

## **Demographic Predictors of Routine Immunization and Vaccines Services Acceptance Among Childbearing Mothers in Bauchi State, Nigeria**

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### ***Abstract***

*This study investigated demographic predictors of routine immunization and vaccines services acceptance among childbearing mothers (CBMs) in Bauchi State. Two specific objectives and, two corresponding research questions and one null hypothesis were formulated for the study. The cross-sectional survey design was used for the study. The population for the study comprised of all childbearing mothers in Bauchi State (3,221,528). Multi-stage sampling procedure was adopted to select a sample size of 800 childbearing mothers (CBM). A structured Demographic Predictor of Routine Immunization and Vaccines Services Acceptance Questionnaire (DPRIVSAQ) was used for data collection. Frequency counts and Percentages were used to answer the research questions while the null hypothesis was tested using Binary logistic regression model at .05 level of significance. The findings showed that CBMs had high level of acceptance of immunization vaccines (70.3%) and routine immunization services schedules (65.1%) in Bauchi State. Tertiary education (OR=0.35 [0.19–0.65],  $p<.05$ ) and secondary education (OR=0.44 [0.24 – 0.81]  $p<.05$ ) were significant predictors of acceptance of routine immunization and vaccines services among CBMs in Bauchi State. This implies that attaining a tertiary and secondary level of education were less likely to predict acceptance of immunization vaccines among CBMs, while attaining a secondary education was less likely to predict acceptance of routine immunization. It was therefore recommended that there is need for continuous maternal education programmes in order to reinforce and sustain the high and moderate levels of acceptance of routine immunization and vaccine services among CBMs in the state.*

**Keywords:** Demographic, Acceptance, Routine Immunization, Vaccines, CBMs Predictors.

### ***Introduction***

The past centuries were replete with successes achieved by man over vaccine preventable diseases (VPDs) through vigorous immunization programmes. However, World Health Organization (2016) reported that evidence in the emergence of once eradicated diseases and emerging diseases presents a worrisome picture that immunization acceptance and coverage has stalled in some regions of the world especially in developing nations. This was apparent in the outbreaks of diseases such as Zika virus in Latin America; Middle-East Respiratory Syndrome Corona virus (MERS-CoV) in Asia; Meningitis and Ebola in West Africa region; cholera and Lassa fever in Nigeria (European Center for Diseases Prevention and Control 2015).

The World Health Organization (WHO) and United Nation International Children Education Fund (UNICEF) formulated, launched, and adopted a Programme in 1974 called the Expanded Programme on Immunization (EPI) with the aim of assisting its member nations carry out routine immunization services on their 0 months to 2 years' child population and all women of childbearing age (15-59years) against vaccines preventable, communicable, and other dangerous diseases (Obionu, 2007). It was called Expanded programme on immunization because in the developing countries, the programme covers children from birth (0 to. 2) years of ages and pregnant women. It also ensures that the child receives "multiples doses" of different antigens at the same time. Nigeria as a member nation of WHO has pursued an active immunizations programmes, it has also shown its commitments to achieving Universal immunizations by initiating the EPI in 1979. However, during the first five years

following its initiation in Nigeria, there was low national immunizations coverage and consequent minimal impact on the target diseases because of poor management and implementation. Unfortunately, the universal, child immunization (UCI) and the routine immunization (RI) in Nigeria suffered setback. Consequently, in August 1997 Nigeria restructured the EPI and renamed it the “National programme on immunization (NPI) under the decree NO: 12 to reflect national consciousness, commitment and ownership (National Primary Health Care Development Agency, 2008).

Immunization services are cost – effective public health intervention strategies that have controlled the emergences and re-emergence of vaccine preventable diseases among childbearing mothers globally. Immunization has been variously defined. World Health Organization WHO, (2014) defined immunization as the process whereby a person is immunized or made resistant to an infectious disease, typically by the administration of vaccines. Immunization according to Ada (2012) is a process of protecting a person from a specific disease through the purposeful introduction into the body of small dose of germs that are killed or extremely weakened or attenuated by means of chemical process. It implies that NPI refers to as public health intervention designed with a view to providing protection against vaccine preventable diseases among children and childbearing women. Immunization averts 2 - 3 million deaths annually, however, an additional 1.5 million deaths should have been avoided if global vaccination acceptance improves (World Health Organization,2014). Furthermore, World Health Organization (2016) reported that about 18.8 million infant’s death nearly one in five children worldwide are still missing routine immunization for preventable diseases such as diphtheria, pertussis and tetanus. Woodruff (2004) also asserted that; immunization aims at reducing drastically the number of deaths from Vaccine preventable diseases (VPDs) among children and childbearing mothers. For instance, routine immunization and vaccines services have successfully attained the Universal child immunization (UCI) target of 80 per cent by 2000 in many countries. Ukpong (2012) stated that the primary aim of NPI was to ensure that all childbearing mothers of 15 – 49 years were vaccinated against tetanus for the ideal purpose of protecting the unborn children and their mothers. Its acceptance by the childbearing mothers offers protection against eight VPDs such as tuberculosis, diphtheria, whooping cough, tetanus, hepatitis B, respiratory diseases, polio and measles. This was crucial to reduction of infant and child mortality in Nigeria (Ndiragu, Baringhausen, Tanser, Tint, Newel, & 2009; WHO, 2009). Consequently, NPI acceptance among childbearing mothers remained a key to attainment of the Sustainable Development Goal 3 (SDG 3) which aims at providing good health and well-being, that was, to ensure healthy lives and promote well-being at all ages. (Oleribe & Robinson, 2016). The benefits of NPI in preventing and eradicating VPDs were enormous. Ukpong (2012) also outlined the benefits of NPI to include prevention of suffering, disability and death from VPDs such as diphtheria, tetanus, pertussis and measles; improvements in health and life expectancy; positive social and economic impact at the global, national and community levels. World Health Organization (WHO) and United Nation International Children Education Fund (UNICEF) (2012) asserted that NPI plays a vital role in preventing the resurgence of VPDs by the introduction of routine immunization new vaccines.

