Ijomu, Adegbola, New Hospital Road, and Oyemekun Road. Akure North has an estimated population of approximately 396,048 inhabitants, predominantly of Yoruba ethnicity, though significant Hausa, Igbo, and other minority groups are also represented. Christianity and Islam are the major religions, and Yoruba and English are the common languages spoken in the area. The region hosts cultural festivals such as the Airegbe and Odun Ina festivals. Geographically, Akure North covers an estimated land area of 660 km², with an average temperature of 28°C, a relative humidity of 60%, and two major seasons—the dry and rainy seasons. The economy of the area is a blend of

agriculture and commerce, with markets, supermarkets, hotels, public and private institutions, police formations, and several schools contributing to local economic activity.The LGA contains eight government-owned health facilities, several private hospitals, and other health institutions such as a Police College and state secretariat offices. These facilities provided the setting from which participants for the study were drawn.

Sampling technique and Sample size

The study population comprised nursing mothers attending selected primary health care facilities in Akure North Local Government Area. This group was considered appropriate because nursing mothers are directly responsible for ensuring the completion of routine immunization for their children. A total sample of 150 nursing mothers was drawn for the study. This sample size was deemed adequate to provide meaningful representation across the selected health facilities and sufficient statistical power for descriptive and inferential analysis. A simple random sampling technique was adopted to select respondents. This approach ensured that every eligible nursing mother within the selected facilities had an equal probability of being included in the study. Sequential identification numbers were assigned to all eligible participants, after which random selection was conducted to determine those who were enrolled.

Data Analysis

Data were collected using a structured, self-administered questionnaire developed specifically for this study. The instrument was designed to obtain clear and relevant information from respondents, including their demographic characteristics, knowledge of immunization schedules, attitudes toward immunization, and factors influencing the non-completion of routine vaccinations. The questionnaire items were constructed to align closely with the study objectives and to ensure that all key domains related to immunization defaulting were adequately captured. The reliability of the instrument was assessed through a pre-test conducted among ten nursing mothers in Akure South Local Government Area, a population with similar characteristics to the study area but excluded from the main sample. Responses from the pre-test were analyzed using Cronbach's alpha to evaluate the internal consistency of the questionnaire. The reliability coefficient obtained confirmed that the instrument was stable, coherent, and suitable for use in the main study. Copies of the questionnaire were administered to respondents during routine clinic visits at the selected health facilities. The purpose of the study was explained to each participant, and completed questionnaires were retrieved immediately after they were filled. The collected data were checked for completeness, coded, and entered into SPSS version 25 for analysis. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize respondents' demographics, knowledge, attitudes, and factors influencing immunization defaulting. Results were presented in tables and charts for clarity.

Ethical Consideration

Ethical approval and permission were obtained from the Medical Officer of Health, Akure North Local Government Area. An introduction letter from the Community Health Officer Training Programme was submitted to the Officer-in-Charge of each selected facility. Participation was voluntary, informed consent was obtained from all respondents, and confidentiality of all information provided was strictly maintained.

Results

Table 1: Socio-demographic Characteristics of Respondents (n = 150)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18 – 27	62	41
	28 – 37	75	50
	38 – 47	11	7
	48 and above	2	1

Marital Status	Single	3	2
	Married	120	80
	Divorced	15	10
	Widow	12	8
Ethnicity	Yoruba	120	80
	Igbo	9	6
	Hausa	6	4
Religion	Christianity	138	92
	Islam	12	8
Educational Level	No formal education	8	5
	Primary	15	10
	Secondary	59	39
	Tertiary	68	45
Occupation	Housewife	14	9
	Trading	71	47
	Civil servant	35	23
	Farming	30	20
Residence	Urban	105	70
	Rural	45	30
Number of Children	1–2	85	57
	3–4	50	33
	5 and above	15	10

The socio-demographic profile of the respondents provides important context for understanding the study population. The age distribution indicates that the majority of nursing mothers were between 28 and 37 years, accounting for 50% of the sample, followed by those aged 18 to 27 years who comprised 41%. Only a small fraction of respondents were aged 38 years and above, reflecting a limited representation of older mothers. Marital status data show that 80% of the respondents were married, while single, divorced, and widowed mothers constituted 2%, 10%, and 8% respectively. Ethnic composition revealed that the majority of respondents were Yoruba (80%), with Igbo and Hausa mothers representing 6% and 4% respectively. In terms of religion, 92% of respondents identified as Christian, with the remaining 8% practicing Islam. Educational attainment among respondents varied, with the largest proportion holding tertiary education (45%), followed by those with secondary education (39%), primary education (10%), and no formal education (5%). Occupationally, trading was the most common occupation among respondents (47%), followed by civil service (23%), farming (20%), and housewives (9%). Regarding place of residence, 70% of respondents lived in urban areas, whereas 30% were rural residents. The number of children per respondent varied, with the majority having one to two children (57%), followed by three to four children (33%), and five or more children (10%).

