

GLOBAL JOURNAL OF MEDICAL RESEARCH: K INTERDISCIPLINARY Volume 25 Issue 2 Version 1.0 Year 2025 Type: Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Online ISSN: 2249-4618 & Print ISSN: 0975-5888

# Assessment of Levels of Immunization and Factors Associated with the Non-completion Routine Immunization within (9-12 Months) Attending Primary Healthcare Centres in Ibadan North and South East, Nigeria

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GJMR-K Classification: NLMC Code: WA 115, WA 540



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# Assessment of Levels of Immunization and Factors Associated with the Non-completion Routine Immunization within (9-12 Months) Attending Primary Healthcare Centres in Ibadan North and South East, Nigeria

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Abstract- Immunization is designed to prevent transmittable diseases and it is an integral public medical intervention and an economical method to decline mortality and morbidity associated with transmittable diseases. This work attempts to determine the vaccine coverage and factors related to the non-completion routine immunization within babies (9-12 months) attending Primary Healthcare Centre (PHC) in Ibadan North and South East Local Government Areas, Oyo State. The descriptive cross-sectional study research design was employed for this work. Health belief model theory and multistage sampling procedures were applied to choose 422 participants from all the chosen PHCs in the study location. The results indicated that complete immunization coverage for all five childhood vaccines in both sites were low (69.5%) relative to the WHO stipulated guideline of 80%. Overall results revealed that the complete immunization coverage from the sampling site for children 12 months of age was 69.7% and 69.5% for children among 9-11 months. The findings of survey indicated that percentage of vaccine coverage reduces as child age increases. Mothers/caregivers' knowledge of vaccination, perception concerning vaccination and sociodemographic factors like educational status, occupation, and monthly earnings were all statistically significantly correlated

with complete immunization in children. This study concluded that knowledge and perception control behavior and disposition of mothers/caregivers towards vaccination. Thus, health personnel and health educators need to underscore the significance of vaccination and likewise seek to decry all the wrong believes and negative attitudes on vaccination.

*Keywords:* vaccine coverage, factors, non-completion routine immunization, children within 9-12 months, preventable diseases, Ibadan.

# I. INTRODUCTION

mmunization denotes building up people's immune response against an agent. Immunization is a more accessible means to get immune to a particular disease, and it is less hazardous (*Fiore et al., 2019*). Vaccines are necessary for both infants and of ages because they defend against the several diseases. Aside from defending infants against life-limiting illnesses, immunization as well assists in building body's defences of infants (*Fiore et al., 2019*). The prescription of a vaccine to help the immune response build defense against diseases is termed vaccination. Vaccines comprise a microbe or virus in a destroyed or weakened condition, or proteins or toxins from the living organism.

Immunization of children against six preventable diseases (diphtheria, pertussis, tuberculosis, polio, tetanus, and measles) is essential to decline childhood morbidity and fatality. Immunization continues to be one of the most cost-efficient and integral public healthcare interventions to reduce child morbidity and mortality. Globally, childhood vaccination is projected to prevent from 2 to 3 million mortalities yearly (Meleko et al., 2017). Using immunizations, a few infectious diseases have been eliminated in most regions of the Earth planet. One instance of such is smallpox and poliomyelitis. Polio is still common in a few nations of the earth and a few people might still be at menace of contacting it, particularly those who have never received the vaccine, people who didn't obtain all doses of the vaccine, and those that journey to regions of the earth in which polio Year 2025

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is still rampant. Immunization is a proven device efficient to prevent and eliminate transmittable diseases. The WHO conducted an immunization crusade between 1967 and 1977 and it led to the eradication of smallpox.

At the beginning of programme, smallpox still threatened 60% of the earth's population. Likewise, the destruction of poliomyelitis is presently possible. Since the inauguration via WHO and its partners of the Global Polio Eradication Initiative in 1988, infection has dropped by 99%, and nearly five million individuals eluded paralysis. It was predicted that from year 2000 to 2008, measles mortalities worldwide fallen by above 78%, in regions of the earth established a goal to eradicate prevalence of polio disease. Neonatal and maternal tetanus have been eliminated from 20 of the 58 heavy-risk nations (*Masresha et al., 2018*).

In man's history, the development and broad dissemination of childhood vaccines have been one of the ultimate successes of public health. Initiatives like Expanded Programme on Immunization (EPI) through WHO promoted coordinated, nation-level development in routine vaccination (e.g., tetanus, diphtheria, pertussis, polio, measles, and BCG), and laid the roots for attempts to bring in fresh vaccines and further increase coverage over the future decade. The EPI continues to be devoted to its aim of global access to all crucial vaccines (*Masresha et al., 2018*).

Empirical reviews have indicated that the mortality of children takes place more often in the growing countries. Essentially, children residing in African nations die yearly as a result of avoidable transmittable diseases. Similarly, Epidemiological accounts in African zones indicate 'nine million mortalities of children globally due to vaccine-avoidable diseases (Masresha et al., 2018), and a greater percentage which is 4.4 million happened in sub-Saharan Africa'. This is considerably attributed to weak immunization coverage and health problems in sub-Saharan Africa. Furthermore, in many areas of Africa, immunization facilities have not been ideal, especially for routine immunization which is known as the critical factor for below vaccination of children (Hill et al., 2021).

In 2017, around 20% of babies in the globe with incomplete DPT immunization lived in Nigeria (*Obanewa et al., 2020*), and three million out of the projected 8.9 million children in the WHO African Zone who were not vaccinated against measles in 2015 are residing in Nigeria (*Obanewa et al., 2020*). Therefore, Nigeria represents nearly 40% of the 28279 measles cases stated in the WHO African Zone in 2016 (*Masresha et al., 2017*). Nigeria has a yearly population growth rate of 2.83% which makes Nigeria the most thickly populated nation in Africa and is the second most significant factor contributory to below–five fatality universally (*Masresha et al., 2018*). There are marked differences across geopolitical regions with vaccination coverage and

completion, which vary from around 50% in the South-South and South-West to 27, 14, and 10% in the North-East, North-Central, and North-West Nigeria, respectively (*Masresha et al., 2017*).