The success of any immunization services depends greatly on vaccines. News Medicine (2012) define vaccines as biological preparation that improve immunity to a particular disease. Vaccines as defined by World Health Organization WHO, (2013) as any preparation intended to produce immunity to a disease by stimulating the production of antibodies. In this study, vaccines are a special preparation of antigenic materials that can be used by CBMs in Bauchi state during routine immunization services schedules to stimulate the production of antibodies and confer immunity against a specific VPDs. These agents stimulate the body immune system to recognize it, so that the immune system can easily recognize and destroy any of these microorganisms that invaded the body. Consequently, the National programme on immunization NPI services prescribed the following vaccines for Nigerian to be implemented through routine immunization services schedules, for effective protections of childbearing mothers against VPDs.

When childhood immunizations are given at scheduled times or periods, they are called routine immunization. Routine immunization refers to as immunization that is given to children at health centers from birth and at various stages of childhood to protect them from having serious disabilities or possible death from the vaccine preventable diseases World Health Organization (WHO, 2012 & 2013).National program on immunization NPI (2005) also defined routine

immunization as the nationally schedule of regular administration of vaccine dosages to infants and mothers at specified ages. Routine immunization in this present study is the deliberate introduction of vaccines into the body of a child at specified periods especially within the first two years of life. Children are taken to the health facilities by their mothers or caregivers to receive age appropriate doses of antigens given at the specific days of the weeks (Federal Ministry of Health, [FMOH] 2005); Tagbo, Uleanya, Nwokoye, Eze, & Omotowo, 2012). According to UNICEF (2003), routine immunization of children in Nigeria was carried out using the following vaccines and at the specified schedules: Bacilli Calmette Guerin (BCG) – at birth or as possible after birth; Oral Polio Vaccines (OPV)-at birth and at 6, 10, and 14 weeks of age; Diphtheria, Pertussis, Tetanus (DPT) – at 6, 10, and 14 weeks of age; Hepatitis B at birth, 6 and 14 weeks; measles, yellow fever and vitamin A, all are given at 9 months. Pregnant mothers and CBMs are given five doses of Tetanus Toxoid vaccine (TT) against neonatal tetanus during childbearing. Despite routine immunization in place, Vaccine Preventable Diseases still occurred in large proportion with attendant consequences, hence the Nigerian Government introduced the pentavalent vaccine and integrated it in routine immunization schedules (Rahj and Ndikom, 2009). Pentavalent vaccine is a combination of five (5 – in – one) vaccine that was designed for the protection of children from diphtheria, tetanus, and whooping cough, hepatitis B, and Haemophilus influenza type b as a single dose. These vaccines were expected to prevent 396,000 cases of Haemophilus influenza type b and save some 27,600 lives yearly (Munya, 2012).

Although National Primary Health Care Development Agency NPHCDA has made a significant effort at eradicating VPDs in Nigeria via NPI routine immunization. Its acceptance and uptake have been abysmally low in many Northern states including Bauchi State (Nigeria Demographic Health Survey [NDHS], 2010 and Bauchi State Primary Health Care Development Agency BSPHCDA, 2014). According to Feliden and Battersby (2005) stated that other factors that have been attributed to poor acceptance of NPI routine immunization services among women in Nigeria especially women in Northern States including Bauchi State included misperceptions of NPI, skepticism about efficacy and effectiveness of vaccines by religious leaders, inadequate cold chain equipment, lack of political willingness, non-acceptance of routine immunization for fear of side effects, low confidence and lack of trust in routine immunization as effective health interventions. All these contributed to low acceptance of routine immunization among childbearing mothers. Acceptance of NPI among childbearing mothers were to reduce cases of morbidity, mortality and dropout rates when correctly followed, children finished the scheduled by one year of age as it is the right of every child to be fully immunized.

Childbearing mothers' acceptance of routine immunization services were aim at dual purpose of protecting the unborn baby, the mother and preventing neonatal tetanus (Obionu,2005). Paul, (2012) reported that acceptance is an act of taking or receiving something offered. Acceptance is also defined as an act of believing or assenting to any programme such as NPI (American Law and Information, 2012). In this study, acceptance is referred to as the expression of agreement and approval of routine immunization services among the childbearing mothers in Bauchi state. Mothers' acceptance of routine immunization services implies that they have endorsed it and have agreed to utilize the programme because of its inherent benefits. American Law and Information (2012) stated that acceptance can be used to resolve issues when a person feels disturbed by place, thing, and situation about facts of life, which were unacceptable to him or her. Similarly, Igbokwe (2009) also posited that immunization acceptance could be divided into two levels namely, low and high levels of acceptance. Low level of acceptance is when less than fifty percent of childbearing mothers accepted routine immunization services and high level of acceptance is when more than fifty per cent accepted routine immunization services. Routine immunization acceptance could be predicted by demographic factors of levels of education.

