

Assessment of Knowledge, Attitudes and Practices of Mothers in Jos North Regarding Immunization

*¹Chris-Otubor, G.O., ²Dangiwa, D.A., ³Ior, L.D, ¹Anukam, N.C.

¹*Department of Pharmaceutics And Pharmaceutical Technology,*

²*Department of Clinical Pharmacy,*

³*Department of Pharmacology, Faculty of Pharmaceutical Sciences, University Of Jos, Plateau State, Nigeria.*

ABSTRACT: Background: *The knowledge of mothers on immunization- a public health intervention that has greatly reduced mortality and morbidity globally- is very vital as they play a great role in child care. Their ability to have the right knowledge will enhance their practice and attitude towards immunization. This study was set to assess the knowledge, attitude and practice of mothers as regards immunization and the influence of socio demographic characteristics on immunizable children.*

Method:

A household multi-stage sampling 48-item questionnaire study design was modified and adopted. Mothers with children born between 26th September 2011 and 26th September 2012 were targeted. Records of children that visited the immunization unit in the month of August 2012 were also studied.

Results:

The number of respondents who participated in the study was 232. Though only 2.6% had excellent knowledge on vaccine preventable diseases, 89.6% had an overall good knowledge while 5.2% each had fair and poor knowledge. Less than 60% reported for vaccination at the stipulated time and less than 3% had negative attitude towards immunization. The education of the mother, marital status, religion, geopolitical zone and her and/or the father of the child been immunized as children significantly influenced their knowledge ($p < 0.05$). The records of 513 children that visited the clinic for the first time in April 2012 also revealed that only 23.4% completed their immunization schedule revealing poor practice by mothers. These findings call for health promotion.

Conclusion:

It is therefore suggested that proper health education and health promotion interventions be taken as measures to improve knowledge, attitude and practice of mothers towards immunization as a disease prevention tool.

KEYWORDS: *Knowledge, attitude, practices, mothers, child immunization*

I. INTRODUCTION

What is immunization? The World Health Organization (WHO) has defined immunization as the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. These vaccines help to stimulate the body's own immune system to protect the person against subsequent infection or disease (WHO, 2013). Immunization therefore depicts the ability to develop immunity. Immunity being the state of having sufficient biological defenses to avoid infection, disease, or other unwanted biological invasion (Gherardi, 1989). Immunity also depicts the capability of the body to resist harmful microbes from gaining access into it.

Immunization is one of the most successful and cost effective public health interventions in the constant effort of human beings against diseases that affect our wellbeing. Immunization has prevented more deaths in the past years than any other health intervention globally (Awosika, 2012). WHO (2013) also stated that immunization is a proven tool for controlling and eliminating life-threatening infectious disease and has been estimated to alleviate 2 to 3 million deaths each year. WHO (2013) further stated that although global vaccination coverage is holding steady but an estimated 22 million infants worldwide are still missing out on basic vaccines. The report on global vaccination coverage showed that the proportion of the world's children who receive recommended vaccines has remained steady for the past few years giving an instance that the percentage of infants fully vaccinated against diphtheria-tetanus-pertussis (DTP3) was 83% in 2011, 84% in 2010 and 83% in 2009.

Every year more than 10 million children in low- and middle-income countries die before they reach their fifth birthdays. Most die because they do not access effective interventions that would combat common and preventable childhood illnesses (Lee, 2003). Vaccine preventable diseases remain the most common cause of childhood mortality with an estimated three million deaths each year (Odusanya *et al.*, 2008). They also observed that uptake of vaccination services is dependent not only on provision of these services but also on other factors including knowledge and attitude of mothers, density of health workers, accessibility to vaccination clinics and availability of safe needles and syringes.

Kapoor and Vyas (2010) had stated that although immunization is one of the most effective, safest and efficient Public Health Interventions, and that its impact on childhood morbidity and mortality has been great, its full potential was yet to be reached. Through proven strategies, immunization has been made accessible to even the most hard-to-reach and vulnerable populations since it involves clearly targeted groups (WHO, 2013). When immunization rates are high, it is much less likely a pathogen will be carried and transmitted from person to person. Declines in vaccination rates allow diseases to emerge in the population again. A case in point is the fact that Measles is now endemic in the United Kingdom, after vaccination rates dropped below 80% (Awosika, 2012). In Nigeria in 2001, unfounded fears of the polio vaccine led to a drop in vaccination rates and re-emergence of infection, and the spread of polio to ten other countries (Awosika, 2012).

It has been reported that in 1958 there were 763,094 cases of measles and 552 deaths in the United States (Orenstein *et al.*, 2004; CDC, 2008). With the introduction of new vaccines, the number of cases dropped to fewer than 150 per year having a median value of 56 (CDC, 2008). In early 2008, it was also reported that there were only 64 suspected cases of measles. Out of these 64 infections, 54 cases were associated with importation from another country, although only 13% were actually acquired outside of the United States; 63 of these 64 individuals either had never been vaccinated against measles, or were uncertain whether they had been vaccinated (CDC, 2008).

