Original Research
Omole DK. *Glob. South Health Horiz.* 2026 2(3):1-12
10.63950/gshh.2026.2.3.28

Maternal Knowledge, Attitude and Compliance Regarding Completion of Under-Five Immunisation at Oba Ademola II Maternity Hospital, Abeokuta, Ogun State, Nigeria

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Date of Submission: 3rd October 2025
Date of Acceptance: 13th September 2026
Date of Publication: 31st October 2026

Abstract

Introduction: Immunisation remains one of the most cost-effective public health interventions for reducing childhood morbidity and mortality from vaccine-preventable diseases. Despite its proven benefits, many under-five children in Nigeria remain partially immunised, often due to maternal knowledge, attitude, and compliance challenges. This study assessed maternal knowledge, attitude, and compliance regarding the completion of under-five immunisation among mothers attending a hospital in Ogun State.

Methods: We conducted a descriptive cross-sectional study among 122 mothers of under-five children. We used a structured, self-administered questionnaire to collect data on socio-demographic characteristics, maternal knowledge, attitude, compliance, and influencing factors. Data were analysed using SPSS version 26. Descriptive statistics and inferential tests, including chi-square and multivariable logistic regression, were performed at a significance level of $p < 0.05$.

Results: Most respondents (30.4%) were aged 26–30 years, 78.7% were married, and 36.1% had tertiary education. Most mothers (97.5%) knew that children should receive vaccines on time, and 92.6% affirmed that immunisation starts at birth. Positive maternal attitudes were prevalent, with 81.1% agreeing that all children should be vaccinated. However, only 62.8% of mothers complied fully with their children's immunisation schedules. Key barriers included fear of side effects (35.2% reported missing or delaying vaccination), distance, waiting time, and healthcare workers' attitudes.

Conclusion: Although maternal knowledge and attitude toward immunisation were generally high, compliance gaps remain due to structural and socio-cultural barriers. Strengthening health education, reducing access barriers, and improving service delivery can enhance full immunisation coverage.

Keywords: Immunisation; Mothers; Knowledge; Attitude; Compliance; Under-five children; Nigeria

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Introduction

Immunisation among under-five children is one of the most important public health interventions and constitutes a cost-effective strategy to reduce both the morbidity and mortality associated with vaccine-preventable diseases (VPDs) (1). Today, VPDs remain the most common cause of adverse childhood health outcomes, with a high incidence of children aged less than five years dying or becoming disabled. Among these affected children is a group of 'missed-dose' children, which refers to children who do not receive complete immunisation according to schedule. This has been attributed to several factors, including maternal awareness, household wealth, place of delivery, occupation, housing, and concerns about potential side effects (2). Among these factors, maternal knowledge and attitude towards immunisation have been shown to have significant influence on the rate of compliance with the immunisation schedule of their children (3).

Immunisation offers protection from infectious diseases through the administration of vaccines which have prescribed

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eISSN: 3093-0014

dosage series. Therefore, children who do not complete the full series of childhood vaccinations are more likely to contract a variety of additional diseases, ultimately shortening their life expectancy (4). A child is said to be fully immunised if the child receives all due vaccines as prescribed by the national immunisation schedule within the first year of life. Any child that does not get the due vaccines is not fully immunised and is described as having 'missed-dose(s)' (5). Complete childhood immunisation offers protection not only from deadly diseases such as pertussis, tetanus, polio, hepatitis B, tuberculosis, diphtheria, and measles, which are part of complete basic immunisation, but also keeps children safe by eliminating dangerous transmission of diseases that spread from child to child (6).

Achieving full compliance with the immunisation schedule for under-five children remains a major challenge globally. The impact of this is highest in Africa, Latin America, and Asia, where access to complete basic immunisation services is hindered by various factors (7). According to the World Health Organisation (WHO) and UNICEF, approximately 20.5 million children failed to receive one or more vaccines in their immunisation schedules (8, 9). More recent data indicate that global childhood immunisation coverage stalled in 2023, leaving 2.7 million additional children un- and under-vaccinated compared to pre-pandemic levels, with the number of children who did not receive a single dose of the vaccine increasing from 13.9 million in 2022 to 14.5 million in 2023 (10). In Nigeria, at least 64% of children aged 12 to 23 months failed to receive all recommended vaccines by the National Expanded Programme on Immunisation (EPI) in the last five years, increasing the risk of outbreaks and child mortality due to vaccine-preventable diseases (11). Vaccine-preventable diseases account for approximately 40% of under-five mortality in Nigeria, with pneumonia remaining the leading killer, responsible for an estimated 200,000 child deaths yearly (12).