Certain demographic factors such as levels of education of mothers could determine their knowledge, perception and acceptance of routine immunization and its benefits (Onusanya, Alufohai & Maurice, 2012). The authors further suggested that educated mothers up to secondary levels can affect individual's decision making with respect to diseases prevention such as acceptance of routine immunization services. According to Alfred, Tabu, Malalu, Marere, Too, and Tenge (2014) educated women are better able to break away from tradition to utilize modern services like acceptance

immunization services to safeguard their health and that of their children against vaccine preventable diseases.

The acceptance of routine immunization and vaccine services are generally accepted as a significant breakthrough in the control and eventual eradication of vaccine preventable diseases. WHO & UNICEF (2007) defined vaccine preventable disease as infectious diseases that kill or disable children, which could be prevented via administration of vaccines. These diseases are diphtheria, pertussis, tetanus, poliomyelitis, measles, yellow fever, hepatitis B, whooping cough, and cerebrospinal meningitis. In this study, vaccine preventable diseases refer to as medical conditions such as measles, tetanus, tuberculosis, poliomyelitis, pertussis, yellow fever, and hepatitis B that constituted threats especially to children and women's health and prevented via administration of routine immunization services. Global Health Education Consortium (GHEC) (2013) further asserted that NPI vaccines formulated to protect children from VPDs include BCG vaccine, which protects children against tuberculosis; DPT vaccines which protect against diphtheria, pertussis and tetanus; hepatitis B vaccine which protect children against viral hepatitis; OPV which protect against poliomyelitis; tetanus toxoid vaccine which protect against neonatal tetanus; yellow fever vaccine which protect against yellow fever virus. (Health Reform Formulation of Nigeria, 2006, WHO & UNICEF, 2007, Omotara, Okujagu, Etavie, Beida, & Gbodossan, 2012). However, acceptance of immunization against vaccine preventable diseases among mothers were on steady decline in many parts of developing nations (WHO, 2004; Awosika, 2006; Tadesse, Derlbeu, & Woldie, 2008; UNICEF, 2011, BSPHCDA, 2014). As reported by Ukpong (2012) that there were variations in routine immunization and vaccine services acceptance in the six geo-political zones of Nigeria. Southwest had 43 per cent coverage rate; Southeast had 43 per cent coverage rate; South-South had 36 per cent coverage rate; North-Central had 26 per cent coverage rate; North-west had 8 per cent coverage rate, and North-East 6 per cent coverage rate. This indicated that South-west, South-south and South-East zones showed higher performance on routine immunization and vaccine services coverage than those in the North-West, North-central and North-East geo-political zones respectively. These declining trends in these services acceptance and coverages were also prevalent in Bauchi State due to its low acceptance among CBMs (National Immunization Coverage Survey, 2012). The trend of decline in NPI acceptance and coverage in Bauchi state for a period of three years were less than 20 per cent. This indicated that about 1.3 million children in Bauchi State were not protected against VPDs including the childbearing mothers (BSPHCDA, 2014).

Childbearing mothers are female parents of a child who are in the process of reproduction (Odoh, 2009). Childbearing mothers are women who are physiologically capable of reproducing young ones, or who are within their reproductive age (Azubuike 2014). Childbearing however is defined as the period during pregnancy, childbirth and early post-partum phase (Azubuike, 2014). Pregnancy, childbirth, and child upbringing have been a thing of concern to this group of people. These are exposed to all sorts of responsibilities which include taking adequate care of the children, knowing the health needs of the children and taking adequate measures to prevent diseases in their children. It is also their responsibility to take full course of their routine immunization services for their children so as to prevent the child killer diseases in Bauchi state

Bauchi State is one of the six states created from the former North East of Nigeria. It was created on 6<sup>th</sup> March 1976 and is one of the six states in the North-East geopolitical zones of Nigeria with the least immunization coverage of six per cent coverage rate (Ukpong, 2012). It has an estimated population of 4.6 million people according to the 2006 population census and with land mass of about 549, 259.61 square kilometers. The inhabitants are mostly farmers and traders and few civil servants. Their acceptance of routine immunization coverage showed of low-level acceptance in 2012 it was 31 per cent, 2013 it was 42 per cent and in 2014 it was 11 per cent respectively which was far below WHO 90 per cent benchmark.

Childhood immunization guarantees protection from major killer diseases of children and prevent neonates, infants, or dying in their early years. The first five years of birth is most dangerous in a child's life therefore requires routine immunization services against these vaccine preventable diseases. In Nigeria, VPDs still accounted for 17 per cent of deaths of under-five children, (USAID, 2012). Ajuogu et al. (2014) reported that neonatal tetanus was also a major cause of 450,000 infant deaths and 40,000 deaths among childbearing mothers.

Routine Immunization and vaccines services are some of the most successful and cost-effective public health interventions, which have prevented illness, disabilities, deaths and protected children and childbearing mothers from VPDs. Routine immunization and vaccines services acceptance by childbearing mothers were important in the improvement of their health, life-expectancy, positive pregnancy, birth outcomes, and reduction in disease burdens at local, national and global levels. Regrettably, it has been reported that children were still dying of VPDs. Despite Routine immunization, Nigeria still has high prevalence of associated vaccines preventable disease among children and mothers. Literature indicated that in Nigeria neonatal tetanus was a major cause of infants and maternal deaths from tetanus infection acquired during deliveries. The NPI coverage rates for three years (2012 – 2014) in Bauchi state was less than 20 per cent leaving about 1.3 million children unprotected against VPDs. These situations were attributed to low levels of routine immunization and vaccines services acceptance among childbearing mothers in the state. The continue low acceptance of routine immunization services among the CBMs in Bauchi state may therefore have a lot of health implications for mothers and their children more so as they are susceptible to VPDs especially the six killers' diseases of children. It may also imply that their growth, development, and survival of these children may be jeopardized. Equally, children would be vulnerable to VPDs as they are incapable of taking decisions for their own health. The question that is pertinent is; what educational level influences the acceptance of routine immunization and vaccines services among the childbearing mothers in Bauchi State. The findings from this study will be of benefit to Bauchi State Ministry of Health, Bauchi state Primary Health Care Development Agency, health care providers, community health workers, public health educators, curriculum planners, childbearing mothers, Federal Ministry of Health, Policy make and our donor agencies. Consequently, the purpose of this study was to investigate demographic predictors of level of educational as a predictor of acceptance of routine immunization and vaccines services among childbearing mothers in Bauchi State. Specifically, the study sought to determine the:

1. level of routine immunization and vaccines services acceptance among childbearing mothers in Bauchi State;
2. Level of routine immunization and vaccines services acceptance among childbearing mothers in Bauchi State based on level of education.

### **Research Questions**

The following research questions guided the study.

1. What is the level of routine immunization and vaccines services acceptance among childbearing mothers in Bauchi State?
2. What is the level of routine immunization and vaccines services acceptance among mother's in Bauchi State based on level of education?

### **Hypotheses**

1. Education level is not a significant predictor of routine immunization and vaccines services acceptance among mothers in Bauchi State at ( $p < .05$ ).

## **Method**

**Design of the study:** To achieve the objective of the study, the cross-sectional survey design was adopted to determine demographic predictors of routine immunization and vaccines services acceptance among childbearing mothers in Bauchi State. The study was carried out in the selected NPI health centres in the two senatorial zones of Bauchi State.

**Area of the study:** This study was conducted in Bauchi State Nigeria, located in the North East of the country. Childbearing mothers in Bauchi state at the moment practice farming activities instead of attending routine immunization centers. Mohammed and Abdulkadir (2015) asserted that CBM in Bauchi state have low knowledge of routine immunization services. Similarly, Saaka and Kokebie (2015) stated that most CBMs have low health information regarding routine immunization. These predispose them to non-compliance with routine immunization services.

**Population for the study:** The population for the consisted of all the 3,221,528 childbearing mothers aged 15 – 49 years in Bauchi State. The population comprised mothers of under-five children and pregnant mothers attending health facilities offering NPI services in the state. According to (2006), population census figure, there were 2,283,800 childbearing mothers in Bauchi State. Due to the fact

that women’s population in Bauchi state have increased since the last census, it becomes necessary to estimate current population of childbearing mothers using population projection formula of International Labor Organization’s [ILO] (2001).

**Sample for the study:** The sample size consisted of eight hundred (800) respondents. These were selected using Cohen, Manion and Morrison (2011) who suggested that where the population was, one million (1000, 000) and above at (5%) interval level and (95%) confidence level, then the sample size should be from six hundred and sixty-three (663) and above. A three-stage sampling procedure was employed to draw the sample for the study. The first stage involved the use of simple random sampling technique of balloting without replacement to select five LGAs each from the selected two senatorial zones. This procedure produced a total of 10 LGAs. The stage also involved the use of purposive sampling technique to select one Teaching Hospital that was, Abubakar Tafawa Balewa University Teaching Hospital (ATBUTHB), and one Federal Medical Center (FMC), Azare. Bauchi Sate. In addition, a disproportionate stratified random sampling technique was used to select 30 (29.4%) PHCs out of 102 PHCs in Bauchi State that are situated in the selected two senatorial zones and 10 LGAs respectively while eight (40%) general hospital (GHs) out of 20 general hospitals located in Bauchi Sate was selected for the study. These procedures provided a total of 40 health facilities that provided routine immunization services in Bauchi State. The third stage involved the use of convenience sampling technique to select 20 CBMs each in all the 40 sampled health facilities in Bauchi State. Finally, eight hundred (800) childbearing mothers were selected and were utilized for this study.

**Instrument for data collection:** The instrument used for data collection was a structured questionnaire titled, Demographic Predictors of Routine Immunization and Vaccines Services Acceptance Among Childbearing Mothers Questionnaire (DPRIVAACBMQ). The DPRIVAACBMQ consisted of two sections (A & B). Section A elicited information on mothers’ demographic variables of level of education while Section B was on the Demographic predictors of routine immunization services and vaccines acceptance among CBMs and rated as follows Totally Unacceptable (1), Unacceptable (2), Slightly Unacceptable (3), Neutral (4), Slightly Acceptance (5), Acceptable (6), and Perfectly Acceptance (7). The respondents were requested to tick (√) as it applied to them. It was validated by five experts, from the Department of Human Kinetic and Health Education, University of Nigeria, Nsukka and Cronbach’s Alpha statistic was used to determine the reliability of the instrument which resulted in a reliability coefficient of .93 and was very adequate and appropriate for the instrument.

**Method of data collection:** The researcher sought the of five research assistants in all the health centers. They assisted in the administration and collection of the copies of questionnaire from the respondents hence they all were used for the analysis.

**Data analysis:** Data collected were analyzed using frequency and percentages to answer the research questions, while the null hypothesis was tested using Binary logistic regression model to examine the demographic variables of level of education, as its predictor of acceptance of routine immunization and vaccine services among CBMs at .05 alpha level.