All states in Nigeria fall under the global goal of 80% coverage for three doses of pentavalent immunization. Performance level of immunization is poorest in North West or North East areas where all the states falls under 50% pentavalent coverage. Children residing in the rural areas are half as possibly to be immunized than those in built-up areas and children of younger and less educated caretakers are at most threat (*Hill et al., 2021*).

Immunization is a vital vision of the PHC system in Nigeria. One of the significant aspects emphasized by the worldwide community is accomplishing global health coverage, and PHC is a needed foundation for these endeavors. Vaccination is an integral part of international health coverage, which is fundamental to PHC. Nevertheless, a few factors like medical distrust, sociopolitical factors, unfriendly behaviours of medical personnel, poor medical systems, clashes between programmes, and supplementary immunization activities are contributing factors that hinder sufficient immunization coverage in *PHCs (Masresha et al., 2017; Hill et al., 2021)*.

An investigation on rural-urban disparities in demographic factors and related immunization status among children of 12-59 months in a south-western region of Nigeria indicates that immunization coverage was relatively high but yet substandard in the southwestern part of Nigeria (ljarotimi et al., 2018). Maternal factors were observed to control immunization status. Other factors in line with the research are location and paternal factors, which are highly related to immunization coverage in the south-western zone of Nigeria. Also, in Oyo State, a survey on unacceptable rates of immunization coverage in governmental recognized factors related to the accomplishment of a total child vaccination schedule in Ido LGAs and Ibadan North East (LGAs) of Oyo State, Nigeria (Fatiregun et al., 2013) The investigation revealed that the status of complete immunization coverage was unacceptable in nearly all the clinic wards (Fatiregun et al., 2013).

Immunization is vital in the prevention of infectious and poor immunization is ascribed to some diseases in little one; hence, it is crucial to evaluate factors that result in non-completion routine immunization in little one. Depending on this proposition, the purpose of this study was to investigate the level of vaccination and factors accountable for noncompletion routine immunization within (9-12 months) attending PHCs in Ibadan North and South East LGAs, Nigeria and offer lasting solution Oyo State, recommendations to the challenge of incomplete immunization status.

# II. MATERIALS AND METHODS

Descriptive cross-sectional analysis was carried out on mothers/caregivers who attended immunization programs in Ibadan North and South East Local Government, Oyo State, Nigeria during November 2019-April 2020. Depending on geographical areas, the study site was separated into two zones: Ibadan North and Ibadan South East. Then the three PHCs each from both Ibadan North and South East LGAs were randomly chosen from this zones and sampling was conducted utilizing multistage sampling technique. The work was approved by the Research Ethics Review Committee of Department of Planning, Research, and Statistics Division, Ministry of Health, Oyo State, Nigeria (code number: AD 13/479/4307A) and written informed consent was obtained from all the participants. After explaining the objectives of the research, the questionnaires were completed by the subjects or researcher in case of illiteracy of the participants. Inclusion criteria were being an all mother/caregiver with children between 9 and 12 months attending immunization clinic at the chosen PHCs in Ibadan North and South East LGA, and those that tend to participate investigation. Exclusion in the criteria were mother/caregiver with children having health problems resulting in hospitalization. The sample size of the survey was estimated as 422 utilizing the Cochran formula the unidentified population, with a standard deviation of the score being 10 ( $\sigma$ =10), the error value of 1 (d=1), type I error ( $\alpha$ =.05, z=1.96) taking into consideration a 10% attrition.

# a) Data Collection

Four questionnaires were employed for data gathering as follows: (i) socio-demographic factors of participants; (ii) child immunization coverage; (iii) knowledge, perceptions, and attitude towards child vaccination; and (iv) associated factors with child vaccination coverage in PHCs'.

# b) Demographic Questionnaire

The demographic factors form comprised nine items regarding age, marital status, education qualification, number of children, occupation, monthly earnings, religion, ethnicity, and baby's age.

# c) Child Immunization Coverage Questionnaire

The child immunization coverage questionnaire was a researcher-made tool comprising thirteen items. The items covered the areas of vaccinating the child after birth is a piece of common knowledge among mothers in our local government area; we, don't think there is adequate immunization coverage in health clinics within my community; all, statutory child vaccines are readily available in health clinics within my community, has your child ever received polio, measles, pneumococcal (PMV) vaccine, yellow fever, and pentavalent immunizations? Has your child ever received any vaccinations, drops, or injections in the past?, Has your child ever received an injection in the right upper arm or shoulder that usually results in a scar? The vaccine is not available in many clinics in my community, where does your child usually receive vaccinations? Where did your child receive their most recent vaccination?

The validity of the questionnaire was confirmed by an authorized letter of introduction from the Department of Public Health, Faculty of Basic and Medical Science, Lead City University, Ibadan, by interviewing technique employing KoBo collect androids application in each LGA by the researcher with the assistance of trained research assistants who were students from colleges of Health Technology with the support of health officers working in the chosen centers picked for the investigation. Also, the test-retest reliability was determined by giving the questionnaire to 10 eligible people in two rounds with a14-day duration. The Chi-square was calculated as 23.544 and 27.528, which were significantly different at the p<0.001.

