Chapter One

Introduction

1.1 Background to the Study

Immunization refers to the process of fortifying individual's immune system against an agent. Immunization is aneasier way to become immune to a specific disease and it is less risky[1.] Vaccines are essential for both children and adults because it protects from the many diseases. Apart from protecting children against deadly diseases, immunization also helps in developing immune systems of children[1]. The administration of a vaccine to assist the immune system develop defense against diseases is called Vaccination. Vaccines contain a microorganism or virus in a killed or weakened state, or proteins or toxins from the organism.

Immunization of children against six avoidable diseases (diphtheria, Pertussis, tuberculosis, polio, tetanus, and measles) is crucial to reduce childhood morbidity and mortality. Immunization remains one of the most cost-effective and essential public health interventions to decrease child morbidity and mortality. Worldwide, childhood vaccination is estimated to avert between 2 and 3 million deaths each year[2.] Through immunizations, some infectious diseases have been eradicated in most parts of the World. One example of such is small pox and poliomyelitis. Polio is still found in some countries of the world and some individuals may still be at risk of contacting it, especially those who have never had the vaccine, individuals who didn't receive all doses of the vaccine, and those that travel to areas of the world where Polio is still prevalent, Polio.Immunization is a proven tool useful to control and eradicate infectious diseases. The World Health Organization carried out an immunization campaign from 1967 to 1977 and it resulted in the annihilation of smallpox. At the start of programme, smallpox still endangered 60% of the world's population. Similarly, the eradication of poliomyelitis

is now feasible. Since the launch by World Health Organization and its associates of the Global Polio Eradication Initiative in 1988, infection has fallen by 99%, and about five million people escaped paralysis. It was estimated that between year 2000 and 2008, measles deaths globally dropped by over 78%, in parts of the world set a target to eliminate incidence of polio disease totally. Neonatal and maternal tetanus have been eliminated from 20 of the 58 high-risk countries[3].

In human history, the development and wide distribution of childhood vaccines has been one of the utmost achievements of public health. Initiatives such as Expanded Programme on Immunization (EPI) by WHOencouraged coordinated, country-level progress in routine vaccination (eg, tetanus, diphtheria, pertussis, polio, measles, and BCG), and laid the bases for efforts to bring in new vaccines and further enhance coverage over the next decade. The EPI remains committed to its goal of worldwide access to all relevant vaccines. The programme aims to increase target groups to include adults, adolescents and older children. The programme is expected to work in synergy with other public health programmes in order to control diseases and achieve improved health for all populations, mostly the underserved populations.

Empirical studies have shown that death of children occurs more frequently in the developing world. Predominantly, children living in African countries die every year due to preventable communicable diseases. Also Epidemiological records in African regions show 'nine million deaths of children worldwide as a result of vaccine-preventable diseases[3], and a bigger percentage which is 4.4 million occurred in sub-Saharan Africa'. This is significantly credited to poor immunization coverage and other health challenges in sub-Saharan Africa. Also, in several parts of Africa, immunization facilities have not been optimal, particularly for routine immunization which is identified as the major factor for under vaccination of children[4].

Report on vaccine-preventable diseases show that roughly‘60% of children that were not reached by routine immunization services were from ten countries and the majority of these countries are from sub-Saharan African region which include Nigeria[5]. Data shows that‘13.5 million infants had not received any dose of vaccination while 19.4 million did not receive the third dose of DPT’[8].

In 2017, about twenty percent of infants in the world with incomplete DPT immunization lived in Nigeria[5], and three million out of the estimated 8.9 million children in the WHO African Region who were not vaccinated against measles in 2015 are living in Nigeria[6]. Hence, Nigeria accounts for almost forty percent of the 28279 measles cases reported from the WHO African Region in 2016[7]. .Nigeria has an annual population growth rate of 2.83% which makes Nigeria the most densely populated countryin Africa and is the second largest factor contributing to under–five mortality globally[6]. There are marked disparities across geopolitical zones with vaccinationcoverage and completion which range from about 50% in the South-South and South-West to 27, 14, and 10% in the North-East,North-Central, and North-West Nigeria, respectively.

All states in Nigeria fall below the universal aim of 90 percent coverage for 3 doses of pentavalent immunization.Performance rate of immunization is weakest inNorth West or North East zones in which all the states falls below 50% pentavalent coverage.Children living in the rural areas are half as likely to be immunizedcompared with those is urban areas andchildren of younger and less educated caretakers are at most risk[8].

Immunization is a major vision of the Primary Health Care (PHC) system in Nigeria. One of the main areas focused by the global community is achieving universal health coverage, and PHC is a necessary foundation for these efforts. Vaccination is an essential part of universal health coverage which is fundamental to PHC. However, some factors such as medical mistrust, socio-political factors, hostile attitudes of health workers, weak health

systems, clashes between programmes, and supplemental immunization activities are contributory factors that prevent adequate immunization coverage in PHC centers[9,10,11].

A study on rural-urban differences in demographic factors and associated immunization status among children of 12-59 months in a south-western part of Nigeria show that immunization coverage was somewhat high but still sub-optimal in the south-western area of Nigeria[12]. Maternal factors were found to influence immunization status. Other factors according to the study are location and paternal factors which are strongly associated with immunization coverage in the south-western part of Nigeria. Similarly, in Oyo State, a study on unacceptable levels of immunization coverage in administrative identified factors associated with achievement of a complete child immunization schedule in Ido local government areas and Ibadan North East (LGAs) of Oyo State, Nigeria.[13.] The study discovered that the level of full immunization coverage was unacceptable in almost all the wards[13].

Immunization is important in the control of communicable and poor immunization is attributable to some diseases in children; therefore, it is essential to assess factors that cause incomplete immunization in children. Based on this premise, this study seeks to determine the immunization status and factors responsible for incomplete immunization among (9-12 months) attending primary health care centre in Ibadan North and South East Local Government Area, Oyo State.

1.2 Statement of the problem

Diseases that are preventable by vaccine contribute considerably to mortality and morbidity; 4 million people were estimated to die yearly from diseases for which vaccines are available. Diarrhea and pneumonia account for about 34% of the worldwide 10.4 million deaths among children less than 5 years of age[14]. With successful immunization, several of these deaths could be averted. Internationally, pneumococcal disease has lately

been revealed to cause the death of 826,000 children between ages 1 to 59 months, while rotaviruses are the most frequent cause of acute diarrheal disease in young children[14]. An estimated 527,000 children under 5 years, most of who live in low-income countries, die each year from vaccine-preventable[8] Rotavirus infections.Poor level of immunization against childhood diseases remain a major public health problem in resource-poor areas of the globe'[16] Children mortalities from vaccine- preventable diseases were estimated to 1.5 million worldwide. Meanwhile, Africa under five mortality stands above 180/1000 live births[17].

In Nigeria, despite the natural and human resources, childhood morbidity and mortality remain very high and in spite of the implementation of primary health care that was designed to advance immunization rates in Nigeria, it was observed that immunization coverage is still low in some parts of Nigeria. This is caused by various factors of far distance healthcare facilities to the mothers 'place of residents, lack of political will of the government to effectively provide more funding and more primary healthcare infrastructures across the local areas, inadequate supply of cold chain facility to maintain the potency of the vaccine, lack of proper understanding of the usefulness of the vaccine, inadequate sensitization on the importance of vaccines against child mortality diseases by the health educators, The recent pandemic of COVID 19 has greatly affected and lowered the number of monthly RI in each Centre of primary healthcare and lastly religion without proper teaching of immunization also lowers the number of RI.

Premised on the above problem statement therefore, there is need to investigate the immunization status and factors responsible for the reduction of immunization in primary healthcare centres in Ibadan North and South-east Local Government Area and proffer lasting solution recommendations to the problem of reduced level of immunization.

1.3 Aim and Objectives of the Study

The aim of this study is to examine immunization status and factors responsible for incomplete immunization coverage in primary healthcare centres in Ibadan North/Southeast Local Government Area, Oyo State, Nigeria.

The specific objectives include:

1. to assess the coverage of childhood immunization in the local government areas in Ibadan North and Southeast Local Government area.
2. to examine knowledge and perception of parents/caregivers towards immunization in primary healthcare centres. In Ibadan North and Southeast Local Government area.
3. to determine the factors associated with the immunization rate/coverage in primary healthcare centres in Ibadan North and Southeast Local Government area.

1.4 Research Questions

1. What is the level of coverage of childhood immunization in the Local Government Areas?

2. How knowledgeable are parents/caregivers towards immunization?

3. What is the perception of parents/caregivers towards immunization?

4. What are the factors associated with the immunization rate/coverage in primary healthcare centres in Ibadan North and Southeast Local Government Area?

1.5 Hypotheses

- There is no significant relationship between knowledge of parents/caregivers and rate of immunization coverage.
- There is no significant relationship between perception of parents/caregivers and rate of immunization coverage.

- There is no significant relationship between perception to barriers and immunization coverage

1.6 Significance of the Study

The findings of this study will contribute to the existing literature and expand the contemporary knowledge of immunization status and the factors contributing to the possible decline in immunization in Ibadan North and Southeast Local Government Area, Oyo State, Nigeria. *The results of the study will contribute to advancement of research in public health, health education, social welfare, education research institutes and other educational professions in several important ways. First, it will contribute to*baseline data in health and educational system.Secondly; it could help to identify gaps in the current immunization coverage in that state towards improving coverage of routine immunization in Oyo State.

Also finding from the study may be useful in the development of social mobilization interventions to focus on religious leaders, caregivers, and other stakeholders who have the ability to improve access to the utilization of health services and encourage positive health outcomes in the completion of routine immunization and decrease in infant/childhood mortality and morbidity. This study is to address the sharp decline in the number of children immunized in Ibadan North and South-east Local Government Area, Oyo State of Nigeria with a view towards understanding the relationship between parents' perception and knowledge, healthcare workers'attitude and utilization of immunization services and behaviour toward completion of immunization schedules. Big Five personality and health model would be used as the theoretical framework.

1.7 Justification of Study

Globally it was estimated, that 1 in every 5 children did not receive schedule life saving immunizations yearly, leading to the death of approximately 1.5 million

infants that could have been prevented by vaccines[15]. Child health is very important to development of any country. The Sustainable Development Goals (SDGs) targets are a set of goals relating to future development which involves every child, because children were considered a significant part of any population, therefore any harm to the development of a child could have adverse consequences on the development of a nation. Researchers and Health organizations globally had made significant strides in reducing some of the common vaccine prenventable diseases associated with children hereby increasing life expectancy, and major progress has been made on increasing access to vaccination. However, most developing countries including Nigeria are still falling short of 90% immunization coverage recommended by the World Health Organization. However several studies have linked high mortality rate among under five children in Nigeria and other sub –Saharan Africa to low immunization status. Thus, this study is a welcoming development as it seek to provide useful information that will help in addressing this nagging problem.

Meanwhile, based on existing literature survey, most previous studies conducted on immunization in Nigeria was carried out in Northern part of the country. Moreover there is paucity of data on factors responsible for this low coverage nationwide .Premised on the above problem, this study seek to fill in the knowledge gap by investigating the immunization status and factors responsible for the reduction of immunization in selected primary healthcare centres in Ibadan metropolis, South-western Nigeria.

1.8 Limitation of the Study

The followings are limitations to the study:

I.Respondents potential social desirability, bias among respondents and the fact that causality from a cross sectional study cannot be ascertain and there is limitation to possible generality of findings.

II.Respondents Attitude: Due to the nature of method of collecting data (Kobo Collect) which is not famous unlike printed questionnaire, the respondents felt reluctant to answers the question freely as expected but with persuasive explanation and enlightenment, they later cooperated.

III COVID 19 pandemic related factors**:** The pandemic which has resulted in a new norm of wearing masks and social distance prevented the respondents to freely communicate.but after many episodes of data collection they complied.

1.9 Operational Definition of Terms

Immunization**:** is fortification of individual's immune system against an agent of disease infection.

Vaccination**:** is a suspension of killed, weakened, or fragmented toxins or microorganisms or of lymphocytes orantibodies that is administered primarily to prevent disease.

Primary Health Centre**:**refers to necessary health care that is based on sound scientific and socially acceptable methods andtechnology.Operating in the community.

Routine Immunization (RI) is the sustainable, dependable and relationship between vaccine, those vaccine service providers and those who receive it to make sure that every person is fully immunized against diseases that could be prevented by vaccine.

End Notes

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Chapter Two

Literature Review

2.1 Theoretical Framework

2.1.1 Health Belief Model

The HBM was postulated in 1950, it is one of the foremost theories of health behavior, by social psychologists Irwin and other colleagues at the United States Public Health Service[1&2].At that time, health practitioners and researchers were concernedabout the few number of people that were getting screened for *tuberculosis(TB)*[3]. The HBM has been used to forecast a wide range of health-related issueswhich include screening for the early detection of asymptomatic diseasesand receive vaccine[4].

Thetheory in Cognitive Psychology has been linked to the origination of HBM theoretical constructs[3]. Cognitive theorists in the early 20thcenturyopined that reinforcements operate by affecting expectations rather than by straightly impacting on behavior[5]. Mental processes are seen as expectancy-value models because they consists of cognitive theories and they propose behavior to be the function of the degree to which people value a result, believing also that expectation from certain action will lead that result[6]. The expectation is that some health behavior could avert the situation for which people consider they could be at risk[3].The constructs of the HBM varies between individuals and predict engagement in health-related behaviors[4].

2.1.2 Perceived Susceptibility

Perceived susceptibility refers to subjective evaluation of risk associated with developing a health problem[4&1]. 'The HBM forecasts that persons who perceive that they are vulnerable to a specific health problem will engage in the act of reducing their risk of developing the health problem'[7].

The mixture of perceived susceptibility and perceived severity is referred to as perceived threat[1]. Perceived susceptibility and perceived severity to a given health condition depend on information about the condition[7]. The HBM forecasts that higher perceived danger leads to a higher probability of engaging in behaviors that promote health.

Perceived Severity

Perceived severity refers to the subjective evaluation of the severity ofchallenges over health issues and its possible effect[&1]. The HBM postulatesthat persons who perceive a known health challenge as serious are mostprobable to engage in behaviors to avert the health challenges from happening (or lessen its severity). Perceived sincerityentailsthinking about the disease itself (e.g., may cause disability/pain or whether it is life-threatening) as well as broader impacts of the disease on functioning in social roles and work[4,7&1].

For example, person may perceive that influenza is not a serious problemmedically, but if the individual observed that there would be severe financial effects as a result of being absent from work for many days, then such person may perceive influenza to be asevere condition.

Perceived benefits

Perceived benefits of taking action also influence Health-related behaviors [1]. For instance, if an individual considered that a particular action will lessen susceptibility to a healthchallenge or reduceits seriousness, then such person is likely to engage in that behavior in spite of objective facts regarding the efficiency of the action[7].

Perceived barriers

Perceived barriers to taking action are also a function of health-related behaviors. Perceived barriers refer to an individual's assessment of the obstacles to behavior change[4]. Even if a person views a health state as dangerous and feels that

specific action iftaking will effectively lower the hazard, barriers may hinder them from engaging in the health-promoting behavior. In other words, for behavior change to occur, the perceived benefits must surpass the perceived restrictions[1, 4,8].

Application of the Theory to the Study

By focusing on major constructs specified in the components of HBM model, the model has been utilized to build efficient interventions to enhance health-related behaviors[9&10]. By providing education about disease incidence and prevalence, individualized risk estimates, and information about disease consequences, interventions based on the HBM may aim to increase perceived susceptibility to (increase immunization status or coverage) and perceived seriousness of a health condition[1]. Provision of information about the efficacy of different behaviors to reduce disease risk, providing incentives to engage in health-promoting behaviors, identification of common perceived barriers, and engagement in social support or other resources to supportbehaviors that promote health, interventions may aim to change the analysis of cost-benefit of engaging in behavior that promote health [1].

Furthermore, HBM-based interventions may provide cues to action to encourage and remind people to engage in behaviors that promotehealth. Self-efficacy may be enhanced by the provision of interventions such as training in certain health-promoting activities, mostly for lifestyle modifications that is not easy (e.g., changing physical activity or diet, sticking to a complicated medication routine) [10]. Individual interventions (e.g., working with a person to enhance engagement in health-related activities) and societal interventions (e.g., physical environment changes, mass media campaigns) are both possible approach on intervention in HBM[11].

Anderson Model

The Andersen behavioral model for health-care use was chosen as the study's theory of choice; it was created to test the hypothesis of unequal access to health-care services in the US .The model addresses the concerns of some groups, particularly minority ethnic groups and other groups living in inner cities and rural communities, who receive insufficient health care in comparison to the general population. This model has become one of the most commonly used theories to predict the use of health care services globally and is based on three characteristics: enabling factors, predisposing factors, and need factors.

The major factors in Andersen behavioral model are bio-socio-demographic characteristics of a person before the existence of illness. In the context of the present study, social structures (occupation, education, social networks, social,ethnicityand culture interactions), The health beliefs (values, knowledge and attitudes) that people have toward and about demographic factors (gender and age) and the health care system may prompt caregivers/parental to make use or not use health care services, such as RI services, which may affect the RI completion schedule negatively or positively. The model includes community-level predisposing factors that are known to influence health-care utilization[12]. These factors, connected to the community level, consist of their collective values, the demographic outline of the community, and their cultural political and beliefs perspectives.

The cultural character of women and men within a community include stereotypical behavior of each gender in that society, religion, or tribe that shapes a parent’s approach to RI and the use of general health services. Caregiver’s orparents who have a good grasp of the value and efficacy of health care services or RI, as well as positive attitudes and behaviors, are more likely to utilize them[12].Factors relate to the community’s and

individual's ability to give services, either in the form of personal income earning or health insurance such as the availability of the health resources within geographical regions and periodic income from other sources or salary, the extent and quality of social relationships[12].Need factors are based on either evaluated or perceived need. Perceived need focuses on how a person views their personal experiences from previous illnesses, functional state and general health. The premise for determining whether the symptoms are severe enough to warrant seeking professional assistance is perceived need.Evaluated need is based on medical investigations, comprising laboratory and clinical judgments of the examining physician, are used to determine the particular patient's health requirement. The Andersen model includes community-level predisposing factors that are known to influence health-care utilization[12]. The demographic profile of the community, collective values, cultural views, and political opinions are all aspects that are linked to the community level.The cultural characteristics of women and men in a society include tribe, stereotypical behavior of each religion or gender in that community that shapes a parent's approach to RI and the use of health services generally. Caregivers or parents who have a good grasp of the value and efficacy of health care services or RI, as well as positive attitudes and behaviors, are more likely to utilize them[12].

2.2 Conceptual Framework

2.2.1 Concept of Immunization

'Immunization or Immunization is the process by which a person's immune system becomes fortified against an agent (known as the immunogen)'.When the system is opened to molecules that are foreign to the body, called non-self, the function of the adaptive immune system it will manage an immune response, and develop the strength to speedily respond to a subsequent encounter. Therefore, when an animal is

exposed to an immunogen in a controlled way, the body of such animal can learn to protect itself: this is referred to as active immunization.

Immunizations are frequently promoted as a safer and easier way to develop immunity to a disease than risking a lesser form of the disease. They are beneficial to both adults and children since they can protect us from a variety of ailments. Immunization not only protects children from life-threatening infections, but it also aids in the development of their immune systems[14]. Some illnesses and diseases have been nearly eradicated throughout the US and the world as a result of vaccination. Polio is one such example.

Polio had been eradicated in the United States since 1979, credit to diligent health care workers and parents who vaccinated their children on time.Polio is still present in several regions of the world, therefore some people may be at risk of contracting it.This includes persons who have never had the vaccine, those who have not received all of the vaccine doses, and those who are traveling to locations where polio is still prevalent.

2.2.2 Passive and Active Immunization

When a person comes into contact with a microorganism for example, active immunization can occur naturally. Anti-bodies and other defenses against the microorganism will eventually be produced by the immune system. The immune response to this germ can be quite effective the second time; this is true of many childhood infections that a person experiences once and then becomes resistant to. Artificial active immunization occurs when a microorganism, or sections of it, is infused into individual before they can naturally absorb it. When using entire microorganisms, they are pre-treated.

Immunization is so important that it was named one of the "Ten Great Public Health Achievements of the 20th Century" by the American Centers for Disease Control and Prevention[15].The pathogenicity of live attenuated vaccinations is reduced. Their success is

based on the immune system's ability to reproduce and elicit an infection-like reaction. With a single dose, it is usually effective.

Passive immunization is the process of transferring pre-made immune system components to a person so that the body does not have to manufacture them. Anti-bodies can currently be used for passive immunization. This form of vaccination works swiftly, but it is only temporary since anti-bodies are broken down naturally, and in situation where there are no B cells to make new antibodies, they will vanish. Passive immunization takes place when antibodies are given from the mother to the foetus during pregnancy in order to protect the foetus after and before birth.

2.2.3 Economic Importance of Immunization

Positive Externality

Immunizations have a positive consumer externality, which means they benefit society. Herd immunity provides higher protection to all other persons in society in addition to offering protection to the individual against certain antigens. Because this additional protection is not accounted for in vaccination market transactions, the marginal benefit of each immunization is undervalued. Individuals make decisions based on their private marginal profit rather than the collective marginal gain, resulting in market failure. Vaccinations are undervalued in society, therefore we end up with a lower quantity than is socially optimal. Individual A, for example, may choose not to be immunized if they value their personal immunity to an antigen at 100 dollars but the immunization costs 150 dollars. Person B values person A's immunity at 70 dollars because of the increased benefit of herd immunity, therefore the total social marginal benefit of their vaccine is 170 dollars. Individual A's private marginal benefit is smaller than his or her societal marginal benefit, resulting in vaccination underuse.