### Results

**Table 1: Percentage Responses on Level of Acceptance of NPI Vaccines Services (n=800)**

S/n	Items on NPI Vaccines	(TU)		(U)		(SU)		(N)		(SA)		(A)		(PA)	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%
1	BCG vaccines	130	(15.4)	41	(4.9)	38	(4.5)	4	(0.5)	111	(13.2)	295	(35.0)	225	(26.7)
	Total %						(24.8%)								(74.9%)
2	Pentavalent vaccines	100	(11.8)	70	(8.3)	27	(3.2)	31		111	(13.2)	321	(38.0)	184	(21.8)
	Total %						(23.3%)		(3.7)						(73.0. %)
3	Oral Polio Vaccines (OPV)	73	(8.6)	30	(3.6)	58	(6.9)	40		110	(13.0)	329	(39.0)	204	(24.2)
	Total %						(19.1%)		(4.7%)						(76.2 %)
4	Measles vaccines	95	(11.3)	43	(5.1)	54	(6.4)	44		161	(12.0)	318	(37.7)	189	(22.4)
	Total %						(22.8%)		(5.2%)						(72.1%)
5	PCV vaccines	130	(15.4)	70	(8.3)	40	(4.7)	64		103	(12.2)	268	(31.8)	169	(20.0)
	Total %				(28.4)				(7.6%)						(64.0%)
6	Yellow fever vaccines	81	(9.6)	85	(10.1)	51	(6.0)	57	(6.8)	102	(12.1)	292	(34.6)	176	(20.9)
	Total %						(25.7)		(6.8%)						(67.6%)

7	Cerebrospinal meningitis vaccines (CSM)	124 (14.7)	84 (10.0)	58 (6.9) (31.5%)	38 (4.5%)	113 (13.4)	246 (29.1)	181 (21.4) (63.9%)
Total %								
8	Vitamin A supplements	94 (11.1)	54 (6.4)	75 (8.9) (26.4%)	22 (2.6%)	114 (13.5)	295 (35.0)	190 (22.5) (71.0%)
Total %								
<b>Cluster Percentage</b>				<b>(25.2%)</b>	<b>(4.5%)</b>			<b>(70.3%)</b>

**Key:** TU = Totally Unacceptable, U = Unacceptable, SU = Slightly Unacceptable, N = Neutral, SA = Slightly Acceptable, A = Acceptable, P A = Perfectly Acceptable.

Table1 showed the level of acceptance routine immunization vaccine against vaccines preventable diseases (VPDs) by childbearing mothers in Bauchi State. The table shows a cluster percentage of 70.3% which implies high level of acceptance of NPI vaccines against VPDs. On specific items, there was high level of acceptance of NPI vaccines as follows; BCG vaccines (74.9%), pentavalent vaccines (73.0%), Oral polio vaccines (76.2 %), measles vaccines (72.2%), This implies that childbearing mothers had high level of acceptance of NPI vaccines in the state

**Table 2: Percentage Responses on Level of Acceptance of Routine Immunization Services Schedules (n=800)**

S/n	Items on Routine Immunization Services Schedules	(TU)		(U)		(SU)		(N)		(SA)		(A)		(PA)	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%
1	BCG vaccines at birth	122	(14.5)	83	(9.8)	32	(3.8)	24	(2.8)	80	(9.5)	258	(30.6)	245	(29.0)
Total %															
2	Oral polio vaccines (OPV) at birth	100	(11.8)	54	(6.4)	45	(5.3)	44	(5.2)	90	(10.7)	276	(32.7)	235	(27.8)
Total %															
3	OPV at 6 weeks of age	132	(15.6)	66	(7.8)	49	(5.8)	43	(5.1)	93	(11.0)	280	(33.2)	181	(21.4)
Total %															
4	OPV at 10 weeks of age	91	(10.8)	58	(6.9)	65	(7.7)	43	(5.1)	98	(11.6)	339	(40.2)	155	(18.4)
Total %															
5	O PV at 14 weeks of age	111	(13.2)	58	(6.9)	55	(6.5)	58	(6.9)	104	(12.3)	240	(28.4)	218	(25.8)
Total %															
6	Pentavalent vaccines (PCV) at 6 weeks of age	86	(10.2)	95	(11.3)	75	(8.9)	40	(4.7)	75	(8.9)	275	(32.6)	198	(23.5)
Total %															
7	Pentavalents vaccines at 10 weeks of age	73	(8.6)	95	(11.3)	93	(11.0)	53	(6.3)	117	(13.9)	270	(32.0)	143	(16.9)
Total %															
8	Pentavalent vaccines at 14 weeks of age	69	(8.2)	70	(8.3)	99	(11.7)	53	(6.3)	129	(15.3)	256	(30.3)	168	(19.9)
Total %															
9	Pneumococcal conjugate vaccines (PCV) at 6 weeks of age	120	(14.2)	97	(11.5)	73	(8.6)	51	(6.0)	88	(10.4)	230	(27.3)	185	(21.9)
Total %															
10	PCV vaccines at 10 weeks of age	80	(9.5)	111	(13.2)	92	(10.9)	43	(5.1)	124	(14.7)	234	(27.7)	160	(19.0)
Total %															
11	PCV at 14 weeks of age	60	(7.1)	92	(10.9)	106	(12.6)	50	(5.9)	148	(17.5)	232	(27.5)	156	(18.5)
Total %															
12	Measles vaccines at 9 months of age	65	(7.7)	73	(8.6)	109	(12.9)	57	(6.8)	68	(8.1)	293	(34.7)	179	(21.2)
Total %															
13	Yellow fever vaccines at 9 months of age	54	(6.4)	70	(8.3)	95	(11.3)	47	(5.6)	99	(11.7)	300	(35.5)	179	(21.2)
Total %															
14	CSM vaccines 1 dose at outbreaks.	102	(12.1)	108	(21.8)	68	(8.1)	64	(7.6)	62	(7.3)	277	(32.8)	163	(19.3)
Total %															
<b>Cluster Percentage</b>				<b>(29.2%)</b>	<b>(5.7%)</b>									<b>(65.1%)</b>	