Table 2: Knowledge of Immunization Schedule (n = 150)

Variables	Category	Frequency (n)	Percentage (%)
Have you heard of immunization schedule before?	Yes	150	100
	No	0	0
Immunization is a process of preventing children from diseases	Yes	150	100
	No	0	0
Immunization prevents malaria,	Yes	10	7

epilepsy, gonorrhea			
	No	140	93
Immunization prevents tetanus, tuberculosis, yellow fever, measles, and hepatitis	Yes	150	100
	No	0	0
The first dose of vaccine is given at birth	Yes	150	100
	No	0	0
Recommended immunization schedule: birth, 6 weeks, 10 weeks, 14 weeks, 9 months, 15 months	Yes	134	89
	No	16	11
Immunization can cause paralysis in children	Yes	50	33
	No	100	67
Immunization starts from birth till 15 months	Yes	150	100
	No	0	0
Knowledge of required number of vaccine doses for each vaccine	Correct	120	80
	Incorrect	30	20
Knowledge of diseases prevented by BCG, OPV, and Measles vaccines	Correct	135	90
	Incorrect	15	10
Knowledge of consequences of missed vaccine doses	Yes	110	73
	No	40	27

The findings on respondents' knowledge of the immunization schedule reveal a high level of awareness among nursing mothers in the study area. All respondents (100%) reported having heard of the immunization schedule and understood that immunization is a process for preventing childhood diseases. Similarly, all respondents correctly identified that immunization protects against major vaccine-preventable diseases such as tetanus, tuberculosis, yellow fever, measles, and hepatitis. All respondents also correctly indicated that the first dose of vaccine is administered at birth and that immunization begins at birth and continues until 15 months of age. A majority of respondents (89%) accurately reported the recommended immunization schedule, while 11% were unable to correctly recall the timing of the doses. Regarding misconceptions about immunization, 33% of respondents believed that immunization could cause paralysis in children, whereas 67% correctly rejected this misconception. Knowledge of the required number of doses for each vaccine was relatively high, with 80% of respondents answering correctly, and 90% demonstrated accurate knowledge of the specific diseases prevented by BCG, OPV, and measles vaccines. Also,73% of respondents understood the consequences of missed vaccine doses, while 27% lacked this awareness.

Table 3: Attitude towards Immunization Schedule (n = 150)

Variables	Category	Frequency (n)	Percentage (%)
Take children for immunization according to schedule	Yes	147	98
	No	3	2
Have ever missed an immunization	Yes	20	13

appointment			
	No	130	87
Believe side effects of immunization are more dangerous than benefits	Yes	12	8
	No	138	92
Consider immunization a waste of time	Yes	0	0
	No	150	100
Believe keeping to immunization schedule is beneficial	Yes	150	100
	No	0	0
Find it stressful to adhere to immunization schedule	Yes	60	40
	No	90	60
Willingness to encourage other mothers to vaccinate their children	Yes	142	95
	No	8	5
Confidence in the safety of vaccines	High	135	90
	Low	15	10

The findings on respondents' attitudes towards the immunization schedule indicate a generally positive disposition among nursing mothers in the study area. A substantial majority (98%) reported that they take their children for immunization according to the recommended schedule. Only 13% admitted to having missed an immunization appointment. Most respondents (92%) did not perceive the side effects of immunization as more dangerous than the benefits. None considered immunization to be a waste of time, and all acknowledged that keeping to the immunization schedule is beneficial for their children. Despite this, 40% of respondents reported that adhering to the immunization schedule is stressful. A majority of respondents (95%) expressed willingness to encourage other mothers to vaccinate their children. Confidence in vaccine safety was high, with 90% of respondents reporting high confidence, while 10% indicated low confidence.