Socially Optimal

When private marginal benefits are lower than social marginal benefits, any good will be under-consumed. The size of the discrepancy is influenced by how much society values each type of vaccination. Immunization doses are frequently insufficient to remove the antigen at a socially optimal level. Instead, they achieve a social quantity that allows for the most number of sick people. Most routinely vaccinated diseases still have a tiny presence in the United States, with greater breakouts on rare occasions. Measles is an example of a disease whose social optimum allows for outbreaks in the US, which frequently result in the deaths of a few people[17].Despite the severity of some diseases, the expense of immunization compared to the societal marginal benefit means that total eradication is not usually the goal of vaccination. Though it's difficult to pinpoint the socially desirable outcome, we know it's not the elimination of every disease for which an immunization is available.

2.3 Expanded Programme on Immunization in Nigeria

In May 1974, the World Health Organization (WHO) launched the Expanded Programme on Immunization (EPI) with the goal of vaccinating children all throughout the world. The WHO established a consistent vaccination schedule for the first EPI vaccines, Bacillus Calmette-Guérin (BCG), diphtheria-tetanus-pertussis (DTP), measles, and oral polio ten years later, in 1984. As our understanding of disease's immunologic components has grown, new vaccinations have been created and added to the EPI's list of recommended immunizations: In places where the disease is endemic, yellow fever, hepatitis B (HepB), and Haemophilus influenzae meningitis (Hib) conjugate vaccines are available[18].

The Global Alliance for Vaccines and Immunization (GAVI) was founded in 1999 with the express goal of improving child health in the world's poorest countries by expanding

the EPI's coverage. The GAVI coalition included UN agencies and institutions (UNICEF, WHO and World Bank), public health institutes, implementing countries and donor, The Rockefeller Foundation and the Bill & Melinda Gates Foundation the vaccination industry, non-governmental organizations (NGOs), and many others. The GAVI initiative has helped to rekindle interest in vaccines and retain their importance in combating the world's high burden of infectious illnesses.

The current goals of the EPI are to:

- ensure full vaccination of children under one year of age in every district,
- globally eliminate poliomyelitis,
- reduce neonatal tetanus and maternal to an incidence rate of less than one case per 1,000 births by 2005,
- cut in half the number of measles-related deaths
- extend all preventative health interventionsand new vaccine to children in all districts in the world.

Furthermore, the GAVI has established precise milestones for achieving the EPI goals: by 2010, all countries will have 90% of their child population coverage withroutine immunization, Hepatitis B will be introduced in 80% of all countries by 2007, and 50% of the poorest countries will have Hib vaccine by 2005[19].

2.4 Factors Affecting Routine ImmunizationSchedule in Nigeria

Northern Nigeria has some of the lowest vaccination rates in the world. According to the 2003 National Immunization Schedule in Jigawa; the percentage of fully immunized babies is 1.5 percent in Yobe, 1.6 percent in Zamfara, and 8.3 percent in Katsina was less than 1%. Thousands of youngsters have been exposed to vaccine-preventable infections as a result. These low rates are due to a number of factors. To begin with, primary health care services are not effective and have worsen as a result of a lack of investment in

employees, buildings, and pharmaceuticals, as well as poor resource management. The public also lacks trust and faith in health care as a result of the poor quality of buildings and low delivery standards.These issues have been worsened by "vertical" interventions by outside agencies, which have harmed local service providers' ability to conduct long-term programs. There is a low demand for immunization at the family/community level due to a lack of knowledge of its importance[20]. Some of these problems are briefly discussed below;

Wrong Perceptions of Routine Immunization

In Nigeria, there is widespread misunderstanding about the preventative role of routine immunization. According to quantitative research undertaken in six states in 2004, diarrhoea, fever, vomiting, malaria and convulsion are considered vaccine-preventable diseases (VPDs) in rural Enugu, whereas malaria, teething issues, vomiting, convulsions, and pneumonia are included in rural and urban Kano. Several immunization decision-makers and caregivers in Katsina state stated during a pilot community research project in March 2005 that only polio immunization is required, and that once a child has received his or her polio 'drops,' he or she is vaccinated against all childhood illnesses, and acute respiratory infection, which has no available vaccine [20]. People who do not use public services for the treatment and management of common illnesses, those who do not have easy access to public health services, and illiterates are among those least likely to display high levels of correct information[19].

Religion's influence

The main barrier to vaccine acceptance in Nigeria is religious, particularly among Muslims in northern Nigerian. The Muslim north has the lowest vaccination coverage, with the lowest at 6% (north-west) and the highest at 44.6 percent (south-east). For example, the north-east and west of Ekiti State (south-west), which have a higher Islamic

influence, have low vaccine coverage and poor educational attainment. Muslims have only 8.8% vaccine coverage compared to 24.2 percent for Christians[21].Religion affected decisions on vaccination[36&35], and religious opposition is often used by caregivers/parents as an excuse to keep away from the vaccination of their children[37]. According to certain research, the number of religious exclusion is on the rise, resulting in vaccine-preventable illness outbreaks like the mumps outbreak in a protestant orthodox group in the Netherlands[38&39]. Shrivastwa[40] (2015), in India found religion as a factor of children's immunization status. Compared to Hindus, children fromMuslim parents had greater chance of being unvaccinated or under-vaccinated when comparing them with the vaccinated infants.

Orthodox opinion

The Orthodox position on vaccination, for example, in Russia, where orthodoxy is the dominant religion and historical viewpoint plays a significant role in social, public, and cultural life.

The Russian Orthodox Church recognizes that immunization is the most effective means of progress. Official Russian statistics show that 3 percent to 5% of the population refuses to be vaccinated every year. Without understanding the history of the anti-vaccination lobby, it is impossible to understand vaccination refusal and its reasons. This history can be traced to 1988 with the article "Well, You Will think, that It Is Only a Prick?"[22]. This article claims that it causes serious complicationsand vaccination is not just a prick. The internet is currently the tribune of the anti-vaccination movement, as it can allow access to the general public without requiring a true scientific review of vaccination's efficacy and hazards. Speculation in religious beliefs is one of the arguments made by vaccine opponents. Anti-vaccination sentiment has recently gained traction in churches,

monasteries, and through a film production. A primarily medical topic became a "thorn in the side" among believers.

All of this caused the official Russian Church to publish a statement on vaccination. The Synod's department of church charity and social assistance hosted a round table in September 2008 entitled "Vaccine's Prevention of Paediatric Problems and Ways of Making the Decision"[23&24]."Vaccination is a great instrument for preventing infectious diseases, some of which are quite hazardous," the Synod's final document adds. In some circumstances, vaccinations do produce difficulties, which are frequently linked to violations of vaccination laws, such as using it on weakened youngsters." Anti-vaccination propaganda was criticized by the Russian Orthodox Church, which outlawed the dissemination of anti-vaccination literature and audio-visual material in its temples and monasteries.

The position of philosophers and orthodox doctors was reflected in statements by the Moscow Patriarchy's Church Public Council on Biomedical Ethics, as well as the Moscow Patriarchy's Department of Church Charity and Social Service and the Russian Federation's Ministry of Health and Social Development[25]. These publications say unequivocally that vaccination is an essential modern measure of infectious illness control, and that refusing to get vaccinated can have serious implications. At the same time, it was pointed out that certain aspects of immunization require extra care. Vaccines against hepatitis A, rubella, and chicken pox, which are made from diploidic cells from embryos that were aborted, have caused concern among the Russian populate. There are alternative (so-called "ethical") rubella vaccines made from a rabbit's cellular line (Japan), as well as hepatitis A vaccines made from a monkey's cellular culture (Vero, Japan). However, because their use is just getting started and they aren't readily available, diploidic vaccinations against these diseases are the most common.

The Islamic position

Certain foods are considered haram by the Qur'n and Islamic tradition (pig flesh).Other animals, depending on how they die, are licit – halal[26]. This issue is mirrored in medicine, where gelatin is used in medical products. It is permitted to use gelatin generated from halal animals.Because of the "rule of necessity," a person who finds himself in a circumstance where there is no halal alternative is not guilty of using a non-halal choice. Vaccines are necessary for medical reasons, not for food, hence haram elements may be allowed (changing of haram componeto halal produces).Vaccination, base on Islamic tradition, protects life, upholds the ideal of averting harm (izalataldharar), and promotes the general good.The law of need should be considered since vaccination protects others. Its components cannot be judged as a diet because it has a preventative purpose[26].

Table 2.1. Vaccination coverage, by vaccine and World Health Organization (WHO) region — worldwide, 2019

Vaccine	No. (%) of countries with vaccine in schedule	WHO region % coverage*						
		Global	AFR	AMR	EMR	EUR	SEAR	WPR
BCG	156 (80)	88	80	83	87	92	93	96
DTP1	194 (100)	90	81	90	89	97	94	95
DTP3	194 (100)	85	74	84	82	95	91	94
HepB BD	111 (49)	43	6	55	34	41	54	84
HepB3	189 (97)	85	73	81	82	92	91	94
Hib3	192 (98)	72	73	85	82	79	89	24
HPV, last†	106 (55)	15	19	55	0	24	2	4
MCV1	194 (100)	85	69	88	82	96	94	94
MCV2	178 (91)	71	33	75	75	91	83	91
PCV3	148 (74)	48	70	83	52	80	23	14
Pol3	194 (100)	86	74	87	83	95	90	94
RCV1	173 (88)	71	33	88	45	96	93	94
Rota, 1	108 (52)	39	50	74	49	25	37	2

Source: World Health Organization (WHO, 2019)

Table 2.2. World Bank economic andWorld Health Organization (WHO) region classification: Population of infants who do not receive DTP1 (zero-dose children), worldwide between years 2000 to 2019

Characteristic/Year	WHO region							Economic classification*		
2000	**Global**	**AFR**	**AMR**	**EMR**	**EUR**	**SEAR**	**WPR**	**Low**	**Middle**	**High**
Total no. of countries	191	46	35	21	52	10	27	63	86	37
No. of surviving infants (millions)	124.6	24.1	15.5	13.8	10.1	37.3	24.0	69.8	44.5	10.2
Global % of surviving infants	—	19	12	11	8	30	19	56	36	8
No. of zero-dose children (millions)	21.4	8.2	0.5	2.7	0.3	8.2	1.5	18.9	2.2	0.3
Global % of zero-dose children	—	38	2	13	1	38	7	88	10	1
2010										
Total no. of countries	193	46	35	21	53	11	27	35	106	49
No. of surviving infants (millions)	133.0	30.5	15.0	16.1	11.2	35.8	24.4	25.1	95.3	12.6
Global % of surviving infants	–	23	11	12	8	27	18	19	72	9
No. of zero-dose children (millions)	14.9	6.1	0.5	2.6	0.5	4.3	0.9	3.6	11.0	0.3
Global % of zero-dose children	—	41	3	17	3	29	6	24	74	2
2019										
Total no. of countries	194	47	35	21	53	11	27	29	103	60
No. surviving of infants (millions)	135.6	35.8	14.6	17.3	10.9	33.8	23.2	21.8	101.3	12.5
Global % of surviving infants	—	26	11	13	8	25	17	16	75	9
No. of zero-dose children (millions)	13.8	6.8	1.5	2.0	0.3	2.0	1.2	4.0	9.5	0.3
Global % of zero-dose children	—	49	11	14	2	14	9	29	69	2

Source: World Health Organization (WHO, 2019)

Abbreviations:AMR = Region of the Americas; AFR = African Region; EUR = European Region; HepB3 = third dose of hepatitis B vaccine; EMR = Eastern Mediterranean Region; Hib3 = third dose of *Haemophilus influenzae* type b vaccine; HepB BD = birth dose of hepatitis B vaccine; MCV1 = first dose of measles-containing vaccine; HPV, last = final dose of human papillomavirus vaccine; MCV2 = second dose of measles-containing vaccine; RCV1 = first dose of rubella-containing vaccine; PCV3 = third dose of pneumococcal conjugate vaccine; Pol3 = third dose of polio vaccine; Rota, last = final dose of rotavirus vaccine series; WPR = Western Pacific Region; SEAR = South-East Asia Region.

2.7 Routine Immunization in Nigeria

In Nigeria, WHO is providing technical support to authorities at federal, state, local government, and ward levels in the strengthening and implementation of the Reaching Every Ward (REW) strategy (WHO Regional Office for Africa).Memorandum of understanding was agreed between WHO and the Government of Nigeria; the WHO will offer technical support for health workers at all levels. The support of WHO, along with other development partners, has greatly contributed to increased access and utilization of routine immunization services in the form of improved coverage (WHO Regional Office for Africa).

In a study in Nigeria,Zamfara State[34], on factors of routine immunization coverage, Five characteristics were found to be substantially linked with full vaccination coverage: a satisfactory level of RI knowledge, ante-natal care (ANC), at least secondary education, having received RI information 12 months before to the study, and delivery at a health facility by mothers. After performing logistic regression, having a satisfactory degree of

knowledge on RI and at least completing secondary level education were the only autonomous drivers of complete immunization[34]. However, because this study was community-based, it was limited by geographical scope, and it was accepted that the results could have been different if it had been conducted over the entire state; hence, the results cannot be extrapolated to the North West zone.

Apart from the biological characteristics (age, parity, sex, birth order), their level of education, cultural factors (ability to make independent decisions, tribe/ethnicity and religious affiliation), place of residence, distance from routine immunization services, and educational level of respondents, this study refuse to take into consideration the role of socioeconomic status (place of residence, proximity to routine immunization center, educational level of participants) and income levels of caregivers/parents.

In Awe local Government of Nasarawa State, a study investigated the reasons for inadequate immunization and variables that lead to missed opportunities among rural Nigerian children in 2011. They discovered that the main reasons for vaccine non-compliance among rural children were parental concerns about the immunization's safety, a long walk to the service site, and extended wait times at health facilities[33]. Although one of the study's limitations was that the sample population was from a homogeneous rural community and participants were primarily poor women and children, Abdulraheem and Onajole found no significant differences in completeness of vaccination due to factors such as schooling level, marital status, mothers' age, and child gender.This could have led to an underestimating of the importance of socio-demographic characteristics as educational attainment, gender, and marital status[33].Again, this study lacked geographic scope, and the sample size does not really represent the population of study, and it could only be applied to the town in which it was done.

A study in Ibadan did a similar survey in 2013, attempting to uncover factors impacting vaccine compliance among nursing moms in the Moniya Community.They discovered that health professionals' attitudes, high wait times, and the expense of immunization were all barriers to immunization schedule compliance[35]. Age, career, religion, education, and time spent at the facilities were all found to have a substantial impact on vaccine regimen compliance[35].

A study conducted in an Enugu hospital on determinants of vaccine coverage among children aged 11 to 23 months in a Nigerian urban district found that delivery of a child in a government hospital, government employment, high maternal education, and knowledge of the age at which a child should begin and complete routine immunization were all independent factors of high coverage of immunization. One of the study's weaknesses was that it was hospital-based and was carried out in an urban setting, so it cannot accurately reflect what is going on in the community. According to studies conducted in several communities across Nigeria and other African countries, maternal knowledge of RI is an independent driver of vaccination coverage.

In a study on the determinants of routine immunization coverage in Bungudu LGA, Zamfara State, it was discovered that maternal understanding of the benefit and schedule of RI services has a favorable impact on the mother's decision to get her kid fully immunized[33,34]. This finding is consistent with an Ethiopian study that found that lack of knowledge about vaccination adds to low coverage, and those children whose mothers knew the age at which vaccination begins and ends were more likely to complete vaccination than their equals whose mothers were unaware of the RI schedule[35].According to a study conducted in Nigeria's Osun State, 80 percent of the antigens given at birth are covered.When compared to other vaccines administered after delivery, these (BCG, OPV0, and HBV1) showed higher coverage rates.This could be

because many of the infants were born in hospitals and received immunizations before being discharged[43]

2.8 Routine Immunization in Oyo State

Oyo State, like other Nigerian states, has a Primary Health Centre system with basic structural and functional units that include routine child immunization.findings on immunization coverage in Oyo State's urban and rural areas. show that routine vaccination of children aged 12 to 23 months in the Ibadan North East and Ido LGAs of Ibadan, Oyo is ineffective. In IBNE, 15.7 percent of youngsters did not receive any immunization, but in Ido LGA, 21.9 percent did not receive any immunization. In IBNE and Ido, the weighted complete vaccination coverage was 40.2 and 41.3 percent, respectively.

Fear of adverse effects and a lack of awareness of the importance of immunization were the main reasons for non-completion or non-vaccination in both LGAs.After correction, factors identified to positively influence immunization schedule completion included mothers' completion of university education, employment, immunization card retention, and maternal age.30 years old, first child born in a hospital or mission home, and firstborn child[44].

A study conducted in Ogo-Oluwa LGA of Oyo using a descriptive cross sectional survey of children aged 12-23 months indicated that apart from BCG, OPV0, OPV1, DPT1, and HBV2, more than half of the children received vaccine doses later than the recommended ages for all other vaccines. The DPT1/Yellow fever vaccination has a dropout rate of 39 percent, about four times the WHO-accepted dropout threshold of 10%.The reasons offered for not completing immunizations were a lack of vaccines, the mother being too busy, and the mother being uninformed of the necessity for future vaccination doses.

Children's birth order, mothers' educational, family type, and delivery in a health institution were all found to be important predictors of being completely vaccinated. This study revealed that vaccination coverage in this rural location is poor, with systemic impediments such as vaccine shortages playing a role.One of the most important predictors of complete immunization is maternal education[45].

2.9.1 Vaccine Logistic and Cold Chain Management

Temperature-sensitive medications and chemoprophylaxis, such as vaccinations, are prone to damages and must be kept and distributed in a regulated environment. Vaccines are delicate biological products that can be easily destroyed if improperly handled. The potency of refrigerated vaccines can be harmed by improper conditions[46].The vaccine's potency loss may also cause it to become more reactogenic.

Due to increased temperature sensitivity and intricate inoculation regimens, vaccines require more complex handling and storage.

Cold chain management is a method of ensuring proper cold chain maintenance, a cohesive and continuous process that ensures temperature potency and availability.-pharmaceuticals with sensitivity [47]. Cold chain management is essential for assuring the efficiency of cold chain storage, handling, and stock management, as well as strict temperature control and suitable logistics management information systems. A good cold chain relies on well-trained staff, temperature monitoring equipment, dependable storage and precise cold chain drug inventory management[48]. Concerns about maintaining proper control in the cold chain have grown in recent decades as the volume and complexity of cold medicines has increased, as has the complexity of the global supply. The growing growth of the biopharmaceutical industry, as well as its complex worldwide sourcing and chain of distribution, has piqued global interest in cold pharmaceutical supply chain management[49].

In underdeveloped countries, cold chain management remains a substantial difficulty, and flaws are frequently identified during the transit and storage of cold chain pharmaceuticals. Delays in transit, refrigerator quality, storage method, and too lengthy storage at the health unit, poor usage of refrigerators, equipment failure, power outages, and a lack of qualified employees on cold chain management are all issues that contribute to the cold chain's vulnerabilities[50]. Errors in cold chain management can cause patient harm, including unexpected disease vulnerabilities that necessitate costly revaccination. Cold chain management and temperature monitoring remain a key concern in developing nations, with only about 56% of health facilities registering temperature records twice daily[51]. Dedicated electronic refrigerator temperature recorders, vaccine refrigerators, and vaccine vial monitors (VVM) are all necessary components formaintaining vaccine viability[50]. Heat inactivates vaccines including OPV, varicella, measles, and oral typhoid, while freezing inactivates vaccines like DPT, HepA, HepB, and TT[52].

Reliable cold chain equipment (CCEs) and temperature monitoring devices are essential for a successful cold chain. Electrical equipment such as cold room/walk-in coolers and freezer room/walk-in freezers are examples of CCEs[53].The National Cold Chain Equipment Inventory revealed insufficient and aged cold chain devices, lack of maintenance systems at all levels, shortage of spare parts, and the use of a variety of ice-lined refrigerators (ILRs) and deep freezers (DFs). Other factors that could encourage cold chain handlers to practice proper vaccine cold chain management include the availability of logistic materials, cold chain guidelines and tools for monitoring temperature of storage (temperature charts, thermometers, and VVMs) at public health centers (PHCs)[54]

Maintaining vaccines in cold chains necessitates proper cold chain infrastructure, educated personnel, and adherence to industry standards. Work experience, educational status, vaccination management training, and adherence to EPI recommendations are all factors that influence cold chain management practices[55]. in-service training, more work experience, and the use of EPI guiding principle at work were all factors that enhanced health professionals' knowledge of cold chain management and the need to keep it running smoothly[56].

The cold chain is thought to be the most vulnerable, especially in nations with unpredictable electricity, transportation, and competent human resources; cold chain maintenance is poor, and temperature monitoring is difficult[57]. Due to the limits of flawed electrical supply, inadequate and incorrectly set up storage amenities, perceived poor regulatory supervision, traceability, and product recall management, health centers in developing nations are at danger[58,59].