**Key:** 0 - 49% =Low Acceptance, 50---69%. =Moderate Level Acceptance, 70% and above == High Level of Acceptance

Table 2 revealed a high (65.1%) acceptance of routine immunization services by childbearing mothers. On specific items, the table also shows that the level of acceptance was high as follows: BCG vaccines at birth (69.1%), Oral polio vaccines at birth (71.2%), Oral polio vaccines at 6 weeks of age (65.6%), Oral polio vaccines at 10 weeks (70.2%), Oral polio vaccines at 14 weeks (66.5%), pentavalent vaccines at 6 weeks of age (65.0%).

**Table 3: Level of Vaccine and Routine Immunization Services Acceptance among Childbearing Mothers based on Level of Education (n = 800)**

	Level of Education											
	Tertiary Education (n = 229)			Secondary Education (n = 308)			Primary Education (n = 183)			Non-formal Education (n = 124)		
NPI Services	UAC n(%)	NEU n(%)	ACP n(%)	UAC n(%)	NEU n(%)	ACP n(%)	UAC n(%)	NEU n(%)	ACP n(%)	UAC n(%)	NEU n(%)	ACP n(%)
NPI Vaccines	61(26.4)	7 (2.9)	161(70.7)	106(34.5)	15(4.7)	187(60.7)	60(32.9)	11(5.9)	112(61.2)	39(31.7)	4(2.6)	81 (65.7)
Routine Immunization	69(30.3)	8(3.4)	152(66.3)	116(37.6)	18(5.9)	174(56.4)	62(33.9)	8(4.4)	113(61.8)	42(33.7)	9(7.3)	73(59.0)

Key: UAC = Unacceptable; NEU = Neutral; ACP = Acceptable; 0- 49% = Low Acceptance, 50 – 69% = Moderate Level of Acceptance, ≥ 70% = High Level of Acceptance

Results in Table 3 showed that overall, childbearing mothers with tertiary education had a high level of acceptance of NPI vaccine services (70.7%) while childbearing mothers with secondary education (60.7%), non-formal education (65.7%) and primary education (61.2 %) had a moderate level of acceptance of NPI vaccines service. Therefore, childbearing mothers with tertiary education had a high level of acceptance while those with other levels of education had a moderate level of acceptance of NPI vaccines. In addition, Table 3 showed that childbearing mothers regardless of educational level had a moderate level of acceptance of NPI routine immunization service schedule (Tertiary education = 66.3 %; secondary education = 56.4%; primary education = 61.8 %; and non-formal education = 59.0%. Hence, childbearing mothers of different education levels had a moderate acceptance of routine immunization service schedules.

**Table 4: Binary Logistic Regression of Education Level as a Predictor of vaccines and Routine Immunization Schedules among Childbearing mothers**

Variable	NPI Vaccines Model 1		Routine Immunization Schedule Model 2	
	COR (95% CI)	P-value	COR (95% CI)	P-value
Level of Education				
NFE	1.00		1.00	
Primary education	0.74 (0.39, 1.41)	0.357	0.75 (0.42, 1.33)	0.316
Secondary education	0.44 (0.24, 0.81)	0.008	0.45 (0.26, 0.76)	0.003
Tertiary education	0.35 (0.19, 0.65)	0.001	0.59 (0.33, 1.06)	0.077

Note. NFE = No formal education; COR = Crude odds ratio; CI = Confidence interval; 1.00 = Reference group (comparison group).

Table 4 showed that having a secondary education (OR = 0.44; 95% CI (0.24, 0.81), and tertiary education (OR = 0.35, 95% CI (0.19, 0.65) were significant predictors of NPI vaccines. This implies that, CBMs with secondary and tertiary education were less likely to accept NPI vaccines compared to CBMs with no formal education. Additionally, only having a secondary education (OR = 0.45; 95% CI (0.26, 0.76) was a significant predictor of acceptance of routine immunization services schedules among CBMs in Bauchi State. However, the odds of accepting routine immunization services were 55 per cent less likely among CBMs with secondary education, respectively compared to CBMs with no formal education.



### ***Discussion***

Findings in Table 1 indicated that childbearing mothers had high level of acceptance (70.3%) of routine immunizations vaccines such as BCG vaccine (74%), pentavalent vaccine (73%), OPV vaccine (76.2%), measles vaccine (72.3%), Other vaccines had a moderate level of acceptance such as CSM vaccine, yellow fever vaccine and vitamin A supplements. This was expected because CBMs had access to immunization education and sensitization programmes on NPI targeted diseases at NPI health care centres during ANC visits. This was also in agreement with this finding of Kaekungwal, Apidechukul and Lawposhi (2015) who reported that mobile technology devices have contributed to high (75%) acceptance of NPI vaccines by childbearing mothers in the hard-to-reach population in the Northern Thailand. Therefore, it is recommended that NPI vaccines to be made available to CBMs at all their health centres.