In response to challenges in global immunization, WHO and the United Nations International Children's Emergency Fund (UNICEF) set up the Global Immunization Vision and Strategy (GIVS) in 2003 (GIVS, 2005). The chief goal of GIVS is primarily to reduce illness and death due to vaccine-preventable diseases by at least two-thirds by 2015 or earlier. The Task Force on Immunization in Africa (TFI) recognized from the outset the need for high vaccination coverage to counter the disproportionate burden from vaccine-preventable diseases in the African Region, and therefore set challenging goals for 2001–2005. These goals aimed to ensure that the immunization performance of the African Region caught up with other regions' performance.

Siddiqi *et al.*, (2010) concluded that mothers' knowledge about Expanded Program on immunization (EPI) vaccination in peri-urban Karachi was quite low and not associated with their children's EPI coverage. Mothers' educational status, however, was significantly associated with child's coverage. This finding depicted a better health seeking behavior of a more educated mother. According to Angelilio *et al.*, (1999), several studies on the immunization status of children have been published in various countries at different times, and comparisons with these studies are interesting but must be made cautiously. They also stated that since many factors may influence vaccination coverage, important differences should be taken into account, such as prevalence of vaccine-preventable diseases, availability of vaccination centers, level of knowledge and information about vaccination, and different methods used to measure immunization status.

In Nigeria, the National Primary Health Care Development Agency has a National Immunization Policy that was revised in 2009. Included within this policy is the Immunization Schedule which is designed to include all children 0-1 year who shall receive one dose of (Bacille-Calmette Guerin) BCG against tuberculosis, one dose of Yellow Fever vaccine, 3 doses of Diphtheria, Pertussis, Tetanus (DPT), 3 doses of *Haemophilus influenza* (Hib) vaccines, 3 doses of Hepatitis B vaccines 4 doses of (Oral Poliomyelitis Vaccine) OPV and one dose of Measles vaccine before the age of one.

Table 1 Immunization Schedule for Vaccines used in Nigeria

Contact	Minimum Target age of child	Type of Vaccine	Dosage	Route of administration	Site
1 st	At Birth	BCG	0.05ml	Intra dermal	Right Upper Arm
2 nd	6 weeks	OPV ₀ Pentavalent1(DPT, HBV and Hib)	2 drops 0.5ml	Oral Intramuscular	Mouth Antero-lateral aspect of thigh
3 rd	10 weeks	OPV ₁ Pentavalent2(DPT, HBV and Hib)	2 drops 0.5ml	Oral Intramuscular	Mouth Antero-lateral aspect of thigh
4 th	14 weeks	OPV ₂ Pentavalent3(DPT, HBV and Hib)	2 drops 0.5ml	Oral Intramuscular	Mouth Antero-lateral aspect of thigh
5 th	9 months	OPV ₃ Measles Yellow fever	2 drops 0.5ml 0.5ml	Oral Subcutaneous Subcutaneous	Mouth Left Upper Arm Left Upper Arm

Sourced from National Primary Health Care Development Agency (NPHCDA, 2009)

II. METHOD

A household multi-stage sampling questionnaire study design was employed in various localities within Jos North Local Government Area. The coverage survey of the Expanded Programme on Immunization (EPI) under the World Health Organization which was revised in 1991 (WHO, 1991), was modified and employed. Various communities were visited and the questionnaires were administered to mothers or caregivers that had children that fell within the study population.

As a way of intervention, during the course of the filling of the questionnaires mothers that lacked adequate knowledge were educated and a little flier was designed for distribution to women to enhance their knowledge as regards the immunization schedule. This served as a form of health promotion.

The records of the month of August 2012 at the immunization centre in the Ministry of Health Jos were also studied and the information required extracted.

The research focused on mothers and caregivers with children aged between 12-23 months. Children born between 26th September 2011 and 26th September 2012 were considered.

A four-sectioned semi-structured questionnaire was used to collect data from mothers/ caregivers. The first section comprised of questions relating to the demographic data while the second, third and fourth section dealt with questions relating to knowledge, practices and attitude of mothers/ caregivers respectively. Each question was constructed as adapted from the EPI coverage survey (WHO, 2011). Copies of the instrument were also handed over to researchers for validation. Structured interview was used for patients with low literacy level especially those who cannot read and/or write. This was to ensure coverage of as many mothers as possible.

In order to ensure a wide coverage of the study population, research assistants were selected and trained to fill the research instruments as well as to interpret information found on the child immunization cards. Questionnaires were pretested to observe response of mothers and ascertain the appropriateness of the questions. A minimum of seven mothers were visited in various wards of Jos North metropolis, thereby generating responses that would represent a higher percentage of the entire population.

Descriptive analysis was utilized for data analysis which involves the use of frequency distribution and percentage. Data was collated, entered and analyzed using Chi-square with the aid of SPSS software version 16 Chicago, Illinois.

Ethical clearance was gotten from the Institutional Health Research Ethical Committee of the Jos University Teaching Hospital before the collection of the data. The consent of the respondents was sought before the administration of the questionnaires. Data collected were treated with utmost confidentiality.