National Primary Health Care Development Agency which is under the Nigerian Federal Ministry of Health's is responsible for reducing morbidity and death related with vaccine-preventable diseases. Maintaining proper vaccination stock levels, however, remains a difficulty, and the Federal Ministry of Health's purposes to deploy numerous additional, more expensive vaccines threaten to further strain an already stretched supply chain. Cold chain equipment for vaccine storage and transportation was recently purchased by the country. From the time vaccines are created until they are shipped and distributed to health care facilities, this apparatus is needed to keep the vaccine refrigerated until they are administered to patients. However, vaccine storage capacity in Nigeria is low, predominantly at 5^0C. Only around 30% of the normal maximum demand for vaccinations is now covered by cold storage capacity[60].

The National Primary Health Care Development Agency's plan to expand the national supply chain is based on a planned system redesign that includes the construction of three national vaccine delivery hubs in Abuja (for North Central and the South Eastzones), Lagos (for the South South and South Westzones), and Kano (for the North West and South South zones) (North East and North West zones)[61].

There are six vaccine delivery hubs in the existing supply chain system. Vaccines are delivered directly from these hubs to storage amenities in Nigerian states, with available storage facilities in other urban areas or cities only functioning as backup storage. Three new hub cities were selected for their closeness to dense populations, ease of travel to the states that these hubs would service, and the presence of zonal stores in the cities previously. Nigeria is also working to improve storage amenities at the National Strategic Cold Store, as well as in states, local government areas, and hospitals[61]. Additional cold rooms are being purchased for existing storage facilities, and new refrigerated storehouses are planned for 2016. Just three states lack centrally located cold rooms, but all states' stores offer dry storage. All local government areas with cold chain equipment have standby generators to power all accessible equipment. Local government area stores typically employ solar-powered refrigerators to store vaccines because keeping a consistent source of electricity is a persistent concern[62].

The vaccine cold chain system in Nigeria consists of the manufacturer, the airport transit store and clearance, the national cold store, six zonal stores (one in each geopolitical zone), 36 State stores, 774 vaccine stores at the Local Government Areas (one in each of the country's 774 Local Government Areas), primary health centers, and other health facilities[59].Vaccine mishandling and incorrect storage are expected to cost the world millions of dollars each year[63]. Nigeria also has vaccine wastage, which is due to

difficulties in maintaining the vaccine cold chain system. These difficulties include inconsistent electric power supply, fueling, and transportation, all of which are required to keep cold chain equipment functioning continuously[64].More importantly, having well-motivated employees who understand how an effective cold chain system operates is critical[65].

Nigeria also requires additional storage capacity at the national and zonal levels if it wants to fulfill its storage objective of 672 million cubic meters by 2020[66]. Furthermore, keeping vaccinations at the right temperature is difficult since some vaccines, such as Haemophilus influenza type-b, and Diphtheria, Pertussis, Tetanus, Hepatitis B are rendered inactive by freezing, while others are harmed by heat.As a result, poor vaccine cold chain management could result in vaccine waste and failure, with significant financial ramifications, especially for developing nations that rely largely on donor money for their immunization programs.The vaccine cold chain system relies heavily on healthcare personnel who are involved in immunization[65].

2.9.2 Development of the Cold Chain: Challenges and interventions

Professor David Morley of the Child Health Institute in London proposed to WHO in 1976 that a team be formed within EPI to address three significant issues relating to WHO's objective to institute global routine immunization services: (a) the lack of systems to check the temperature of vaccines that are thermosensitive, (b) the lack of suitableapparatus to store and transport vaccines, and (c) the lack of adequately trained personnel to handle vaccines. By development and dissemination of appropriate technology and training materials for vaccination distribution and administration, a strategy paper and plan of action to address these concerns were developed[67]. To ensure speedy adoption, the approach anticipated distinct 'vaccine stores' based on the

conventional pre-existing distribution hierarchy.Starting with a central or national shop and ending at a fixed, peripheral health facility where immunization services are provided. This cold chain included 'outreach sessions' held in communities far from medical facilities on a regular basis. In addition to vaccines, the vaccine distribution plan comprised injections and other service-related goods.However, the plan was only focused on immunization. Because the essential control over stock management, transit priorities, monitoring and maintenance of storage temperatures could not be accomplished at the time of integration with medicines and other hospital supplies[68].

Absence of systems to check the Temperature of Vaccines that are Thermo Sensitive

Heat sensitivity was found in all but one of the first EPI vaccinations.Some people were susceptible to freezing, however the amount of their sensitivity was unknown at the time, and freezing damage received little attention.Because there was no method to analyze the effects of heat exposure after the vaccines were distributed, vaccine handling and storage temperatures were governed by rigorous guidelines[69].

In 1976, the normal temperature monitoring approach was used twice daily to read and record the temperature in each vaccine refrigerator, and then show the temperature profile on a chart once a month.The temperature was recorded continuously on a revolving disk of paper by an ink stylus in large national retailers.Although conventional processes were followed in some circumstances and action was taken when temperatures exceeded pre-determined limits, compliance was inadequate in others and temperature reports were unreliable. It was also difficult to tell whether cooling equipment needed maintenance due to a lack of routine temperature monitoring[70].

WHO saw the need for a 'end-to-end' monitoring system oftemperature for vaccines in the cold chain as a response to the lack of mechanisms to check the temperature of thermosensitive vaccines. Companies in the United States and Switzerland created a cold

chain monitor (CCM) based on blue wax absorption on a visual 'track' in the early 1980s.The CCM tracked vaccine shipments from producer to country and was used to keep track of stores at all levels[71]. In the late 1970s, PATH (an international non-profit organization) and WHO collaborated to establish a technique to detect the heat exposure of individual vaccination vials. The Temptime Corporation andPATH developed a vaccination vial monitor (VVM) based on polymerization technology, building on past work to produce an enzyme indicator to warn of breakdowns in the food cold chain in the US. VVMs are little stickers that stick to vaccination vials and change color permanently when exposed to heat, allowing health workers to quickly assess whether the vaccine has been damaged by heat [72].The World Health Organization then mandates that all vaccines purchased and used VVMs via UNICEF. The VVM eliminated a key difficulty caused by the lack of temperature monitoring, but it still faced additional obstacles.

The same Swiss company that invented the CCM developed an electronic 30-day temperature recorder 20 years later (30DTR). The 30DTR device is now accessible as a standalone recording device as well as a remote recording device with internet-based reporting, alarms, and data transmission. Electronic recorders have become the gold standard for larger vaccination stores. Temperature loggers with several channels, remote alerts, and recording capabilities have made it feasible to respond rapidly to temperature alarms and analyze refrigerator performance using temperature data[73].

Absence of appropriate equipment to transport and store Vaccines

In 1976, ensuring vaccinations were preserved at the proper storage temperatures from arrival in the country to usage posed a difficult set of obstacles. Inadequate energy to power chilling equipment: The shortage and inadequate energy quality to refrigerate vaccines and freeze ice packs for shipment was perhaps the most pressing obstacle. In 1977, roughly two-thirds of health institutions that housed vaccines lacked electricity,

making the use of ordinary electric-compression refrigerators unfeasible. Only kerosene, gas, or electricity-powered absorption refrigerators could be used[74].

Power supply was intermittent and voltages vary greatly even among institutions with access to the electrical grid.Diesel generators were employed in several nations as an intermittent, grid-independent power source, but they required frequent maintenance and were noisy and expensive to run.Grid electricity is still scarce, expensive, and of low quality in many nations today.A key difficulty is the performance of freezers that are insufficient for vaccine storage and freezing icepacks.Because they could run on kerosene, gas, or electricity, absorption-type refrigerators were commonly utilized in non-industrialized countries[75]. Despite having a clean fuel source and practically continual attention, the models available at the time were unable to maintain the temperature range needed for vaccines or to freeze enough ice packs for vaccine shipment.

Water pollution of the fuel supply was becoming more common in rural areas of emerging countries, lowering performance and raising maintenance costs[76].

Aside from refrigerators' poor performance, the short cold-life of passive-cooled containers is another issue.At order to transport vaccine in high and low ambient temperatures, insulated containers were required, including hand-carriers for immunization outreach efforts and larger boxes for bulk vaccine.Picnic boxes and carriers iced by frozen ice packs, which are common in temperate zone regions, were inappropriate for transporting vaccination due to their short cold life[77]. Their performance was insufficient even for a one- or two-day routine outreach.

They were also delicate, and usually came with non-replaceable ice packs.The problem was solved by adapting low-cost freezers and refrigerators that were used in the home to store food.These 'home' refrigerators and freezers were primarily developed for industrialized markets with reliable energy supplies and temperatures rarely exceeding

+320°C. Walls and cooling units were modified to work well enough to reliably store vaccines in places with inconsistent energy, contaminated fuel supplies, with low and high ambient temperatures. These performance-enhancing characteristics were gathered from 1979 draft standard performance standards[78].

On this foundation, Electrolux created a line of tiny freezers for health centers that merged a normal absorption cooling unit with a new twenty-five long-range cold box that was previously designed for vaccine distribution.Many of these refrigerators are still being manufactured after more than three decades, even though the absorption refrigerator industry is dwindling. Where grid electricity is available, power outages and 'brown-outs' can be common, even routine, in countries with poor distribution[79].

Consumer Association Laboratory uses theirengineering consultant toadapt a household chest freezer with an inside layer of water containers to preserve vaccination storage temperatures during power outages. The Ice-Lined Refrigerator (ILR) was configured to maintain steady temperatures with just eight hours of electricity each day80 once the lining was frozen.Internal temperatures in ILRs have a tendency to drop below freezing, according to comments from the field over the last decade, and manufacturers have recently adjusted the design to avoid freezing. Today, the ILR is the preferred vaccine storage technology because it ensures continuous chilling when grid power is unavailable[81].

Furthermore, to address the issue of insufficient equipment, solar-powered (photovoltaic) refrigerators are gradually replacing absorption refrigerators in the cold chain industry. In the late 1980s, several versions of solar refrigerators were created and deployed, but difficulties with the battery and control module were prevalent and difficult to resolve. The ILR principle was used by new generation solar freezers, known as solar direct drive. There is no need for a control device or battery because solar energy was utilized to

freeze an ice liner that keeps the unit cool overnight or on cloudy days. The resulting refrigerator has proven to be trouble-free and has become the market leader in sales[82].

Inadequate number of trained health personnel that handle Vaccines

It was a huge technological challenge to develop temperature monitoring and cooling devices.

Developing managerial skills to operate and control the system was and continues to be considerably more difficult.Following the elimination of smallpox, governments began to implement national immunization programs, which revealed the problem.There was hardly one manager in charge of immunization services at this time.Furthermore, most programs lacked logisticians or mid-level managers and there were no standardized procedures, policies, or training materials to serve as a guide[83].

The WHO also addresses the issue of a lack of sufficiently educated workers to handle vaccinations by assisting immunization programs in reaching deeper into remote regions by developing high-performance vaccine cool boxes and carriers.Electrolux Luxembourg created a transportable vaccine cold box that stayed cool for more than five days in an ambient temperature of +430C, based on a hardwood cold box developed in Sweden in 1974by the National Bacteriological Laboratory. The Luxembourg cold box was successfully tested in Ghana and has since become a benchmark for many developing-country manufacturers[84].

In 1977, a US portable container maker teamed together with the Pan American Health Organization to meet performance goals for outreach immunization.This vaccine carrier was copied and improved by low-cost producers in areas like the Philippinesand India.These carriers and crates are now widely utilized in poor countries.Countries were able to attain great results in terms of cold chain immunization supply thanks to

innovations.The introduction, scaling-up, and assuring accuracy and credibility of manufacturers' performance are driving the process.One-on-one collaboration between manufacturers is part of the innovation[85]. Many firms and individual developers, including Electrolux, Temptime, and Berlinger, worked directly with WHO technical employees and advisors on a one-to-one basis. This close, mutual assistance made it simple to convey the unique demands of harsh climates, aging infrastructure, limited compliance, and the importance of building vigor and allowed producers to meet performance targets[86].

Engineering laboratories were employed to evaluate new items as a counterpoint to this public/private closeness.In most cases, these laboratories assessed residential and commercial products on behalf of retail customers.To immunization stakeholders, the Universidad del Valle (Colombia) and the Consumers Association (UK) served as autonomous product design and testing contractors[87].WHO educated country managerial teams, UNICEF, and other donors on quality of equipment by issuing a list of pre-qualified, laboratory-evaluated tools with guidelines and standard operation procedures, a procedure now called Product Quality and Safety (PQS).The WHO/PQS system included technologies that were deemed adequate for a variety of programmatic needs, easing buyer demands to accept merely the lowest price[88].

The World Health Organization (WHO) investigated four solutions to the human resource issues associated with implementing the EPI as a routine vaccination service.The EPI was described as a set of standard practices aimed at obtaining high coverage for the vaccinations chosen.In 1976, WHO released an EPI loose-leaf booklet known as the 'Blue Book,' which served as the foundation for future policies and training[89].The vaccine supply and distribution infrastructure was designed to fulfill the needs of the vaccinations

as well as the EPI's field activities.Dedicated EPI managers were tasked with ensuring reliable vaccine delivery.A cold chain model game was developed and utilized in numerous countries to show top ministry officials the difficulties of vaccine delivery and to assist national EPI offices in developing and agreeing on detailed logistical plans that best met their needs[90].

Staff from all levels of national vaccination programs received training and support to address the EPI's global standard operating procedures. Since 1977, innovative techniques such as participatory training (which replaced traditional presentations) have been used to develop training courses for senior program managers, regional and district level staff, and these courses have been developed in partnership with theCenters for Disease Control and Prevention, US [91]. Countries were offered 'cascade training,' which began with national-level training and progressed to participants being paired to manage training in their particular areas and districts.

Modules gave each participant specific instructions, with a focus on what to do after the course ended.Staffs from other organizations involved in immunization were given special training. These included seminars for Médecins Sans Frontières in Paris, the US Centers for Disease Control and Prevention in Atlanta, and UNICEF workers at regional and country offices in the mid-1980s[92].

The final key human resource solution was training for users and repair personnel of vaccine storage refrigeration equipment.Because front-line health workers were unfamiliar with compression refrigerators, they were given extra help with refrigerator maintenance.Job aids were supplied, outlining how the health worker should care for and maintain their cold chain equipment on a daily, weekly, and monthly basis.Refrigerator repair technicians were given a ten-day intensive training course modified from a nine months South London Technical College programme[93]. Simple diagrammatic instructions

were prepared, and after only ten days of hands-on practice, the trainees were able to diagnose and fix all common compression refrigerator issues.Participants got a standard set of 'universal spare parts' devised by a Danfoss engineer that could be fitted to a variety of refrigerator models, as well as a UNICEF-supplied toolkit that is still accessible today[94].

Furthermore, the World Health Organization and other organizations developed resources and software applications to aid immunization program workers with logistics management and planning.

Applications like John Snow, Inc.'s Commodities and Logistics Management (CLM) stock control tool and Management Sciences for Health, for example, have improved vaccination stock control and forecasting.Through collaboration with WHO/EPI, CLM was expanded to vaccines.By the mid-1990s, WHO had developed the Vaccine and Supplies Management System, a more capable web-based vaccine stock control tool that is now utilized throughout the Eastern Mediterranean Region.Several more stock control equipments have lately been developed, and several of them are widely used[95].

Current Improvement in Immunization Supply Chain

The term 'vaccine cold-chain,' which was first used in 1976, has been supplanted by the word supply chain. The name suggests that the vaccine-only distribution and storage policy is giving way to a strategy that includes both vaccinations and medicines.This shift toward a more integrated strategy can be explained by three considerations. First, in the previous 25 years, health-care logistics and distribution have vastly improved, with both public and commercial systems receiving increased managerial attention. Second, in many countries, the fastest-growing demand is in the field of noncommunicable diseases, which necessitate refrigerated storage at +2 to +8C or +20 to +25C. Finally, when the cost

of transportation procuring and operation rises, there is a greater urgency to rationalize supply routes and maximize vehicle capacity use[96].

As the number of vaccines increases, the portfolio of vaccination operations expands, and new target groups are discovered, the supply chain must be streamlined and enhanced. Immunization strategies are becoming increasingly integrated. Routine immunization services in fixed facilities, field immunization services, and occasional single-vaccine campaigns are all combined into one plan. Vaccine logistics and supplies should be coordinated with other preventative services, especially in the context of remote vaccination outreach, where the expense of reaching out beyond the "last mile" should be shared[97].

Other factors that motivate changes in the supply chain are;better access to data related to vaccines and immunization; the increased use of information and communications technology, the need for more storage space to contain the increasing number of vaccines; and the much higher costs for some new immunization, which necessitate a reduction in vaccine wastage rates.Some countries have been able to reduce the number of steps in the vaccine distribution process thanks to improvements in management, equipment, and transportation.While governments try to lower the supply chain's energy requirements, solar-powered refrigeration is already assisting in the proper storage of vaccines in these places. Rooftop solar arrays that are connected to the electrical grid have been proved to save expenses, improve security, and lessen environmental effect[98].

As supply chain performance get better, as evidenced by lessons acquired over the last 40 years, particularly by the GAVI Alliance over the last 15 years, vaccine distribution should more closely match consumption, vaccine delivery should become more consistent, and stock-outs should decrease.As distribution efficiency improves, hazards associated with repacking and unpacking at each store should decrease, and fewer vaccine should

expire before reaching the intended recipient[99].To improve supply chain reliability and performance without disrupting supplies, more competent managers will be required to manage changes to the supply chain and its continuing development.Through education, information sharing, andon-line forums on a global scale, the International Association of Public Health Logisticians (IAPHL) and some other organizations are encouraging the professionalization of public health logistics.This global understanding feeds supply chain planning at the country level, ensures that country decisions are evidence-based and modifications are suitable and "outcome-oriented." While vaccine manufacturers and regulators strive toward a future without refrigeration in the vaccine supply chain, equipment designers and policymakers are currently evaluating and implementing modifications to achieve more reliable cooling and less cumbersome procedures[100].

The delivery of immunization services is still hampered by cold chain procedures and equipment.

VVMs address this limitation by allowing vaccines to be used to the confines of their stability in the event of a cold chain failure, however this requires off-label use.Vaccine is transmitted along the cold chain for as long as cooling is possible.Vaccine can only be employed if the VVM indicator enables it outside of the system's reach and after a break in the cold chain.Taking a vaccine out of the cold chain on purpose is now only possible if it has been pre-qualification by WHO for 'Controlled Temperature Chain' (CTC). The number of vaccines that have been pre-qualified for CTC is increasing, but progress is gradual, and it appears doubtful that all vaccinations in the normal schedule will be able to be removed from the cold chain for many years[101].

Increases in immunization coverage rates have been seen in the Polio Eradication Initiative (PEI) and numerous recent, thriving trials of off-label vaccine use.To gain this

benefit, the ultimate goal for all vaccines should be to eradicate refrigeration at +2C to +8C from the whole supply chain, with equivalent on-label storage rules[102].

The existing vaccination distribution system is based on 40-year-old methodologies and ideology.Vaccines are transported at several levels.Each level either acquires new vaccine supplies or receives vaccines that have been provided.This mix of collection and delivery results in unpredictable vaccine supplies and inadequate cold chain standards, including an increased risk of freezing of vaccines during transport.The delivery of vaccinations to pre-set circuits of stores is standardized thanks to high-performance management of supply chain for routine vaccine.Given the dangers of delivery interruption, the frequency of re-supply is set as high as possible[103].

Reducing the number of storage steps and improving the pathselected for each delivery circuit by picking ideal store sites and minimizing "reserve" stock levels can also improve distribution speed.Stock-outs and surplus stock accumulations can be avoided by preplanned, reliable, and punctual deliveries combined with quantity supply supervision.Supply system redesign, not the transitory, small-scale fixes that have defined efforts to enhance supply networks until recently, can accomplish these programmatic gains[104].

The supply chain continues to be a barrier to reaching the remaining 15–20 percent of unvaccinated persons.These individuals fall into one of three priority categories: Partially vaccinated people who are not able to complete the sequence of contacts due to poor service quality. Easily accessible populations, particularly in peri-urban settings, who refuse or are unable to participate in immunization for different reasons and those who live in physically difficult-to-reach rural places.This group's service delivery costs per fully immunized child are significantly greater than the first two.The first two are typically metropolitan populations that are quickly expanding over the world[105].

Cities have grown by roughly 750 million people in the last decade, with four-fifths of the expansion occurring in Africa and Asia[106]. The third population category, on the other hand, is rural and in decline.These considerations influence programmatic objectives and explain why people who live in remote places are generally the last to be reached. To fully immunize a child, remote groups such as those living in mountains, on islands, on rivers, and as nomadic tribes often require a 'brave' outreach strategy that costs up to five times more than in urban areas[107]. Integrating immunization programs with other specified services in these remote places may help to share the expense of outreach[108].

The polio eradication effort (PEI) is a crucial roadmap for revolutionary change in supply chains in the near future, much as smallpox eradication was a catalyst for the EPI 40 years ago. The PEI has already proved its worth:Using the most heat-sensitive vaccine, oral polio vaccine, off label to the limits of its stability, guided by the VVM. Many countries are leapfrogging intermediate depots to speed up and streamline vaccine supply.[109].