## d) The Measure of Parental/Caregivers' Knowledge and Misperceptions of Routine Immunization Questionnaire

The questionnaire comprises ten questions, and the questions dealt with the areas of childhood vaccines are vital for my child's health, getting vaccines is a good way to protect our child/children from diseases, measles vaccine needs to be obtained at nine months, vaccination schedule needs to be completed before twelve months?, oral polio ought to be received three times?, several communities and caregivers reject RI because of rumors, false information, and fear, lack of confidence and trust in RI as effective health interventions seem to be pretty common in all regions of Nigeria; RI, is to depopulate the society; RI will make their children infertile when they grow up, and we are afraid that our child/children will be affected with virus.

e) Associated Factors with Child Immunization Coverage in Primary Healthcare Centers Questionnaire

The questionnaire involved fourteen questions and contained three sublevels comprising why the child was not vaccinated, why the child hasn't had all recommended vaccines, and health officers' attitudes. This questionnaire measured the associated factors with child immunization coverage and determine of medical worker attitude. The overall knowledge level for child vaccination was estimated as the composite of five knowledge questions, which comprised whether the participants knew the significance of vaccine to health, whether the vaccine is a suitable means to defend the child from disease, knowledge of the age measles vaccine needs to be given, awareness on whether vaccination has to be completed before 12 months, and the number of times polio vaccines needs to be given. Assessment of Levels of Immunization and Factors Associated with the Non-completion Routine Immunization within (9-12 Months) Attending Primary Healthcare Centres in Ibadan North and South East, Nigeria

Those who had the correct answer to each knowledge questions were graded 1 point and those who didn't know were graded 0 point. The knowledge mark was estimated as the sum of all knowledge questions with a lowest mark of 0 and highest mark of 5. The knowledge status of participants was classified as good knowledge when participants grade was more significant than the average mark (which was 2), and poor knowledge when grade was below the average mark. Depending on the total mark in this questionnaire, the samples were categorized as negative perception concerning RI (1 mark) and positive perception regarding RI (0 mark) groups. The validity and reliability of this instrument were approved in research conducted by the WHO Vaccination Coverage Survey published in 2018 and reviewed in 2019 *(NDHS, 2019)*. Furthermore, the authors evaluated the reliability and validity of this instrument in Nigeria by interviewing procedure utilizing the KoBo collect androids application *(Hill et al., 2021)*. In this work, the validity of this questionnaire was estimated using the informed content validity. For this the questionnaire was submitted to 10 experts, the confirmation of whom was indicative of approved informed content validity. More so, intending to measure the reliability of the questionnaire, ten eligible people completed the questionnaire in two rounds with 14 days. By the way, the Chi-square between the questionnaire marks was found to be 23.544 and 27.528.



Fig. 1: Field Sampling from the Researcher from One of the PHCs in Ibadan

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#### Data Analysis f)

Statistical analysis was conducted utilizing SPSS software (Statistical Package for the Social Sciences, version 21.0, SPSS Inc., Chicago, Illinois, USA). We used descriptive (e.g., frequency, mean, standard deviation, percentage, bar, and pie charts) and inferential (e.g., regression analysis) statistics. Lastly, p<0.05 was regarded as significantly different.

# III. Results

#### Search Results and Survey Characteristics a)

Socio-demographic characteristics of the study participants: 422 mothers/caregivers of children aged 9 to 12 months were involved in this work. The age of the respondents varied between 14 and 34 years, with an average of 29±6.17 years. The most represented age class was 24 to 28 (37.9%). The proportion of the study population following the study geographical distribution was 54% for Ibadan South East while 46% for Ibadan North LGA. Among the PHCs, 115 (27.3%) were Boluwaji PHC. Four hundred and seven (97.4%) mothers/caregivers were married, 6 (1.4%) were single, and 4 (1.0%) were widowed/separated/cohabiting. One hundred and twenty-two (28.9%) mothers/caregivers' had a level of education at least equivalent to a secondary school certificate, while 93 (22%), 87 (20.6%), 42 (10%), 49 (11.6%), and 2 (0.5%) stated possessing a primary school certificate, OND, HND, BSc, and Postgraduate certificates, and 27 (6.4%) had no formal education. Of the 422 participants involved in this assessment, 146 (34.6%), 242 (57.3%), and 34 (8.1%) had 1 to 2 children, 3-4 children, and five and more children, respectively. Concerning occupation, 203 (48.6%) study participants were traders. About religion, 174 (41.2%) were Christian, 241 (57.1%) were Islam, while 7 (1.7%) were other religions; 41.3% of the study population had a mean monthly income of between 0 and 18,000 Naira; the most common ethnic group in the study population was Yoruba (69%). There was a significant relationship between age group, marital level, academic status of females, women's employment level, women's monthly income, number of children, religions, and ethnic status. Details of the sociodemographic profile of the respondents are shown in Table 1.

Table 1: Summary of Measure of Demographic Variables based on Descriptive Statistics The number of participants=422

Attributes	Frequency (n)	Percentage (%)
Mean age: 29.29 ± 6.17		
Age group		
14 to 18 years	11	2.6
19 to 23 years	43	10.2
24 to 28 years	160	37.9
29 to 33 years	108	25.6
34 years and above	100	23.7
Total	422	100.0
LGA		
Ibadan North	194	46.0
Ibadan Southeast	228	54.0
lotal	422	100.0
Primary Health Centre		
Idi Ogungun PHC	103	24.4
Agbowo PHC	52	12.3
Basorun PHC	39	9.2
Molete PHC	71	16.8
Algon Comprehensive PHC	42	10.0
Boluwaji PHC	115	27.3
Total	422	100.0
Marital Level		
Single	6	1.4
Married	407	97.4
Cohabiting	1	.2
Widowed/separated/cohabiting	4	1.0
Total	418	100.0
Academic Status		
No formal education	27	6.4
Primary school leaving certificate	93	22.0
Secondary school certificate	122	28.9
OND	87	20.6
HND	42	10.0

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BSC	49	11.6
Postgraduate	2	0.5
Total	422	100.0
Number of Children		
1-2 Children	146	34.6
3-4 Children	242	57.3
Five or more Children	34	8.1
Total	422	100.0
Occupation		
Housewife	66	15.8
Trader	203	48.6
Artisan	35	8.4
Skilled worker	53	12.7
Civil servant	59	14.1
Other, identify	2	0.5
Total	418	100.0
Monthly Income (Naira)		
0 - 18,0000	173	41.3
19,000-40,000	126	30.1
41,000-60,000	52	12.4
81,000-80,000	33	7.9
	33 410	0.4 100.0
lotai	419	100.0
Religion		
Christianity	174	41.2
Islam	241	57.1
Others	7	1.7
Total	422	100.0
Ethnic Status		
Yoruba	292	69.2
Igbo	49	11.6
Hausa	77	18.2
Others	4	0.9
Total	422	100.0

Source: Author's Computation, (2022)

## b) Coverage of Childhood Immunization in the two Lgas In Ibadan Primary Healthcare Centers

Immunization coverage of children aged 9 to 12 months in the two LGA in Ibadan Primary Healthcare Centres of the 422 children aged 9 to 12 months involved in this survey, 77.7% received polio immunization, 62.3% obtained measles immunization, 66.8% obtained pneumococcal immunization, 59.2% had yellow fever vaccination, 78.2% obtained pentavalent vaccination, 89.3% received any vaccination drops or injections in the past. In contrast, 84.4% received injection in the right upper arm (Figures 2-8).