The data in Table 2 also revealed that CBM had both moderate 50—69% and 70% and above high level of acceptance routine immunization services. This was also consistent with that of Babalola and Lawan (2009) who also reported very high acceptance (81.6%) of BCG vaccine among CBMs at birth in Bauchi state during routine immunization services. This finding was due to the fact that NPI routine immunization services schedules were available in almost all the political wards and health facilities visited in the state. This implies that the government should use mass media penetration and health education to encourage CBMs full acceptance of NPI routine immunization and vaccines services in the state.

The findings in Table 3 further indicated that childbearing mother with tertiary education had (70.7%) acceptance of NPI vaccines, followed by those with secondary education (60.7%), primary education (61.2%) and the least are those with no formal education (65.7%) had a high and a moderate level of acceptance routine immunization and vaccines services in the state. This was expected because education exposes mothers to the importance of immunization and helps to correct misconception about NPI services. The result was consistent with that of Babalola and Lawan (2009) who reported that maternal awareness on VPDs, knowledge about the immunization schedules and facility-based delivery had enhanced significantly CBMs acceptance of routine immunization services. The finding also agrees with that of Akinbami (2012) who also reported that maternal education assisted CBMs to complete their children NPI routine immunization schedules by the age of 12-23 months with DPT3 vaccine (90.2%) and yellow fever vaccine (55%) having very high and moderate levels of acceptance. This finding was at variance with Nankabirwa (2014) who reported that maternal education was not positively associated with compliance of routine immunization services in Uganda. The differences in the findings could be attributed to differences in study settings. The implication of this is that maternal education and health education are of utmost necessity to inform mothers on the need for acceptance of routine immunization and vaccines to control emergence and reemergence of VPDs.

Furthermore, data in Table 4 indicated that level of education of childbearing mothers was a significant predictor of acceptance of NPI services to vaccines preventable diseases control ( $P = 0.01$ ,  $OR = 1.305$ ,  $CI = 1.119 - 1.522$ ), routine immunization services schedules ( $p = .011$ ,  $OR = 1.220$ ;  $CI = 1.047 - 1.4217$ ). This finding was expected because education has been seen to associate with improved access to health services and improved health outcomes. The finding was in line with that of Babalola and Lawan (2009) who reported that maternal education was a predictor to CBMs acceptance of BCG vaccines. This implies that levels of education can be used to predict acceptance of NPI services among childbearing mothers in Bauchi State.

### ***Conclusion and Recommendations***

These findings have shown that there were high levels of acceptance of routine immunization vaccines and routine immunization services schedules by childbearing mothers. Tertiary education and secondary education were significant predictors of acceptance of routine immunization and vaccines services among CBMs in Bauchi State, while only secondary education was a significant predictor of routine immunization services among CBMs. The following recommendations were made in accordance with the conclusion.

- 1 There is need for continuous maternal education programmes in order to reinforce and sustain high and moderate levels of acceptance of routine immunization and vaccines services among the childbearing mothers as revealed by the study.
- 2 Health education on the need for adequate acceptance of routine immunization and vaccines services should be conducted by health educators and other health professionals regularly at the health centres for the childbearing mothers.
- 3 Routine immunization services schedules and vaccines education should be included into secondary schools' curriculum to equip the students with the knowledge of immunization education.

### *References*

- Ananomo, L. E., Ibeagha, E. J., & Chujor, O. C. (2013). National programme on immunization (NPI) implementation strategies as determinants of immunization coverage in rural and urban areas, Imo State. *Nigerian Journal of Health Promotion*, 6.
- Applana, R., Nteta, S., & Babalola, S. (2012). Maternal reasons for non-immunization and partial immunization in Northern Nigeria. *Journal of Pediatrics and Child Health*, 47(5), 276 – 281
- Ada, G. (2012). *Vaccines and vaccination*. Owerri: Abanahearpuplication.
- Ajaegbu, O. O. (2014). Perceived challenge of using maternal healthcare services in Nigeria. *Art and Social Science Journal*, 63(3), 47—68.
- Alfred, R., Tabu, S., Malalu, P., .K, Marete, T., Too, R., & Teneger. (2014). Utilization of essential immunization services among children Under-Five –Old in Kacheliba Division Potocot Country Kenya. *Science Journal of Public Health*, 2(6), 617 -623.
- Azubuike, A. S. (2014). *Extent of Utilization and Strategies for Enhancement of Maternal and Child Health Care Services Utilization Among Childbearing Mothers* (Unpublished Master's thesis). University of Nigeria, Nsukka.
- Babalola, S., & Lawal, U. (2009). Factors predicting BCG immunization status in Northern Nigeria: Behavioral ecological perspective. *Journal of Child Health*, 46-62.
- Bauchi State Primary Health Care Development Agency BASPHCDA. (2014), Mohammed, U & Abdulkadir, S. (2015). Health and management information system, Department of planning research statistic.
- Centre for Disease Control and Prevention (CDC). (2013). Global routine vaccination coverage. *Morbidity and Mortality Weekly Report (MMWR)*, 62(48), 858 – 861
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7<sup>th</sup>ed.). Routledge, 2 Pack square, Abingdon, Oxon OX144RN.
- European Center for Diseases Prevention and Control. (2015). *Rapid Assessment of Zika virus Infection Outbreaks*. Brazil and the Pacific Region.
- Federal Ministry of Health. (2005). Expanded programme on immunization 5-year national plan of action for boosting EPI coverage and attainment of measles control, neonatal Tetanus elimination and eradication of poliomyelitis in Nigeria. *Bulleting Federal Ministry of Health*, 6(1), 72-73.
- Feliden Battersby Analyst. (2005). *The state of routine immunization services in Nigeria and Reasons for current problems*: 3-42 Bath; Health Systems Analysts URL
- FMOH, 2005, NDHS 2013, & NPHCDA 2014 National Routine Immunization (2013 –2015) Strategic Plan. Intensifying Reaching Every Ward Through Accountability, NPHCDA.
- Global Health Education Consortium. (2013). *Vaccine preventable diseases and immunization programmes*.
- International Labor Organization (ILO). (2001). *ILO population projection model- Technical guide*. The International Financial and Actuarial Service (ILO-FACTS). Geneva, Switzerland.
- Igbokwe, C. C. (2009). Levels of knowledge and practice of childbearing mothers about National Programme on Immunization (NPI) Nsukka. Local Government Area. Enugu State. *Official Journal of the Department of Social Science Education University of Nigeria Nsukka*, 11, 1.
- Lynn, E.U., & Lynn, C.E. (2015). *SOC – 200 Research methods in the social science; cross-sectional design*. Retrieved on 5<sup>th</sup> March 2016 from <http://lynn-libguides.com/researchmethods>.

