



Knowledge and Practice of Childhood Immunization among Men with Infants in Enugu Metropolis

**Chekwube Catherine Agu¹, C. N. Onwasigwe², Emmanuel Ifeanyi Obeagu^{3*},
C. C. N. Vincent⁴, Uduoma Olive Chijioke⁵, Calista Ndidi Adike⁶,
Chukwum J. Okafor⁷, Adaobi Maryann Ibekwe⁸, Lizzy Agunwah¹
and Confidence Ogechi Anyanwu⁹**

¹Department of Nursing Science, Evangel University, Akaeze, Ebonyi State, Nigeria.

²Department of Community Medicine, College of Medicine, University of Nigeria.

³Department of Medical Laboratory Science, Imo State University, Owerri, Imo State, Nigeria.

⁴Department of Nursing Science, Imo State University, Owerri, Imo State, Nigeria.

⁵Department of Health Administration and Management, Faculty of Health Sciences, University of Nigeria, Enugu Campus, Enugu State, Nigeria

⁶Department of Medical Laboratory Science, Nnamdi Azikiwe University, Nnewi Campus, Nnewi, Nigeria.

⁷Department of Pathology and Biochemistry, State University of Zanzibar, Tanzania.

⁸Department of Nursing Science, Nnamdi Azikiwe University, Nnewi Campus, Nnewi, Anambra State, Nigeria

⁹Department of Medical Laboratory Science, Madonna University, Elele, Rivers State, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i39B32174

Editor(s):

(1) Dr. Prem K. Ramasamy, Brandeis University, USA.

Reviewers:

(1) Jing Pengyu, Air Force Medical University, China.

(2) Muhammad Zufadli Mehat, Universiti Putra Malaysia, Malaysia.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/70467>

Original Research Article

Received 10 May 2021

Accepted 15 July 2021

Published 31 July 2021

ABSTRACT

Background: Immunization is the process by which a person's immune system is fortified and made resistant to an infectious disease/ agent. Immunization saves millions of lives. It is the most important means of preventing childhood morbidity and mortality. This study investigated the knowledge and practice of childhood immunization among men with infants in Enugu Metropolis.

*Corresponding author: E-mail: emmanuelobeagu@yahoo.com;

Methods: A cross sectional descriptive study using multi stage sampling involving 81 men with infants in Ogbete Main Market Enugu. Data obtained were analyzed using SPSS version 22 adopting descriptive statistics and chi square to test difference and relationship between variables. P-values <0.05 were taken to be level of significance.

Results: Findings indicated that median, mean \pm standard deviation of the men's age are 35, 35.8 \pm 3.5 respectively. Men's total knowledge level was significantly associated with their level of education ($P < 0.05$) and their level of practice was significantly associated with their religion ($\chi^2 = 35.7$, $df = 8$, $P = 0.000$).

Conclusion: This study concludes that the men studied had good knowledge and poor practices of immunization.

Keywords: Childhood; infants; immunization; men; knowledge.

1. INTRODUCTION

Immunization against childhood diseases save millions of lives [1]. Immunization is the process by which an individual's immune system becomes fortified against an agent (known as the immunogen). Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine [2]. Immunizations are definitely less risky and an easier way to become immune to a particular disease than risking a milder form of the disease itself. They are important for both adults and children in that they can protect us from the many diseases out there. Through the use of immunizations, some infections and diseases have almost completely been eradicated throughout the United States and the World [3]. One example is smallpox. Thanks to dedicated health care professionals and the parents of children who vaccinated on schedule, polio has been eliminated in the U.S. since 1979 [3]. Polio is still found in other parts of the world like Nigeria, so certain people could still be at risk of getting it. This includes those people who have never had the vaccine, those who did not receive all doses of the vaccine, or those travelling to areas of the world where polio is still prevalent.

Immunization can be achieved in an active or passive manner [4]. Vaccination is an active form of immunization. Active immunization can occur naturally when a person comes in contact with a microbe. The immune system will eventually create antibodies and other defences against the microbe [4]. Artificial active immunization is where the microbe or parts of it are injected into the person before they are able to take it in naturally.

Passive immunization is where pre-synthesized elements of the immune system are transferred

to a person so that the body does not need to produce these elements itself. This method of immunization begins to work very quickly, but it is short lasting, because the antibodies are naturally broken down, and if there are no B cells to produce more antibodies, they will disappear [4]. Passive immunization occurs physiologically, when antibodies are transferred from mother to fetus during pregnancy, to protect the fetus before and shortly after birth. Artificial passive immunization is normally administered by injection and is used if there has been a recent outbreak of a particular disease or as an emergency treatment for toxicity, as in tetanus. The antibodies can be produced in animals, called "serum therapy," although there is a high chance of anaphylactic shock because of immunity against animal serum itself. Thus, humanized antibodies produced in vitro by cell culture are used instead if available [4].