Assessment of Levels of Immunization and Factors Associated with the Non-completion Routine

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Figure 2: Percentage of Children Reported to Have Ever Received Polio Immunization by Study Geography



Figure 3: Percentage of Children Stated to Have Ever Received Measles Immunization by Study Geography

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*Figure 4:* Percentage of Children Reported to Have Ever Received Pneumococcal (PCV) Immunization by Study Geography



Figure 5: Percentage of Children Reported to Have Ever Received Child Yellow Fever Vaccine by Study Geography



Figure 6: Percentage of Children Reported to Have Ever Received Pentavalent Immunization by Study Geography



Figure 7: Percentage of Children Reported to Have Ever Received any Vaccinations, Drops, or Injections in the Past by Study Geography

### Assessment of Levels of Immunization and Factors Associated with the Non-completion Routine Immunization within (9-12 Months) Attending Primary Healthcare Centres in Ibadan North and South East, NIGERIA



Figure 8: Percentage of Children Reported to Have Ever Received any Injection in the Right Upper Arm (Measles Vaccine) in the Past by Study Geography

Missed immunization determined was employing the five scheduled immunization. Out of 422 children within 9 - 12 months, 90 (21.3%) missed at least one of expected scheduled immunization and was high among children that are 12 months (see Table 2). Reasons for missed vaccination of mothers of children aged 9 to 12 months who were not or partially vaccinated in the Ibadan healthcare centers in 2022.

Ninety mothers/caregivers of children aged 9 to 12 months who were not or partially vaccinated gave the reasons for not vaccinating of their child. Visits to the clinic were not on the date of vaccination (32% and 51%), the child fell sick (46% and 24%), there was no vaccine (7% and 12%), and waiting was too much (4% and 7%) were the four reasons most often mentioned (Table 2).

Table 2: Summary of Missed Immunization Schedule based on Child's Age

Sn	Child's Age	Nos of Child	Nos. of Missed	% missed	Nos. vaccinated	% vaccinated
1	Nine months	94	2	2.1	92	97.9
2	Ten months	72	7	9.7	65	90.3
3	Eleven months	154	47	30.5	107	69.5
4	Twelve months	102	34	33.3	68	66.7
	Total	422	90		332	

Source: Author's Computation, (2022)



Figure 9: Reasons for Missing Vaccination of Children in both Study Locations

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c) Summary of Caregiver and Child Immunization Characteristics

Caregiver child immunization and characteristics are classified into five subtitles: (i) vaccinating the child after birth is a piece of common knowledge among mothers; (ii) no adequate immunization coverage in health clinics within the community; (iii) all statutory child vaccines are readily available in health clinics within the community; (iv) place of usual child vaccinations; and (v) place of most recent child vaccination (see Table 3). They are classified by frequency of inclusion in the assessments examined, denoted 'n'. In précis, the most often recognized factors for evaluating caregiver and child munization characteristics were: vaccinating the child after birth agree (n = 187, 44.3%); no adequate immunization coverage in health clinics agree (n = 209, 49.5%); all statutory child vaccines are readily available in health clinics agree (n = 158, 37.4%); place of usual child vaccinations (n = 407, 96.4%); and place of most recent child vaccination (n = 401, 95%).

	Table 3: Summary	of Caregiver	and Child	Immunization	Characteristics
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Variables	Frequency (n)	Percentage (%)
Vaccinating the child after birth is a piece of common knowledge among mothers.	22	00.7
Strongly agree	96	22.7
Agree	187	44.3
Neither agree nor disagree	5	1.2
Disagree	132	31.3
Strongly disagree	2	0.5
Total	422	100
There is no adequate immunization coverage in health clinics within the community		
Strongly agree	48	11.4
Agree	209	49.5
Neither agree nor disagree	13	3.1
Disagree	151	35.8
Strongly disagree	1	0.2
Total	422	100
All statutory child vaccines are readily available in health clinics within the community		
Strongly agree	67	15.9
Agree	158	37.4
Neither agree nor disagree	10	2.4
Disagree	185	43.8
Strongly disagree	2	0.5
Total	422	100
Place of usual child vaccinations		
Local government health clinic	407	96.4
Local private doctor's office	4	0.9
Secondary healthcare facility	2	0.5
In a private healthcare facility	9	2.1
Total	422	100
Place of most recent child vaccination		
Local government health clinic	401	95
Local private doctor's office	8	1.9
Secondary healthcare facility	2	0.5
In a private healthcare facility	11	2.6
Total	422	100

Source: Author's computation, (2022)

- d) Summary Parental/Caregivers of Knowledge. Perceptions, and Attitude towards Child Vaccination
  - i. Summary of Participant's Knowledge of Child Vaccination

Most knowledge and misperceptions were assessed as part of a multi-factorial approach to increase childhood vaccination coverage and were identified as adequate by the respective study authors. Specific expertise and misperceptions are classified into six subheadings: (i) childhood vaccines are essential for a child's health; (ii) getting vaccines is a good way to protect children from diseases; (iii) measles vaccine is received at nine months; (iv) vaccination schedule should be completed by twelve months; and (v) oral polio should be received three times (see Table 4). They are computed by frequency in the incorporated works, termed below as 'n'. In a nutshell, the most generally mentioned knowledge comprised childhood vaccines are essential for child's health (n = 297, 70.4%); getting vaccines is a good way to protect children from diseases (n = 329, 77.9%); measles vaccine is received at nine months (n = 244, 57.9%); vaccination schedule needs to be completed by twelve months (n = 161, n = 161)38.2); and oral polio must be received three times (n = 224, 53.1%). In general, expertise was estimated with the composite immunization knowledge score of participants, which indicated 41% for high knowledge and 59% for low knowledge regarding immunization. Higher knowledge was found among participants in Ibadan North (52.6%) than in Ibadan South East (31.1%).