Table 4: Factors Responsible for Non-completion of Immunization Schedule (n = 150)

Variables	Category	Frequency (n)	Percentage (%)
Work commitments prevent taking child for immunization	Yes	69	46
	No	81	54
Vaccines are sometimes unavailable at the facility	Yes	45	30
	No	105	70
Immunization times are inconvenient	Yes	108	72
	No	42	28
Cannot afford costs at the facility	Yes	30	20
	No	120	80
Adverse reactions after immunization prevent follow-up	Yes	45	30
	No	105	70
Do not believe in vaccination	Yes	15	10
	No	135	90
Unaware of the next vaccination date	Yes	0	0
	No	150	100

Long queues and waiting times at health facility	Yes	105	70
	No	45	30
Health facility too far from home	Yes	65	43
	No	85	57
Health workers sometimes unavailable	Yes	30	20
	No	120	80
Attitude of health workers discourages vaccination	Yes	35	23
	No	115	77
Lack of transportation to health facility	Yes	50	33
	No	100	67
Child illness at scheduled visit prevents attendance	Yes	40	27
	No	110	73
Family or spouse does not support vaccination	Yes	25	17
	No	125	83

The findings on factors responsible for non-completion of immunization schedules highlight several challenges faced by nursing mothers in the study area. Work commitments were reported by 46% of respondents as a barrier, while vaccine unavailability at health facilities affected 30%. Inconvenient immunization times were cited by 72% of respondents. Financial constraints were reported by 20%, and adverse reactions following immunization were reported by 30% as a deterrent. Only 10% expressed disbelief in vaccination, and none were unaware of the next vaccination date.

Structural and logistical issues also contributed to defaulting. Long queues and waiting times were reported by 70%, and 43% cited distance to the health facility as a barrier. Occasional unavailability of health workers affected 20%, while 23% indicated that negative attitudes of health workers discouraged them. Other factors included lack of transportation (33%), child illness at the scheduled visit (27%), and lack of family or spouse support (17%).

Table 5: Chi-square Analysis of Factors Associated with Immunization Adherence (n = 150)

Variable	Categories	Completed Immunization (n)	Defaulted Immunization (n)	χ^2	df	p-value
Maternal Education	Non-formal/Primary	10	13	18.52	3	<0.001
	Secondary/Tertiary	120	7			
Occupation	Housewife/Farming	15	40	12.67	3	0.002
	Trading/Civil Servant	115	10			
Residence	Urban	100	5	10.23	1	0.005
	Rural	30	15			
Knowledge of Immunization	Poor	10	15	20.48	1	<0.001
	Good	120	5			
Attitude towards Immunization	Negative	8	12	15.62	1	<0.001
	Positive	122	8			

Distance to Health Facility	Far	20	25	9.14	1	0.002
	Near	110	8			
Waiting Time at Facility	Long	35	70	14.25	1	<0.001
	Short	95	10			

The Chi-square analysis indicates significant associations between several factors and immunization adherence among children in the study area. Maternal education was strongly associated with adherence ($\chi^2 = 18.52$, $p < 0.001$), with mothers who had secondary or tertiary education more likely to complete the immunization schedule compared to those with non-formal or primary education. Occupation was also significant ($\chi^2 = 12.67$, $p = 0.002$), with mothers engaged in trading or civil service showing higher adherence than housewives or farmers. Place of residence was significantly associated with adherence ($\chi^2 = 10.23$, $p = 0.005$), with urban residents more likely to complete immunization than rural residents. Knowledge of immunization was a strong predictor of adherence ($\chi^2 = 20.48$, $p < 0.001$), as mothers with good knowledge of vaccine schedules and diseases prevented ensured higher completion rates. Similarly, attitude toward immunization was significantly associated with adherence ($\chi^2 = 15.62$, $p < 0.001$), with positive attitudes correlating with higher compliance. Service delivery factors were also significant. Distance to the health facility influenced adherence ($\chi^2 = 9.14$, $p = 0.002$), with mothers living closer more likely to complete immunization. Waiting time at the facility was strongly associated ($\chi^2 = 14.25$, $p < 0.001$), with shorter waiting times corresponding to higher adherence