III. RESULTS

Three hundred and fifty-five, 48-item questionnaires were distributed to the respondents through trained research assistants between 26th September and 25th October 2013. Two hundred and thirty two were correctly filled and returned by the time of analysis. Sixty-four were improperly filled, forty-four returned late and fifteen are yet to be returned as at the time of compilation. Thus the response rate was 65.4%.

The survey of children that reported for immunization at the epidemiologic unit of the Ministry of Health in Jos in the month of August 2012 revealed that five hundred and seventeen children (517) visited the unit out of which two hundred and fifty-six (256) were males and two hundred and fifty-seven (257) were females. The sexes of four (4) children were not recorded so they were eliminated from the study.

I. Results from survey of mothers in Jos north

The figure below shows that out of a total of 232 questionnaires that were returned correctly filled, more males (51.3%) than females (48.7%) were sampled.

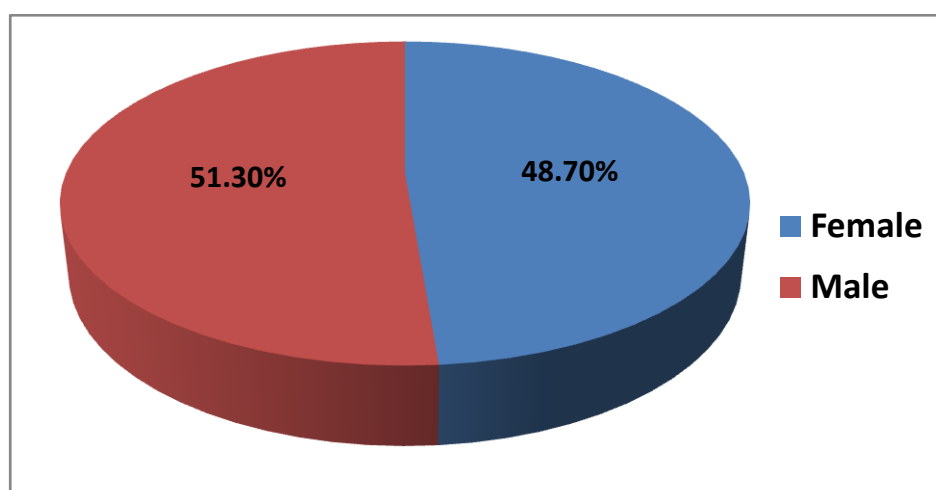


Fig 1: Distribution of sampled children by sex

Table 2 depicts that the mothers were largely between the ages of 25-30years (44.4%) which is the reproductive period for most women. Only about 4% were above 40 years of age.

Table 2 Distribution of the age of mothers sampled

Age	Frequency	Percentage
<25	49	21.1
25-30	103	44.4
31-40	71	30.6
>40	9	3.9
Total	232	100.0

Table 3 shows that almost 93% of the mothers were married while the remaining percentages were single, separated, divorced or widowed.

Table 3 Marital Status of the mothers

status	Frequency	Percentage
Single/separated/divorced/widowed	17	7.3
married	215	92.7
Total	232	100.0

Table 4 revealed that most of the mothers have had some form of secondary education, this accounted for over 56%. However, 3.9% never had any formal education.

aTable 4 Mothers' education

Education	Frequency	Percentage
Primary	28	12.1
Secondary	131	56.5
Tertiary	64	27.6
None	9	3.9
Total	232	100.0

Table 5
portray
ed that
a large
majorit
y of

mothers were from the north central (75.4%) geopolitical zone of Nigeria. Other women represented other zones as follows; north-west (3.0%), north-east (3.4%), south-west (7.3%) and south-east (10.8%). South-south were not represented in the study.

Table 5 Distribution of mothers by their geopolitical zones

Zone	Frequency	Percentage
North-central	175	75.4
North-west	7	3.0
North-east	8	3.4
South-south	0	0
South-west	17	7.3
South-east	25	10.8
Total	232	100.0

Table 6 showed that almost 93% of sampled mothers were Christians as compared to 7.3% that were Muslims.

Table 6 Religion of mothers surveyed

Religion	Frequency	Percentage
Christianity	215	92.7
Islam	17	7.3
Total	232	100.0

Table 7 portrayed that most women were into business/trading (52.1%), 23.7% were not in any paid employment (housewives), 13.8% were civil servants, and 5.2% each were students or workers in corporate organizations.

Table 7 Mothers' occupation

Occupation	Frequency	Percentage
Housewife	55	23.7
Business/trading	121	52.1
Civil servant	32	13.8
Corporate organization	12	5.2
student	12	5.2
Total	232	100.0

In Fig 2 it was observed that majority (83.6%) of mothers were immunized as children but 6.0% were not. Unlike mothers, 60.3% of fathers were immunized as children and 5.2% were not.