Variables	Frequency (n)	Percent (%)
Childhood vaccines are essential for a child's health		
Strongly agree	169	40.1
Agree	128	30.3
Neither agree nor disagree	63	14.9
Disagree	24	5.7
Strongly disagree	38	9.0
Total	422	100.0
Getting vaccines is a good way to protect children from diseases	s	
Strongly agree	217	51.4
Agree	112	26.5
Neither agree nor disagree	36	8.5
Disagree	34	8.1
Strongly disagree	23	5.5
Total	422	100.0
Measles vaccine is received at nine months		
Strongly agree	178	42.3
Agree	66	15.6
Neither agree nor disagree	18	4.3
Disagree	104	24.6
Strongly disagree	56	13.2
Total	422	100.0
The vaccination schedule should be completed within twelve mc	onths	
Strongly agree	76	18.0
Agree	58	13.7
Neither agree nor disagree	161	38.2
Disagree	56	13.3
Strongly disagree	71	16.8
Total	422	100
Oral polio should be received three times		

Table 4: Summary of	Participant's	Knowledge Profile on	Child Vaccination
<u> </u>		5	

Variables	Frequency (n)	Percent (%)
Strongly agree	15	3.6
Agree	33	7.8
Neither agree nor disagree	224	53.1
Disagree	52	12.3
Strongly disagree	98	23.2
Total	422	100

Source: Author's Computation, (2022)

ii. Summary of Participant's Perceptions towards Child Vaccination

Most respondent's perceptions were assessed regarding child vaccination. Specific perceptions are classified into six classes: (i) many communities and caregivers reject routine immunization due to rumors, incorrect information, and fear; (ii) lack of confidence and trust in routine immunization as effective health interventions appear to be relatively common in all parts of Nigeria; (iii) routine immunization is to depopulate the community; (iv) routine immunization will make children impotent when they grow up; (v) afraid that child/children will be infected with a virus; and (vi) it is not a crime in my religion to be vaccinated (see Table 5). They are categorized by frequency in the included works, regarded below as 'n'. In conclusion, the most regularly stated perceptions consisted of many communities and caregivers reject routine immunization

due to rumors, incorrect information, and fear (n = 269), 53.8%): lack of confidence and trust in routine immunization as effective health interventions appears to be relatively common in all parts of Nigeria (n = 216, 51.2%); routine immunization is to depopulate the community (n = 213, 50.4%); routine immunization will make children impotent when they grow up  $(n = 264, \dots, n = 264)$ 62.6%); afraid that child/children will be infected with a virus (n = 193, 45.8%); and it is not a crime in my religion to be vaccinated (n = 298, 70.6 %). Generally, perception was evaluated with the composite immunization perception score of participants, which signified 30.6% for good perception and 69.4% for poor perception concerning immunization. Good perception was obtained more among participants in Ibadan South East (39.9%) likened to Ibadan North (19.6%) as displayed in Figure 8.

Table 5. Summary of Participant's Perceptions towards Unite Vaccinatio
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Variables	Frequency (n)	Percentage (%)
Many communities and caregivers reject routine immunization due to rumors, incorrect information, and fear		
Strongly agree	154	36.5
Agree	115	27.3
Neither agree nor disagree	54	12.8
Disagree	43	10.2
Strongly disagree	56	13.2
Total	422	100.0
Lack of confidence and trust in routine immunization as effective health intervention appears to be relatively common in all parts of Nigeria		
Strongly agree	113	26.8
Agree	103	24.4
Neither agree nor disagree	59	13.9
Disagree	78	18.5
Strongly disagree	69	16.4
Total	422	100
Routine immunization is to depopulate the community		
Strongly agree	62	14.7
Agree	53	12.6
Neither agree nor disagree	94	22.3

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### Assessment of Levels of Immunization and Factors Associated with the Non-completion Routine Immunization within (9-12 Months) Attending Primary Healthcare Centres in Ibadan North and South East. NIGERIA

Variables	Frequency (n)	Percentage (%)
Disagree	112	26.5
Strongly disagree	101	23.9
Total	422	100
Routine immunization will make children impotent when they grow up		
Strongly agree	61	14.4
Agree	40	9.5
Neither agree nor disagree	57	13.5
Disagree	121	28.7
Strongly disagree	143	33.9
Total	422	100
Afraid that child/children will be infected with a virus		
Strongly agree	77	18.3
Agree	58	13.7
Neither agree nor disagree	94	22.2
Disagree	110	26.1
Strongly disagree	83	19.7
Total	422	100
It is not a crime in my religion to be vaccinated		
Strongly agree	144	34.1
Agree	154	36.5
Neither agree nor disagree	8	1.9
Disagree	94	22.3
Strongly disagree	22	5.2
Total	422	100

Source: Author's Computation, (2022)

iii. Summary of Participant's Perceived Barriers to Child Vaccination

Most participants perceived barriers to child vaccination. Specific perceived barriers are classified into nine subtitles: (i) health staff who deal with mothers in an unfavorable, rude, and sometimes abusive manner were found to be associated with the mother's refusal for bringing children for vaccination; (ii) health workers shouting at mothers who forgot to bring their children's immunization record cards or missed scheduled appointments affects the completion of RI services; (iii) behaviour of healthcare workers could undermine trust in the health workers and could also discourage caregivers from listening to health education messages; (iv) healthcare workers with calm and friendly attitude towards caregivers increases respond to vaccination information during RI session; (v) lack of confidence in healthcare workers made me not complete my child's immunization; (vi) lack of vehicular movement hinders my child immunization; (vii) mothers that are domiciled near a health facility providing RI services are more likely to fully immunize their children than those living in areas