A vaccine is a biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism, and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and "remember" it, so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters [5].

Nigeria's Expanded Programme on Immunization (EPI) was first initiated in 1979 and the Federal Government of Nigeria through the Federal Ministry of Health continues to place high priority on immunization [6,7]. In 1996, the immunization system was strengthened for polio eradication. Consequently, the Federal Government established the National Programme on

Immunization (NPI) whose key focus was to provide support to the implementation of state and LGA immunization programmes [7]. The support provided by World Health Organization (WHO) to reach out to every ward, along with other partners, to the efforts of national authorities in routine immunization contributed to improved coverage of routine immunization services. There is steadily increase in the number of fixed immunization service delivery points and outreach immunization sites. Nigeria has made great strides in her polio eradication efforts [7]. Immunization against childhood diseases is one of the most important means of preventing childhood morbidity and mortality. Achieving and maintaining high levels of immunization coverage must therefore be a priority for all health systems. In order to monitor progress in achieving this objective, immunization coverage data can serve as an indicator of a health system's capacity to deliver essential services to the most vulnerable segment of a population [6].

In May 2012, Nigeria joined other member states of the World Health Assembly to endorse the Global Vaccine Action Plan; an agenda for universal access to immunization by 2020 [8]. In 1st May 2012, Nigeria introduced a pentavalent vaccine to expanded programme on immunization (EPI) to be given to children under one year of age. The pentavalent vaccine is five in one vaccine that protects a child against Diphtheria, pertussis and tetanus, Haemophilus influenza type B, hepatitis B. Pentavalent vaccine replaces the current DPT vaccine administered at 6, 10, and 14 weeks.

1.1 Global Immunization Vision and Strategy (GIVS)

In response to challenges in global immunization, United Nations Children's Fund (UNICEF) and WHO have developed the Global Immunization Vision and Strategy (GIVS) which was launched in 2006 to last till 2015. Its framework aimed at controlling morbidity and mortality from vaccine-preventable diseases and helping countries to immunize more people, from infants to seniors, with a greater range of vaccines [8].

In Nigeria, routine vaccination coverage for all recommended vaccines has remained poor though there has been a gradual rise in vaccination coverage from 21% of eligible children (0–11 months of age) in 2003 to 25% a decade later [9]. Efforts have focused on the

health worker, health system and logistics with little attention being paid to paternal factors like knowledge of childhood immunization. Several studies have been carried out in different cities and countries on knowledge, attitude and practice of childhood immunization among women, but from literature antecedents none has been conducted on men in Enugu metropolis.

1.2 General Objectives

To determine the knowledge and practice of childhood immunization among men with children aged 0-1 year in Enugu Metropolis.

1.3 Specific Objectives

To determine the level of men's knowledge and determine the factors affecting the involvement and practice about childhood immunization in Enugu Metropolis.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Ogbete Main Market in Enugu Metropolis.

2.2 Study Design

A cross sectional descriptive study was used for this study.

2.3 Study Population

The study population includes randomly selected men with children aged 0-1 year in Ogbete Main Market in Enugu Metropolis.

2.4 Inclusion Criteria

This study includes fathers of children aged 0-1 year who are traders in Ogbete Main market Enugu metropolis.

2.5 Exclusion Criteria

Fathers who did not consent to study despite adequate explanation.

2.6 Sample Size Determination

The sample size was calculated using a formula with the assumption of 5% margin of error, 95% confidence level. Sample size was calculated by

considering the estimated proportion of mothers knowledge on immunization (95.2%)⁹ which was taken from recent study in Enugu.

$$N = \frac{z^2 pQ}{D^2} \quad n = \frac{Z^2 p(1-p)}{d^2} \quad 10$$

Where

N = Sample size

Z = Confidence Limit (a constant) = 1.96

P = Prevalence of this condition from previous similar studies = 95.2%⁹

Q = 1 - P

D = degree of accuracy desired. (a constant) = 0.05.
P=95.2%⁹

$$\frac{95.2}{100} = 0.95$$

$$\therefore Q = 1 - 0.95 = 0.18$$

$$n = \frac{(1.96)^2 \times 0.95 \times 0.18}{(0.05)^2}$$

$$= 72.9 \approx 73$$

However, considering attrition rate of 10% for possible non responders or drop outs, it was calculated as shown below.

$$S = N/0.90$$

Assuming 10% attrition rate

Whereas = sample size to compensate for attrition and non-response.

N = calculated sample size

0.90 = 90% response rate is anticipated

$$\therefore NS = 73/0.90$$

N.S = 81.11 \approx 81. A sample size of 81 will be used

2.7 Sampling Technique

A multi stage sampling technique was used.