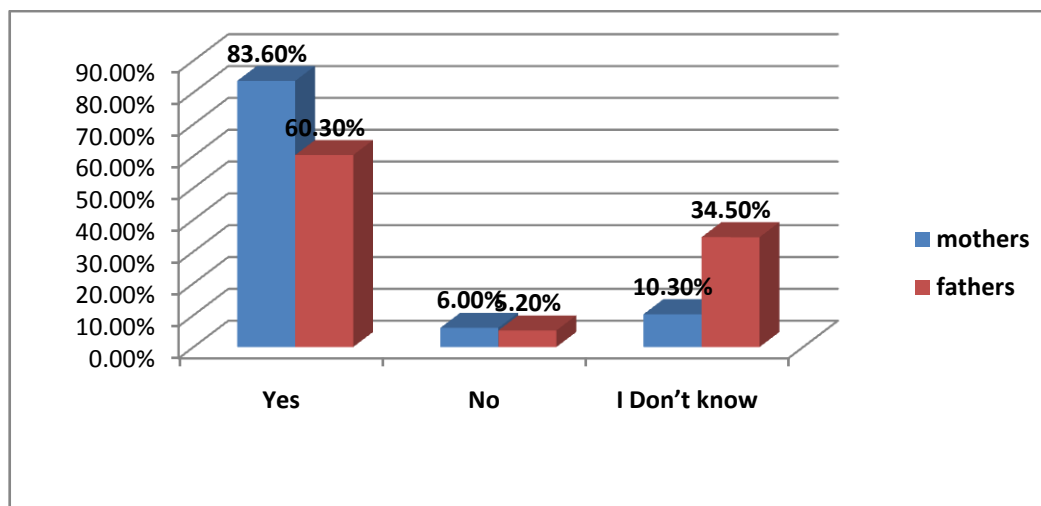


Fig 2: History of parental immunization at infancy

Table 8 revealed that overall; most mothers were able to give correct answers to questions on immunization and were generally able to identify vaccine preventable diseases. Only 6 mothers (2.6%) however showed excellent knowledge on the vaccine preventable diseases and were able to identify that malaria and HIV were not vaccine preventable diseases in Nigeria currently.

Table 8 Assessment of Knowledge

	Yes N (%)	No N (%)	I don't know N (%)
Heard about immunization	230 (99.2)	1(0.4)	1 (0.4)
Immunization prevents childhood disease	218 (94.0)	5 (2.2)	9 (3.9)
It stops children from developing properly	10 (4.3)	207 (89.2)	15 (6.5)
<i>Vaccine preventable diseases catered for in Nigeria</i>			
Tuberculosis	184 (79.3)	12 (5.2)	36 (15.5)
Malaria	136 (58.6)	55 (23.7)	41 (17.7)
Diphtheria	105 (45.3)	24 (10.3)	103 (44.4)
Pertussis	114 (49.1)	19 (8.2)	99 (42.7)
HIV	61 (26.3)	118 (50.9)	53(22.8)
Measles	203 (87.5)	15(6.5)	14 (6.0)
Influenza	113 (48.7)	44(19.0)	75 (32.3)
Poliomyelitis	213 (91.8)	8 (3.4)	11 (4.7)
Hepatitis	187 (80.6)	20 (8.6)	25 (10.8)
Tetanus	182 (78.4)	22 (9.5)	28 (12.1)
Yellow fever	202 (87.1)	8 (3.4)	22 (9.5)

Table 9 summarized the outcomes of Table 3.7 by scoring and categorizing them into three. The first group was rated “good” when the mothers scored between 8 and 14 questions correctly. The second group was rated “fair” if they scored between 5 and 7 points while the third group was rated “poor” if they scored less than 5 points. The overall knowledge of sampled women was good as almost 90% had a good knowledge of immunization even though an equal percentage of 5.2 had fair and poor knowledge respectively.

Table 9 Cumulative assessment of knowledge

Knowledge	Frequency	Percentage
Good	208	89.6
Fair	12	5.2
poor	12	5.2
Total	232	100.0

Assessment of Knowledge, Attitudes and Practices of Mothers in Jos North Regarding Immunization

Table 10 classified the children and their level of immunization depicting the practice of their mothers. In terms of receiving the vaccine at the stipulated time; for BCG, those that had taken it by two weeks fell into this group along with those that had taken the other vaccines within one month of the due date.

About 56.0%, 40.5% and 39.7% mothers vaccinated their children within the stipulated time for BCG, DPT and hepatitis vaccines respectively. Over 30% were said to be immunized against each of the diseases but, there was no record in the form of immunization cards available to prove it. There were also cases of incomplete dosage for DPT (7.8%), hepatitis (9.9%) and OPV (8.6%). However, some children were not presented for vaccination at all; yellow fever had the highest prevalence (10.7%) while BCG was the lowest (2.2%).