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where there are no health facilities providing RI close to them; (viii) long walking distances, as well as long waiting time at the facility, are critical factors associated with poor completion of RI schedules ; and (ix) lack of good roads to health centre affected my child's immunization completion (see Table 6). Perceived barriers for non-vaccination of mothers/caregivers of children aged 9 to 12 months who were not or partially vaccinated in the Ibadan North and Ibadan South East health district in 2022. Four hundred and twenty-two mothers/caregivers of children aged 9 to 12 months who were not or partially vaccinated gave the reasons for not vaccinating their child. Health staff who deal with mothers in an unfavorable, rude, and sometimes abusive manner (n = 368, 87.2%); health workers shouting at mothers who forgot to bring their children's immunization record cards or missed scheduled appointments affects the completion of RI services (n= 337, 79.8%); behaviour of healthcare workers could undermine trust in the health workers and could also discourage caregivers from listening to health education messages (n= 335, 79.3%); healthcare workers with calm and friendly attitude towards caregivers increases respond to vaccination information during RI session (n=345, 77.7%); lack of confidence in HCWs made me not complete my child's immunization (n=299, 70.8%); lack of vehicular movement hinders my child immunization (n= 292, 69.2%); mothers that are domiciled near a health facility providing RI services are more likely to fully immunize their children than those living in areas where there are no health facilities providing RI close to them (n= 333, 78.9%); long walking distances, as well as long waiting time at the facility, are critical factors associated with poor completion of RI schedules (n= 334, 78.1%); and lack of good roads to health centre affected my child's immunization completion (n= 325, 77.0%) were the nine reasons most frequently mentioned.

Table 6:	Summary of	Participant's	Perceived Barri	iers to Child	Vaccination
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Variables	Frequency (n)	Percent (%)
Health staff who deal with mothers in an unfavorable, rude, and sometimes abusive manner were found to be associated with the mother's refusal to bring children for vaccination.		
Strongly agree	197	46.7
Agree	171	40.5
Neither agree nor disagree	3	0.7
Disagree	31	7.4
Strongly disagree	20	4.7
Total	422	100
Health workers screaming at mothers who forgot to bring their children's immunization record cards or missed scheduled appointments affect the completion of RI services Strongly acros	162	38.4
Agroo	175	41 A
	0	41.4
	0	1.9
	10	10.0
Stroligiy disaglee	12	2.8 100
TOTAL	422	100
Behaviour of healthcare workers could undermine trust in the health workers and could also discourage caregivers from listening to health education messages.		
Strongly agree	195	46.2
Agree	140	33.1
Neither agree nor disagree	8	1.9
Disagree	59	14.0
Strongly disagree	20	2.8
Total	422	100
HCWs with calm and friendly attitudes towards caregivers increase response to vaccination information during RI sessions.	106	40.0
	160	40.0
Agree	159	37.7
Neither agree nor disagree	2	0.5
Disagree	56	13.3
Strongly disagree	19	4.5
Iotal	422	100
Lack of confidence in healthcare workers made me not complete my child's immunization.		
Strongly agree	176	41.7
Agree	123	29.1
Neither agree nor disagree	11	2.6
Disagree	94	22.3

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Strongly disagree	18	4.3
Lack of vehicular movement hinders my child's immunization		
Strongly agree	147	34.8
Agree	145	34.4
Neither agree nor disagree	11	2.6
Disagree	95	22.5
Strongly disagree	24	5.7
Total	422	100
Mothers who are domiciled near a health facility providing RI services are more likely to fully immunize their children than those living in areas where there are no health facilities are providing RI close to them. Strongly agree	187	44 3
Agroo	146	34.6
Neither agree per disagree	140	2 0
	50	2.0 12.0
Strongly disagree	10	13.9
Long walking distances, as well as long waiting times at the facility, are critical factors associated with poor completion of RI schedules	10	4.4
Strongly agree	158	37.4
Agree	176	41.7
Neither agree nor disagree	14	3.3
Disagree	61	14.5
Strongly disagree	13	3.1
Total	422	100
The lack of good roads to the health center affected my child's immunization completion		
Strongly agree	196	46.4
Agree	129	30.6
Neither agree nor disagree	13	3.1
Disagree	68	16.1
Strongly disagree	16	3.8
Total	422	100

Source: Author's Computation, (2022)

iv. Summary of Associated Factors with Child Immunization Coverage in Ibadan North and South East Primary Healthcare Centers

Associated factors with child immunization coverage in 9-12 months children are classified into ten subheadings: (i) knowledge of vaccination; (ii) perception of child vaccination; (iii) LGA; (iv) age category; (v) occupation; (vi) number of children; (vii) marital status; (viii) academic status; (ix) monthly income; and (x) religion (see Table 7). They are categorized by frequency of inclusion in the works investigated, regarded as 'n' (see also Table 7). In short, the most often determinant factors for estimating child immunization coverage utilizing Chi-square were: knowledge of vaccination (23.544), perception of child vaccination (27.528), LGA (1.293), age category (4.034), occupation (27.318), number of children (8.316), marital

status (7.734), educational qualification (27.318), monthly income (20.521); and religion factors (1.091).

Multivariable regression analysis to model employing the probability ratio technique (forward: LR) was used to estimate the share of association between vaccination knowledge, perception, and sociodemographic factors in the prediction of the complete vaccination among children while controlling for the confounders. This analysis revealed that knowledge of vaccination was the significant predictors of vaccination coverage. Among these three variables (e.g., knowledge, perception, and socio-demographic factors), the level of knowledge was the most influential factor in this respect (AOR: 0.34, CI: 0.19 - 0.58, p < 0.001), followed by the level of perception (AOR: 0.28, CI: 0.16 - 0.47, p<0.001). Generally, the likelihoods of exposure to complete immunization coverage were 0.34 and 0.28, respectively (see Table7).