The PEI has amassed a substantial body of evidence on reaching the unreached with the schedule's most heat-sensitive vaccine.These efforts that have contributed to the PEI's success help to define the agenda for the development of immunization services in the short to medium term, encompassing all routine and supplementary delivery techniques.The vaccine supply chain will begin by addressing the 'last mile' barrier by simplifying both the technologies used to cool vaccines during outreach activities and standard operating procedures.

However, when vaccine temperature sensitivity decreases and regulations allow, the possibility of removing refrigeration from the vaccine supply chain remains constant. The system will become much less expensive and easier to manage in the long run.These

approaches will aid in reaching underserved populations and allow for speedier vaccine delivery with minimal handling[110].

2.10 Immunization Coverage per Antigen in Nigeria

Although there is an alternate data source from UNICEF and the Central Bank of Nigeriaestimatesper antigen coverage which includes information on just four antigens in Nigeria, which are used in this analysis.BCG (TB), DPT (diphtheria, pertusis, and tetanus), measles and polio are among them.Between 1995 and 2005, coverage of BCG in Nigeria fell from 80 percent in 1990 to 42 percent in 1995, fluctuating between 43 percent in 1996 and 60 percent in 2003, according to UNICEF data.BCG had a 53 percent in 1997.This indicates that the EPI policy's aim of at least coverage of 80% in Nigeria could not be achieved, just as it had not been accomplished in 2005[111].

The BCG coverage has increased by over 35 percent between 2006, when it was 40.50 percent, to 76.41 percent in 2010, and by over 53 percent since 2003, when it was 23 percent. Enugu State recorded the highest BCG coverage at 99.55 percent, while Kano State reported the lowest at 35.23 percent.Nigeria's EPI policy stated that no community in the country should have or report cases of diphtheria by 2004.The findings indicate that this ideal has yet to be achieved.

DPT had a coverage rate of 56 percent in 1990.Between 1997 and 2005, this fell to 31% in 1995 and 26% in 1996, with a range of 25% to 45 percent between 1997 and 2005.Apart from 56 percent in 1990, the highest percentage recorded between 1995 and 2005 was 45 percent in 1997[112].

This figure applies not only to the national figure but to all zones as well. The southeast zone has the maximum coverage (91.18 percent), while the northeast zone has the lowest coverage (46.16 percent).Enugu State had the uppermost DPT3 coverage of 98.2 percent, while Taraba State had the lowest DPT3 coverage of 15.63 percent. Polio coverage was

around 55 percent in 1990. In 1995, it fell to 31.5 percent, and from 1996 and 1999, it fell to between 26 and 19 percent.

It climbed to 26% in 2000, and it continued to rise to 45 percent in 2005.These findings indicate that Nigeria's goal of eliminating polio by 2004 with 95 percent coverage was not achieved[113].

Oral polio vaccination (OPV3) coverage is 73.95 percent nationwide, with the southeast zone having the greatest rate at 86.63 percent and the northeast zone having the lowest rate at 60.2 percent.The percentage fell from 38.60 percent in 2003 to 36.70 percent in 2006 and then rose to 73.95 percent in 2010.Enugu State had the highest OPV3 coverage with 99.11 percent, while Taraba State had the lowest with 18.75 percent.In 1990, 54 percent of people had measles, which declined to 44 percent in 1995 and then to 38 percent in 1996.In 1997, coverage peaked at 69 percent, then dipped to 40 percent in 1998 and 35 percent in 1999. Since 1999, there has been no major change in coverage, except in 2004 and 2005 when it fell to 32%[114].

The decreased trend of antigen coverage appears to be linked to political issues. Low government commitment to ensuring EPI policy implementation was one of these political issues[115].Also mentioned was the over-centralization of EPI administration at the federal level of governance in Nigeria.Also, vaccination shortages and administrative issues were cited for poor measles coverage between 1998 and 2005, as they were for Polio coverage during 1996, 1999, and 2000, when Polio recorded 26 percent, 19 percent, and 26 percent, respectively[116]. Measles vaccination coverage increased from 25.30 percent in 2003 to 32.70 percent in 2006 and 63.55 percent in 2010.According to the data, the southeast has 82.35 percent coverage, the south-south has 74.40 percent coverage, and the northeast has 47.15 percent coverage. Enugu had a measles coverage of 97.77 percent,

Zamfara had a median coverage of 65.48 percent, and Kano had the lowest coverage of 16.48 percent[117].

In 2006, more Nigerian states were polio-free than in 2005: 22 states reported no wild poliovirus cases in 2006, compared to 16 in 2005.NPI has developed a more integrated strategy aimed at raising vaccination acceptance and demand in general, as well as lowering child mortality. Nigeria reported substantial poliovirus transmission in 2006, primarily in six states in the country's northern region[118].

Polio, measles, diphtheria, tetanus, and pertussis are vaccine-preventable diseases that account for a major portion of child mortality.Around 1.5 million children under the age of five die each year as a result of various diseases worldwide.Vaccine-preventable diseases account for a considerable portion of child mortality in Nigeria each year.According to the 2018 World Health Organization (WHO) Measles Fact Sheet, around 86% of the children in theworld received one dose of measles vaccine duringroutine health services by the time of there are one year old.Between 1999 and 2005, global measles mortality dropped by 60 percent[119].

Increased measles vaccine coverage resulted in a 75 percent reduction in measles infections and deaths in Africa.In Nigeria, government and partner attempts to increase vaccination coverage have generated varying results throughout time.The peak occurred in the early 1990s, when universal childhood immunization coverage reached 81.5 percent; however, national data in 1996 revealed less than 30 percent coverage for all antigens, which fell to 12.9 percent in 2003[120]. According to the NICS (2017) report, fully immunized children had a coverage rate of 23%.Vaccine Preventable Diseases (VPDs) in children under the age of five years cause significant morbidity and mortality.According to the 2018 Nigeria Demographic and Health Survey (NDHS), just 23% of children in

Nigeria obtained all recommended vaccines, while 3% of children between 12 to 23 months had taken all basic immunizations[121].

Immunization started in Nigeria in 1956, when smallpox was widespread, and the national immunization program, known as the Expanded Programme on Immunization (EPI), began in 1979 to fight deadly childhood diseases that were thought to be the cause of high infant mortality and morbidity in the country. Vaccine coverage refers to the number of children who received age-appropriate vaccines at a certain time and location.Only four antigens are covered according to UNICEF's assessment of coverage per antigen in Nigeria.BCG (TB), DPT (diphtheria, pertussis, and tetanus), measlesandpolio are among them[122]. Between 1995 and 2005, BCG coverage in Nigeria fell from 80 percent in 1990 to 42 percent in 1995, fluctuating between 43 percent in 1996 and 60 percent in 2003, according to UNICEF data. BCG had a 53% success rate in 1997[123].

This means that the EPI policy's aim of at least 80% coverage in Nigeria was not fulfilled, as it was in 2005.The BCG coverage has increased by over 35 percent between 2006, when it was 40.50 percent, to 76.41 percent in 2010, and by over 53 percent since 2003, when it was 23 percent.Enugu State recorded the highest BCG coverage at 99.55 percent, while Kano State reported the lowest at 35.23 percent.Nigeria's EPI policy stated that no community in the country should have or report cases of diphtheria by 2004.The findings indicate that this ideal has yet to be achieved[124].

DPT vaccine coverage was 56 percent in 1990.Between 1997 and 2005, the percentage fell to 31% in 1995 and 26% in 1996, and varied between 25% and 45 percent.Apart from 56 percent in 1990, the highest percentage recorded between 1995 and 2005 was 45 percent in 1997.Despite the fact that nationwide DPT3 coverage is now at 67.73 percent, coverage increased by about 95 percent in 2010, compared to 36.3 percent in 2006.This

figure applies not only to the national figure but to all zones as well. The southeast zone has the maximum coverage at 91.18 percent, while the northeast zone has the lowest coverage at 46.16 percent[125]. Enugu State had the highest DPT3 coverage of 98.21 percent, while Taraba State had the lowest DPT3 coverage of 15.63 percent.Polio coverage was around 55 percent in 1990.In 1995, it fell to 31.5 percent, and from 1996 and 1999, it fell to between 26 and 19 percent.It rose in 2000, peaked at 26%, and then proceeded to rise to 45 percent in 2005[126].

These findings indicate that Nigeria's goal of eliminating polio by 2004 with 95 percent coverage was not achieved. Oral polio vaccination (OPV3) coverage is 73.95 percent nationwide, with the southeast zone having the greatest rate at 86.63 percent and the northeast zone having the lowest rate at 60.2 percent.The percentage fell from 38.60 percent in 2003 to 36.70 percent in 2006, then rose to 73.95 percent in 2010.Enugu State had the highest OPV3 coverage with 99.11 percent, while Taraba State had the lowest with 18.75 percent.In 1990, 54 percent of people had measles, which reduced to 44 percent in 1995 and then to 38 percent in 1996[127].

In 1997, coverage peaked at 69 percent, then dipped to 40 percent in 1998 and 35 percent in 1999.Since 1999, there has been no major change in coverage, with the exception of 2004 and 2005, when it fell to 32%.The decreased trend of antigen coverage appears to be linked to political issues.Low government commitment to ensuring the implementation of EPI policy was one of these political issues.It also includes excessive centralization of EPI administration at the federal level of Nigerian governance.Vaccine administrative issues and shortages were cited for low measles coverage between 1998 and 2005, just as they were for low Polio coverage between 1996, 1999, and 2000, when Polio recorded 26 percent, 19 percent, and 26 percent, respectively[128].

Measles vaccination coverage increased from 25.30 percent in 2003 to 32.70 percent in 2006 and 63.55 percent in 2010.According to the data, the southeast has 82.35 percent coverage, the south-south has 74.40 percent coverage, and the northeast has 47.15 percent coverage.Enugu state had a measles coverage of 97.77 percent, Zamfara had 65.48 percent of coverage, and Kano had the lowest coverage of 16.48 percent. A child is deemed completely vaccinated, according to the Federal Ministry of Health, if he or she has received the BCG TB vaccine, three doses of DPT to avert diphtheria, tetanus, and pertussis (whooping cough), at least one dose of measles vaccine and three doses of polio vaccine, [128].

Nigeria began expanding current children's programs in May 2012, with a focus on polio annihilation and routine immunization, including the substitution of the Diphtheria, Pertussis, and Tetanus (DPT) vaccine with a pentavalent vaccine that contains more antigens (Haemophilus type B and Hepatitis B) [129]. Pneumococcal conjugate vaccine (PCV) was introduced in 2014, single dose inactivated polio vaccine (IPV) was introduced in 2015, and the routine vaccination program switched from trivalent (tOPV) to bivalent (bOPV) in April 2016[130]. All of this was done to bolster existing measures targeted at eliminating vaccine-preventable childhood killer illnesses.The government in Nigeria provides routine vaccination services to the public primarily through the primary health care system[131].

Routine immunizations are regular administrations of vaccine planned nationally for infants, which require parents/caregivers to take their children to a health facility to receive doses of the antigen specific for age on specific days of the week to lessen vaccine wastage, as most vaccines are supplied in multi-dose vials[132]. The National Programme on Immunization (NPI) recommends five visits to the health facility for Hepatitis B and one dose of BCG at birth, 3 doses of Oral Polio Vaccine, and 3 doses of

Pentavalent vaccine at 6, 10, and 14 weeks, and one dose of measles and yellow fever vaccine at nine months of age[133-134]. To ensure maximum protection from vaccine-preventable diseases, it is advised that a kid receive all immunizations at the right ages and intervals[135-136].

Vaccination coverage is determined by the proportion of children who have received the required number of vaccine doses, regardless of their age at the time of vaccination, and the third dose of pentavalent vaccine is the important indicator for measuring immunization program coverage[137].According to the 2013 National Demographic and Health Survey (NDHS), 25% of children were fully vaccinated, whereas 21% of eligible youngsters had no vaccine at all. Fifty-one percent received the BCG vaccine, 42 percent the measles vaccine, 51 percent the first dose of DPT vaccine, and just 38 percent received the third dose of DPT vaccine, indicating a DPT dropout rate of 25%.Before their first birthday, 21% of the youngsters had gotten all of the required vaccines.In Edo State, however, the vaccine coverage rate was 52 percent in 2013[138].

Although coverage of immunization in Nigeria has increased over the last decade, from 13% in 2003 to 25% in 2013, it still falls short of the 90% coverage required to meet the Millennium Development Goal[138]. Nigeria's low vaccination coverage has been attributed to a number of issues.Lack of maternal knowledge of immunization, poor attitude and mal-orientation of health workers, lack of political will, religious insurgency/terrorism, poor health infrastructure, and religious/cultural aversion to vaccine acceptance, ignorance, lack of awareness about vaccine availability, fear of Adverse Effects Following Immunization (AEFI), inadequate cold chain facilities, and vaccine stock-outs are among these[139-143].

Between 2011 and 2016, Nigeria made significant progress in lowering the death rate of children under five years of age from 158 to 120 per 1000 births. However, coverage of

the primary vaccines delivered through routine immunization has decreased over time. According to the government of Nigeria's recent Multiple Indicator Cluster Survey done in 2016/17, barely one out of every four youngsters in the country receives all of the recommended vaccines.Coverage of immunization with the pentavalent vaccine varies drastically amongst the 36 states, ranging from 80 percent in Lagos to 3 percent in Sokoto, and it is below the recommended worldwide objective of 90% in all of them[144].

In Nigeria, children are immunized through regular immunization and catch-up supplemental immunization campaigns either throughout the country or in specified sub-national areas[145-146]. In Nigeria, 'a fully immunized kid is anticipated to have been given one dose of Bacillus Calmette–Guérin (BCG) at birth or soon after birth, three doses of diphtheria, pertussis, and tetanus (DPT) and oral polio vaccine (OPV) vaccines at six, ten, and fourteen weeks, and one dose of measles vaccine (at nine months)'[147].

Yellow Fever immunization is also given at the age of nine months. Hepatitis B, Pneumococcus, and rotavirus vaccines were recently introduced and delivered within the first year of life[116]. Vitamin A is also given at the ages of 9 and 15 months[120]. Inactivated polio vaccine was introduced into the normal immunization schedule in 2015 as part of the Polio Eradication and Endgame Strategic Plan, and Nigeria took part in the April 2016 changeover from trivalent to bivalent polio vaccine[148]. Furthermore, when countries implement a second dose of measles vaccine and other booster doses, enhanced routine immunization coverage is projected in the second year of life and beyond, as this allows for catching up on any missed immunizations from the first year[120].

Since 1988, Nigeria has been a part of worldwide efforts to get rid of polio, however things have not always gone well. A polio vaccine boycott in three northern states in 2003 caused a severe setback in Nigeria and neighboring countries, which contributed to the re-introduction of the wild polio virus (WPV) into thirty-one previously polio-free

countries[148-150]. Political tensions between the north and south of the country sparked the boycott, which culminated in religious and political leaders in the three affected northern states alleging that the vaccines were contaminated with anti-fertility agents and HIV and were being used to target the northern population[149,151].

More recently, frequent Boko Haram attacks on communities and on health workers in several sections of northeastern Nigeria have made immunization difficult to obtain in these areas[150]. In spite of these and other setbacks, Nigeria was proclaimed polio-free in 2015 in the month of September, and has not had a single incidence of WPV since July 2014, as of the publication of this article. Nevertheless, concerted efforts are needed to ensure that polio does not resurface and that the African continent is declared polio-free in 2018.

Immunization coverage varies significantly across low- and high-income nations, as well as within countries Individual, cultural, and institutional factors all contribute to unequal childhood vaccination coverage.Regional differences in immunization coverage,

Empirical Review

In a cross sectional study by Borus[78] on missed opportunities and immunization coverage of 418 children under two years in the slum areas of Nairobi Kenya, it was found that 80% of the children were immunized against Measles, 96.7% had received BCG, 85% against DPT and 75% against Polio. Overall 84% of the children were fully immunized. The study also revealed that the most frequently reported reasons for child not being fully vaccinated were: vaccine was out of stock (20%), vaccine scheduled not to be given that day (35%), child was sick or under weight (20%), child not yet of age (15%) and syringe out of stock (10%). The author argues that the lower immunization coverage for Polio (75%) compared to DPT (85%) was due to missed opportunities arising from shortage of Polio vaccine that was reported in the period proceeding to and during the survey[79.] In a cross-sectional survey to describe the immunization coverage in a rural part of north India with a sample of 747 children, it was found out that 94.8 % (708 of 747) eligible children were immunized and had received the required doses of the primary schedule vaccines[79]. The coverage was (BCG (94.8%), OPV/DPT (91.6%), and Measles (72.6%). Only 39 (5.2%) of the eligible children had not completed immunization schedule for BCG, DPT, Polio and Measles due to temporary or permanent migration of the children or family to the village or went back to the parents' home or divorce or the child was adopted by relative. Much as the results of this study indicate high responses and positive results, the study was conducted in the rural setting of India, a situation that may significantly differ from the Kawempe division which is an urban setting, although there are some clear similarities like frequent temporary or permanent migrations of the children or families which may affect child completion of immunization schedules. Internal migration is also

the order of the day in urban areas; hence the same factors could be important in explaining the existing levels of immunization coverage in Kawempe division. In a cohort study of childhood immunization on 760 newborns in rural Malawi, it was found that at 1 year of age, 91% were vaccinated against Polio, 90% against DPT and 64% against Measles [80]. At 2 years of age, the corresponding vaccination coverages were 93%, 93% and 84%, respectively. The study further revealed that low coverage was associated with living in villages with no access to mobile vaccination teams, and birth at home. A study to identify factors influencing urban and rural immunization coverage in 220 households with children 12-13 months of age in a rural district of Ethiopia revealed 12 that higher community awareness was associated with effective community mobilization for immunization[79]. Furthermore, the study found that immunization coverage for DPT, Polio and Measles in these areas were 97.3% for DPT1/OPV1, 92.7% for DPT3/OPV3 and 75.5% respectively and the reason for this high coverage was that mothers were literate. The WHO multi-stage cluster sampling method with stratification was used. The method does not allow selection of households from the sampling frame, but instructs the interviewer to follow a random procedure in the field, resulting in a cluster of households being selected within the community. This procedure is open to conscious or unconscious bias of the interviewer, and does not lead to a sample selected with known probability. The method also includes all the eligible children in the household in the sample. There is also an element of stratification which introduces the element of extensive sampling frame, which is necessary in stratified sampling, significant attributes that can be subjectively selected thus increasing costs (due to extra time and manpower). A prospective study on eliminating a missed opportunity as one of the barriers to immunization in 919 children aged 5 years and below in Calabar South-Eastern Nigeria, showed that 60.9% of the children whose immunization status was ascertained were fully

immunized, while 26.6% were partially immunized and 12.5% had no form of immunization[81.] The study further revealed that immunization coverage for BCG was 65.7%,OPV0 65.7%, DPT1/OPV1 64.1%, DPT2/OPV2 62.7%, DPT3/OPV3 62.4% and 61.3% for Measles. Reasons for missing scheduled immunization were: child being ill at the time of immunization, ignorance about repeat visits, change of residence and fever following previous immunization[79]. This was a hospital based study which used immunization cards and immunization history method. Which involved cross-checking immunization history and immunization cards at each visit and following the respondents forward in time. A follow-up study had the disadvantages of time and cost considerations. The study, having taken a long time in cross-checking immunization history and immunization cards, most likely obtained results that were not accurate and hence to a great extent unreliable. In a study on attendance at National Immunization days and routine immunization involving 48 mothers and fathers in Bushenyi District, Uganda, it was found that immunization coverage was 95% for BCG, 82% for DPT, 81% for Polio and 77% for Measles[79]. The study revealed that the coverage was due to knowledge of immunization, attitudinal beliefs and social influence of the mothers and fathers. The mothers and fathers believed that routine immunization were well intentioned and meant to eradicate childhood diseases. In terms of social influence, the study revealed that while it was the woman who decides the issue of routine immunization, the man was regarded as the one who makes the very important decision not to immunize in exceptional situation when immunization strengthens disease[80] The authors recommend the involvement of men and women in health education/promotion activities for immunization. Factors Associated with Immunization of Infants less than One Year for DPT, Polio and Measles A study carried out on immunization in urban areas in China revealed that poor uptake of immunization in urban areas was associated with lack of

mother's awareness about repeat visits to achieve complete immunization rather than overall vaccine awareness. This led to failure by mothers to make repeat visits to complete immunization[79]. The study suggested that the community's concerns about immunization should be addressed through involvement of decision- makers like fathers and mothers in-law. Furthermore, anti-vaccine rumors such as pathogenicity of a vaccine and propaganda of vaccines weakening their children which were encountered in the community, affected immunization coverage attained. Most illiterate mothers as well as their husbands have negative attitudes towards vaccination and believe that vaccines have got side effects on the health of their children. Negative perceptions about vaccination and anti-vaccine rumors in some communities affect the level of immunization coverage. Mis-information about the side effects of vaccine during illness and false contraindications also affect the level of immunization coverage.[81] This study was therefore carried out to establish whether similar situations existed in Kawempe Division as it is also an urban setting which is multi-ethnic with varying socio-cultural and education background. In a related study, a representative sample of 221 respondents was used in investigating the reasons for non-vaccination and the effects of socio-demographic factors on vaccinations in a district of Istanbul, Turkey,[79] This study revealed that distance from the health centre and internal migration from less developed parts to more developed parts of the country, were significantly related to the level of immunization coverage. The study also revealed that immunization coverage was associated with educational level of the father and the mother. Children whose mothers' education level was at least primary school were more likely to be fully immunized than those whose mothers had no education. The study used the '30x7' cluster sampling, a method recommended by WHO as a rapid and economic method used in assessment of vaccine coverage. Using this method, communities are selected with probability

proportional to size according to the most recent census data, but these data can be 15 inaccurate and outdated, particularly with respect to fast-growing urban areas like Istanbul. This will often mean that such areas, which may have the poorest access to health care, will be under-represented in the sample, and overall estimate of vaccine coverage will be biased upwards. It is most likely that such results may have some inaccuracies thus creating a situation of unreliability, even though the data was collected from an urban setting like Kawempe Division. In another study on child immunization coverage in 700 households in the slum areas of Rajshahi City Corporation Bangladesh, it was found that full immunization was higher (92.3%) in the higher ages (24+ months) than the age 12-23 months (89.5%)[81]. The high coverage in the higher ages of 24+ months was attributed to demographic and socio-economic factors such as mother's education, husband occupation and family's monthly income. The study found that the place of delivery and exposure to mass media had highly significant effects on child immunization. In other words, the mothers who were exposed to any mass media were more likely to have their children immunized compared to the mothers who were not exposed to any mass media. Furthermore, mothers who delivered at health institutions such as hospitals and clinics were more likely to have their children given the Polio 0 vaccine on delivery than those who delivered at home. In a study on determinants of immunization coverage in 510 children aged 12-23 months in urban slums of Lucknow district, India, it was reported that only 44% of the children were fully immunized. Incomplete immunization and unimmunized status of the children were associated with low socio-economic status which constrained the poor parents to take their children for repeated visits to complete 16 immunization schedules, higher birth orders which are associated with low child care with a mentality that high numbers act as insurance for those that may die, home delivery and Muslim religion which limit access to immunization centres[81]. The study used WHO