Table 10 Assessments of practices

Vaccine	A	B	C	D	E
BCG	130 (56.0)	27 (11.6)	70 (30.2)	-	5(2.2)
DPT	94 (40.5)	41(17.7)	72 (31.0)	18 (7.8)	7 (3.0)
Hepatitis	92 (39.7)	35 (15.1)	75 (32.3)	23 (9.9)	7 (3.0)
OPV	93 (40.1)	37 (15.9)	75 (32.3)	20 (8.6)	7 (3.0)
Measles	116 (50.0)	18 (7.8)	76 (32.8)	-	22 (9.5)
Yellow fever	112 (48.3)	19 (8.2)	76 (32.8)	-	25 (10.7)

Note: DPT and Hepatitis were taken as single vaccines or as in **PENTA**

Key:

- A- Vaccinated at the stipulated time
- B- Vaccinated but not at the stipulated time
- C- Mothers history
- D- Incomplete doses
- E- Not vaccinated

Table 11 portrayed that the level of education was significantly associated with how knowledgeable mothers were on immunization and vaccine preventable diseases, the higher the level of education, the higher the knowledge. Other factors that significantly associated with knowledge were marital status, geopolitical zone, religion, mothers being immunized as children as well as fathers.

Table 11 Influence of socio demographic characteristics on knowledge

Characteristics	knowledge			Chi-square	p-value
	Good n=208	Fair n=12	Poor n=12		
<u>Sex</u>				0.486	0.784
Female	100(88.5%)	7 (6.2%)	6 (5.3%)		
Male	108 (90.8%)	5 (4.2%)	6(5.0%)		
<u>Mothers age</u>				3.722	0.714
<25	42 (85.7%)	3(6.1%)	4(8.2%)		
25-30	94(91.3%)	4(3.9%)	5(4.9%)		
31-40	64(90.1%)	5(7.0%)	2(2.8%)		
>40	8(88.9%)	0 (0.0%)	1(11.1%)		
<u>Mothers Marital Status</u>				14.766	0.001*
Single/separated/divorced/ widowed	(64.7%)	4(23.5%)	2 (11.8%)		
married	197 (91.6%)	8 (3.7%)	10 (4.7%)		
<u>Mothers Education</u>				22.846	0.001*
None	6 (66.7%)	0 (.0%)	3 (33.3%)		
Primary	22(78.6%)	4(14.3%)	2(7.1%)		
Secondary	120 (91.6%)	7 (5.3%)	4 (3.1%)		
Tertiary	60 (93.8%)	1 (1.6%)	3 (4.7%)		
<u>Geopolitical Zone</u>				46.747	0.000*
North-central	160 (91.4%)	8 (4.6%)	7 (4.0%)		
North-west	2 (28.6%)	1 (14.3%)	4 (57.1%)		
North-east	6 (75.0%)	1 (12.5%)	1 (12.5%)		
South-south					

Assessment of Knowledge, Attitudes and Practices of Mothers in Jos North Regarding Immunization

South-west	17 (100.0%)	0 (0.0%)	0 (0.0%)		
South-east	23 (92.0%)	2 (8.0%)	0 (.0%)		
Mother's Occupation				14.540	0.069
Housewife	44 (80.0%)	3 (5.5%)	8 (14.5%)		
Business/trading	110 (91.7%)	7 (5.8%)	3 (2.5%)		
Civil servant	30 (93.8%)	1 (3.1%)	1 (3.1%)		
Corporate organization	12 (100.0%)	0 (0.0%)	0 (0.0%)		
student	12 (92.3%)	1 (7.7%)	0 (0.0%)		
Religion				24.324	0.000*
Christianity	198 (92.1%)	10 (4.7%)	7 (3.3%)		
Islam	10 (58.8%)	2 (11.8%)	5 (29.4%)		
Mother's immunized				31.933	0.000*
Yes	179 (92.3%)	9 (4.6%)	6 (3.1%)		
No	7 (50.0%)	2 (14.3%)	5 (35.7%)		
I don't know	22 (91.7%)	1 (4.2%)	1 (4.2%)		
Father's immunized				27.757	0.000*
Yes	134 (95.7%)	3 (2.1%)	3 (2.1%)		
No	6 (50.0%)	3 (25.0%)	3 (25.0%)		
I don't know	68 (85.0%)	6 (7.5%)	6 (7.5%)		
Birth order				5.532	0.699
1st	70(93.3%)	3 (4.0%)	2 (2.7%)		
2nd	61 (91.2%)	2 (2.9%)	4 (6.0%)		
3rd	42 (85.7%)	3 (6.1%)	4 (8.2%)		
4th	13 (86.7%)	1 (6.7%)	1 (6.7%)		
>4th	21 (84.0%)	3 (12.0%)	1 (4.0%)		

*P<0.05

Table 12 shows several reasons identified by mothers for negative attitude toward immunization. Prominent among these were mothers' busy schedule and family issues (2.7% each). Some mothers also blamed it on strikes and lack of money.