#### Received all five Received less than five vaccines at nine vaccines at nine months and Factors Total X² Р months and above above Ν % Ν % Knowledge of Vaccination Low knowledge 175 70.3 74 29.7 249 23.544 0.000 High knowledge 92 81 46.8 53.2 173 Total 256 60.7 166 39.3 422 Perception of child vaccination Poor perception 202 68.9 91 31.1 293 27.528 0.000 75 Good perception 54 41.9 58.1 129 Total 256 60.7 166 39.3 422 LGA Ibadan North 57.7 82 42.3 194 1.293 0.255 112 Ibadan South East 144 63.2 84 36.8 228 Total 256 60.7 166 39.3 422 Age category 8 72.7 3 27.3 11 4.034 14 to 18 years 0.401 28 65.1 15 19 to 23 years 34.9 43 24 to 28 years 88 55.0 72 45.0 160 29 to 33 years 70 64.8 38 35.2 108 34 years and above 38 62 62.0 38.0 100 Total 256 60.7 166 39.3 422 Occupation Housewife 41 62.1 25 37.9 66 27.318 0.000 Trader 144 70.9 59 29.1 203 Artisan 22 35 13 37.1 62.9 Skilled worker 27 50.9 26 49.1 53 26 33 59 Civil servant 44.1 55.9 Other, specify 2 100.0 0 0.0 2 Total 253 165 60.5 39.5 418 Number of children 1-2 children 51.4 71 146 8.316 0.000 75 48.6 3-4 Children 160 66.1 82 33.9 242 Five or more children 21 61.8 13 38.2 34 Total 60.7 166 39.3 422 256 Marital Status 16.7 5 83.3 6 7.734 0.052 Single 1 157 407 Married 250 61.4 38.6 Cohabiting 100.0 0 0.0 1 1 Widowed/separated 1 25.0 3 75.0 4 165 Total 253 60.5 39.5 418 Educational Qualification 22 5 27 No formal education 81.5 18.5 27.318 0.000 Primary education 71 76.3 22 23.7 93 Secondary education 77 63.1 45 36.9 122 Higher education 86 47.8 94 52.2 87 Total 256 60.7 166 39.3 422

## Table 7: Summary of Associated Factors with Child Immunization Coverage using Chi- Square

Factors	Received le vaccines months and	ess than five at nine dabove	Received vaccines months above	all five at nine and	Total	X	Р
Monthly Income							
0 - 18,0000	121	69.9	52	30.1	173	20.521	0.000
18,000-40,000	57	45.2	69	54.8	126		
41,000-60,000	31	59.6	21	40.4	52		
61,000-80,000	20	60.6	13	39.4	33		
81,000 and above	25	71.4	10	28.6	35		
Total	254	60.6	165	39.4	419		
Religion							
Christianity	101	58.0	73	42.0	174	1.091	0.580
Islam	150	62.2	91	37.8	241		
Others	5	71.4	2	28.6	7		
Total	256	60.7	166	39.3	422		

Source: Author' Computation, (2022)

# IV. DISCUSSION OF FINDINGS

By result of this work, the status of immunization coverage varies in both Local Government Areas and vaccine. Coverage of many vaccines were high while few were low. The pentavalent vaccine had the maximum (79%) overall mean coverage in both Ibadan North (92%) and Ibadan South East (66%). Polio immunization coverage comes next to that of pentavalent with overall mean coverage rate (77.7%) in Ibadan North (92.3%) and Ibadan Southeast (65.4%), respectively. Pneumonia had an overall vaccine rate (68.3%) with Ibadan North (87%) and Ibadan South East (49.6%). Measles overall vaccination rate (62.3%) with Ibadan North had (59.3%) and Ibadan South East (64.9%). Yellow fever overall injection rate (59%) with Ibadan North (59%) and Ibadan South East (60%), respectively. It is clear from the finding of study that pentavalent, polio, pneumonia, measles, and yellowfever vaccine had coverage rate that were above average in both LGAs. Notwithstanding, the coverage of pentavalent, polio, and pneumonia vaccines were more in Ibadan North relative to Ibadan South East, while measles injection rate was more remarkable in Ibadan South East than Ibadan North and the rate is just at the same range for yellow-fever in both LGAs. The immunization status in Ibadan North and Ibadan South East were poor likened to the result in a survey carried out in Osun State Nigeria that detected 80% coverage rate for all antigens administered at birth. These vaccines (BCG, OPV0, and HBV1) had greater coverage levels (Adedire et al., 2016).

Furthermore, results signified that the percentage of missed vaccination was lower in Ibadan North (14%) with Ibadan South East (43.9%) and primary reason for missed vaccination is child sickness, the rest reasons indicated were no vaccine at the clinic and long waiting time at the health center. The work obtained complete immunization coverage for all five vaccines at

39.3%. The status of immunization coverage in this work is likewise related to Ibadan North East and Ido by *Fatiregun et al. (2013)*, which revealed that the weighted complete injection coverage was 40.2% and 41.3% in Ibadan North East and Ido, respectively.

Our results showed that awareness and knowledge of vaccines among mothers/caregiver were high, more significant part (70%) of participants were conscious that childhood vaccines were crucial for the child and significant percentage (78%) expressed that receiving vaccines for their child is a best method to immune the child from illnesses. Notwithstanding, caregivers understanding on particular immunization information like vaccination date for all injections were not very sufficient because more significant part of them counts on records on vaccination cards and database offered by health personnel.

About perception, just 39.9% of sampled caregivers in Ibadan South East had good perception concerning immunization and few (19.6%) had good perception toward immunization in Ibadan North. More significant part of the sampled respondents are still of the notion that vaccination may be utilized to depopulate the society and children may become infertile or affected with virus. The result of this analysis is related to the deduction of *Fatiregun et al. (2013)* result that shows that non-completion of immunization or non-immunization is mostly be as a result of unawareness regarding injection schedule and fear of aftermaths of vaccination.

