

Full Length Research Paper

Evaluating mothers' knowledge and attitude as a contributing factor to the low childhood immunization uptake in Ebonyi State, Nigeria

Uzoma Vivian Asiegbu^{1,2}, Dorathy Chinwe Obu^{1*}, Alfred F.I. Una,³ Chinonyelum Thecla Ezeonu^{1,2} and Obiora Kingsley Asiegbu⁴

¹Department of Paediatrics, Alex Ekwueme Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria.

²Institute of Child Health, Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria.

³Department of Community Medicine, Alex Ekwueme Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria.

⁴Department of Obstetrics and Gynaecology, Alex Ekwueme Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria..

Received 26 May, 2020; Accepted 28 July, 2020

Childhood immunization remains one of the most important and cost-effective public health interventions that reduces both morbidity and mortality associated with infectious diseases in children yet it is still underutilized. The study assessed the level of knowledge and attitude of mothers towards childhood immunization. This is a cross-sectional questionnaire-based study involving 141 mothers that brought their babies for vaccination at Alex Ekwueme Federal University Teaching Abakaliki, Nigeria. The data collected were analyzed using SPSS version 23. Only 40 (28.8%) had good knowledge of childhood immunization. Positive attitude towards immunization was seen in 139 (98.6%) mothers. 101 (71.6%) had missed vaccination appointments for their child with the far immunization center (50.0%) being the main reason given by the respondents. Age, parity of respondents, number of living children, educational status, and place of residence were significantly associated with knowledge of childhood immunization among the study participants ($p < 0.05$). Majority of the mothers had poor knowledge of childhood immunization. Maternal educational status was a positive and the only significant ($p < 0.05$) predictor of good knowledge of childhood immunization. It is recommended that information on immunization be taken to the door step of every mother, while intensifying optimized routine immunization sessions to daily vaccination at fixed post as well as integration of routine immunization with other health services.

Key words: Attitude, childhood, immunization, knowledge, maternal.

INTRODUCTION

Globally, vaccine-preventable diseases (VPDs) account for nearly 20% of deaths occurring in children under five

years of age (World Health Organization, 2019). This makes childhood immunization one of the most important

*Corresponding author. E-mail: obudora@yahoo.com.

public health interventions and a cost-effective strategy that has reduced both the morbidity and mortality associated with infectious diseases in children (Babalola and Olabisi, 2004). Even though immunization is proven to be the most successful and cost-effective public health intervention in reducing childhood morbidity and mortality as it averts 2 to 3 million deaths every year, the global vaccination coverage has remained stalled at 86% since 2010, with no significant changes during the past years (World Health Organization, 2018). Of the estimated 19.5 million infants that were not reached with routine immunization services worldwide in 2016, 60% of them live in 10 countries including Nigeria (National Population Commission, 2014). According to the National Demographic and Health Survey 2018, vaccination coverage in Nigeria has improved over the past 10 years. The percentage of children aged 12-23 months who received all the basic vaccinations increased from 23% in 2008 to 31% in 2018; while the percentage of children who received none of the basic vaccinations declined from 29 to 19% during the same period. Although these trends show improvement in childhood vaccination coverage, they fall short of the Sustainable Development Goal 3, for which the target is achieving more than 90% coverage of all basic vaccinations among children aged 12- 23 months. Vaccination coverage among children aged 12-23 months is highest in Anambra (76%) and lowest in Sokoto (5%), with Ebonyi State having a coverage rate between 34 - 48% (National Population Commission, 2019).

Reports from studies have shown that uptake of immunization services depends not only on the provision of these services but also on knowledge and attitude of mothers, accessibility to immunization services, the density of health workers and the availability of safe needles and syringes (Torun and Bakirci, 2006; Anand and Bamighausen, 2007). Misperceptions of routine immunization, the influence of religion, inadequate cold chain equipment, rejection of routine immunization, health-worker and political factors, attitudes of community stakeholders and members, poor communication, funding constraints, shortage of vaccines and immunization supplies are other factors affecting optimal uptake of routine immunization in Nigeria (Ophori et al., 2014). Frequent communal conflict, difficult terrain, religious belief, lack of political will, and inadequate knowledge and negative attitude toward childhood immunization are frequent hindrances to vaccination in in most cities in Nigeria including Ebonyi State. A good attempt to address these factors may go a long way to improve vaccine utilization and subsequent protection of the children against childhood infectious diseases.