30-cluster sampling method which was similar to the study . Again, the method used did not select households from a sampling frame, but instructs the interviewer to follow a random procedure in a cluster of households being selected within the community. The procedure is open to conscious or unconscious bias of the interviewer, and does not lead to a sample selected with known probability. In case of non-response, one simply goes to select the next households, leading to bias if non – responders differ systematically from those who did not participate. Only the first household in each cluster is selected and every eligible subject in the household is included in the sample. Such a methodology definitely remains questionable in the scientific research, and the accuracy of the findings remains questionable, though they can not be wholly discarded because of its homogeneity with Kawempe Division in terms of having slum areas. In another study on childhood immunization of 6300 children in urban slums of India, it was found that slum dwellers did not demand immunization services. Demand immunization services require acceptability, clear understanding of the benefits, no fear of vaccines, specific knowledge of the vaccine doses, motivation to avail services and overcoming barriers for seeking immunization. The authors argue that slum dwellers were unable to demand for services owing to weak community organization and low collective confidence, which is known to increase utilization of health services in public institutions. This is possibly related to the observed low utilization of health services including immunization services.[82] The study also used WHO 30- cluster survey method with modification similar to the one used in a study[79] . Although the method is a modified one, still it does not select households from a sampling frame, but instructs the interviewer to follow a random procedure in the field, resulting in a cluster of households being selected within the community. It also includes all the eligible children in the household in the sample and only the first household in each cluster is randomly selected. In Uganda, a cross-sectional descriptive study on

comparison of vaccination status of children born in health units and those born at home of 486 children under five years in Jinja town, Eastern Uganda, it was found that 68% of the children were up to-date with their vaccines[81]. The study revealed that a child born in a health unit was more likely to be up to-date with their vaccination compared to a child born at home. Being born at home was found to be a risk factor for incomplete or non vaccination. Continuation of vaccination was similarly observed to be poor in children born at home and those born in health centres. The authors recommend training by community Health workers of TBAs and the participation of TBAs and parish development committees in routine immunization coverage. In a cross-sectional survey on factors influencing immunization coverage among 410 children under five years of age in Khartoum State Sudan[81],found that children in urban and rural areas differed significantly in their reported vaccination coverage and their receipt of each vaccine. In urban areas, accessibility to immunization centers is high compared to rural areas where amidst the few centers immunization is schedule based. The study also confirmed that vaccination coverage increased with an increase in the age of the children and the education level of 18 the mother. Furthermore, the study found that the mothers' knowledge of and attitude to vaccination showed a strong relationship with the vaccination status of their children. This study used a similar method as applied . Equally, a sample collected may not be an accurate representation of the entire population if the list being sampled had periodic arrangement. In a study on health infrastructure and immunization coverage of 43,416 children aged 2-35 months residing in rural India[81], it was found that the availability of health infrastructure significantly improved immunization coverage for non Polio vaccines[79] . The study further revealed that larger and better equipped facilities such as hospitals and health centres had bigger effects on immunization coverage. The findings of this study suggest that the nature of health

infrastructure: hospitals and health centres play an important role in increasing immunization coverage. Much as the results of this study could not depict a similar situation in Kawempe division, it is evident however that this was an urban dwelling which is synonymous to Kawempe Division which houses big health institutions like Mulago hospital and others as indicated above, which could make a good comparison for the study, hence explaining how health facilities can be a factor associated with immunization coverage. In Kenya, a cluster survey with sample size of 204 children aged 9-23 months was carried out by Ndiritu et al. (2006). This study investigated immunization coverage and risk factors for failure to immunize children below one year for DPT. The study revealed that immunization coverage declined with increasing distance from the vaccination clinics. The study also showed that immunization coverage was more strongly associated with annual patterns of rainfall. A WHO 30-cluster sampling method together with simple random sampling method was used in the study. The WHO 30-cluster sampling method again does not select households from a sampling frame. Simple random sampling which requires a population listing was applied and each chosen subject was located and questioned. Certain significant attributes may also be under or over represented. In a cross-sectional descriptive study of 408 care takers with children aged 12-23 months) on missed opportunities and caretaker constraints to childhood vaccination in Kiyeyi, a rural area in Eastern Uganda, it was established that complete vaccination coverage was 44.6%. Reasons for non completion of vaccination were: caretaker not being bothered, being busy or ill, and feared health workers. Other reasons were: not knowing immunization schedule, low level of formal education, fear of vaccine side effects and perceived contraindications to vaccinations[78]. Although the results of this study which was conducted in rural Uganda cannot be confirmed to be relevant to Kawempe division which is urban setting, relevance can be found in the low

level of education of the caretakers and their being busy. Kawempe division has a high level of illiteracy and unemployment[81.] The same factors therefore, could be important in explaining factors associated with immunization coverage in Kawempe division. A participatory study of 114 participants to assess the impact of decentralization of health services in Ntungamo District in Western Uganda revealed that routine immunization coverage in infants below one year for Polio, DPT, Measles and BCG was high, averaging 80% since 2000. The study found that the community members hailed the decentralization of services as instrumental in improving 20 accessibility to health services[81.] Much as the findings of this study which was conducted in rural district of Uganda cannot be relevant to Kawempe division which is urban, relevance can be found in the existence of decentralized health services. Hence the existence of decentralized health services could be important in explaining factors associated with immunization coverage in Kawempe division. In summary, much as the literature reveals several factors affecting immunization coverage in children aged 12 to 18 months, the main demographic and socio-economic factors associated with vaccine coverage are: distance from health centre facility, family migrations, place of delivery, the role of the mass media, availability of health infrastructure or facilities, mother's education, age, knowledge, attitudes, weather conditions, decentralized health services and community awareness. The study used primary source of data due to the fact that secondary data with variables under study in Kawempe Division was not available. A descriptive, cross-sectional research design was conducted to describe the immunization coverage for Polio, DPT and Measles among children of 12 to 18 months. The descriptive design was preferred because it provides further insights into the research problem by unfolding the variables of interest, estimating, predicting and examining associative relationships. 3.3 Study Population The study population comprised of 18,344 households in Kawempe Division,

Uganda[79]. It is estimated that about 8% (1,468) of households had children in the age group of 12-18 months (KDPSA, 2006). 3.4 Sample Size A sample of 225 households was calculated using Epi Info Statcalc and applying the following parameters: a 95% level of confidence (5% margin of error); and prevalence of 53% according[81] To cater for non-responses to some of the questions, a 7.5% over-sampling was applied to give the stated value of 241 households. In the actual study, 239 respondents were successfully interviewed and the response rate was 99.2%. During the study, parents from 22 households were absent. However, since there 22 was over sampling (by 7.5%), this challenge was overcome. Therefore, a sample of 239, which is greater than the minimum sample size calculated (225), was realized. 3.5 Sampling Procedure In an effort to minimize data collection costs and to ensure precision, the study used a multi-stage sampling technique at the first stage cluster sampling technique was applied to obtain the enumeration unit. At the second stage, simple random sampling was used to select five (5) administrative units (parishes) from 19 administrative units (parishes) that constituted the selected cluster (Kawempe division). This was done by writing the names of the parishes on pieces of papers and placing them in a tin. The researcher shook the tin until the papers were mixed up before selecting the five, one by one without replacement. From each of the five (5) selected administrative units [parishes], again simple random sampling was used to select one village (cluster) from 12 villages on average in each parish. Again, the researcher went through the same process that was used to select the parishes. Thus a total of five (5) villages were selected. The study finally used systematic sampling to select households from the five (5) selected villages. First, with the help of Local Council one [LC 1] leaders, the research team established the number of households that had children aged between 12-18 months. Secondly, the total number of households in each village was divided by the respective samples for each of the villages to calculate the intervals

that were used when selecting the households. Thereafter, every fifth household that had children between 12-18 months was selected. At the household level, the mother was selected as the respondent. The father or caretaker was used only if the mother was unavailable and this was the case in 7 households. This selection affected the results in such a way that 232 (97.1%) of the 23 respondents were mothers and only 7 (2.9%) of the respondents were fathers or caretakers. scientific research methods were applied to design the data collection tool as well as the selection of the samples. Using critically assessed instruments, scientific sampling techniques were followed to minimize information bias. The selection targeted women and care takers staying with children aged between 12-18 months. This is because it is such women/care takers that would give unbiased information about the immunization of their children who were supposed to have completed immunization schedules for DPT, Polio and Measles within a period of one year (12 months) after birth. Selecting respondents without children in this group (12-18 months) would lead to giving of incorrect data. Seven male respondents become part of the sample after failing to tress the responsible women he could give information pertaining to the immunization status of their children. However, the 7 male respondents selected for the interview out of 239 respondents were too few to bias the information presented in this study. 3.6.2 Reliability According to Amin (2005), Procedures Guidelines of the WHO and UNEPI Operational Framework were used to provide standards for effective immunization. Conciseness was critically considered in formulating questions to enhance clarity. To ensure reliability, the instruments were edited and pre-tested on 50 respondents from households who were not part of the study in the study area. In addition, they were given to two professors from the School of Public Health, Makerere University to ascertain their validity and find out whether they were suitable for collecting information that would answer the questions in the study. The

questionnaire was then pilot-tested on 50 respondents of the un-sampled number of the study population. After piloting the tools, they were reviewed to ensure that they captured reliable information and modified to improve clarity before undertaking the main study. The reviewed and modified tools were then used by the thoroughly trained Research Assistant to collect data. Supervision of all interviewers was undertaken during data collection to avoid inaccurate recording of responses. Data was collected using interviewer-administered questionnaires due to the fact that illiteracy rate stands at 31% among women in Uganda[79]. Therefore to put into consideration of respondents who could neither read nor write interviewer administered questionnaires were used. The questionnaire was developed according to the research question and the objectives of the study. It consisted of 36 questions, with 25 11 questions on background information, 7 questions on immunization coverage and 18 questions on factors influencing immunization coverage (Annex I). The questionnaire included close-ended questions set in a yes/no format. Following consultation from experts, the questionnaire was translated into Luganda a language that is ably understood by over 95% of the residents in Kawempe Division[79]. Child vaccination status was determined through inspection of the child's immunization card by the study interview. Information on demographic and socio-economic factors was obtained from self identified and reporting by the mother and caretaker. Since the study population was large, using the questionnaire was advantageous, in that respondents were easily interviewed by four (4) well trained Research Assistants. Secondly, given that the questionnaire was interviewer administered, it enhanced the response rate and saved time and money for emailing and collecting the questionnaires. Data Management and Analysis Data Management Data processing included the following steps: sorting, categorization, coding, entry, cleaning and validation. Data was appropriately recorded and edited to ensure accuracy and

consistency. Coded data was entered using Epi Info and later transported to SPSS for cleaning and analysis. Data Analysis Data was analyzed at three levels using statistical package for social scientists version 13. The levels of analysis included univariate and bivariate analyses. Univariate Analysis At this level of analysis, frequency tables and descriptive statistics were constructed to indicate the background characteristics of respondents. The variables of interest included; sex, marital status, highest level of education, employment status, monthly income, Religion and age. Bivariate Analysis Pearson chi-square test was appropriate for the study because all variables were categorical. Statistical significance of the association between the dependent variable (immunization coverage) and the independent variable (socio-demographic factors) are interpreted using the Pearson chi-square test with the significant level fixed at 95%. Interpretation of results The test explains the level of association using p-Value, the level of significance which is the probability of rejecting or accepting the hypothesis being tested. It was fixed at 0.05 and if the p-value is greater than 0.05, then the statistical relationship between the dependant and independent variable under study is not significant. Else, if the p-value is equal or less than 0.05, then there is a significant statistical relationship between the two variables in that a change in one makes the other change. The general formulae of the Chi-square used is X2 = – ∑ ∑) (= = r i k j E ij O ij E ij 1 1 2 Where; 27 j= 1, 2, ……..,k i = 1, 2 …r Oij = Observed frequency. Eij = Expected frequency. k = Number of categories of the dependent variable. r = Number of categories of the independent variables. Limitations to the study include language barrier since Kawempe division is an urban centre with a collection of different tribes and nationalities. To solve this problem, questionnaires were translated into the most popular local language (Luganda) of the respondents. 3.11 Ethical Considerations In conducting this study, the researcher took care not to infringe on ethical and legal issues. Ethical

approval was obtained from the Ethics committee of the Ministry of Health in Kampala. This permission in the form of official letters (Annex VI) was taken to the Local Government council leaders in the localities. The respondents were adequately informed using the participant's information sheet about all the relevant aspects of the study, including its aim, interview procedures, anticipated benefits and potential hazards before the main data collecting team arrived. The interviewers outlined the scope of the interview and its approximate length prior to the start of the interview. The respondents were informed that participation in the study was entirely voluntary. They were also informed that they had the right to do the interview, to abstain from participation and to terminate their participation at anytime, whenever they wanted. In this case, the respondents did not become subjects of the study unless they provided informed consent as stated on the consent form. The consent forms were signed by the 28 respondents who agreed to participate in the study with no pressure or inducements of any kind being applied to encourage them to become subjects of the study. The respondents were also informed that the interviews would be conducted in privacy. Caution was maintained to ensure that the identity of respondents from whom the information was obtained would be kept strictly confidential and would be referred to their words, pseudonyms or invented names which they had chosen. They were also assured that at the end of the study, any information that revealed the identity of individuals who were subjects of the study would be destroyed. No information, revealing the identity of any participant was included in the final report or in any other communication prepared in the course of the study, unless the participant concerned had consented in writing to its inclusion beforehand. Adherence to strict confidentiality and safeguards was therefore ensured. immunization coverage in Kawempe Division, parents' perceptions about factors affecting immunization coverage and the relationship between socio-demographic variables and immunization The

background characteristics include; sex, age, income, marital status, highest level of education, employment status and religion. Sex of respondents Sex of respondents affects immunization perceptions where females are more likely to ensure that their children are immunized than their counterparts. The percentage distribution of respondents by sex. Results from the survey indicate that majority of the respondents were female, accounting for 97.1% of the total number of respondents Sex of the Respondents (n=239) Marital Status F 44.8% of the respondents were married, 37.7% were cohabiting, 9.6% were single parents, 5.4% had separated, 2.1% were widowed and 0.4% divorced. Marital Status of Respondents (n=239) 0 5 10 15 20 25 30 35 40 45 50 Married Single Widow Cohabiting Separated Divorced Marital status Percentage (%) Highest Level of Education Out of a total of 239 respondents, only 43.9% of the respondents had completed secondary level education, 35.1% had completed primary level education, 10.9% had 31 vocational training, 5.4% had completed tertiary institutions, and 4.6% had not obtained any formal education, (Figure 3). Levels of Education (n=239) 0 5 10 15 20 25 30 35 40 45 50 Tertiary Vocational Secondary Primary Uneducated Education Level Percentage (%)Employment Status The employment status has an effect on immunization related issues particularly on the side of the woman. Table 2 shows the percentage distribution of respondents in different categories of their employment. 32 Table 2: Employment Status (n = 239) Employment status Number (N) Percentage (%) Working (full-time) 64 26.8 Working (part-time) Unemployed 121 50.6 Retired 2 0.8 Student 5 2.1 Self employed 3 1.3 Total 239 100 It was revealed that most of the respondents (50.6%) were unemployed. Respondents working full time contributed 26.8%, 14.2% were part-time workers, 2.1% were students, 1.3% were self-employed and 0.8% had retired from formal employment. It is not surprising that the employed only formed 47.5% due to low education levels. . Monthly Income indicates 36.4% of the respondents

earned a monthly income between UGX 100,000 and 200,000, 28.5% earned less that UGX 100,000, 11.7% earned more than UGX 200,000 but less than UGX 300,000, 4.2% earned an income of between UGX 400,000 and 500,000 while 3.3% earned more than UGX 500,000 per month. Monthly Income of Respondents (n=239) 0 5 10 15 20 25 30 35 40 More than 500,000 Between 400,000- 500,000 Between 300,000- 400,000 Btn 200,000- 300,000 Between 100,000- 200,000 Below 100,000 Income Level Percentage (%) . Religious Affiliation shows that 67% of the respondents were Christians, 29.3% were Muslims, 2.9% belonged to other religions and 0.8% were unaffiliated to any religion. Religious Affiliation (n=239) Religious affiliation No. of Respondents Percentage % Christians 161 67% Pagans/Traditionalists 2 0.8% Muslim 70 29.3% Other religions 6 2.9% Total 239 100% . Age of Respondents Age of respondents is a very important demographic fact in affecting immunization coverage. There is likelihood for age to be associated with experience pertaining to immunization. The age distribution of respondents is presented in Table 2 below; Table 4: Age of Respondents (n=239) Age Group No. of Respondents Percentage (%) 15-19 29 12.1 20-24 74 31.0 25-29 67 28.0 30-34 39 16.3 35-39 19 7.9 40+ 11 4.6 Total 239 100.0 Table 4 shows that 31% of the respondents were aged between twenty and twenty-four, 28% were aged between twenty-five and twenty-nine, 16.3% were between thirty and thirty-four years, 12.1% were aged between fifteen and nineteen, 7.9% were between thirty-five and thirty-nine years and 4.6% were above the age of forty. Immunization Coverage among children aged 12 to 18 months in Kawempe Division Among the specific objectives of the study was to describe the immunization coverage in Kawempe Division for Polio, DPT and measles in children aged 12 to 18 months. Presentation of immunization cards was one of the criteria used to justify whether the respondents had immunized their children. Out of 239 respondents, 225 (94.1%) of the respondents presented immunization cards of their children during the

study, while 14 (5.9%) of the respondents did not present immunization cards of their children because they were not available during the survey. Immunization coverage for DPT in children aged 12 to 18 months Respondents were asked to indicate whether they had taken their children for DPT immunization. In addition, respondents that had taken their children for immunization were also asked if they completed its schedule. The responses obtained shows Percentage of Parents who took their Children for DPT Results from the survey show that out of the 239 respondents, 229 (95.8%) had taken their children for DPT. The study further revealed that out of the 229 parents who had 36 taken their children for the DPT vaccine, 184 (80.3%) had completed the immunization schedule. Immunization coverage for Polio in children aged 12 to 18 months Respondents were asked to indicate whether they had taken their children for Polio immunization. In addition, respondents that had taken their children for immunization were also asked if they completed its schedule.

End Note

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Chapter Three

Methodology

This aspect of the dissertation addressed the methods used in carrying out this research under the following sub-headings: research design or plan, population of the study, sample and sampling method, research instrument, procedure for data collection and method of data analysis.

3.1 Research Design

The research design adopted for this study is a descriptive cross sectional study. This type of research .design does not add to or subtract from the existing facts. However, it is carefully observed and recorded information from the respondents as it naturally occurs. This study was designed to investigate immunization status and factors responsible for the reduction in immunization in Ibadan north and SoutheastLocal Government Area, Oyo State.

3.2 Population of the Study

Parents and caregivers who attended immunization programs in Ibadan North and Southeast local government, Oyo State, were the study's target group.Ibadan North is a Local Government Area in Oyo State, Nigeria, with Agodi as its administrative center.It is home to Nigeria's first premier university, which is the University of Ibadan, which was founded in 1948, as well as Ibadan Polytechnic. This local government region was established to ensure that resources from the upper tier government are used efficiently and effectively, and that services are delivered in accordance with best value principles in order to best fulfill the needs of the people at the grassroots level.

Ibadan Southeast is a local government area in Ibadan, Oyo state, Nigeria. It is located in the southwest geopolitical zone. The LGA's headquarters are in Ibadan's Mapo Hall

district, and it shares borders with the LGAs of Ibadan Southwest, Ibadan Northeast, and Oluyole. Boluwaji, Challenge, Ring Road, Odinjo, Felele, Molete, and Owode are among the districts that make up Ibadan Southeast LGA. Ibadan Southeast LGA has a population of 201,441 people, with the Yoruba being the most populous ethnic group in the area. The Yoruba and English languages are extensively spoken in the LGA, and Christianity and Islam are both widely practiced religions.