Table 12 Reasons for negative attitude toward immunization

Reason	Frequency	Percentage
Mother was too busy	6	2.7
There was a family problem	6	2.7
The vaccine was not available	5	2.3
The time for immunization was not convenient	3	1.3
I postponed going until another time	3	1.3
The child was ill-was brought but not immunized	3	1.3
The child was ill-was not brought	3	1.3
Wasn't aware of the need for a second or third dose	3	1.3
don't believe in the vaccine	2	0.9
Was not aware of the need for immunization.	2	0.9
Heard bad things about immunization	2	0.9
Did not know the place and time for immunization	1	0.4
Long queue and waiting time	1	0.4
Strike (industrial action by health workers)	1	0.4
Lack of money	1	0.4
Total	42	18.5

II. Records of August 2012 at the epidemiologic unit

Table 13 showed that only 23.4% of children that had their first immunization in the unit returned for the subsequent immunizations until they completed the schedule. The remaining (76.6%) did not show up at the unit to complete the immunization schedule indicating that non-adherence to the immunization schedule was clearly visible.

Table 13 Children that completed or did not complete their immunization schedule at the unit

Sex	Completed	Did not complete	Total
	N (%)	N (%)	N (%)
Male	57(11.1)	199(38.8)	256(49.9)
Female	63(12.3)	194(37.8)	257(50.1)
Total	120(23.4)	393(76.6)	513(100)

IV. DISCUSSION

Knowledge of mothers on immunization

The study which was an analytical epidemiology seeking for determinants of health-related outcomes which are the factors that often increase or decrease a person's risk to a specific health outcome- which in this study is immunization- revealed that a high percentage (99.2%) of mothers reported that they have heard about immunization. About 90% also reported that they knew that vaccines are meant to prevent childhood diseases rather than cause harm to the children. This knowledge therefore accounts for the overall 'good' knowledge rated among the sampled women (89.6%). It was alarming however that only 2.6% of the mothers had excellent knowledge about all the vaccine preventable diseases (VPDs) children are immunized for. This discovery calls for targeted information, education and communication.

While more than 90% knew about poliomyelitis- which one can easily attribute to the continual door-to-door immunization and the constant jingles being aired on television and radio- less than 50% knew about influenza, diphtheria and pertussis. Tetanus, tuberculosis, hepatitis and yellow fever were also readily identified by about 80% of the women. Angelillo *et al.*, (1999) also reported similarly that only 20% knew that pertussis, measles, mumps, and rubella were diseases that are vaccine-preventable in children while carrying out a survey in Italy.

Poor knowledge of mothers on VPDs is detrimental in achieving a high percentage of coverage during immunization. When mothers are not properly educated with regards to the diseases their children are meant to be immunized against, they may not realize the necessity of the vaccines. One of the Millennium Developmental Goals (MDGs) is to reduce child mortality. This would not be achieved significantly if mothers are not aware of these VPDs. This lack of knowledge also extends to the appropriate time for each vaccine to be taken.

Just as a vast population has been sensitized with regards to poliomyelitis, other diseases should also be given a similar enlightenment. Such enlightenment is bound to urge mothers to present their wards for immunization. This requires health promotion in the form of health education where persuasive communication could be utilized in passing the information on by gaining the attention of the people, relaying the message in such a manner that the content would be comprehended and accepted by the people.

Attitude of mothers towards immunization

Only a small percentage of women (less than 3%) gave reasons for their failure in availing their children for immunization. The most popular reasons given were 'mother being too busy' and 'there was a family problem'. The least reasons given by mothers were 'Did not know the place and time for immunization', 'long queue and waiting time', 'Strike (industrial action by health workers)' and 'Lack of money'. The unavailability of vaccines as a reason for not being immunized was given by only 2.3% of women. Most of the reasons proffered by the women only show the lack of education on the part of women. If mothers were better educated on the importance of immunization and the need for it to be taken at the right time, they probably would not have excuses for not showing up for immunization. Proper information needs to be passed on to the women. It is also important to note that 'Lack of money' should not so much as be an issue in Jos North because the government has provided a facility that is very reliable and the services offered in the facility is free including the vaccines given. This further stresses the fact that ignorance is a major reason for mothers not immunizing their children. Health education must be utilized to promote health protection through vaccination in order to prevent these childhood killer diseases.

Practice of mothers as regards immunization

In terms of showing up for immunization at the right time (within one month of the expected date) it was observed that almost 60% of mothers brought their children promptly for the first immunization- BCG. This high turnout could be attributed to the fact that women who give birth in hospitals, clinics or maternity homes are usually given this vaccine immediately or advised to go to approved centers. Antai (2009) had also stated that the proportion of mothers that delivered in a hospital setting is a predictor of child immunization uptake. Further noting that hospital delivery is one of the most important preventive measures against maternal and

child health outcomes, and an important determinant of full immunization. It has also been observed (during data collection and brief interviews at the child immunization unit) that mothers that have their babies at home often are not aware of the vaccines or turn up very late for the vaccines especially if they begin to suspect ill health in their children.