Discussion

The findings of this study provide a comprehensive understanding of the socio-demographic characteristics, knowledge, attitudes, and determinants of immunization defaulters among children aged 0–5 years in Akure North Local Government Area, Ondo State. The socio-demographic data revealed that the majority of respondents were within the age range of 28–37 years (50%) and predominantly married (80%), Yoruba (80%), and Christian (92%). Most respondents had attained secondary (39%) or tertiary education (46%), indicating that the population comprised mothers with relatively high literacy levels, which is consistent with studies showing that maternal education significantly influences child health behaviors, including immunization adherence (Antai, 2020; Adeyemi & Badeola, 2019). Analysis of knowledge regarding the immunization schedule indicated a high level of awareness among respondents, with all participants (100%) aware of the schedule and the importance of vaccination in preventing common childhood diseases such as tetanus, tuberculosis, measles, yellow fever, and hepatitis. Most respondents correctly identified the timing of the first vaccine dose at birth (100%), the recommended intervals between doses (89%), and the full duration of immunization up to 15 months (100%). Additionally, 77% of respondents understood that immunization does not cause paralysis, 80% knew the required number of vaccine doses, 90% correctly identified the diseases prevented by BCG, OPV, and measles vaccines, and 73% were aware of the consequences of missed vaccine doses. This high level of knowledge aligns with findings from Gidado et al. (2014), who reported that maternal knowledge positively influences the likelihood of completing immunization schedules. However, the finding contrasts with earlier reports from Birhanu (2016) and global CDC data, which indicate that parental knowledge of immunization schedules remains low in many African settings, reflecting regional disparities in health education and access to information (WHO, 2019). The assessment of attitudes towards immunization revealed that nursing mothers generally exhibited positive perceptions and behaviors. Most respondents (98%) adhered to the recommended immunization schedule, 87% had not missed any appointment, and 92% believed that the benefits of immunization outweighed potential side effects. All respondents (100%) perceived immunization as beneficial and not time-wasting, while 40% reported stress in

maintaining the schedule, and 60% did not find it stressful. This finding is consistent with studies in similar Nigerian contexts where positive maternal attitudes were associated with higher rates of routine immunization completion (Ayebo & Charles, 2019).

Despite the high levels of knowledge and positive attitudes, several systemic and personal factors were identified as contributors to non-completion of immunization. Work commitments affected 46% of respondents, while 30% cited vaccine unavailability at health facilities. Inconvenient immunization times were reported by 72%, financial constraints by 20%, and adverse reactions following immunization by 30%. Only 10% of respondents expressed disbelief in vaccination. Service delivery challenges, including long queues and waiting times (70%), distance to the facility (43%), occasional unavailability of health workers (20%), and negative staff attitudes (23%), were also significant. These findings corroborate prior research indicating that accessibility, service delivery efficiency, and caregiver-related factors significantly influence immunization completion (Animaw & Taye, 2016; Abdulraheem & Onajole, 2011). Inferential analysis using Chi-square tests demonstrated significant associations between maternal education, occupation, residence, knowledge, and attitude with immunization adherence. Service delivery factors such as distance to the health facility and waiting time were also significantly associated with adherence, emphasizing that structural and logistical barriers can undermine otherwise positive maternal knowledge and attitudes. These results align with evidence suggesting that both maternal characteristics and systemic factors jointly determine immunization outcomes in developing country contexts (Belachew, 2012; Funmilayo, 2013).

Conclusion

The study revealed that immunization knowledge and positive attitudes among nursing mothers in Akure North Local Government Area, Ondo State, are generally high, with the majority of respondents adhering to the recommended immunization schedule for their children. Despite this, several factors contribute to immunization defaulting, including maternal work commitments, inconvenient immunization times, long waiting periods at health facilities, distance to vaccination centers, occasional vaccine stock-outs, and negative attitudes of some health workers. Socio-demographic factors such as maternal education, occupation, and place of residence, alongside service delivery challenges, were significantly associated with immunization adherence. These findings underscore that while maternal awareness and attitude are critical, systemic and logistical barriers continue to hinder complete immunization coverage. Addressing these barriers through targeted health education, improved accessibility to health facilities, efficient service delivery, and supportive maternal interventions is essential to reduce immunization default rates and enhance child health outcomes in the study area.