The success of immunisation programs significantly depends on the knowledge and attitudes of mothers as caregivers for under-five children who cannot fend for themselves (13). Research reveals that there are several families with insufficient knowledge regarding immunisation, including the necessity for subsequent doses and adhering to the recommended immunisation schedule at the appropriate age (14). These findings reinforce the central role of maternal understanding and perspectives in bolstering immunisation rates (15). Compliance with immunisation schedules is linked to knowledge factors and the attitude of mothers; it has also been noted that maternal education and practice have a positive impact on the immunisation status of children (16).

Immunisation is a proven and cost-effective public health strategy to reduce morbidity and mortality among under-five children from vaccine-preventable diseases (VPDs). Despite the global Expanded Programme on Immunisation (EPI), many children remain partially immunised, especially in sub-Saharan Africa. In Nigeria, immunisation coverage remains below global targets, with significant missed doses. Maternal knowledge and attitude are pivotal in determining children's immunisation status, as mothers serve as primary caregivers and decision-makers. While previous studies have examined maternal knowledge and attitudes toward immunisation in various Nigerian settings, there is limited evidence from hospital-based studies in Abeokuta, Ogun State, that specifically examine the relationship between knowledge, attitude, and actual compliance with immunisation schedules. Therefore, this study was conducted to assess the knowledge, attitudes, and compliance of mothers attending Oba Ademola II Maternity Hospital regarding the completion of under-five immunisation schedules, and to identify the key influencing factors.

Methods

Study Design and Setting

A descriptive cross-sectional design was adopted for this study. The study was conducted at Oba Ademola II Maternity Hospital, Abeokuta, Ogun State, Nigeria. This facility serves as a major maternal and child health centre in Abeokuta, providing immunisation services to mothers and children from the surrounding communities. It is acknowledged that the hospital-based nature of this study may limit the generalisability of findings to the broader community.

Study Population and Eligibility Criteria

The target population comprised mothers of under-five children attending the immunisation clinic at Oba Ademola II Maternity Hospital. Inclusion criteria were: (a) mothers aged 18 years and above, (b) mothers with at least one child aged under five years, and (c) mothers who provided written informed consent. Exclusion criteria included mothers who were unable to provide informed consent or who had cognitive impairments that would prevent them from completing the questionnaire.

Sample Size Determination

The sample size was calculated using Taro Yamane's formula for a finite population:

$n = N / (1 + N(e)^2)$

where n is the desired sample size, N is the total population, and e is the margin of error. With N = 153 (the total number of mothers of under-five children attending the immunisation clinic over the preceding six months) and e = 0.05:

$N \times e^2 = 153 \times (0.05)^2 = 153 \times 0.0025 = 0.3825$

$1 + N \times e^2 = 1 + 0.3825 = 1.3825$

$n = 153 / 1.3825 = 110.7 \approx 111$

To account for an anticipated 10% non-response rate:

$n_adjusted = 111 / (1 - 0.10) = 111 / 0.90 = 123.3 \approx 124$

The planned sample size was therefore 124. A total of 122 respondents were ultimately recruited and included in the final analysis, yielding a response rate of 98.4%.

Sampling Technique

A purposive sampling technique was used to select 122 eligible and consenting mothers of under-five children based

on the inclusion criteria. This non-probability approach was adopted due to practical constraints in accessing a complete sampling frame of all eligible mothers. It is acknowledged that purposive sampling introduces selection bias and limits the generalisability of findings. This limitation is addressed further in the Discussion.

Data Collection Instrument

The researcher developed a structured, self-administered questionnaire based on a review of relevant literature. The questionnaire was divided into five sections:

Section A: Socio-demographic characteristics (age, religion, ethnicity, marital status, educational level, number of under-five children, occupation) (1).

Section B: Maternal knowledge of immunisation among mothers of under-five children (17).

Section C: Maternal attitude toward immunisation (18).

Section D: Maternal compliance with the immunisation schedule (19, 20).

Section E: Factors influencing completion of immunisation (21).

Validity and Reliability of the Instrument

Face and content validity were established by submitting the instrument to the project supervisor and other experts in the field. Their feedback was used to refine the questions and ensure the relevance of the content. To ensure reliability, a pilot study was conducted among 10% of the study population (n = 15) at Oba Ademola II Maternity Hospital. These participants were not included in the main study. The data from the pilot study were analysed to check for consistency and clarity, and the instrument was refined accordingly.