Mothers have an important role to play in child care, so their awareness and involvement are a necessity to implement programs for a child's wellbeing. Mothers with sufficient knowledge, a favorable attitude, and healthy

practices toward a child's overall development are good assets of our communities and nation. Assessing their knowledge and attitude towards childhood immunizations becomes an important step to understanding and addressing some of the factors that contribute to low uptake of childhood immunization (Vonasek et al., 2016). Therefore, this present study was carried out to assess the knowledge and attitude of mothers attending immunization clinics in a tertiary hospital in Ebonyi State. The findings obtained may serve as the basis for effective intervention.

MATERIALS AND METHODS

This was a cross-sectional descriptive questionnaire-based study that was conducted over 3 months at the Institute of Child Health (ICH) of Alex Ekwueme Federal University Teaching Hospital Abakaliki (AEFUTHA), Ebonyi State between August and October 2019. Mothers/caregivers who brought their babies for immunization during the study period and gave consent were recruited and enrolled in the study. Care was taken not to enroll any participant twice since most of them came for the subsequent immunization schedules.

Data were collected with the assistance of trained research assistants who were mainly nurses and resident doctors working in the institute using a standard structured questionnaire adapted from the previous studies (Awodele et al., 2010; Tagbo et al., 2012; Awosan et al., 2018) which had three sections on socio-demographic characteristics, knowledge on immunization and attitude towards childhood immunization. Knowledge and attitude were assessed using 8 stem questions some of which had multiple responses, resulting in a total of 15 questions. Each correct response was allotted a point. Knowledge was further dichotomized using half (7.5 points) of the maximum score as a cutoff into good (≥ 7.5 points) or poor knowledge (≤ 7.5 points). The attitude was also determined using 8 questions, each of which had 1 point for a favorable response. It was further categorized into positive (5-8 points) and negative (0-4 points), attitude. Ethical approval was obtained from the Research and Ethical Committee of Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi state while Informed consent was obtained from the participants.

The collected data were coded, entered in an excel sheet, and imported into SPSS software version 23 which was used for the analysis. The data were presented in frequency distribution tables with percentages. Chi-square statistics were used to test for association between the dependent variables (knowledge and attitude of the mothers towards childhood immunization) and independent ones such as socio-demographic characteristics. Multivariate analysis using the Binary Logistics Regression model was applied to determine the predictors of good knowledge of immunization among the mothers. Statistical significance was set at $p < 0.05$.

RESULTS

Socio-demographic characteristics of respondents

Seventy-eight (55.3%) of the respondents were aged ≥ 40 years. Most of them, 139 (98%) were Christians. A total of 58 (41.1%) have had 1-4 pregnancies while 70

Table 1. Socio-demographic characteristics of respondents.

Variables	n (%)
Age (year)	
<30	36 (25.5)
30-39	27 (19.1)
≥40	78 (55.3)
Religion	
Christianity	139 (98)
Islam	1 (0.7)
Traditional	1 (0.7)
Parity of respondents	
1-4 pregnancies	58 (41.1)
5-8 pregnancies	49 (34.8)
>8 pregnancies	34 (24.1)
Number of living children	
1-4	70 (49.6)
5-8	60 (42.6)
>8	11 (7.8)
Marital status	
Single	4 (2.8)
Married	130 (92.2)
Separated	1 (0.7)
Widowed	6 (4.3)
Educational status	
None	40 (28.4)
Primary	36 (25.5)
Secondary	28 (19.9)
Tertiary	37 (26.2)
Place of residence	
Urban	42 (29.8)
Rural	99 (70.2)

(49.6%) have 1-4 living children. Majority 130 (92.2%) were married. Respondents residing in rural areas constituted 99 (70.2%) of the study population (Table 1).