Stage 1

Enugu metropolis has four main urban markets in Enugu: Ogbete Market, Kenyatta Market, Gariki Awkunanaw Market and New Market. Ogbete Main Market Enugu was selected by simple random sampling (balloting) technique.

Stage 2

Ogbete Main Market Enugu is made up of different lines ranging from alphabet A to O. A simple random sampling was used to select ten lines.

Stage 3

Each line is made up of about thirty (30) shops. To get the sampling interval Alphabet A to O will be 10 lines. ($\therefore 30 \times 10 = 300$ shops).

$$SI = \frac{\text{population size}}{\text{Sample size}} = \frac{300}{81}$$

$$= 3.7 \text{ approx. } 4 \text{ shops}$$

\therefore Sampling interval was every other four shops across each line to select men with children 0-1year.

2.8 Study Instruments

The interviewer administered semi-structured questionnaires to each participant which was used to elicit information on the knowledge, attitude and practice of childhood immunization among men with children aged 0-1year during the time of the study. For internal consistency of the instrument, Pre-testing of the questionnaire was performed using a sample of 20 men in a small survey (Abakpa Market).

2.9 Data Collection Method

Data was collected by three trained research assistants (Master of Public Health student, and 2 B.Nsc Nurse Graduates) and Researcher, using semi structured pretested questionnaire and a total of 81 questionnaires in English language. The research assistants were trained by the researcher. The training was one day training on how to administer questionnaire and

record the outcome using the departmental class as venue for training.

Questionnaires were distributed by trained research assistants to Men with children 0-1year across the ten lines of Ogbete Market in Enugu Metropolis. The questionnaires were collected immediately upon completion and it was developed from scratch. These were done within a period of five days. The questionnaire was designed by researchers to purpose of obtaining information about knowledge and practice of men with children 0-1year.

2.10 Measurement of Variables

Demographic variables were presented as tables, tabulated in frequencies and percentages.

2.11 Grading That Was Used for Knowledge and Practice

≤ 50% poor

≥ 50% good

2.12 Statistical Analyses

Data obtained from the questionnaire was entered and tabulated using Microsoft Excel 2007 and analysis were done using IBM SPSS version 22 software. Data was analyzed as proportion of responses and results presented as tables and charts. Association between variables was tested using chi square to determine the

relationship between knowledge of immunization and socio demographic characteristics of the respondents. P-values below ≤ 0.05 were taken to be level of significance.

3. RESULTS

This study was aimed to determine the knowledge and practice of childhood immunization among men with children aged infants in Enugu Metropolis.

A cross sectional descriptive study was used and eighty one, 19-item questionnaires were distributed to the respondents (fathers of children aged 0 to 1 year) through trained research assistants and the researcher with a response rate of (n=81)100%.

Table 1 shows the socio-demographic characteristics of the respondents and their children. The median age of the fathers was 35, mean of 35.8 ($\pm 3.504SD$), which range from 30 to 45 years. Of the total 81 respondents, the commonest age group 35-39 years was found to be 49(60.5%). Over 40% of the respondents completed their secondary education level. Most of the respondents 63(77.8%) were married. Majority 75 (92.6%) of respondents belong to Igbo ethnic group, and almost all the respondents 71 (87.7%) of them were Christian in religion.

45 (55.6%) of the respondents children were females, 36(44.4%) were males. Majority of their children's age group falls within the ages of ≤ 3 months and 7-9 months.

Table 1. Distribution of socio-demographic indicators of the respondents

S/N	Socio-demographic indicators	(n=81)	Percent
1	Age of respondents in(years)	19	23.5
	30 - 34	49	60.5
	35- 39	13	16.0
	≥40 years		
	Mean age \pm SD is 35.8 \pm 3.5		
2	Marital status	63	77.8
	Married	10	12.4
	Widowed	5	6.2
	Divorced	3	3.7
	Single		
3	Educational level	41	50.6
	Secondary school	18	22.2
	Tertiary level	15	18.5
	Primary school	7	8.6
	No formal education		
4	Ethnicity	75	92.6
	Igbo	4	4.9
	Yoruba	2	2.5

S/N	Socio-demographic indicators	(n=81)	Percent
5	Hausa		
	Religion	71	87.7
	Christian	8	9.9
	Traditionalist	2	2.5
6	Sex of child	45	55.6
	Female	36	44.4
	Male		
7	Age of child in (months)		
	≤ 3 months	28	34.6
	4 - 6	18	22.2
	7 – 9	28	34.6
	≥10 months	7	8.6
Mean age of child ± SD is 24.4 ± 16.8			

Table 2. Knowledge of respondents on immunization

Ever heard of immunization		
valid	yes	81
		100.0
Initial source of information		
valid	media	40
	hospital	19
	church	10
	health talk	7
	family member	5
	total	81
		100.0
Reasons for immunizing child		
valid	To prevent vaccine preventable diseases	46
	Helps children to develop properly	20
	Govt. says it is important	13
	Do not know	2
	Total	81
		100.0