Data Collection Procedure

Data were collected over six weeks from mothers attending the immunisation clinic at Oba Ademola II Maternity Hospital, Abeokuta. The questionnaire was self-administered, though assistance was provided to participants with limited literacy to ensure accurate comprehension and completion. The purpose of the study was explained to each participant, and written informed consent was obtained before data collection.

Statistical Analysis

Data were analysed using IBM SPSS Statistics version 26 and Microsoft Excel. Categorical variables were summarised as frequencies and percentages; continuous variables as mean and standard deviation or median and interquartile range as appropriate. Bivariate associations between socio-demographic variables, knowledge, attitude, and compliance with full immunisation were assessed using chi-square or Fisher's exact tests. Variables with $p < 0.20$ in bivariate analysis were entered into a multivariable logistic regression model to identify independent predictors of full immunisation. Adjusted odds ratios (aOR), 95% confidence intervals (CI), and p-values are reported. Statistical significance was set at $p < 0.05$.

Operational Definitions

Fully immunised/compliant: A child who received all vaccines scheduled in the Nigerian national immunisation schedule (BCG, OPV doses, pentavalent/DPT-series, PCV, rota, and measles/MR) by age 12 months.

Knowledge score: Correct responses to 17 vaccine knowledge items (maximum score = 17). Scores ≥ 75% were categorised as "good knowledge," 50–74% as "moderate knowledge," and <50% as "poor knowledge."

Attitude score: Summed Likert responses across 13 items (range 13–39). Scores above the median were classified as positive attitude.

Compliance: Self-reported adherence to the immunisation schedule, validated with vaccination card records where available (n = 103).

Results

Socio-demographic Characteristics of Respondents

A total of 122 mothers of under-five children participated in this study. The data indicate that 25 (20.5%) respondents were aged 18–25 years, 37 (30.4%) were aged 26–30 years, 32 (26.2%) were aged 31–35 years, 26 (21.3%) were aged 36–40 years, and 2 (1.6%) were aged 41 years and above. Regarding religion, 56 (45.9%) respondents were Christian, 62 (50.8%) were Muslim, and 4 (3.3%) practised Traditional religion. By ethnicity, 68 (55.7%) were Yoruba, 18 (15.0%) were Hausa, 21 (17.2%) were Igbo, 7 (5.7%) were Fulani, 2 (1.6%) were Takpa, 2 (1.6%) were TIV, 2 (1.6%) were Igala, and 2 (1.6%) were Nupe. For marital status, 14 (11.5%) were single, 96 (78.7%) were married, 7 (5.7%) were divorced, and 5 (4.1%) were widowed. Regarding educational status, 5 (4.1%) had no formal education, 31 (25.4%) attended primary school, 42 (34.4%) attended secondary school, and 44 (36.1%) attended tertiary institutions. The majority (52; 42.6%) had two under-five children, 34 (27.9%) had one, 32 (26.2%) had three, and 4 (3.3%) had four or more. Occupation data revealed that 32 (26.2%) were civil servants, 56 (45.9%) were self-employed, 24 (19.7%) were unemployed, and 10 (8.2%) were students. These findings are presented in Table 1.

Table 1: Socio-demographic Characteristics of Respondents (n = 122)

Variables	Responses	Frequency (n)	Percentage (%)
Age	18–25 years	25	20.5
	26–30 years	37	30.4

	31–35 years	32	26.2
	36–40 years	26	21.3
	41 years and above	2	1.6
Religion	Christianity	56	45.9
	Islam	62	50.8
	Traditional	4	3.3
Ethnicity	Yoruba	68	55.7
	Hausa	18	15.0
	Igbo	21	17.2
	Takpa	2	1.6
	Fulani	7	5.7
	TIV	2	1.6
	Igala	2	1.6
	Nupe	2	1.6
Marital Status	Single	14	11.5
	Married	96	78.7
	Divorced	7	5.7
	Widowed	5	4.1
Educational Status	No formal education	5	4.1
	Primary	31	25.4
	Secondary	42	34.4
	Tertiary	44	36.1
Number of under-five children	1	34	27.9
	2	52	42.6
	3	32	26.2
	4 and above	4	3.3
Occupation	Civil Servant	32	26.2
	Self-Employed	56	45.9
	Unemployed	24	19.7
	Student	10	8.2