Knowledge and attitude of mothers' regarding childhood immunization

All of the respondents had heard about childhood immunization. Health workers were the major source of knowledge for 72 (56.3%) mothers. Fear of general illness 119 (88.1%) was the main driving force for taking their children for vaccination. Only 40 (28.8%) had good

knowledge of childhood immunization. Positive attitude towards vaccination was seen in 139 (98.6%) (Tables 2 and 3).

Relationship between socio-demographic characteristics and knowledge of immunization

Age, parity of respondents, educational status, and place of residence were significantly associated with knowledge of childhood vaccination among the study participants ($p < 0.05$) (Table 4).

Table 2. Awareness and knowledge of mothers regarding childhood immunization.

Variable	n (%)
Have heard about immunization	
Yes	141(100)
No	0 (0.0)
Source of information on immunization	
Neighbor	24 (18.8)
School	19 (14.8)
Health worker	72 (56.3)
Radio	10 (7.8)
Television	4 (3.1)
Magazines	3 (2.3)
Family member	7 (5.5)
Reasons for taking a child for immunization	
Fear of general illness	119 (88.1)
Father asked me to bring the child	2 (1.5)
Due to school enrollment	2 (1.5)
The government says we must get it	2 (1.5)
Health care worker insists we must get it	7 (5.2)
Fear of death	
Grading of knowledge	
Poor	101 (71.6)
Good	40 (28.4)

Relationship between socio-demographic characteristics and attitude towards immunization

There was no significant association between socio-demographic variables and attitudes of the respondents towards childhood immunization (Table 5).

Predictors of good knowledge of immunization

Table 6 shows that though age groups were seen as positive predictors of good immunization knowledge, they were not statistically significant predictors ($p > 0.05$), even though women who were 30-39 years (AOR = 2.6) and ≥ 40 years (AOR = 3.7) had a higher likelihood of having good immunization knowledge compared to the younger mothers. The only significant predictor of good knowledge of immunization was a formal educational status ($p < 0.05$) in which mothers who completed secondary or primary school were about 12 (AOR = 0.02); the timeless likelihood of having poor immunization knowledge compared to those who had no formal education. However, mothers who had tertiary education were about 3 times more unlikely to have poor knowledge compared to the uneducated, a finding that was not statistically

significant.

DISCUSSION

This study investigated the level of mothers' knowledge and attitude towards childhood immunization at the institute of child health, Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Nigeria and found poor knowledge of childhood immunization among mothers that participated in the study. All respondents were aware that vaccines are given to under-five children. This may be because of a continuous campaign in the country on childhood immunization aimed at creating immunization awareness among the public to reduce morbidity and mortality arising from vaccine-preventable diseases. All mothers being aware of childhood immunizations mean that they are likely to disseminate this information which may lead to more women taking their children to hospitals for vaccination thereby increasing vaccine uptake rate. This is similar to reports by some researchers in Nigeria and beyond (Mapatano et al., 2008; Adeyinka et al., 2009; Awodele et al., 2010; Awosan et al., 2018; Adefolalu et al., 2019). A lower number of mothers being

Table 3. Attitude of mothers towards childhood immunization.

Variable	n (%)
Have missed vaccination appointment for my child	
Yes	101 (71.6)
No	40 (28.4)
Reason for my child missing immunization	
Vaccination centers very far	8 (50.0)
Busy at work	6 (37.5)
No health worker at the center	0 (0.0)
No vaccine at the center	2 (12.5)
Sent back by a health worker	0 (0.0)
Actions were taken to make up for my child's missed immunization	
Nothing	13 (46.4)
Returned to the health center for missed vaccine	14 (50.0)
Continued vaccination schedule without makeup for missed vaccine	1 (3.6)
The adverse effect that will prevent vaccination visit	
Presence of history of an allergic reaction to vaccine components	3 (6.8)
Prematurity	0 (0)
The child is very sick	39 (88.6)
Child circumcised	3 (6.8)
The child has jaundice	3 (6.8)
An adverse reaction seen following immunization	
Fever	56 (67.5)
Blindness	1 (1.2)
Swelling and redness	34 (41.0)
Convulsion	7 (8.4)
Allergy	0 (0.0)
Deafness	1 (1.2)
Inconsolable crying	3 (3.6)
Grading of attitude	
Positive attitude	139 (98.6)
Negative attitude	2 (1.4)

aware of childhood immunization was, however, found in a study done in Ethiopia (Birhanu et al., 2015).