For DPT, Hepatitis and OPV, a slight drop to a lower rate (about 40%) was observed which may not be unconnected to mothers not being aware of the actual date they are expected to return for another vaccine. There was however another hike in turn up (up to 50%) observed for yellow fever and measles. A smaller percentage (less than 20%) was generally observed to turn up late for the vaccines while less than 10% were either not vaccinated or had incomplete doses. Considering those that were immunized at the stipulated time and those who were immunized late, it will be observed that only about 60% of children were recorded within these groups. This shows that though there is a seemingly good knowledge about immunization among mothers, their being available for these vaccines does not reflect this knowledge. The survey of the records at the epidemiologic unit showed that less than 25% of children who had their first immunization at the unit had returned to complete their full course of vaccination. Dropouts were observed at various levels of schedule. Many reasons could be postulated for this high rate of dropout such as moving to another area, changing the place used for immunization, death of the child or ignorance on the part of the mother. Health education is greatly required in this regard.

It must also be stated that just as the EPI coverage survey of WHO (2009) noted that although routine reports from health centers also provide important information about immunization coverage, immunization coverage estimates based on health centre records may be inaccurate or misleading. It was observed while going through the records that omissions were sometimes inevitable probably as a result of high turnout of women for immunization of their children leading to work pressure on the staff.

These findings are similar to that of Sadoh & Eregie (2009) in Benin, Nigeria who reported that the uptake of vaccines was the highest for BCG, OPV₀, and Hepatitis at birth having a percentage rate of 89.5%, 96.7%, and 93.8% respectively having studied the records of a clinic. They however noticed that uptake was the lowest for measles and yellow fever vaccines having percentage rates of 57.6% and 57.2% respectively.

Though over 30% of women claimed to have immunized their children, no concrete evidence was presented as to how promptly this was done or the completeness of the schedule for such children. Inappropriate immunization of children generally leads to the spread of vaccine preventable diseases which would result in increased morbidity and mortality were they could have been prevented. Sadoh and Eregie (2009) commented in this regard stating that to achieve maximal protection against vaccine-preventable diseases, a child should receive all immunizations within recommended intervals.

One of the health indicators of achieving reduction in child mortality is to increase the proportion of one year olds that have been immunized against measles. From this study, only 50% of the children were immunized promptly against measles and 9.5% were yet to be immunized even after one year of age.

Influence of socio demographic characteristics on knowledge

Some demographic factors were observed to have significant effects on the knowledge of mothers. One of such factors was marital status of the mothers. Married women were observed to have a significantly higher knowledge of immunization ($p=0.001$) than their single/divorced/widowed or separated counterparts. This is unlike the study conducted by Odusanya *et al.*, (2008) where the marital status of the mother was not found to significantly affect their level of knowledge on immunization. The marital status of a mother may enhance her knowledge in the sense that those that are married may have more access to education compared to those that are single mothers who may generally have more responsibility and would tend to put aside education in order to seek for a means to cater for their children. The supportive role of their partners may also enhance her knowledge if both partners jointly seek for ways to better the health status of their offspring.

The level of education of mothers was observed to be very significant ($p=0.001$) to their knowledge on immunization. The higher the level of education of the mother, the greater their knowledge on immunization. This has been similarly reported by Angellilo *et al.*, (1999) and Odusanya *et al.*, (2008) who stated that the level of knowledge about mandatory vaccinations for infants correlated significantly with level of education. This expected because those with higher educational standards would have greater ability to process information generally than those who are not.

The geopolitical zone of the mother also significantly ($p=0.000$) affected their level of knowledge on immunization. Those from the south-west had the highest rate (100%) compared to those from the north-west who had the least (28.6%) rate of people with good knowledge and the highest rate (57.1%) with poor knowledge. The states that fall into the north-west are Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara states. This finding may not be unconnected to the earlier report by the Nigeria Demographic and Health Survey (NDHS 2003) which noted that widespread inequities persist in immunization coverage to the disadvantage of children of parents in the lowest socio-economic quintile, parents with no education and parents in the rural areas, especially in the northern region of the country as reported by Aina & Ejembi (2013). The wide spread of information that vaccines served as contraceptives may have resulted in this poor knowledge and practice by mothers from this zone. The religion of the mother was also observed to have a significant effect ($p=0.000$) on the knowledge of the mothers. This finding may also be linked to the geopolitical zone since certain religions are more acceptable in zones. A higher percentage (92.1%) among the Christian women had good knowledge compared to the Muslims (58.8%). The practice of 'purdah' where the women are not permitted to freely come into the society, serves as a form of restriction that hinders their access to relevant information. To overcome this challenge imams and other Islamic leaders must be enlightened on the need of immunization as a disease prevention exercise. Church leaders and traditional rulers should also be properly informed. The fact that the mother and/or father were immunized as children also significantly ($p=0.000$) affect their knowledge on immunization.

V. CONCLUSION

Within the limits of this study it can be said that though there seems to be a high level of knowledge among mothers in Jos North generally, this knowledge is not reflected in their practices. Knowledge of mothers in Jos North was also found to be significantly affected by education, marital status, religion, geopolitical zone and the mother and/or father been immunized as a child. Health promotion in the form of health education is still lacking in some areas making adherence to the immunization schedule a challenge for some mothers. There is a need to properly counsel them on disease prevention and health protection. Some mothers were observed to still have negative attitudes towards immunization which calls for periodic health promotion and education.