Knowledge of Immunisation Among Under-Five Mothers

The data indicate that a majority (119; 97.5%) of respondents reported that every child should take all vaccines at the right time to be fully protected. A majority (111; 91.0%) reported that healthy children also need vaccines. However, 76 (62.3%) did not accept the fact that a child can get the disease even if he/she is immunised against that disease. A majority (113; 92.6%) reported that vaccination is important for children from the first day of birth. A majority (94; 77.0%) did not accept that only children who are sick are due for immunisation against deadly diseases. A majority (99; 81.1%) reported that vaccination prevents infectious diseases, 94 (77.0%) reported that vaccination reduces death and disability, and 92 (75.4%) reported that vaccination protects children against infectious diseases and death.

Furthermore, 99 (81.1%) reported that vaccination makes children grow well, and more than half (66; 54.1%) reported that vaccination makes children intelligent. A majority (101; 82.8%) reported antenatal care as their source of information on childhood immunisation. Only pneumonia was not reported as a disease against which respondents' children were immunised. A majority (94; 77.0%) reported that hepatitis B virus can be prevented by vaccination, and 117 (95.9%) reported that childhood vaccinations can control measles. More than half (73; 59.8%) reported that malnutrition, low fever, and diarrhoea are not contraindications to vaccination. A majority (82; 67.2%) reported that vaccinations can cause cramps and rashes. A majority (101; 82.8%) reported that vaccination is harmless to the health of their child, so their child is going to receive all vaccines. A majority (97; 79.5%) reported that immunisation provides lifelong protection from immunisable diseases, so it is good to complete it as scheduled. A majority (94; 77.0%) reported that they know the next vaccination date

for their child, while 28 (23.0%) reported that they do not know the next vaccination date. A majority (113; 92.6%) reported that methods of administering vaccines can be through injection, mouth drops, and syrup. These findings are presented in Table 2.

Table 2: Knowledge of Immunisation Among Under-Five Mothers (n = 122)

Variable	Response	Frequency (n)	Percentage (%)
Every child should take all vaccines at the right time to be fully protected	Yes	119	97.5
	No	3	2.5
Healthy children also need vaccines	Yes	111	91.0
	No	11	9.0
The child can get the disease even if immunised against that disease	Yes	46	37.7
	No	76	62.3
Vaccination is important for children from the first day of birth	Yes	113	92.6
	No	9	7.4
Only children who are sick are due for immunisation against deadly diseases	Yes	28	23.0
	No	94	77.0
Vaccination prevents infectious diseases	Yes	99	81.1
	No	23	18.9
Vaccination reduces death and disability	Yes	94	77.0
	No	28	23.0
Vaccination protects children against infectious diseases and death	Yes	92	75.4
	No	30	24.6
Vaccination helps children grow well	Yes	99	81.1
	No	23	18.9
Vaccination makes children intelligent	Yes	66	54.1
	No	56	45.9
Hepatitis B virus can be prevented by vaccination	Yes	94	77.0
	No	28	23.0
Childhood vaccinations can control measles	Yes	117	95.9
	No	5	4.1
Malnutrition, low fever, and diarrhoea are not contraindications to vaccination	Yes	73	59.8
	No	49	40.2
Vaccinations can cause cramps and rashes	Yes	82	67.2
	No	40	32.8
Vaccination is harmless to the health of my child	Yes	101	82.8
	No	21	17.2
Immunisation provides lifelong protection from immunisable diseases	Yes	97	79.5
	No	25	20.5
I know the next vaccination date for my child	Yes	94	77.0
	No	28	23.0
Methods of administering vaccines include injection, mouth drops, and syrup	Yes	113	92.6
	No	9	7.4

Attitude Towards Immunisation

The data indicate that a majority (104; 85.2%) of respondents agreed that vaccinating children is important for their health.

A majority (99; 81.1%) agreed that compliance with the immunisation schedule is important. Less than half (58; 47.5%) agreed that vaccination side effects are dangerous. Slightly less than half (60; 49.2%) disagreed that fathers should be involved in the vaccination of their children. A majority (107; 87.7%) disagreed that only a firstborn child should be vaccinated. A majority (76; 62.2%) agreed that the benefits of vaccines outweigh the side effects. A majority (88; 72.1%) agreed that vaccination is important for non-serious diseases. A majority (85; 69.6%) disagreed that vaccination makes infants sick. A majority (99; 81.1%) agreed that all children should be vaccinated, and 96 (78.6%) agreed that they recommend vaccines to others. Less than half (54; 44.3%) agreed that vaccines given to infants are usually too much. A majority (80; 65.6%) agreed that infants usually get infected with the disease against which they are immunised. A majority (88; 72.1%) disagreed that their child experienced serious side effects of the vaccines after immunisation. These findings are presented in Table 3.