As health care workers give health talks during the well-baby immunization clinic and antenatal care days, little wonder they constituted the major source of childhood immunization awareness among mothers in this study. This should be sustained in addition to optimizing other media of information dissemination on immunization such as radio jingles, town criers, and others to maintain this high level of awareness among mothers. This is comparable to the findings of other researchers in and outside Nigeria, where health workers

were reported to be a major source of childhood immunization information to the mothers (Awodele et al., 2010; Birhanu et al., 2015; Vinish, 2016; Ramawat and Goswami, 2018). On the contrary, television was reported as the major source of information in other studies (Al-Lela et al., 2014; Ahmed et al., 2013).

Fear of general illness was the commonest reason for taking their children for vaccination. This was followed by the fear of death and insistence by health workers. This is likely to encourage mothers to regularly bring their children for vaccination as well as inform other mothers on the importance of childhood immunization against

Table 4. Relationship between socio-demographic characteristics and knowledge of immunization.

Variable	Level of knowledge (%)		X ² (P-value)
	Poor knowledge	Good knowledge	
Age (year)			
<30	23 (63.9)	13 (36.1)	17.35 (0.00) [*]
30-39	12 (44.4)	15 (55.6)	
≥40	66 (84.6)	12 (15.4)	
Religion			
Christianity	100 (71.9)	39 (28.1)	FT (0.49)
Others	1 (50.0)	1 (50.0)	
Parity of Respondents			
1-4 pregnancies	36 (62.1)	22 (37.9)	7.47 (0.02) [*]
5-8 pregnancies	35 (71.4)	14 (28.6)	
>8 pregnancies	30 (88.2)	4 (11.8)	
Number of living children			
1-4 children	44 (62.9)	26 (37.1)	5.04 (0.08)
5-8 children	48 (80.0)	12 (20.0)	
>8 children	9 (81.8)	2 (18.2)	
Marital status			
Single	3 (75.0)	1 (25.0)	2.71 (0.44)
Married	91 (70.0)	39 (30.0)	
Separated	1 (100.0)	0 (0.0)	
Widowed	6 (100.0)	0 (0.0)	
Educational status			
None	35 (87.5)	5 (12.9)	25.65 (0.00) [*]
Primary	32 (88.9)	4 (11.1)	
Secondary	18 (64.3)	10 (35.7)	
Tertiary	16 (43.2)	21 (56.8)	
Place of residence			
Urban	22 (52.4)	20 (47.6)	10.91 (0.01) [*]
Rural	79 (79.8)	20 (20.2)	

*Statistically significant.

preventable diseases. Similarly, Tagbo et al. (2012) and Al-ela et al. (2014) reported fear of general illness as the major driving force of mothers for taking their babies for vaccination.

Surprisingly, majority had poor knowledge of childhood immunization having all been aware of it. One would have expected a greater percentage of the mothers to have demonstrated good knowledge of childhood immunization. Likely, having more of the respondents from rural locations and with limited education may have contributed to this finding. There is, therefore, a need for

health workers to improve the content and quality of health talks delivered to these mothers as well as reach mothers in rural locations. A reward system should also be instituted to encourage mothers who pay detailed attention during such health talks. This finding is comparable to report given by Dharmaligman et al. (2017) and Jose et al. (2013) who studied similar population, but quite at variance with findings from other studies done in Nigeria and other countries (Al-Lela et al., 2014; Birhanu et al., 2015; Awosan et al., 2018; Konwea et al., 2018); Adefolalu et al., 2019).