- Mohammed, U., & Abdulkadir, S. (2015). Determination of the knowledge of vaccine preventable diseases and routine immunization among nursing mothers in Katagum LGA, Bauchi State. *Journal of Nursing and Health Science*, 4(4), 16 – 21.
- Munya, C. (2012). *Why Nigeria introduced pentavalent vaccines*. Retrieved on 29<sup>th</sup> September.
- Nankabirwa, V. T., Tumwine, J. K., & Sommerfelt, H. (2014). Alfred, R, Too, S and Tenge, C (2014) Maternal education is associated with vaccination status of infants less than 6 months in Eastern Uganda: *A cohort study. BMC Pediatrics*.
- National Population Commission (NPC) (Nigeria) and ICF Macro. (2013). Nigerian Demographic and Health Survey.
- National Primary Health Care Development Agency. (2009). Report on 2010 National Immunization Coverage Survey, Abuja. Nigeria.
- National Immunization Coverage Survey. (2010). Immunization coverage rate by geo – political zones of Nigeria.
- National Routine Immunization Strategic Plan Report. (2012 - 2015). National Immunization Coverage Survey. Abuja: FMOH.
- News Medicine. (2012). Vaccines. Retrieved from <http://www.news.medicine.net/health>. What are vaccines?
- Nwokeukwu, H. I., Ukegbu, A. U., Nwogu, K. C., Nwankwo, N., Osunkwo, D., & Ajuogu, E. (2014). Tetanus toxoid immunization coverage in federal medical centre, Umuahia, Abia State. South-East, Nigeria. *International Journal of Tropical Disease & Health*, 49(12), 1268-1277.
- Oleribe, O. O., & Robinson, S. D. (2016). Before sustainable development goals (SDG) Why Nigeria failed to achieve the Millennium Development Goals (MDG). *The Pan African Medical Journal*, 24 – 156.
- Omotara, B. A., Akujagu, T. F., Efaturie, S. O., Beida, O., & Gbodossou, E. (2014). Assessment of knowledge, attitudes and practice of stakeholders towards immunization in Borno State, Nigeria: A qualitative approach. *Journal of Community Medicine & Health Education*, 2, 181. doi: 1041 72/2161-0711.1000181
- Odusanya, O. O., Alufohal, E. F., Maurice, F., & Ahonkhai, V. I. (2008) Determinants of vaccination coverage in Rural Nigeria. *BMC public Health* 8, 381. Retrieved from <http://www.biomedcentral.com/1471-2458/8/31/3/2010>.<https://doi.org/10.1186/1471-2458-8-381>
- Peter, H., Towle, V., & Manisha, M. (2007). Testing measurement reliability in older populations; Methods for informed discrimination in instrument selection and application. *Journal of Aging Health*, 20(2), 183- 192.
- Paul, O. (2012). *The big book of alcoholic anonymous* p 449-3<sup>rd</sup> Ed or pg. 417 4<sup>th</sup> ed.
- Rahaji, R., & Ndikom, C. M. (2013). Factors influencing compliance with immunization regimen among mothers in Ibadan. *Nigerian Journal of Nursing and Health Science*, 2(2), 01 – 09.
- Robert, A. A., Izuka, M. I., Ekanem, E. E., & Mabogunje, C. A. (2013). Predictors of pneumococcal immunization uptake among caregivers of children with Sickle Cell Diseases in Lagos, *Nigeria Journal of Public Health and Epidemiology*, 5(12), 488-492.
- Saaka, M., & Idris, M. (2014). Patterns of determinants of essentials newborn care practices in rural areas of Northern Ghana. *In J Popul Res.* 5, 1 – 10.
- Tagbo, B. R., Uleanya, N. D., Nwokoye, I. C., Eze, J. C., & Omotowo, I. B. (2012). Mothers' knowledge, recognition and practice of childhood immunization in Enugu. *Nigeria Journal of Pediatrics*, 39(3), 90-96.
- Ukpong, I. E. (2012). *Immunization in Nigeria: Challenges and way forward*. Ikeja, Lagos.
- UNICEF. (2010). The State of World children, 2009. *United Nation Children's Fund*, 3 United Nation Plaza, New York, NY 10017, USA.
- World Health Organization. (2013). *Behavioral factors in immunizations, Department of mental health and substance dependence* World Health Organization Geneva.
- World Health Organization. (2016). *WHO. Vaccine*. Preventable diseases monitoring system. Geneva.