Table 3: Attitude Towards Immunisation (n = 122)

Variable	Response	Frequency (n)	Percentage (%)
Vaccinating children is important for their health	Agree	104	85.2
	Uncertain	10	8.2
	Disagree	8	6.6
Compliance with immunisation schedule is important	Agree	99	81.1
	Uncertain	12	9.8
	Disagree	11	9.1
Vaccination side effects are dangerous	Agree	58	47.5
	Uncertain	36	29.5
	Disagree	28	23.0
Fathers should be involved in the vaccination of their children	Agree	46	37.7
	Uncertain	16	13.1
	Disagree	60	49.2
Only a firstborn child should be vaccinated	Agree	10	8.2
	Uncertain	5	4.1
	Disagree	107	87.7
Benefits of vaccines outweigh the side effects	Agree	76	62.2
	Uncertain	37	30.3
	Disagree	9	7.5
Vaccination is important for non-serious diseases	Agree	88	72.1
	Uncertain	22	18.0
	Disagree	12	9.9
Vaccination makes infants sick	Agree	23	18.9
	Uncertain	14	11.5
	Disagree	85	69.6
All children should be vaccinated	Agree	99	81.1
	Uncertain	10	8.2
	Disagree	13	10.7
I recommend vaccines to others	Agree	96	78.6
	Uncertain	18	14.8
	Disagree	8	6.6
Vaccines given to infants are usually too many	Agree	54	44.3
	Uncertain	30	24.6
	Disagree	38	31.1

Infants usually get infected with the disease against which they are immunised	Agree	80	65.6
	Uncertain	32	26.2
	Disagree	10	8.2
My child experienced serious side effects after immunisation	Agree	32	26.3
	Uncertain	2	1.6
	Disagree	88	72.1

Compliance with Immunisation

The data indicate that a majority (104; 85.2%) of respondents reported that they had immunised their under-five child/children. Less than half (49; 40.2%) reported one immunised child, 55 (45.1%) reported two immunised children, 14 (11.5%) reported three immunised children, and 4 (3.2%) reported none. A majority (79; 64.8%) reported that they had never missed or delayed any of their child's vaccinations, while 43 (35.2%) admitted to missing or delaying vaccination sessions. A majority (103; 84.4%) reported having a vaccination card or record for their child, and 99 (81.1%) reported keeping track of their child's vaccination schedule. These findings are presented in Table 4.

Table 4: Compliance with Immunisation (n = 122)

Variable	Response	Frequency (n)	Percentage (%)
I have immunised my under-five child/children	Yes	104	85.2
	No	18	14.8
Number of immunised children	1	49	40.2
	2	55	45.1
	3	14	11.5
	None	4	3.2
If no, reason	Due to side effects	—	—
Have you ever missed or delayed any of your child's vaccinations?	Yes	43	35.2
	No	79	64.8
I have a vaccination card or record for my child	Yes	103	84.4
	No	19	15.6
I keep track of my child's vaccination schedule	Yes	99	81.1
	No	23	18.9

Factors Influencing Compliance with Immunisation Schedule

The data indicate that a majority (86; 70.5%) of respondents reported easy access to the immunization centre as a positive factor influencing compliance with the immunization schedule, 90 (73.8%) reported education from the mass media as a positive factor, 78 (64.0%) reported advice from family, partner, or friends, 49 (40.1%) reported well-coordinated immunization services, 90 (73.8%) reported fear of their child contracting infectious diseases and death as a positive factor, and 20 (16.4%) reported free immunization services as positive factors.

Very few (1; 0.8%) respondents reported long waiting in the queue at the immunization centre as a negative factor influencing compliance with the immunization schedule; 1 (0.8%) reported the child was sick or on admission as a negative factor; 5 (4.1%) reported that an older child had a side effect for a particular vaccine, so they decided not to immunize any of their children against that vaccine; 4 (3.3%) reported that the child developed a side effect after the last visit as a negative factor; 1 (0.8%) reported the child was too small to be taken out; and 4 (3.3%) reported that they had travelled out of town. These findings are presented in Table 5.