Table 5. Relationship between socio-demographic characteristics and attitude towards immunization.

Variable	Level of attitude (%)		X ² (P-value)
	Positive attitude	Negative attitude	
Age			
<30 years	36 (100.0)	0 (0.0)	1.67 (0.41)
30-39 years	26 (96.3)	1 (3.7)	
≥40 years	77 (98.7)	1 (1.3)	
Religion			
Christianity	137 (98.6)	2(1.4)	FT (1.00)
Others	2 (100.0)	0(0.0)	
Parity of Respondents			
1-4 pregnancies	58 (100.0)	0 (0.0)	2.59 (0.18)
5-8 pregnancies	47 (95.9)	2 (4.1)	
>8 pregnancies	34 (100.0)	0 (0.0)	
Number of living children			
1-4 children	70 (100.0)	0 (0.0)	2.51 (0.33)
5-8 children	58 (96.7)	2 (3.3)	
>8 children	11 (100.0)	0 (0.0)	
Marital status			
Single	4 (100.0)	0 (0.0)	4.53 (1.00)
Married	128 (98.5)	2 (1.5)	
Separated	1 (100.0)	0 (0.0)	
Widowed	6 (100.0)	0 (0.0)	
Educational status			
None	40 (100.0)	0 (0.0)	2.59 (0.35)
Primary	35 (97.2)	1 (2.8)	
Secondary	27 (96.4)	1 (3.6)	
Tertiary	37 (100.0)	0 (0.0)	
Place of residence			
Urban	40 (95.2)	2 (4.8)	FT (0.09)
Rural	99 (100.0)	0 (0.0)	

A reasonable number of mothers had missed their child's immunization with vaccination centers being far away from their house as the commonest reason. Being busy at the workplace and no available vaccine at vaccination centers also contributed. Mothers from a rural area with a limited number of health facilities and difficult terrain are likely to be affected here. Also, difficulty in transporting these vaccines to these areas may contribute to its limited availability. These highlighted reasons need to be addressed to ensure compliance with the vaccination schedule. Different researchers have reported husband's refusal, not remembering vaccination day, unaware of the need for vaccination, lack of vaccination information

provided to parents by health workers and a child's illness as well as the unavailability of vaccines as the commonest reasons for the missing vaccine (Tagbo et al., 2012; Al-lela et al., 2014; Birhanu et al., 2015; Mugada et al., 2017; Awosan et al., 2018). Although some mothers took their babies back for vaccination, many of them did nothing after missing their child's vaccination. This creates a gap that should be addressed when providing information concerning childhood vaccination to mothers on the importance of catch-up vaccination following missed schedule as this will further strengthen compliance to immunization among mothers.

Despite many mothers' poor knowledge of childhood

Table 6. Predictors of good knowledge of immunization.

Variable	Wald statistics	p-value	AOR
Age group (year)			
<30			
30-39	0.98	0.32	2.56 (0.40 - 16.41)
≥ 40	3.10	0.08	3.71 (0.80 – 16.45)
Parity			
1-4 pregnancies			
5-8 pregnancies	0.28	0.60	0.51 (0.04 – 6.40)
>8 pregnancies	1.15	0.29	2.49 (0.45 – 12.16)
Number of children			
1-4 children			
5-8 children	0.30	0.59	0.49 (0.04 – 6.32)
>8 children	0.82	0.37	0.36 (0.04 – 3.33)
Level of formal Educational			
None			
Primary	6.17	0.01*	0.12 (0.02 – 0.64)
Secondary	9.25	0.002	0.08 (0.02 – 0.41)
Tertiary	2.87	0.09	0.34 (0.01 – 1.19)
Place of residence			
Urban			
Rural	0.00	1.00	1.00 (0.25 – 3.95)

*The only significant predictor of good knowledge of immunization was maternal educational level ($p < 0.05$).

vaccination in this study, they however, demonstrated a very good attitude towards immunization of their children.