Hints on factors associated with poor immunization coverage indicate that more significant part (64%) of caregivers assumed that rumors of aftermaths, inadequate information, and fear inhibit complete immunization coverage in both Ibadan North and Ibadan South East. The rest indicated factors resulting in mothers rebuff to bring children for vaccination are related to negative attitude of health personnel. For health officer attitude causing hindrance to complete immunization program, this work is not the just work that detects the attitude and conduct of health officers as hindrance to immunization coverage. The study by *Rahji and Ndikom (2013)*, determined in Ibadan too concur that health providers' attitude is a factor hinders conformity with vaccination schedules. Most mother/caregivers may find it hard to relate sufficiently with some health officers and this poor relational association may deter the immunization completion.

Our results also revealed that caregivers' understanding of vaccination, perception concerning vaccination, and the socio-demographic, for example, academic status, mothers' profession, and earnings, are all related to complete immunization in children. Mothers/caregivers who have a good knowledge of vaccination had significantly higher proportion of their children who acquired all five vaccines. Also, mothers/caregivers with poor perception of child vaccination had a reduced percentage of their children obtaining all five vaccinations. Other factors that statistical significance with vaccination indicated coverage were work, parity, academic status, and earnings. Nevertheless, age of the mothers/caregivers was not statistically associated with immunization coverage rate. This result is in harmony with the result in Bungudu, Zamfara State, North West Nigeria (Adedokun et al., 2017), signified that degree of knowledge on RI and obtaining at a minimum secondary school is considerably related to complete immunization. Likewise, this study is in agreement with the Abdulraheem et al. (2020) finding that indicates that there is no statistical differences about immunization fullness as a result of determinants like marital level, age of mothers', and sex of the child. Thus, the results of this work and previous literature affirmed the reality that the academic status of the mother/caregiver is more crucial to immunization coverage than the rest of demographic factors like age or marital level; this could be a result of the truth that there is no age that is most likely be excessive or inadequate for dissemination of information, any person at any age class or marital level could fathom and use any medical associated information specified by health workers.

Moreover, Shelton et al. (2013) deduced in their work that the profession of mothers/caregivers can deter the completion of immunization in children. Occupation schedule particularly in public servants are continuously hard to change, so mothers who fall under this group of labor force who usually resume at 8 in the morning which is the similar time appoint for most immunization appointment may find it hard to attend all injection schedules. Likewise, result from this work is in harmony Ethiopian research which ascribed with the unawareness concerning immunization to poor coverage. The work too asserted that children of mothers that understood the age in which vaccination needs to begin and finishes have the probability to finish vaccination appointment likened to those whose mothers are uneducated of RI appointment (*Shelton et al., 2013*).

# V. Conclusion

Immunization is directed at the averting of infectious diseases and it is a crucial community medical intervention and a cost-efficient approach to decline fatality and morbidity related to infectious diseases. Complete immunization coverage for all the five vaccines in Ibadan North and Ibadan South East is low relative to the WHO guideline limit. Notwithstanding, a few critical child vaccine like pentavalent, polio, pneumonia, measles, and yellow-fever vaccine had coverage level that were more than average in both LGAs. Causes for missed vaccination were child sickness, lack of vaccine at the health center, long waiting time at the medical building, and poor attitude of health personnel. Conscious and understanding of vaccines among caregiver in both Ibadan North and Ibadan South East were high and knowledge of childhood vaccines were crucial to adequate children. Mothers/caregivers' vaccination of understanding of vaccination, perception regarding immunization and the socio-demographic like academic qualification, mothers' profession, and earnings were all related to complete vaccination in children. Mothers/caregivers who have good knowledge on immunization had considerably more significant proportion of their children who had all five vaccines. Similarly, mothers/caregivers with low perception of child immunization have a reduced proportion of their children getting all five vaccinations. Other factors that demonstrated statistical differences with immunization coverage are profession, parity, academic level, and earnings. Nevertheless, age of mothers/caregiver was not significantly associated with vaccination coverage status. This study recommended that health officers and health educators need to stress the significance of immunization and also attempt to decry all the wrong beliefs and negative attitudes on immunization.

# VI. LIMITATION OF THE STUDY

The following are limitations to the work:

- 1. Participants Potential Social Desirability, bias among participants, and the truth that causality from a cross sectional study cannot be determined and there is limitation to potential generalization of results.
- 2. Participants Attitude: Because of the nature of technique of gathering data (Kobo Collect) which is unpopular not like printed questionnaire, the participants felt hesitant to answers the question willingly as anticipated but with compelling clarification and education, they thereafter concurred.

3. COVID-19 Pandemic Associated Factors; The pandemic which has led to a new rule of wearing masks and physical distancing hindered the participants to willingly relate but after several episodes of data gathering they conformed.

# Acknowledgements

This study is taken from a MSc dissertation of Community Health approved by the Research Ethics Review Committee of Department of Planning, Research, and Statistics Division, Ministry of Health, Oyo State, Nigeria (code number: AD 13/479/4307A). The authors express their thanks for the cooperation and assistance of the authorities of the Department of Public Health, Faculty of Basic and Medical Science, Lead City University, Ibadan, and all the organizations and people who assisted us in this work. We also thank health officials and members of Health Committees of Ibadan North and South East Health Districts for facilitating this work. The authors are also grateful to the anonymous reviewers for their enlightening, constructive, and helpful comments on the paper.

# Statement of Competing Interests

The author(s) declared no potential conflicts of interest in terms of the research, authorship, and/or publication of this manuscript.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this paper.

# Abbreviations:

EPI: Expanded Program on Immunization;

GAVI: Global Alliance for Vaccines and Immunization; WHO: World Health Organization;

DTP: diphtheria, tetanus, and pertussis vaccine;

HDI: Human Development Index;

USA: United States of America;

PHC: Primary Health Care service;

*RI:* Routine immunization; HCWs: healthcare workers

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