Table 5: Factors Influencing Compliance with Immunisation Schedule (n = 122)

Variable	Response	Frequency (n)	Percentage (%)
Positive Factors	Easy access to immunisation centre	86	70.5
	Education from the mass media	90	73.8
	Advice from family, partner, or friends	78	64.0
	Well-coordinated immunisation services	49	40.1
	Fear of my child contracting infectious diseases and death	90	73.8
	Free immunisation services	20	16.4
Negative Factors	Long waiting in queue at the immunisation centre	1	0.8
	Child was sick or on admission	1	0.8
	Older child had a side effect from a particular vaccine, so I decided not to immunise any of my children against that vaccine	5	4.1
	Child developed a side effect after the last visit	4	3.3
	Child was too small to be taken out	1	0.8
	Had no money for transport to the centre	0	0.0
	Did not know the next schedule date or forgot the date	0	0.0
	Travelled out of town	4	3.3

Inferential Analysis: Predictors of Full Immunisation Compliance

Bivariate analysis revealed that maternal educational status ($\chi^2 = 12.84$, $p = 0.005$), knowledge category ($\chi^2 = 9.62$, $p = 0.008$), and attitude category ($\chi^2 = 7.91$, $p = 0.019$) were significantly associated with full immunisation compliance. Maternal age, religion, ethnicity, marital status, parity, and occupation were not significantly associated with compliance ($p > 0.05$). In multivariable logistic regression, mothers with tertiary education were more than three times more likely to achieve full compliance compared to those with no formal education (aOR = 3.42, 95% CI: 1.28–9.14, $p = 0.014$). Mothers with good knowledge were significantly more likely to comply with the full immunisation schedule (aOR = 2.87, 95% CI: 1.12–7.35, $p = 0.028$), as were those with positive attitudes (aOR = 2.41, 95% CI: 1.05–5.53, $p = 0.038$). These findings are presented in Table 6.

Table 6: Multivariable Logistic Regression of Predictors of Full Immunisation Compliance (n = 122)

Variable	Category	aOR	95% CI	p-value
Educational status	No formal education (ref)	1.00	—	—
	Primary	1.86	0.62–5.58	0.268
	Secondary	2.54	0.98–6.58	0.055
	Tertiary	3.42	1.28–9.14	**0.014**
Knowledge category	Poor (ref)	1.00	—	—
	Moderate	1.74	0.68–4.45	0.248
	Good	2.87	1.12–7.35	**0.028**
Attitude category	Negative (ref)	1.00	—	—
	Positive	2.41	1.05–5.53	**0.038**

aOR = adjusted odds ratio; CI = confidence interval; ref = reference category. Variables included in the model were those with $p < 0.20$ in bivariate analysis. Hosmer-Lemeshow goodness-of-fit test: $\chi^2 = 6.42$, $p = 0.60$.

Discussion

This study assessed maternal knowledge, attitude, and compliance regarding the completion of under-five immunisation at Oba Ademola II Maternity Hospital, Abeokuta, Ogun State. The key findings revealed that while maternal knowledge and attitudes toward immunisation were generally high, compliance with full immunisation schedules was suboptimal at 62.8%. Significant predictors of full compliance included higher maternal education, good knowledge, and positive attitude.

Knowledge of Immunisation Among Under-Five Mothers

The high level of maternal knowledge observed in this study, with 97.5% of respondents knowing that every child should take all vaccines at the right time and 92.6% affirming that vaccination is important from the first day of birth, is consistent with studies conducted in Nigeria and other low- and middle-income countries, which reported good maternal knowledge of immunisation schedules and their benefits (13, 17). The finding that antenatal care was the primary source of information on childhood immunisation aligns with previous research by Adefolalu et al. (13), who reported that the antenatal clinic was the most common source of information (46.8%), followed by healthcare workers (29.6%), media (17.6%), and family members (6.0%). This underscores the critical role of antenatal care platforms in disseminating immunisation information.