This finding aligns with the reports of studies conducted in different parts of the world (Birhanu et al., 2015; Awosan et al., 2018; Ramawat and Goswami, 2018; Adefolalu et al., 2019).

In this study, a significant association was found between age, parity of respondents, educational status, place of residence, and mothers' knowledge regarding childhood immunization. It is also likely that older mothers and mothers with higher parity had more opportunities for more visits to hospitals and therefore receive more health talks on childhood immunization compared to younger respondents with lower parity levels. Also, those with higher educational levels may understand health talk information on childhood immunization, better than respondents with lower educational attainment. This may explain the reason for the observed significant association between educational level and knowledge of childhood immunization as more than half of respondents in this study either had no formal education or only attained primary level of education. Similarly, most researchers have reported a significant association between maternal education and knowledge of childhood

immunization (Awodele et al., 2010; Birhanu et al., 2015; Dharmalingam et al., 2017; Mugada et al., 2017; Awosan et al., 2018; Ramawat and Goswami, 2018; Adefolalu et al., 2019). Besides, Birhanu et al. (2015), Adefolalu et al. (2019), and Ramawat and Goswami, (2018) noted maternal age and parity was significantly associated with mothers' knowledge regarding childhood immunization. Our findings are at variance with reports by other researchers (Jose et al., 2013; Vinish, 2016).

Only maternal educational level significantly predicted respondents' knowledge of childhood immunization. This finding is important in the design and implementation of childhood immunization programs. Thus, measures such as female education, adult literacy programs, health education campaigns, and new or improved immunization campaign delivery methods should be considered for raising immunization uptake in Ebonyi State, Southeast Nigeria.

Conclusion

This study shows that mothers had poor knowledge of childhood immunization. For the few mothers who knew

childhood immunization, their major sources of information were from health workers. The maternal educational level predicted good knowledge of childhood immunization. Far vaccination centers and being busy at work contributed to missed vaccination in their children. It is recommended that immunization information should be taken to the doorsteps of mothers, especially at various female gatherings. Optimization of routine immunization sessions should be intensified in every community with the implementation of daily immunization at every fixed post, weekly vaccination for outreach sessions, and monthly vaccination for mobile sessions. Also, the integration of routine immunization with other health services, reducing multiple hospital visits that will disrupt mothers' busy schedules is advocated. These measures may likely increase immunization awareness as well as improve its uptake in Ebonyi State, southeast Nigeria.

Limitations

This was a cross-sectional study with small sample size so the findings may not be generalized to the populace. Further research is needed to understand the respondents' perception of childhood immunization and factors that influence its uptake in Ebonyi State, Nigeria.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