Ibadan Southeast LGA hosts a number of industries such as agro processing and manufacturing industries. A number of banks, restaurants, relaxation spots, hotels, and institutions can be found in Ibadan Southeast. Trade and commence also boomsin the area with the LGA having a number of markets such as the Owode academy and Oranyan markets where the residents of the LGA go to sell and buy a range of produce. Other essential economic enterprises undertaken by the residents of Ibadan southeast LGA include dyeing and textile weaving, woodwork, and traditional medicine. There are several health care facilities in Ibadan Southeast LGA which includes Myvision Ophthalmic Eye Clinic, PHCs in some wards and private health care facilities.

3.3 Sample and Sampling Technique

Sample is a sub-set of the population. The study utilizedmultistage sampling techniques. Simple random sampling was used to select three PHCs each from both Ibadan North and Southeast.LGAs The proportionate sampling technique was used to select a total of four hundred and twenty-two(422) respondents from all the selected PHCs base on the proportion of registered parent/caregivers attending immunization clinic in the past 1 month. The table 3;1 below andproportionate sample gotten from each of the PHCs.

Inclusion Criteria – All parent/caregiver with children within 9-12months attending immunization clinic at the selected PHCC in Ibadan North and Southeast LGA.

Exclusion Criteria – Parent/caregiver with children having health challenging leading to hospital admission

Sample Size Determination

Sample size was derived using Cochran's formula for finite proportion. Cochran's (1977) formula proportion is stated as:

$$n_o = \frac{z^2pq}{e^2}$$

where:

n_o - initial sample size calculated

z – standard normal deviation (1.96) which corresponds to the 95% confidence level

(P) (q) = estimated of variance

P = maximum possible proportion (0.5)

q = 1-p =0.5

thus

$$n_o = \frac{(1.96)^2 \, x \, (0.5) x \, (0.5)}{(0.05)^2} = \frac{3.842 \, x \, 0.5 \, x \, 0.5}{0.0025}$$

$$\frac{0.9605}{0.0025} = 384.2$$

384 + 10% attrition rate added

= 422

Table 3.1: The Distribution of Samples in PHCC base on population of registered list of caregiver attending immunization clinic

S/N	Names of Primary Health Centres	LGA	Monthly Coverage	Sample Size
1.	Idi Ogungun PHC	Ibadan North	116	106
2.	Agbowo PHC	Ibadan North	79	72
3.	Basorun PHC	Ibadan North	43	39
4.	Molete PHC	Ibadan Southeast	80	74
5.	Algon Comprehensive PHC	Ibadan Southeast	45	42
6.	Boluwaji PHC	Ibadan Southeast	96	89
	Grand Total		**459**	**422**

Source: field survey 2022

3.4 Research Instrument

This study adapted question items from the standard WHO Vaccination Coverage Survey published in 2018 and revised in 2019. The instrument divided into four sections. Section 'A 'elicited demographic information of the respondents; Section 'B' covers questions on the 'Coverage of childhood immunization in the local government areas; Section 'C' is on 'knowledge and perception of parents/caregivers towards immunization in primary healthcare centers', while Section 'D' is on 'factors associated with the immunization rate/coverage in primary healthcare centers'.

3.5 Method of Data Collection

In order for the researcher to be accepted and permitted by head of each selected facility and to carry out the study, an endorsed letter of introduction was obtained from the Department of Public Health, Faculty of Basic and Medical Science, Lead City University, Ibadan, Oyo State. Interviewing method using KoBo collect androids application ineach LGA by the researcher with the help of trained research assistants who were students from colleges of Health Technology with the support of health workers working in the selected centres chosen for the study. On the spot collection method was adopted and this helped to maintain high-quality data rate.

Respondents' responses were categorised as having poor or good perception by computing a composite perception score by summing all the perception variables. Participants with negative perception on the perception questions were awarded a score of '1'on each question, while those with positive perception were awarded a score of '0' on each question. The minimum possible total score on all the question was 0 and maximum score was 6. The overall perception level of participants was categorised as good perception when participants score was higher than the median score (which was 1), and poor perception when score was lower than the median score.

3.6 Ethical Consideration

Ethical approval was gotten from Lead |City University ethical approval committee and Oyo state ministry of health and informed consent was obtained from each clinic head selected for the study. The participants were briefed of the purpose of the study and their confidentiality assured. An informed consent was also obtained from each respondent. They were informed that their participation in the study is voluntary, free of coercion and there is no need to pay at all.

3.7 Method of Analysis

After data collection, collation and sorting, data was inputted into Statistical Package for Social Sciences Both inferential and descriptive statistics was adopted for the study. The inferential statistics of Pearson Product Moment Correlation (PPMC) would was used to test the null hypotheses at 0.05 level of significance. The descriptive statistics was used to express the frequency of each variable and the study uses regression analysis to evaluatethe relationship betweenknowledge/perception and rate of immunization coverage.

The overall knowledge level for child vaccination was computed as the composite of 5 knowledge questions whichincluded whether participant had knowledge on importance of vaccine to health,whetheur vaccine is a good way to protect the child form disease, knowledge of age measles vaccine should be given, awareness on whether vaccination should be completed before 12 months and the number of times polio vaccines should be given. Those who had the correct answer to each knowledge questions were scored 1 point and those who didn't have the knowledge were scored 0 point. The knowledge score was computed as the sum of all knowledge questionswith a minimum score of 0 and maximum score of 5. The knowledge level of participants was categorised as good

knowledge when participants score was higher than the median score (which was 2), and poor knowledge when score was lower than the median score.

Chapter Four

Results and Discussion of Findings

4.0 Socio-demographic characteristics of participants

Total number of participants interviewed in the study was 422 and the average age of participants was 29.29 ± 6.17 years. More than a third of the participants were aged 24-28 years (37.9%), followed by those aged 29 to 30 years (23.7%) and 19 to 23 years (10.2%). Those aged 18 years and below were only about 3%. The proportion of the study participants according to the study geographical distribution was 54% for Ibadan Southeast and 46% for Ibadan North LGA. The majority of the participant were married (97.4%). most participants had a secondary school certificate (approximately 29%), while another 22% and 21% reported having a primary school certificate and an OND certificate, respectively.

About 57% of participants reported having 3 to 4 children, with 34.6% reporting having 1 to 2 children. Participants who reported having 5 or more children was only about 8%. The main occupation of majority of the participants was trading (48.6%). Majority reported making a monthly income of between 0 to 18,000 Naira (41%), while another 30% reported a monthly income of between 19,000 Naira to 40,000 Naira. The most common ethnic group in the study was Yoruba (69%). Details of the socio-demographic profile of the respondents are shown in table 4.1

Table 4.1: Participant's Socio-Demographic Characteristics

Characteristics	Frequency (n)	Percent (%)
Mean age: 29.29 ± 6.17		
Age category		
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
Total	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 status		
Single	6	1.4
Married	407	97.4
Cohabiting	1	.2
Widowed/separated/cohabiting	4	1.0
Total	418	100.0
Educational qualification		
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**
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
5 and more children	34	8.1

Table 4.1: Participant's Socio-Demographic Characteristics (contd.)

Characteristics	Frequency (n)	Percent (%)
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, specify	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
61,000-80,000	33	7.9
81,000 and above	35	8.4
Total	419	100.0
Religion		
Christianity	174	41.2
Islam	241	57.1
Others	7	1.7
Total	422	100.0
Ethnic background		
Yoruba	292	69.2
Igbo	49	11.6
Hausa	77	18.2
Others	4	0.9
Total	422	100.0

Source :Field Survey 2022

4.1 Child Immunization Coverage

The level of uptake of the different childhood immunization was assessed. Figure 4.1 shows the rate of polio immunization among the index child as reported by the participants in the two study locations. Higher polio immunization was reported among participants in Ibadan North (92.3%) compared with the polio immunization rate in Ibadan Southeast (65.4%). Total polio immunization rate in the study was however 77.7%. Measles immunization rate was lower (59.3%) in Ibadan North compared with the rate in Ibadan Southeast (64.9%), with an overall rate of 62.3%Figure 4.2. However, for childhood pneumonia vaccine the rate was higher in Ibadan North (87%) compared with Ibadan Southeast 49.6%Figure 4.3. Nearly equal proportion of yellow fever vaccination rate was reported in both Ibadan North and Ibadan Southeast (approximately 58.8% and 59.6% respectively) with the overall rate of 59.2%Figure 4.4 Comparatively lower percentage of Pentavalent vaccination was reported among participants in Ibadan Southeast (66%) than Ibadan North (92%)Figure 4.5.

As presented in Figure 4.6 when participants were asked about their child receiving any type of vaccination, drops or injection in the past,as high as 99% in Ibadan north reported in the affirmative, while inIbadan southeast thepercentage was 81%. Similarly, 86% in Ibadan North participants and 82% in Ibadan Southeast reported that their child had been given an injection in the past in the right upper arm

Table 4.2: Missed Immunization Schedule Based on Child's Age

Sn	Child's Age	Nos of Child	Nos. of Missed	% missed	Nos. vaccinated	% vaccinated
1	9 months	94	2	2.1	92	97.9
2	10 months	72	7	9.7	65	90.3
3	11 months	154	47	30.5	107	69.5
4	12 months	102	34	33.3	68	66.7
	Total	422	90		332	

Source :Field Survey 2022

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Missed immunization is measured using the five scheduled immunization that is expected to be completed within 12 months. Out of 422 children within 9 – 12 months, 90 of them which represent 21.3%missed at least one of scheduled immunization. Figure 4.1 through Figure 4.7 reveals the percentage of missed immunization, however the number of missed immunization was high among babies that are 12 months which are supposed to have completed all immunization schedule.

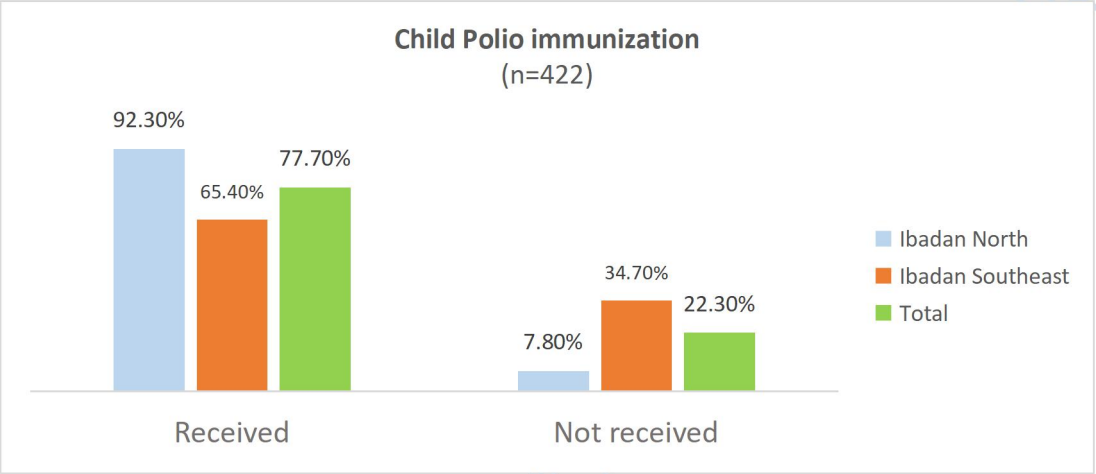

Figure 4.1 Percentage of children reported to have ever received polio immunization by study geography

Source: Field Survey 2022

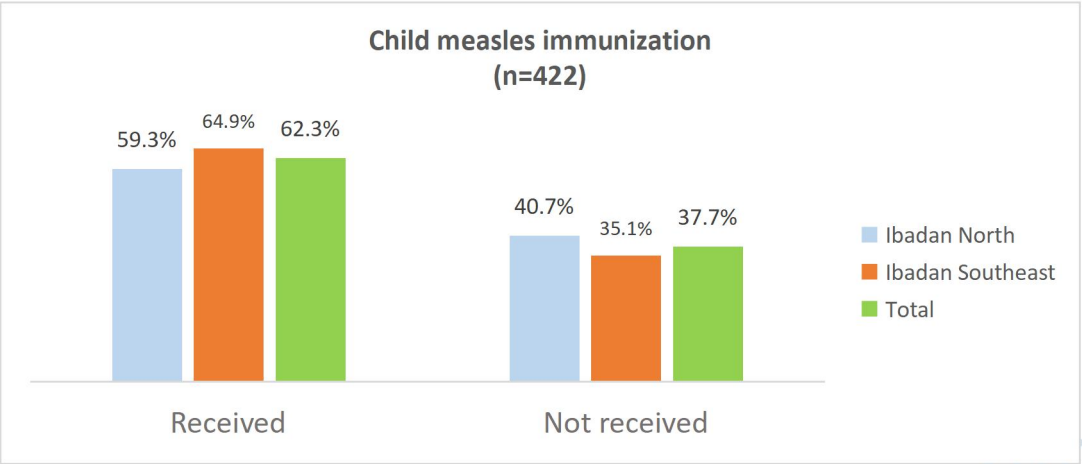

Figure 4.2 Percentage of children reported to have ever received measles immunization by study geography

Source :Field Survey 2022

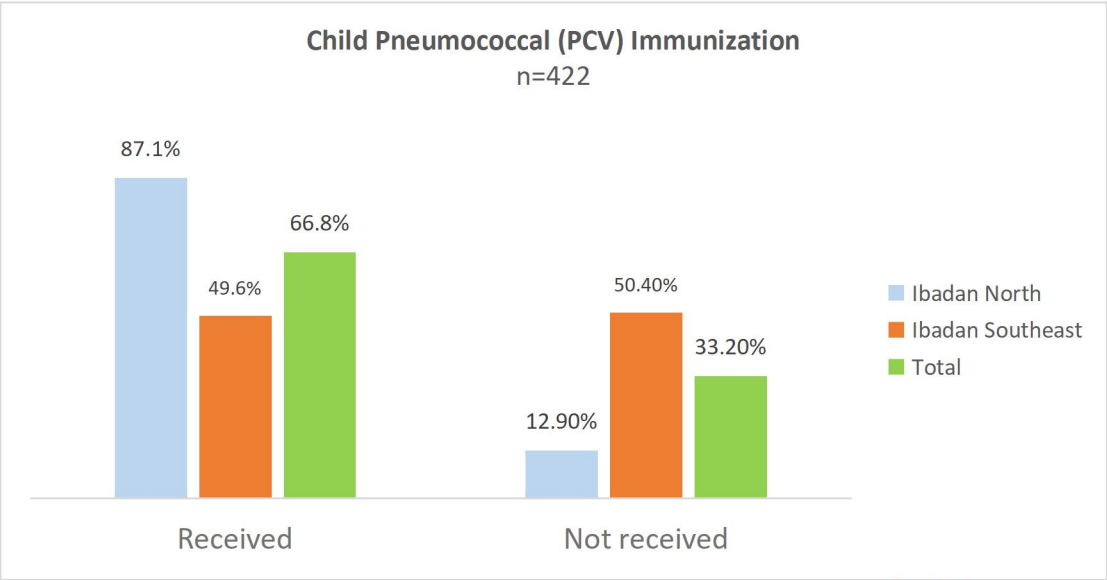

Figure 4.3 Percentage of children reported to have ever received Pneumococcal (PCV) Immunization by study geography

Source :Field Survey 2022

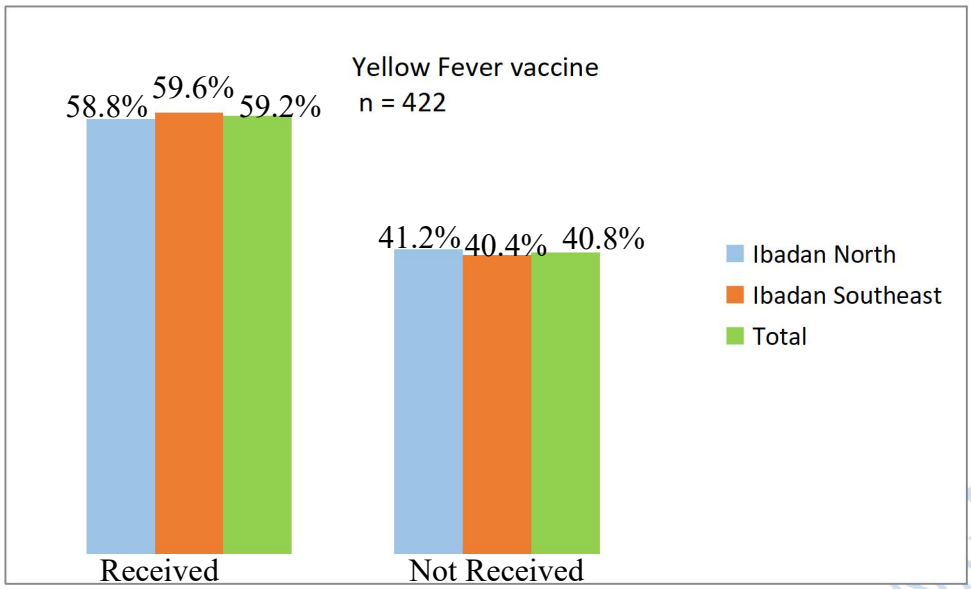

Figure 4.4 *Percentage of children reported to have ever received Child Yellow Fever vaccine by study geography*

Source :Field Survey 2022

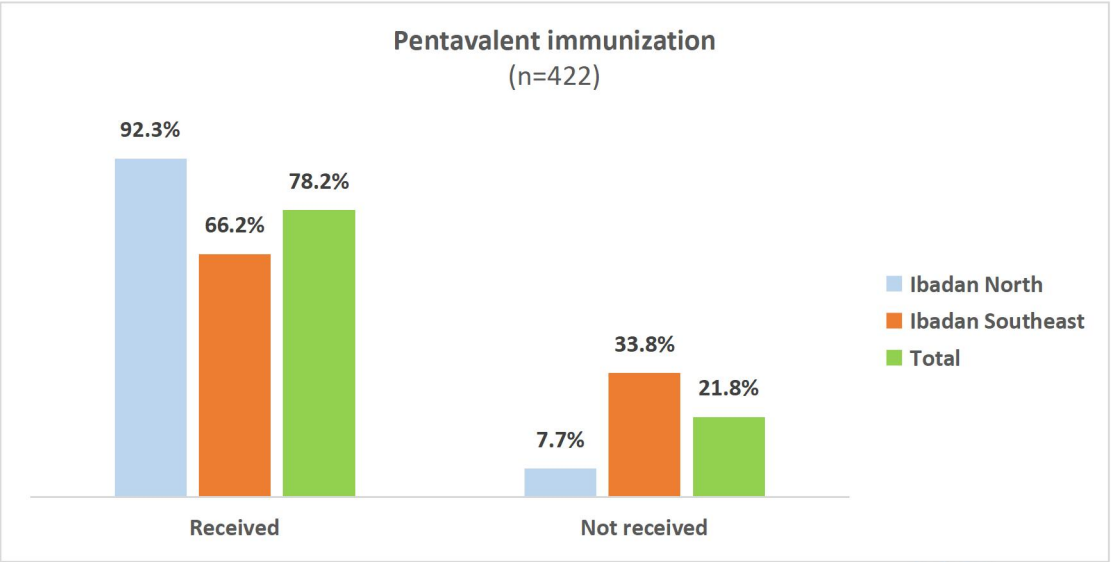

Figure 4.5 *Percentage of children reported to have ever received Pentavalent immunization by study geography*

Source :Field Survey 2022

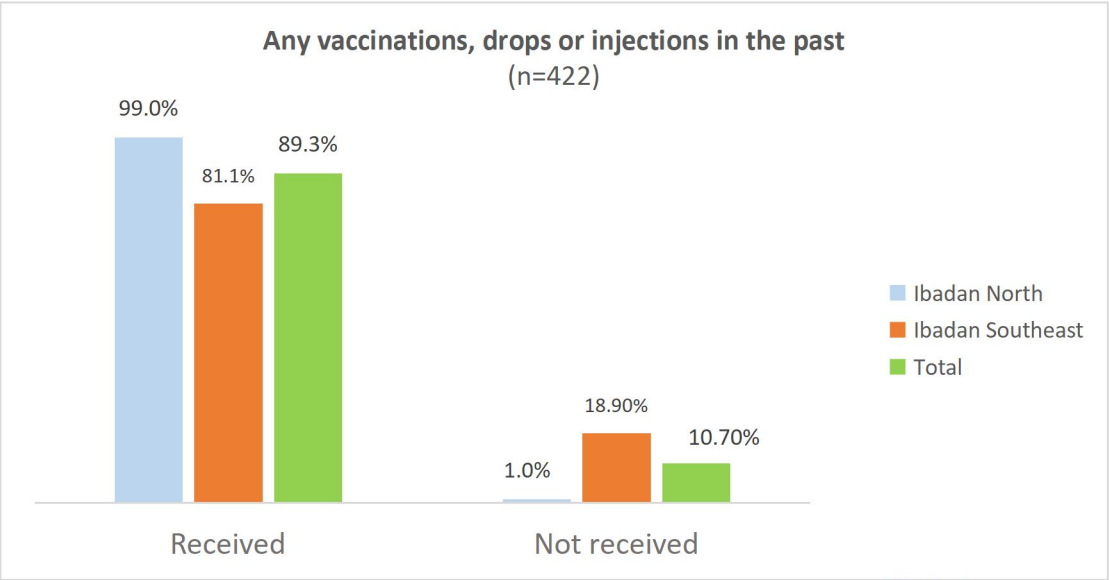

Figure 4.6 Percentage of children reported to have ever received any vaccinations, drops or injections in the past by study geography