VI. CONTRIBUTION TO KNOWLEDGE

This study has established that there is a high knowledge of immunization among mothers in Jos North which is evident among mothers with children born between 26th of September 2011 and 26th September 2012. Knowledge of mothers in Jos North was also found to be significantly affected by education, marital status, religion, geopolitical zone and the mother and/or father been immunized as a child. This knowledge however did not translate into practice since some mothers did not complete the immunization schedule. A case study of the month of August 2012 also showed that among the mothers who visited the epidemiologic unit for immunization only a few mothers completed the full schedule for their children emphasizing non-adherence. Generally, only a few women had negative attitudes towards immunization.

VII. RECOMMENDATIONS

- ❖ There will be a need to create more jingles on air in English and other dialects to promote knowledge on the immunization schedule and the various vaccines that should be taken.
- ❖ Fliers and billboards with relevant information on immunization should be produced and widely distributed.
- ❖ Traditional birth attendants in various localities should be reached and educated on immunization as a disease prevention and health protection tool. Health protection in the area of preventing sepsis during child birth through tetanus toxoid vaccines can be taught also.
- ❖ Pharmacists especially those in public health and community can take up the challenge and educate the women through public health activities centered on health promotion.
- ❖ The Government should make it mandatory for children to present their immunization cards before being admitted into public and private schools.
- ❖ Similar studies should be conducted in various local governments, published and the results forwarded to their Chairmen for action.
- ❖ Areas that have poor access roads should be considered and given adequate attention to ensure better coverage.

Suggestions for further study

Studies that are focused on the individual wards in Jos North will greatly provide specific information as regards what is obtainable within the wards and enable interventions that are focused and purposeful in these wards.

VIII. ACKNOWLEDGEMENT

The authors accept hereby acknowledge the Ministry of Health, Plateau State, Nigeria for their willingness to grant us access to their records.

REFERENCES

- [1]. Angelillo I.F., Ricciardi G., Rossi P., Pantisano P., Langiano E. & Pavia M.(1999) Mothers and vaccination: knowledge, attitudes, and behaviour in Italy. *Bulletin of the World Health Organization*, 77 (3): 225-228
- [2]. Antai, D., (2009) Inequitable childhood immunization uptake in Nigeria: a multilevel analysis of individual and contextual determinants. *BMC Infectious Diseases*, 9: 181
- [3]. Awosika D. (2012) Access to immunization and other public health interventions through the pharmacists. *West African Journal of Pharmacy* 23 (1): 3 –11
- [4]. Centers for Disease Control and Prevention (CDC) (2008). "Measles--United States, January 1 - April 25, 2008". *Morbidity Mortality Weekly Report(MMWR)* 57 (18): 494–8.
- [5]. Gherardi E. The Concept of Immunity. History and Applications. Immunology course Medical School, University of Pavia. [http://en.wikipedia.org/wiki/Immunity_\(medical\)#cite_ref-Silverstein_2-0](http://en.wikipedia.org/wiki/Immunity_(medical)#cite_ref-Silverstein_2-0) Accessed 2nd August 2013
- [6]. Global Immunization Vision and Strategy (GIVS). *Facts and figures April 2005*. Geneva: WHO; 2005.
- [7]. Global immunization vision and strategy 2006-2015. Geneva: WHO; 2005
- [8]. Kapoor R. and Vyas S., (2010) Awareness and knowledge of mothers of under five children regarding immunization in Ahmedabad, *Healthline* 1(1): 12 – 15.
- [9]. Lee J.W., (2003) Child survival: a global health challenge. *Lancet* 362: 262
- [10]. National Primary Health Care Development Agency (NPHCDA) (2009) National Immunization Policy.
- [11]. Odusanya O.O., Alufohai E.F., Meurice P.F. & Ahonkhai V.I., (2008). Determinants of vaccination coverage in rural Nigeria. *BMC Public Health*. 8: 381. Published online 2008 November 5 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2587468/>
- [12]. Orenstein W.A., Papania M.J., Wharton M.E., (2004). "Measles elimination in the United States". *Journal of infectious Diseases* 189 (Suppl 1): S1–3
- [13]. Sadoh A.E. & Eregie C.O., (2009) Timeliness and Completion Rate of Immunization among Nigerian Children Attending a Clinic-based Immunization Service *J Health Popul Nutr*. 27(3): 391–395.
- [14]. Siddiqi N.; Siddiqi A.; Nisar N. and Khan A. (2010) Mothers' knowledge about EPI and its relation with age-appropriate vaccination of infants in peri-urban Karachi in *Journal of Parkistan Medical Association* 60:940.
- [15]. World Health Organization (1991) The Expanded Programme on Immunization (EPI) Survey WHO/EPI/MLM/91.10 http://www.who.int/immunization_monitoring/routine/EPI_coverage_survey.pdf
- [16]. World Health Organization (WHO) (2013) Immunization. www.who.int/topics/immunization/en Assessed February 19th 2013