- Adefolalu OA, Kanma-Okafor OJ, Balogun MR (2019). Maternal Knowledge, attitude, and compliance regarding immunization of under-five children in Primary Health Centers in Ikorodu Local Government Area, Lagos State. *Journal of Clinical Sciences* 16(1):7-14.
- Adeyinka DA, Oladimeji FE, Aimakhu C (2009). Uptake of childhood immunization among mothers of under-five in South-Western Nigeria. *The Internet Journal of Epidemiology* 7:1-5.
- Ahmed SM, Abd-El Rahman TA & Masoed ES (2013). Mothers' awareness and knowledge of under-five years children regarding immunization in Minia city Egypt. *Life Sciences* 10:1224-1232.
- Al-lela OQB, Bahari MB, Al-Qazaz HK, Salih MRM (2014). Are parents' knowledge and practice regarding immunization related to Pediatrics' immunization compliance? A mixed-method. *BMC Pediatrics* 14(1):1-7.
- Anand S, Bamighausen T (2007). Health workers and vaccination coverage in developing countries: an econometric analysis. *Lancet* 368:1277-1285.
- Awodele O, Oreagba AI, Akinyede A, Awoele DF, Dolapo DC (2010). The knowledge and attitude towards childhood immunization among mothers attending antenatal clinics in Lagos University Teaching Hospital, Nigeria. *Tanzania Journal of Health Research* 12(3):172-177.
- Awosan KJ, Ibrahim MTO, Yunusa EU, Isah BA, Raji MO, Abubakar N (2018). Knowledge, attitude, and compliance with full immunization of children against vaccine-preventable diseases among pregnant mothers in Sokoto, Nigeria. *International Journal of Contemporary Medical Research* 5(6):10-16.
- Babalola S, Olabisi A (2004). Community and systematic factors affecting the uptake of immunization in Nigeria: A quantitative study in Five States. Nigeria; Abuja: Department of International Development (DFID).
- Birhanu S, Anteneh A, Kibie Y, Jejaw A (2015). Knowledge, attitude, and practice of mothers towards immunization of infants in health centers in Addis Ababa, Ethiopia. *American Journal of Health Research* 4(1):6-17.
- Dharmalingam A, Raghupathy NS, Sowmiya M, Amudharaj D & Jehangir HM (2017). Immunization knowledge, attitude, and practice among mothers of children from 0 to 5 years', *International Journal of Contemporary Pediatrics* 4(3):783-789.
- Jose J, Lobo MR, Nisha K, Shilpa GS, Umarani J (2013). Awareness of immunization among mothers of under-five children. *International Journal of Innovative Research and Development* 2(6):620-627.
- Konwea PE, David FA, Ogunbile SE (2018). Determinants of compliance with child immunization among mothers of children under five years of age in Ekiti State, Nigeria. *Journal of Health Research* 32(3):229-236.
- Mapatano MA, Kayembe K, Piripiri L, Nyandwe K (2008). Immunization-related knowledge, attitudes, and practices of mothers in Kinshasa, Democratic Republic of the Congo. *South African Family Practice* 50(2):61-61
- Mugada V, Chandrabhotla S, Kaja DS, Machara SGK (2017). Knowledge of childhood immunization among mothers and reasons for incomplete immunization. *Journal of Applied Pharmaceutical Science* 7(10):157-161
- National Population Commission (NPC) [Nigeria] and ICF International (2014). Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International. Available at: <https://dhsprogram.com/pubs/pdf/FR293/FR293.pdf>. Accessed (Last accessed 2020 Jan 4).
- National Population Commission (NPC) [Nigeria] and ICF (2019). Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF. Available at: <https://www.dhsprogram.com/pubs/pdf/FR359/FR359.pdf>. Accessed (Last accessed 2020 Jan 4).
- Ophori EA, Tula MY, Azih AV, Okojie R, Ikpo PE (2014). Current trends of immunization in Nigeria: Prospect and Challenges. *Tropical Medicine and Health* 42(2):67-75.
- Ramawat P, Goswami VP (2018). A study of knowledge about immunization amongst mothers of children below 5 years of age. *International Journal of Pediatric Research* 5(3):109-112.
- Tagbo B, Uleanya N, Nwokoye I, Eze JC, Omotowo B (2012). Mother's knowledge, perception, and practice of childhood immunization in Enugu. *Nigerian Journal of Paediatrics* 39(3):90-96.
- Torun SD, Bakirci N (2006). Vaccination coverage and reasons for non-vaccination in a district in Istanbul'. *BMC Public Health* 6:125. <https://doi.org/10.1186/1471-2458-6-125>.
- Vinish V (2016). Mother's knowledge of the immunization schedule of her child: A descriptive survey. *Manipal Journal of Nursing and Health Sciences* 2(2):41-45.
- Vonasek BJ, Bajunirwe F, Twesigye L, Dahm J, Grant MJ (2016). Maternal Knowledge and attitudes towards childhood immunizations in rural Uganda correlate with complete childhood vaccinations? *PLoS ONE* 11:e0150131.
- World Health Organization (WHO) (2018). Immunization coverage, Geneva, Switzerland: WHO. Available at: <http://www.who.int/mediacentre/factsheet/fs378/en> (Last accessed 2020 Jan 5).
- World Health Organization (WHO) (2019). Immunization, surveillance, assessment, and monitoring. Vaccine-preventable disease. Available at: <http://www.who.int/immunization/monitoring/en>. [Last accessed 2019 Mar 20].