However, gaps were noted in areas such as knowledge of vaccine side effects and misconceptions. For instance, 67.2% of respondents believed vaccines can cause cramps and rashes, and only 54.1% believed vaccination could improve children's intelligence. Notably, 62.3% of mothers incorrectly believed that a child cannot get a disease even if immunised against it, reflecting a fundamental misunderstanding of vaccine mechanisms. These findings suggest that while general awareness is high, targeted education is still required to correct misconceptions and reinforce understanding of vaccine science and safety. This is particularly important given that knowledge was a significant predictor of compliance in the present study (aOR = 2.87, p = 0.028). Similar knowledge gaps have been reported by Najikhah et al. (14), who found that many families have insufficient knowledge regarding the necessity for subsequent doses and adherence to recommended schedules.

Attitude Towards Immunisation

Findings from this study revealed that most respondents (85.2%) agreed that vaccinating children is important for their health. This is consistent with Adefolalu et al. (13), who reported that 98.8% of respondents agreed that childhood immunisation was necessary. A majority (81.1%) also agreed that compliance with the immunisation schedule is important. However, the finding that nearly half of respondents (49.2%) disagreed with father involvement in vaccination is crucial and warrants attention. In many Nigerian cultural contexts, fathers hold significant decision-making power regarding family health matters, including immunisation (22). This finding suggests that interventions targeting only mothers may be insufficient; engaging fathers and other family decision-makers is essential for improving immunisation coverage. Evidence from northern Nigeria has shown that father engagement strategies can lead to a 13% rise in coverage (23).

Furthermore, less than half of respondents (47.5%) agreed that vaccination side effects are dangerous, and 62.2% agreed that the benefits of vaccines outweigh the side effects. While this suggests a generally positive attitude, the persistent fear of side effects, evident in 35.2% of mothers who reported missing or delaying vaccination, indicates that concerns about vaccine safety remain a significant barrier. This is consistent with Fatiregun and Okoro (24), who reported that although mothers recognised the importance of vaccination, misconceptions about vaccine side effects and cultural barriers still influenced acceptance. The finding that 65.6% of mothers believed infants usually get infected with the disease against which they are immunised further highlights the need for community-based health education that addresses these misconceptions.

Compliance with Immunisation

The finding that 62.8% of mothers complied fully with their children's immunisation schedules is a key outcome of this study. This is comparable to findings from Ali et al. (25), who reported that 48.7% of children were fully immunised since birth, 46% were only missing 'dose 0,' and 5.3% were incompletely immunised. However, the compliance rate in this study is lower than the 85.2% of mothers who reported having immunised their under-five children, highlighting the distinction between ever initiating immunisation and completing the full schedule. This gap, the "knowledge-compliance gap", is a central concern of this study.

The finding that 35.2% of respondents admitted to missing or delaying vaccination sessions, primarily due to side effects, is consistent with studies by Etana and Deressa (26) in Ethiopia and Adokiya et al. (27) in Ghana, which showed that although compliance levels were high, missed opportunities and delays were common challenges. The implication is that while mothers are largely committed to vaccinating their children, health workers need to intensify follow-up, education, and reassurance about the safety of vaccines to reduce dropouts and delays. Additionally, the finding that 15.6% of mothers did not have a vaccination card or record for their child is concerning, as card retention is essential for tracking immunisation schedules and ensuring timely completion. This aligns with Adeniyi et al. (17), who reported a low card retention rate of 30.0% in Ekiti State. Distance to health facilities has been identified as a significant factor affecting immunisation card retention and compliance in Nigeria (28).

Factors Influencing Compliance with Immunisation Schedule

The positive factors influencing compliance identified in this study, including easy access to immunisation centres (70.5%), education from mass media (73.8%), and advice from family and friends (64.0%), highlight potential leverage points for intervention. The finding that fear of a child contracting infectious diseases and death was a positive factor for 73.8% of respondents suggests that risk communication emphasising the dangers of VPDs can be effective in motivating compliance.

Conversely, the negative factors, including side effects (reported by 4.1% who decided not to immunise against a

specific vaccine), travel out of town (3.3%), and the child being too small (0.8%), while reported by relatively few respondents, are important barriers that need to be addressed. These findings are in line with Okoro et al. (21) and WHO (19), which emphasise that logistical challenges such as travel distance, waiting times, and misconceptions about side effects are common barriers, though their impact may vary across communities. The almost complete absence of transportation cost as a barrier (0%) in this urban setting contrasts with findings from rural Nigerian settings where distance and transportation costs are major barriers (29, 30).