Source :Field Survey 2022

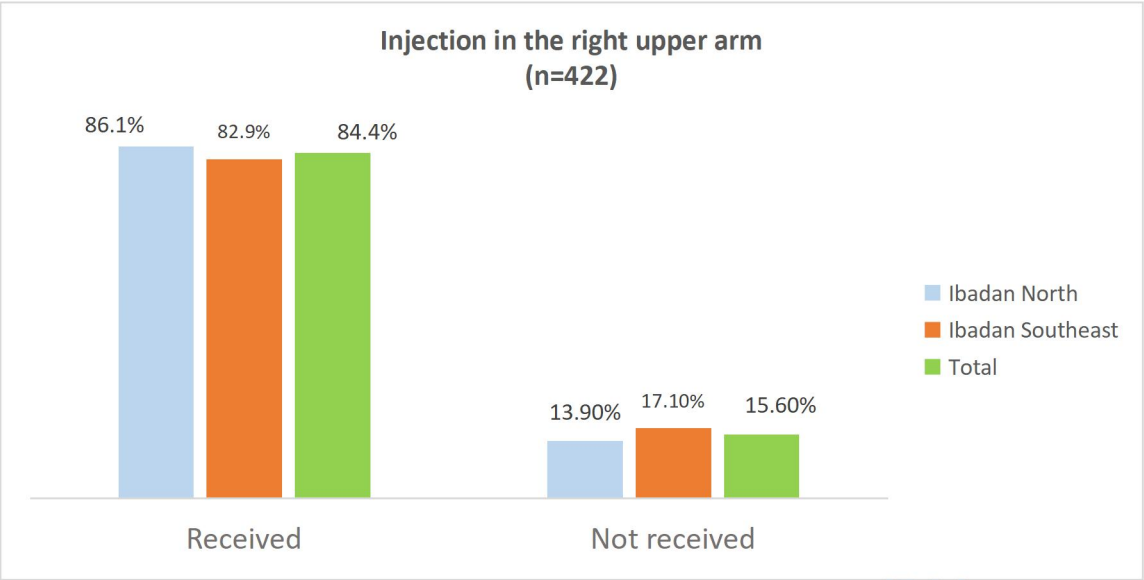

Figure 4.7*Percentage of children reported to have ever received any Injection in the right upper arm (measles vaccine) in the past by study geography*

Source :Field Survey 2022

The participants reported missed vaccination of the child. The proportion of missed child vaccination was lower in Ibadan North (14%) compared with Ibadan southeast (43.9%). The most common reason for the missing child vaccination was mainly because visit to the clinic was not on the date of vaccination and because the child fell sickFigure 4.9. In Ibadan North the major reason was the child was sick (46%), compared with Ibadan southeast which was lower (24%). Missing vaccination because visit to the clinic was not on vaccination day was higher in Ibadan Southeast LGA (51%) than in Ibadan North LGA (32%). Other reported reasons for missing vaccination were because of no vaccine at the clinic (Ibadan North 7% and Ibadan Southeast LGA 12%), and long waiting time at the facility (Ibadan North 4% and Ibadan Southeast 7%).

The commonly missed vaccines for the children from all sites were polio vaccine PCV vaccine (56.6%), measles vaccines (25.3%) and pentavalent vaccine (13.3%) (Figure 4.10). While the yellow fever vaccine was generally missed less (3.6%), 20% of the time the vaccine was missed in Ibadan North facilities. Similarly, measles vaccine was missed more among children in Ibadan North (33.3%) than in Ibadan Southeast (23.5%). The pentavalent and polio vaccines were only missed in Ibadan Southeast.

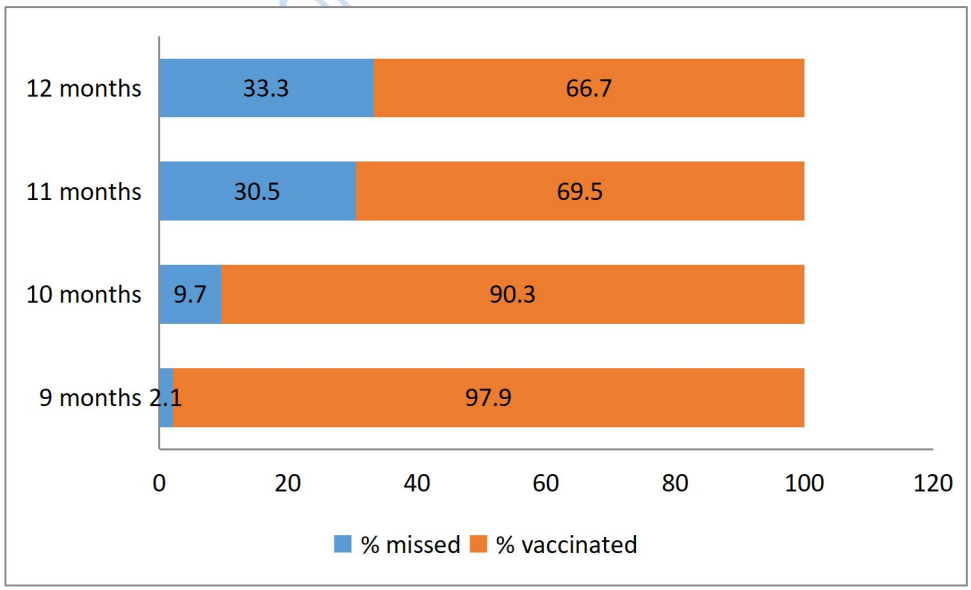

Figure 4.8: *Missed vaccination rate by age of children*
Source :Field Survey 2022

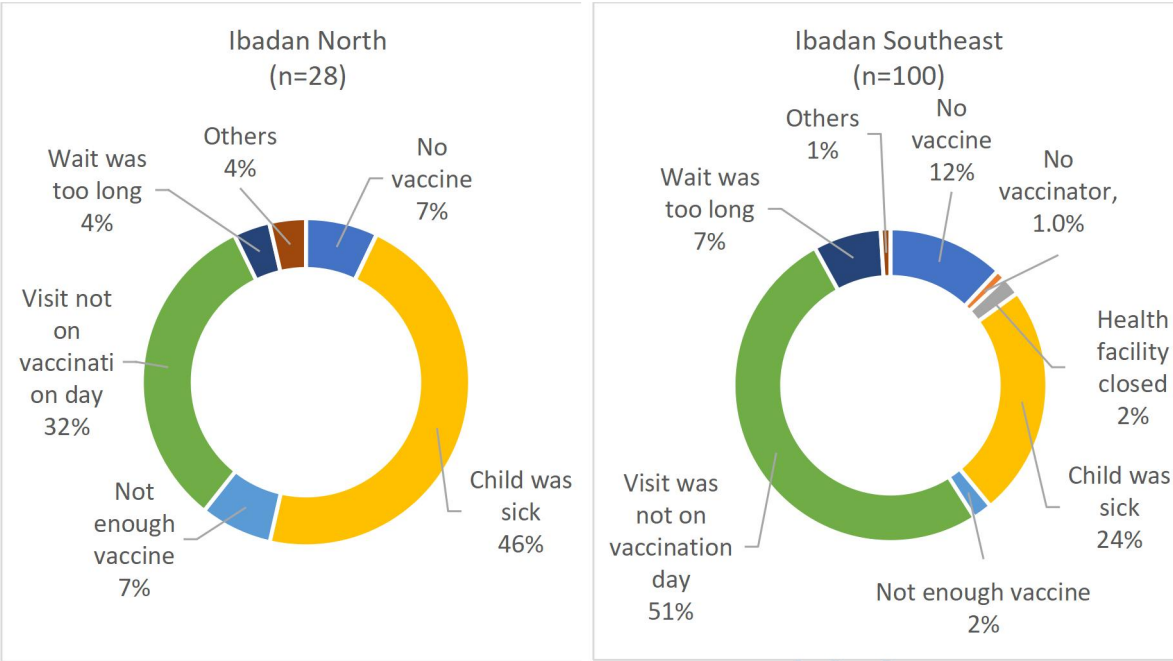

Figure 4.9: Reasons for missing vaccination of child in both study geography

Source :Field Survey 2022

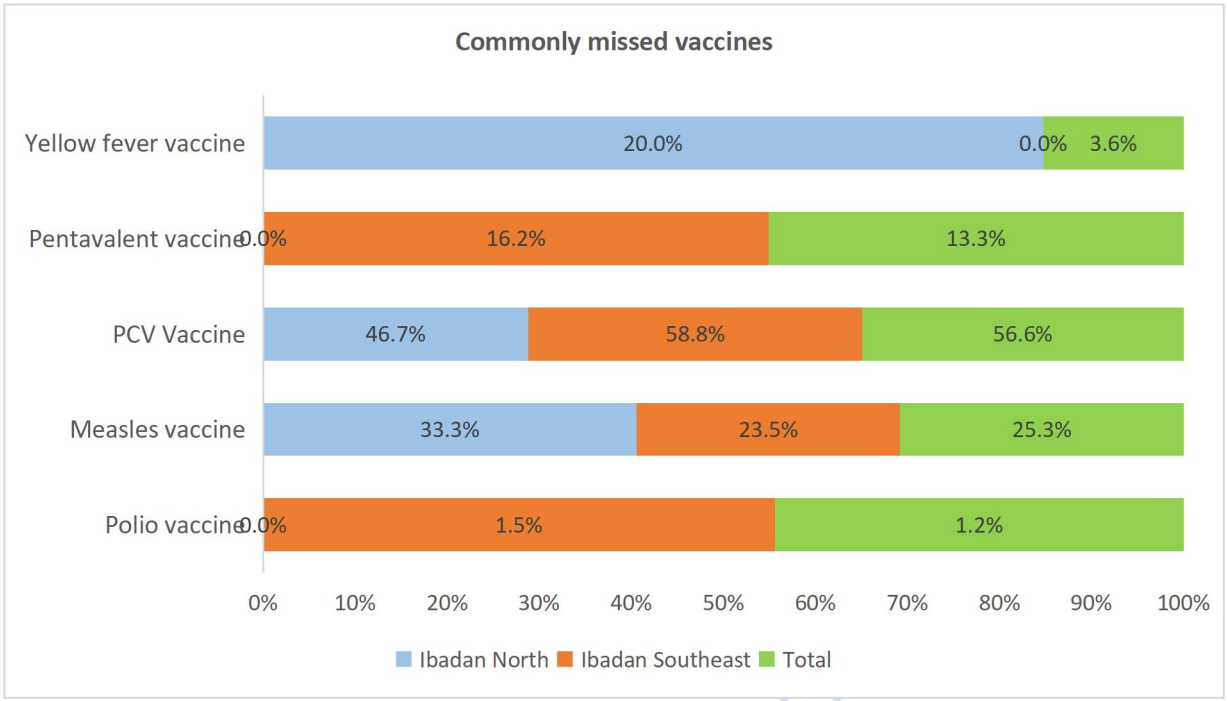

Figure 4.10 *Common types of vaccination missed according to study geography*

Source :Field Survey 2022

Overall the result showed that the full immunization coverage from the study sites for children 12 months of age is 69.7% and 69.5 for children within 9 – 11 months. The findings of study shows that percentage immunization coverage descreases as child age increases. Less mothers complied with immunization schdule as age of child increases according to Figure 4.11.

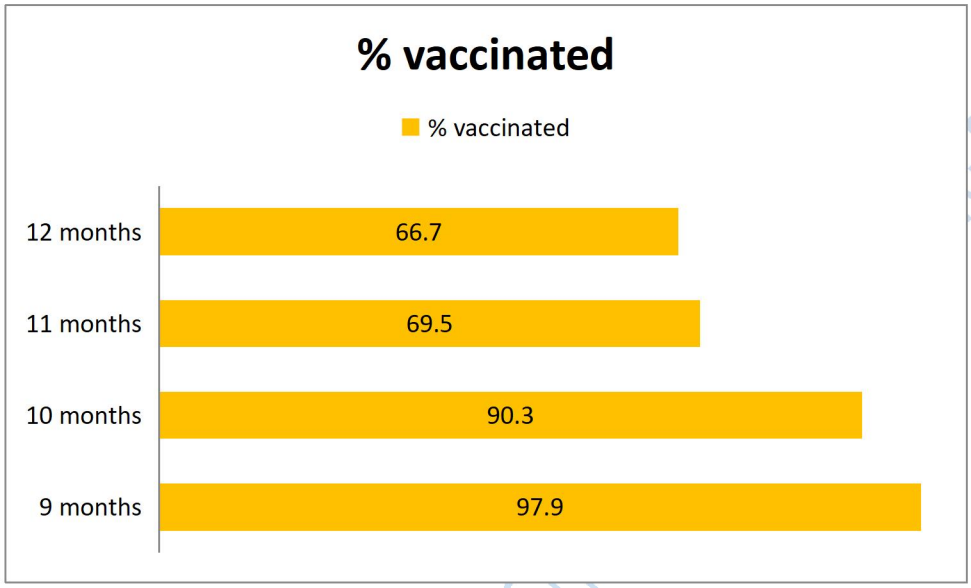

***Figure 4.11** Rate of immunization coverage in study location based on child's age*

Source :Field Survey 2022

Table Table 3. When participants were asked if vaccinating a child at birth was a common knowledge among mothers in their community, most of the participant (44%) agreed on the position and 22.7% strongly agreed, while another 31.3% disagreed on the position. About half (49.5%) of the participants and agreed that there was no adequate immunization coverage in health clinics within their community, against 35.8% who disagreed on the position. When participants were asked if all statutory vaccines are easily available in health clinic within their community, a higher proportion (43.8%) of the participants disagreed on the position, while 37.4% agreed and 15.9% strongly agreed.

Regarding the usual place of obtaining child vaccination and where the most recent child vaccination was obtained 96% and 95% respectively said it is obtained from a local government health clinic

Table 4.3 *Caregiver and Child Immunization Characteristics*

Variables	Frequency (n)	Percent (%)
Vaccinating the child after birth is a common knowledge among mothers		
Strongly agree	96	22.7
Agree	187	44.3
Neither agree nor disagree	5	1.2
pDisagree	132	31.3
Strongly disagree	2	0.5
Total	422	100
No adequate immunization coverage in health clinic 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 easily available in health clinic 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 :Field Survey 2022

4.2 Knowledge, perceptions, and attitude towards child vaccination

The knowledge and perceptions of parents towards child vaccination was assessed and is presented in Table 4.4 throughTable 4.6. The result showed that up to 70.4% of participants were aware that childhood vaccines are important for children as 30.3% strongly agreed and 40.1% agreed that childhood vaccines are very important to the child. With another 77.9% reporting that getting vaccines for the child was a good way to protect the child from diseases because 51.4% of the respondents strongly agreed that getting vaccines for the child is a good way to protect the child from disease and 26.5 of the respondents also affirmed the statement.

While only 57.9% responded that measles vaccine is given to a child at 9 months, about 37.8% of these respondents actually disagreed that measles vaccines is received at 9 months, while 4.3 did not know whether or not measles vaccines should be received at 9 months. When the respondents were also asked about their knowledgeon completing all scheduled vaccination for the child at the age of 12 months only 31.7% agreed vaccination schedule should be completed by 12 months while 30.1% disagreed and 38.2% does not know whether the statement is correct or not. The participants differed on the number of times polio vaccine should be received by the child. Majority (35.1%) are not sure of the correct number of times that a child should receive oral polio vaccine.

Overall, knowledge was assessed with the composite immunization knowledge score of participants. Analysis showed that the percentage of participants who recorded good knowledge on child immunization, which was a score higher than the median score on the computed knowledge score, was 41%, with 59% recording poor knowledgeFigure 4.12. Higher knowledge was observedmore amongparticipants in Ibadan North (52.6%) than in Ibadan southeast (31.1%).

Table 4.4Participants Knowledge profile on Child Vaccination

Variables	Frequency (n)	Percent(%)
Childhood vaccines are important for 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 good way to protect child/children from diseases		
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 9 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
Vaccination schedule should be completed by 12 months		
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		
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 :Field Survey 2022

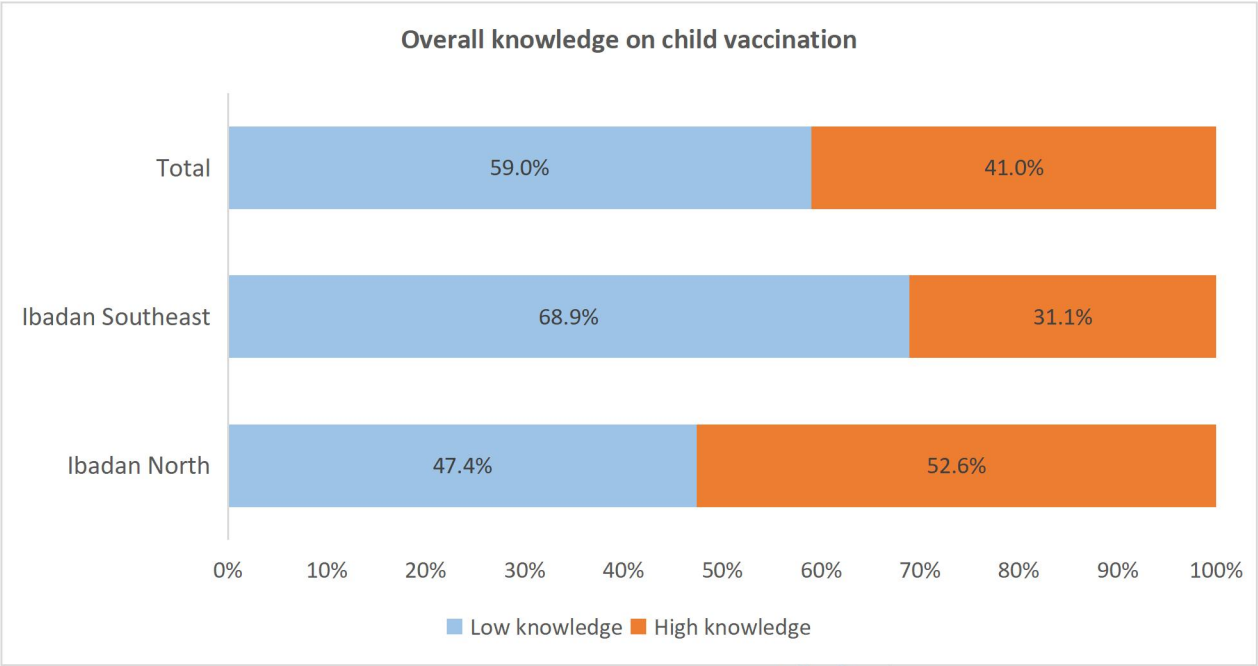

***Figure 4.12**: knowledge of childhood immunization among the study participants*

Source : field survey 2022

Perceptions of participants on immunization were assessed and are presented in Table 4.5. About 63.8% of the participants agreed that many communities and caregivers decline routine immunization due to rumours, incorrect information and fear. About 51.2% reported that lack of trust and confidence in routine immunization as effectual health interventions appears to be fairly common in all parts of Nigeria. When the participants were asked about their perception on whether routine immunization was to depopulate the community, more than half (50.4%) of the respondents disagreed with the statement. Similarly, 50.4% disagreed that routine immunization will make children become impotent when they grow up, and this does not instil fear in mothers as 35.8% of the participants reported that they were not afraid that a child will be infected with virus after taking scheduled immunization.

The overall perception of the participants was assessed by computing a composite perception variable categorised as poor and good perception. About 30% of the participants were observed to have good perception about immunization. Good perception on immunization was higher among participants in Ibadan southeast (39.9%) compared with Ibadan North (19.6%) as presented in Figure 4.13

Table 4.5 Participant's Perceptions towards Child Vaccination

Variables	Frequency (n)	Percent(%)
Many communities and caregivers reject routine immunization due to rumours, 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 interventions 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
Disagree	112	26.5
Strongly disagree	101	23.9
Total	422	100
Routine immunization will make children become 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 virus		
Strongly agree	77	18.3
Agree	58	13.7
Neither agree nor disagree	94	22.2

Table 4.5 Participant's Perceptions towards Child Vaccination (contd.)