References

1. Abdulraheem, I.S., Onajole, A.T., Jimoh, A.A.G. and Oladipo, A.R. (2011) Reasons for Incomplete Vaccination and Factors Missed Opportunities among Rural Nigeria Children. Journal of Public Health and Epidemiology, 3, 194-203.
2. Adeyemi E.O and Badeola J.F (2019Exploring Factors Influencing Immunization Utilization in Nigeria-A Mixed Methods Study
3. Animaw W, Taye W.(2016) Expanded program of immunization coverage and associated factors among children age 12–23 months in Arba Minch town and Zuria District, Southern Ethiopia, 2013. BMC Public Health. 2016;14:464.
4. Antai D. (2019) Inequitable childhood immunization uptake in Nigeria: a multilevel analysis of individual and contextual determinants. BMC Infect Dis. 2019;9(1):181.
5. Ayebo ES, Charles OE. (2019) Timeliness and completion rate of immunization among Nigerian children attending a clinic-based immunization service. J HealthPopulNutr. 2019 Jun;27(3):391–5

6. Belachew, T. (2012). Maternal health care utilization and immunization coverage in Ethiopia. *African Health Sciences*, 12(3), 404–412.

7. Birhanu, T. (2016). Knowledge and practice of immunization among mothers in African countries. *International Journal of Community Medicine*, 3(4), 897–903.

8. Funmilayo, A. (2013). Determinants of full child immunization among 12-23 months old in Nigeria (Doctoral dissertation). Retrieved

9. Gidado, S., Oladipo, O., & Ojo, J. (2014). Determinants of routine immunization coverage among children in Nigeria. *African Journal of Reproductive Health*, 18(1), 57–65.

10. Machingaidze S., Charles S. Wiysonge, Gregory D. H (2015) Strengthening the Expanded Programme on Immunization in Africa:

11. Maina LC, Karanja S, Kombich J. Immunization coverage and its determinants among children aged 12-23 months in a peri-urban area of Kenya. [cited 2019 Apr 18];Pan AfrMed J. 2013 14 Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3597865/ [PMC free article]

12. Mosiur Rahman, SarkerObaida-Nasrin (2018) Factors affecting acceptance of complete immunization coverage of children under five years in rural Bangladesh

13. Mustafi, Mohitul and Azad, Mir, Factor Influencing of Child Immunization in Bangladesh (2013). International Journal of Mathematics and Statistics Studies Vol.1, No. 3, pp-55 65, 2013, Available at SSRN: https://ssrn.com/abstract=2574776

14. National Population Commission - NPC/Nigeria and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF.

15. Nita Bharti, Ali Djibo (2016) Measuring populations to improve vaccination coverage Nigeria Demographic and Health Survey. Key indicators report. Nigeria: National Population Commission Abuja; 2018.

16. Odusanya O.O, Alufohai E.F (2018). Determinants of Vaccination Coverage in Rural Nigeria BMC Public Health, 8:381 doi:10.1186/1471-2458-8-381

17. Oladejo I.O. (2018) Nigerian rural mothers' knowledge of routine childhood immunization and attitudes about use of reminder text messages for promoting timely completion. J Public Health Pol 2019; 40: 459-477.

18. Oladokun RE, Lawoyin TO, Adedokun BO. Immunization status and its determinants among children of female traders in Ibadan, South-Western Nigeria. Afr J Med Med Sci. (2019) 38:9–15.

19. Oliveira M, Martinez E, Rocha J. Factors associated with vaccination coverage in children < 5 years in Angola. Rev SaudePublica. 2014;48(6):906 15. https://doi.org/10.1590/s0034-8910.2014048005284

20. Ogundele Z.F (2022) knowledge, attitude and factors responsible for non-completion of immunization schedule among nursing mothers in Akinyele Local Government Area, Oyo State

21. Ogundare, Odutola A, Mackenzie G, ,Afolabi MO.(2015) Coverage and timing of children's vaccination: an evaluation of the expanded programme on immunisation in The Gambia. PLoS One. 2015;9(9), e107280.

22. Ophori, E. A., Tula, M. Y., Azih, A. V., Okojie, R., and Ikpo, P. E. (2014). Current trends of immunization in Nigeria: Prospects and challenges. Tropical Medicine and Health, 42(2), 67–75.Socio-cultural Factors Influencing Immunization of Children in Ekiti State, Nigeria

23. Rahji and Ndikom (2013) Factors Influencing Compliance with Immunization Regimen among Mothers in Ibadan, Nigeria
24. Salisbury, Ramsay and Noakes, (2016) Effectiveness of Meningococcal B Vaccine against Endemic Hypervirulent Neisseria meningitidis W Strain, England
25. WHO. (2019). Immunization coverage and global vaccine strategies. Geneva: World Health Organization.