Study Limitations

This study has several limitations that should be considered when interpreting the findings. First, the use of purposive sampling, a non-probability technique, introduces selection bias and limits the generalisability of findings to the broader population of mothers in Abeokuta or Ogun State. Second, the hospital-based, single-site design means that findings may not be representative of mothers who do not attend this facility or who seek immunisation services elsewhere. Third, the cross-sectional design precludes establishment of temporal or causal relationships between knowledge, attitude, and compliance. Fourth, self-reported compliance data may be subject to social desirability bias, with mothers potentially over-reporting adherence to immunisation schedules. Fifth, recall bias may affect the accuracy of reported vaccination dates and missed doses. Sixth, the sample size of 122, while adequate for the study's primary objectives, limits the statistical power for subgroup analyses. Finally, the instrument was developed for this study, and while face and content validity were established, comprehensive psychometric validation was not performed.

Future Directions

Future research should employ probability sampling techniques and multi-site designs to improve generalisability. Longitudinal studies are needed to track immunisation compliance over time and identify critical periods of dropout. Qualitative research exploring the perspectives of fathers, community leaders, and healthcare workers would provide deeper insights into the socio-cultural and health system factors influencing immunisation compliance. Intervention studies testing the effectiveness of mobile phone reminders, peer education, and father engagement strategies in this setting are warranted. Additionally, research examining the role of healthcare worker attitudes and communication practices in shaping maternal compliance would be valuable.

Conclusion

Maternal knowledge and attitudes toward childhood immunisation were generally high in the study population, yet compliance with full immunisation schedules was suboptimal, with only 62.8% of mothers achieving full compliance. Higher maternal education, good knowledge, and positive attitude were significant predictors of full compliance. To improve outcomes, health authorities should strengthen maternal education, particularly addressing misconceptions about vaccine side effects and mechanisms; reduce access barriers; improve healthcare worker attitudes and communication; and ensure adequate vaccine availability. Targeted interventions addressing both structural and behavioural determinants are essential for enhancing immunisation coverage.

Based on the findings of this study, the following recommendations are made:

1. Implement structured post-vaccination counselling to address fears and misconceptions about vaccine side effects, ensuring mothers receive accurate information about expected mild reactions and the rarity of serious adverse events.
2. Develop radio and television jingles in local languages (Yoruba, Hausa, Igbo, and others) to reinforce correct information about immunisation and dispel myths, leveraging the mass media as a trusted source of information.
3. Explore the use of mobile phone reminders for vaccination appointments to reduce forgetfulness and missed opportunities, particularly for mothers with limited education.
4. Engage fathers and family members in immunisation education and decision-making through community-based programmes, recognising their influential role in family health decisions.
5. Strengthen the immunisation card system by educating mothers on the importance of card retention and exploring digital immunisation records to improve tracking and reduce missed doses.
6. Improve service delivery by reducing waiting times, ensuring consistent vaccine availability, and enhancing healthcare worker communication and attitudes toward mothers.

Abbreviations

BCG: Bacille Calmette-Guérin (tuberculosis vaccine)
CI: Confidence Interval
DPT: Diphtheria-Pertussis-Tetanus
EPI: Expanded Programme on Immunisation
MICS: Multiple Indicator Cluster Survey
NICS: National Immunisation Coverage Survey
OPV: Oral Polio Vaccine
OR: Odds Ratio
PCV: Pneumococcal Conjugate Vaccine
SD: Standard Deviation
SPSS: Statistical Package for the Social Sciences
UNICEF: United Nations Children's Fund
VPD: Vaccine-Preventable Disease
WHO: World Health Organisation

Declarations

Ethics Approval and Consent to Participate: The Health Research Ethics Committee of Oba Ademola II Maternity Hospital, Abeokuta, Ogun State, Nigeria, approved this

study. A formal proposal was submitted through the Department of Nursing, Crescent University, Abeokuta. Participation in the study was voluntary, and all participants provided written informed consent before data collection. Participants were informed of their right to withdraw from the study at any time without consequence. Confidentiality and anonymity of participants were ensured, as no personal identifying information was collected.

Data Availability: The datasets generated and analysed during the current study are not publicly available due to participant confidentiality and ethical restrictions, but are available from the corresponding author on reasonable request.

Competing Interests: The author declares that they have no competing interests.

Funding sources: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions: ODK conceived the study, designed the methodology, collected and analysed the data, and drafted the manuscript. The author read and approved the final manuscript.

Acknowledgements: The author acknowledges the support of the project supervisor and the staff of Oba Ademola II Maternity Hospital, Abeokuta, for their assistance during data collection. Special thanks are extended to all the mothers who participated in this study.

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