Variables	Frequency (n)	Percent(%)
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: Field Survey 2022

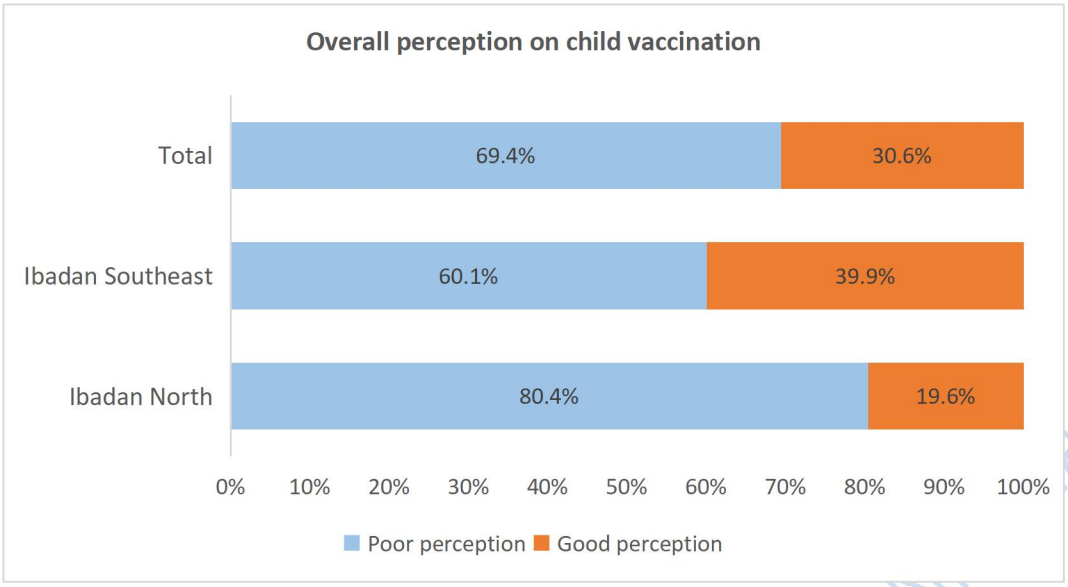

Figure 4.13 *Perception of level of participants on child immunization*

Source :Field Survey 2022

Perceived barriers of childhood vaccination among the participants, according toTable 4.6, most participants (87.2%) perceived that mother's refusal to bringing children for vaccination can be associated with unfavorable attitude of health workers. Mothers also reported that lack of vehicular movement can hinder children from immunization (69.2%). About 79% reported that residing neat a health facility providing a routine immunizationwere associated to receiving a routine immunization.

Table 4.6*Participant's Perceived barriers to Child Vaccination*

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 for bringing 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 affects the completion of RI services		
Strongly agree	162	38.4
Agree	175	41.4
Neither agree nor disagree	8	1.9
Disagree	65	15.5
Strongly disagree	12	2.8
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 attitude towards care givers increases respond to vaccination information during RI session		
Strongly agree	186	40.0
Agree	159	37.7
Neither agree nor disagree	2	0.5
Disagree	56	13.3
Strongly disagree	19	4.5
Total	422	100

Table 4.6*Participant's Perceived barriers to Child Vaccination (contd.)*

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
Strongly disagree	18	4.3
Lack of vehicular movement hinders my child 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 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		
Strongly agree	187	44.3
Agree	146	34.6
Neither agree nor disagree	12	2.8
Disagree	59	13.9
Strongly disagree	18	4.4
Long walking distances, as well as long waiting time at the facility, are key factors associated with poor completion of RI schedules		
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
Lack of good roads to health centre 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 :Field Survey 2022

4.3 Associated Factors with Child Immunization Coverage

Analysis on the associated factors with child immunization was performed as presented in the Chi-square result in Table 4.7. Knowledge of vaccination, perception about vaccination and other socio-demographic variables were associated with whether child received all five vaccination or not. Participants who had higher knowledge on vaccination had significantly higher proportion of children who received all 5 vaccines (53.2%) than those who had low knowledge on vaccination (29.7%) (X^2:23.544, P<0.001). Similarly, presenting with poor perception on child vaccination indicated lower proportion to receiving all five vaccination (31.1%) compared with having good perception, which showed higher proportion on receiving all 5 vaccination (58.1%)(X^2:27.528, P<0.001).Although, the location of study also showed difference in the proportion of vaccination coverage,with those who took all 5 vaccination presenting higher among those in Ibadan North (42.3%) compared with those in Ibadan southeast (36.8%) this association was not statistically significant(X^2:1.293, P>0.05). Other factors that showed statistical significance with vaccination coverage in study were occupation of the participants, parity, educational qualification, and income (as presented in Table 4.8). Age of participants was, however, not statistically related with immunization coverage rate.

Table 4.7 Association between Vaccination Knowledge, Perception, and Socio-demographic Factors with Child Vaccination Coverage

Factors	Received less than five vaccines at 9 month and above		Received all five vaccines at 9 month and above		Total	X^2	*P*
	N	%	N	%			
Knowledge on Vaccination							
Low knowledge	175	70.3	74	29.7	249	**23.544**	**0.000**
High knowledge	81	46.8	92	53.2	173		
Total	256	60.7	166	39.3	422		
Perception on child vaccination							
Poor perception	202	68.9	91	31.1	293	**27.528**	**0.000**
Good perception	54	41.9	75	58.1	129		
Total	256	60.7	166	39.3	422		
LGA							
Ibadan North	112	57.7	82	42.3	194	1.293	0.255
Ibadan Southeast	144	63.2	84	36.8	228		
Total	256	60.7	166	39.3	422		
Age category							
14 to 18 years	8	72.7	3	27.3	11	4.034	0.401
19 to 23 years	28	65.1	15	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	62	62.0	38	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	13	37.1	22	62.9	35		
Skilled worker	27	50.9	26	49.1	53		
Civil servant	26	44.1	33	55.9	59		
Other, specify	2	100.0	0	0.0	2		
Total	253	60.5	165	39.5	418		
Number of children							
1-2 children	75	51.4	71	48.6	146	**8.316**	**0.000**
3-4 children	160	66.1	82	33.9	242		
5 and more children	21	61.8	13	38.2	34		
Total	256	60.7	166	39.3	422		

Table 4.7 Association between Vaccination Knowledge, Perception, and Socio-

Factors	Received less than five vaccines at 9 month and above		Received all five vaccines at 9 month and above		Total	X^2	*P*
Marital status							
Single	1	16.7	5	83.3	6	7.734	0.052
Married	250	61.4	157	38.6	407		
Cohabiting	1	100.0	0	0.0	1		
Widowed/separated	1	25.0	3	75.0	4		
Total	253	60.5	165	39.5	418		
Educational qualification							
No formal education	22	81.5	5	18.5	27	**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		
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 :Field Survey 2022

In the multivariable regression analysis to model the predictors of full vaccination among children while controlling for the confounders), several factors that were statistically significant in the bivariate analysis result remained statistically significant in the multivariate adjusted model. The result showed that knowledge on vaccination was significant predictor of vaccination coverage as those who had low knowledge on vaccination had lower probability (AOR: 0.34, CI: 0.19 – 0.58, p<0.001) of achieving full immunization, compared with those who had high knowledge. Those with poor perception also had significantly lower odds of achieving full immunization coverage (AOR: 0.28, CI: 0.16 – 0.47, p<0.001) compared with the reference group who had good perception on immunization.

4.4 Discussion of Findings

According to finding of the study, the level of immunization coverage varies in both local government areas and also varies based on vaccine. While the coverage of some vaccines were high some were low. Pentavalent vaccine has the highest (79%) overall average coverage in both Ibadan North and Ibadan Southeast, however, Ibadan Southeast is low (66%) compared to Ibadan North (92%). Polio immunization coverage follows that of pentavalent with average rate of 77.7%, however 92.3% rate was reported in Ibadan North for polio vaccine and 65.4% wasu reported in Ibadan Southeast.

Pneumoniaoverall vaccine rate of 68.3% but higher (87%) in Ibadan North compared with Ibadan Southeast that was 49.6%. Measles immunization rate was lower (59.3%) in Ibadan North compared with the rate in Ibadan Southeast (64.9%), with an overall rate of 62.3% and yellow fever overall vaccination rate is 59% with Ibadan North at 59% and Ibadan Southeast at 60% respectively). It is clear from the finding of study that Pentavalent, Polio, Pneumonia, Measles and Yellow-fever vaccine have coverage rate that is above average in both Local Government Area, however the coverage of

pentavalent, polio and pneumonia vaccines are higher in Ibadan North than Ibadan Southeast, while measles immunization rate is higher in Ibadan Southeast than Ibadan North and the rate is just at the same range for yellow-fever in both local government area. The immunization rate in Ibadan Northand Ibadan Southeast is low compared to the finding in a study conducted in Osun State Nigeria that discovered 80% coverage rate for all antigens given at birth. These vaccines (BCG, OPV0, and HBV1) had higher coverage rates[43]

Finding indicates that the proportion of missed vaccination was lower in Ibadan North (14%) compared with Ibadan southeast (43.9%) and major reason for missed vaccination is child sickness, other reasons reported are no vaccine at the clinic and long waiting time at the healthcare facility. Finding from both local government of study indicates that caregivers misses immunization schedule for their children therefore the study found full immunization coverage for all the five vaccines at 39.3%. The level of immunization coverage in this study is also similar to that of Ibadan North East and Ido by Fatiregun and colleagues that reveals that the weighted full immunization coverage was 40.2% and 41.3% in Ibadan North East and Ido respectively [44].

Result of findings show that awareness and knowledge of vaccines among caregiver is high, majority (70%) of participants were aware that childhood vaccines are important for the child and large percentage(78%) opined that getting vaccines for their child is a good way to protect the child from diseases.However , caregivers knowledge on specific immunization information such vaccination date for each vaccines are not vary adequate because many of them depends on records on vaccination cards and information given by health workers.

In terms of perception, only 39.9% of sampled caregivers in Ibadan Southeast have good perception about immunization and few (19.6%) have good perception toward

immunization Ibadan North. Many of the sampled respondents are still of the opinion that immunization may be used to depopulate the community and children may become impotent or infected with virus. The finding of this study is similar to the conclusion of Fatiregun' finding that shows that non completion of vaccination or non vaccination is largely due to lack of awareness about vaccination process and fear of side effects of immunization[44].

Indications on factors associated with low immunization coverage reveals that majority (64%) of caregivers opined those rumours of side effects, incorrect information and fear prevents full immunization coverage in both Ibadan North and Ibadan Southeast. Other reported factors causing mothers refusal to bring children for vaccination isassociated with unfavorable attitude of health workers. In term of health worker attitude constituting barrier to complete immunization schedule, this study is not the only study that sees the attitude and behavior of health workers as barrier to immunization coverage. The study by Rahji and Ndikom conducted in Ibadan also agree that health workers' attitude is a factor hinders compliance with vaccination schedules[35]. Most mother/caregivers may find it difficult to relate adequately with some health and this poor interpersonal relationship may mar the completion of immunization.

Findings reveal that caregivers' knowledge of vaccination, perception about vaccination and other socio-demographic such as level of education, mothers' occupation, and income are all associated with full immunization in children. Mothers/caregivers who have high knowledge on vaccination had significantly higher proportion of their children who received all 5 vaccines. Similarly, mothers/caregivers with poor perception of child vaccination have lower proportion of their children receiving all five vaccinations. Other factors that showed statistical significance with vaccination coverage are occupation, parity, educational qualification and income. However, age of mothers/caregiver is not

statistically related with immunization coverage rate.This finding is in agreement with the finding in Bungudu, Zamfara State, North West Nigeria[34],that revealed that level of knowledge on RI and having at least secondary education is significantly associated with full immunization. Similarly, this study is consistent with the Abdulraheem and Onajole finding that shows that there is no significant differences with respect to immunization completeness due to factors such as marital status, mothers' age and gender of the child[33]. Therefore findings of this study and past literature alluded to the fact that educational qualification of mother/caregiver is more important to immunization coverage than other demographic factors such as age or marital status, this could be due to the fact that there is no age that is probably be too high or too low for information dissemination, anybody at any age group or marital status could understand and utilize any health related information given by health officers.

Also Rahji and Ndikom concluded in their study that that occupation of mothers/caregivers can hinder the completion of immunization in children[35]. Work schedule especially in civil service are always difficult to alter, therefore mothers who belong to this category of work force who normally resume at 8am in the morning which is the same time schedule for most immunization visit may find it difficult to attend all immunization schedule. Similarly, finding from this study is consistent with the Ethiopian study which attributed lack of awareness about immunization to low coverage. The study also affirmed that and children of mothers that knew the age at which vaccination should start and endshave the likelihood to complete vaccinationschedule compare to those whose mothers are notknowledgeable of RI schedule[35].

Chapter Five

Conclusion

5.0 Summary of Findings

Ibadan North and Ibadan Southeast are two prominent local government areas in Ibadan. This study examines immunization coverage and factors responsible for incomplete immunization coverage in Ibadan North and Ibadan Southeast Local Government Area, Oyo State, Nigeria. The study raised four research questions and tested three hypotheses. The Health Belief Model was used as the theoretical model for this study to explain behavior of mothers/caregivers toward immunization as a health behavior. The study adopted for the descriptive cross sectional study and self-questionnaire that was design electronically was used to gather data from selected mothers/caregivers attending PHCs in Ibadan North and Ibadan Southeast Local Government Area.

Demography information of sampled mothers/caregivers shows that majority (37.9%) are between age 24 – 28years and almost all (97.4%) of samples mothers are married. Since the study was carried out in southeast Nigeria which is dominated by the Yoruba tribe, this also reflected in the study as majority (69.2%) of respondents are from the Yoruba ethnic group. Parity of mothers in the study shows that majority (57.3%) have between 3 – 4 children which is an indication that immunization schedule should not be strange to them. Also only few (6.4%) of the sampled mothers has no formal education.

5.1 Conclusion

Immunization is aimed at the prevention of infectious diseases and it is anessential public health intervention and a cost effective strategy to reduce mortality and morbidity associated with transmittable diseases. Full immunization coverage for all the five vaccines in Ibadan North and Ibadan Southeast is low (69.5%) compared with the WHO recommended standard of 80%. However, some major child vaccine such as Pentavalent, Polio, Pneumonia, Measles and Yellow-fever vaccine have coverage rate that is above average in both Local Government Area. Reason for missed vaccination is child sickness, shortage of vaccine at the clinic, long waiting time at the healthcare facility and unfavorable attitude of health workers.Aware and knowledge of vaccines among caregiver in both Ibadan North and Ibadan Southeast is high and knowledge of childhood vaccines is important to adequate immunization of children.

Mothers/caregivers' knowledge of vaccination, perception about vaccination and other socio-demographic such as level of education, mothers' occupation, and income are all associated with full immunization in children. Mothers/caregivers who have high knowledge on vaccination had significantly higher proportion of their children who received all 5 vaccines. Also, mothers/caregivers with poor perception of child vaccination have lower proportion of their children receiving all five vaccinations. Other factors that showed statistical significance with vaccination coverage are occupation, parity, educational qualification and income. However, age of mothers/caregiver is not statistically related with immunization coverage rate.

5.2 Recommendations

Sequel to the findings of study, conclusions from past literatures and the theoretical model adopted for this study, it is evident that knowledge and perception influence attitude and disposition of mothers/caregivers towards immunization; therefore the following recommendations are imperative for adequate immunization coverage:

- Hospital, Clinic and community base sensitization programme on importance and effects immunization should be organized for adult female and male parents/caregivers
- Government and PHCC management should ensure feedback and complain system in place for every immunization clinic in other to detrmnine the effectiviness and efficiency of health workers while delivering their services to mothers/caregivers
- Health workers and health educators should emphasize the importance of immunization and also try to denounce all the erroneous believes and negative perceptions on immunization
- Enactment of health policy that will accommodate immunizationn schedules

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Questionnaire

Assessment of Immunization Status And Factors Responsible For Incomplete Immunization Among (9-12 Months) Attending Primary Health Care Centre In Selected Local Government In Oyo State

Dear Respondent,

This research study is on the assessment immunization status and factors responsible for incomplete immunization among (9-12 month) attending primary health in Ibadan North and South East local government area. The questionnaire is to solicit your assistance for relevant information on the above mentioned study. All information provided will be treated with absolute confidence and be used for this research only.

Thank you.

Researcher

Consent Session:

I am willing to take part in this study ( )

I am not willing to take part in this study ( )

Section A (Measure of Demographic Variables). Please select your appropriate answer to the following questions

1. Age: _____
2. Marital Status A. Married ( ) B. Single ( ) C. Separated ( ) D. Widowed ( )
3. Education Qualification: (A) No formal education ( )

   (B) Primary school leaving certificate ( ) (C) Secondary school certificate ( )

   (D) OND ( ) (E) HND ( ) (F) BSC ( ) (G) Postgraduate ( )
4. Number of children: _____
5. Occupation: A. Housewife ( ) B. Trader ( ) C. Artisan ( ) D. Skilled worker ( ) E. Civil servant ( )F. Others specify ( )

6. Monthly income: (A) 18,000-40,000 ( ) (B) 41,000-60,000 ( ) (C) 61,000-80,000 ( )

(D) 81,000 and above

7. Religion: (A) Christian ( ), (B) Muslim ( ), (C) Others ( )

8. Ethnicity: (A) Yoruba ( ) (B) Igbo ( ) (C)Hausa ( )

9. Baby's Age: (A) 9 months ( ) (B) 10 months (C) 11 months ( )

(D) 12 months ( )

Section B: Coverage of childhood immunization in the local government areas

Kindly tick the option that best expresses your views from the following SA – Strongly Agree, A – Agree, U – Undecided, D – Disagree, SD – Strongly Disagree

S/N	Coverage of childhood immunization	SA	A	U	D	SD
9	Vaccinating the child after birth is a common knowledge among mothers in my local government area					
10	I don't think there is adequate immunization coverage in health clinic within my community					
11	All statutory child vaccines are easily available in health clinic within my community					
12	Has your child ever received polio immunization					
13	Has your child ever received measles immunization					
14	Has your child ever received Pneumococcal (PCV) vaccine					
15	Has your child ever received Yellow Fever vaccine					
16	Has your child ever received Pentavalent immunization					
17	Has your child ever received any vaccinations, drops or injections in the past					

18	Has your child ever received an injection in the right upper arm or shoulder that usually causes a scar	
19	The vaccine is not available in several clinics in my community	

20	Where does your child usuallyreceive vaccinations?	1. Local GovernmentHealth Clinic ( ) 2. Local Private Doctor'sOffice ( ) 3. Secondary healthcare facility ( ) 4. In a private health care facility ( ) 5. Others, specify _____ _____
21	Where did your child receive his/her most recent vaccination?	1. Local GovernmentHealth Clinic ( ) 2. Local Private Doctor'sOffice ( ) 3. Secondary healthcare facility ( ) 4. In a private health care facility ( ) 5. Others, specify _____ _____

Section C: knowledge and perception of parents/caregivers towards immunization in primary healthcare centres.

S/N	**Measure of Parental/Caregivers' Knowledge**	**SA**	**A**	**U**	**D**	**SD**
22	Childhood vaccines are important for my child's health					
23	Getting vaccines is good way to protect my child/children from diseases					

24	Measles vaccine should be received at 9 months	
25	Vaccination schedule should be completed before 12 months?	
26	Oral polio should be received three times?	
	Measure of Misperceptions of Routine Immunization	
27	Many communities and caregivers reject RI due to rumors, incorrect information and fear	
28	Lack of confidence and trust in RI as effective health interventions appears to be relatively common in all parts of Nigeria	
29	RI is to depopulate the community	
30	RI will make their children become impotent when they grow up	
31	I am afraid that my child/children will be infected with virus	

Section D: factors associated with the immunization rate/coverage in primary healthcare centres

32	Did your child miss any vaccination	Yes ( ) No ( )
33	Why was the child not vaccinated	No Vaccine ( ) No Vaccinator ( ) Health FacilityClosed ( ) Child Was Sick ( ) Not Enough ( )

		The Visit Was Not On The VaccinationDay ( ) Wait was too long ( ) Others (Specify) _____
34	Why hasn't the child had all recommended vaccines	Time of immunization inconvenient ( ) Mother too busy ( ) Family problem such as illness of mother ( ) No faith in immunization ( ) Fear of side reactions ( )

S/N	**Measure of Health Worker Attitude**	**SA**	**A**	**U**	**D**	**SD**
35	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					
36	health workers screaming at mothers who forgot to bring their children's immunization record cards or missed scheduled appointments affects the completion of RI services					
37	Behaviour of healthcare workers could undermine trust in the health workers and could also discourage caregivers from listening to health education messages.					
38	HCWs with calm and friendly attitude towards care givers increases respond to vaccination information during RI session					
39	Lack of confidence in healthcare workers made me not complete my child's immunization					
40	Lack vehicular movement hindering my child immunization					
41	Mothers that are domicile near where 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
42	Long walking distances, as well as long waiting time at the facility, are key factors associated with poor completion of RI schedules
43	Lack of good roads to health centre affected my child's immunization completion
44	My religion any preach against immunization
45	It is not a crime in my religion to be vaccinated

TELEGRAMS.....

TELEPHONE.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....

All communications should be addressed to the Honorable Commissioner quoting

Our Ref. No. AD 13/479/4307

26th July, 2021

The Principal Investigator,
Department of Public Health,
Lead City University,
Ibadan, Nigeria.

Attention: Adekola Basiru

ETHICS APPROVAL FOR THE IMPLEMENTATION
OF YOUR RESEARCH PROPOSAL IN OYO STATE

This is to acknowledge that your Research Proposal titled: "The Immunization Status and Factors Responsible for Incomplete Immunization among (0-12 Months) Attending Primary Health Care Centre in Selected Local Government in Oyo State." has been reviewed by the Oyo State Ethics Review Committee.

2. The committee has noted your compliance. In the light of this, I am pleased to convey to you the full approval by the committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations, in line with this, the Committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of findings as this will help in policy making in the health sector.

4. Wishing you all the best.

Dr. Abbas Gbolahan
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethics Review Committee