Table 3. Relationship between knowledge of immunization and level of education

Level of education	Knowledge of Immunization (Initial Source of Information)					Total	X ²	df	p-value
	Family Member	Hospital	Health talk	Church	Media				
No formal education	5	2	0	0	0	7			
Primary	0	16	0	0	0	16	142.988	12	0.000*
Secondary	0	1	7	10	22	40			
Tertiary	0	0	0	0	18	18			
Total	5	19	7	10	40	81			
Level of education	Knowledge of Immunization (Reasons for immunizing child)				Total	X ²	df	p-value	
	To prevent vaccine preventable diseases	Govt. says it is important	Helps children to develop properly	Do not know					

Level of education	Knowledge of Immunization (Initial Source of Information)					Total	X ²	df	p-value
	Family Member	Hospital	Health talk	Church	Media				
No formal education	7	0	0			7			0.000*
Primary	16	0	0	0		16	77.333	9	
Secondary	23	13	4	0		40			
Tertiary	0	0	16	2		18			
Total	46	13	20	2		81			

All the respondents were aware about immunization. Media (Television, Radio) 40(49.38%) was the initial source of information for majority of the respondents. Over 50% of the respondents were knowledgeable about the reasons for childhood immunization.

There was statistical significant relationship between men's level of education and knowledge of immunization. The greater percent falls within men with secondary level of education.

Table 4 shows the practice of immunization among respondents. Majority of the respondents

61(75.3%) have not taken their children for immunization before. Among the men who have taken their children for immunization and the ones who support their wives during immunization, 47(58.0%) reported they usually go to Government hospitals. Most of the respondents 59(72.8%) have missed immunization due to one reason or the other. Not all the respondents could tick the vaccines correctly. A good number of them 59(72.8%) reported that their children have received the recommended vaccines for the ages of their children.

Table 4. Practice of immunization

Have you taken your child for immunization before?			
		Frequency	Percent
Valid	Yes	20	24.7
	No	61	75.3
	Total	81	100.0
Where your children get immunization			
		Frequency	Percent
Valid	Health Centers	9	11.1
	Private Hospital	25	30.9
	Govt. Hospital	47	58.0
	Total	81	100.0
Has your children missed any immunization so far			
		Frequency	Percent
Valid	Yes	22	27.2
	No	59	72.8
	Total	81	100.0
Has your child received all the vaccines recommended for their age			
		Frequency	Percent
Valid	Yes	59	72.8
	No	22	27.2
	Total	81	100.0
If yes to question 16 tick the correct vaccines			
		Frequency	Percent
Valid	BCG	30	37.0
	OPV	25	30.9
	Pentavalent	16	19.8
	Rotarix(Rotavirus)	9	11.1
	Kwashiokor Vaccine	1	1.2
	Total	81	100.0

Table 5. Factors affecting men involvement during immunization of their children

Factors affecting the support of men during immunization			
		Frequency	Percent
Valid	Women's responsibility	50	61.7
	Busy schedule	15	18.5
	Long queue and waiting	13	16.0
	Division of labour between me and my wife	3	3.7
	Total	81	100.0

Table 6. Relationship between practice of immunization and religion

Religion	If yes to Q16 tick the correct vaccines					Total		
	BCG	OPV	Pentavalent	Rotarix (Rotavirus)	Kwashiokor Vaccine	X ²	df	p-value
Christian	30	20	16	5	0	35.651	8	0.000*
Muslim	0	0	0	2	0			
Traditionalist	0	5	0	2	1			
Total	30	25	16	9	1			

Over 60% of the respondents said that it is women's responsibility to immunize their children. So many other reasons were encountered as factors affecting men involvement in their children's immunization ranging from busy schedule 15 (18.5%) to division of labour between the men and their wives 3 (3.7%).

There is significant relationship between practice of immunization and religion. This practice was significantly greater among Christians.

4. DISCUSSION

Immunizations can save your family time and money. To achieve the benefits of immunization, vaccinations against vaccine preventable diseases should be reached and at complete doses. Several studies on the immunization status of children and the knowledge attitude and practice of mothers have been published in various countries at different times, but from literature antecedent none has been published on men. So this study was targeted at determining the knowledge and practice of childhood immunization among men with infants aged 0-1 year in Enugu Metropolis, most of the men were between the ages of 35 and 39 years with a mean age 35.81(± 3.50) years. This result is similar to studies in [10-13] where the respondents' age group falls within the ages of 31 and 35 years, 20 and 30 years, 26 and 35 years and 26 and 30 years respectively. Same with study from Africa [14], where the respondents' age group falls within the ages of

26 and 33 years. Same with studies in Nigeria [15,16], where the respondents' age group falls within the ages of 31 and 35 years, 21 and 30 years respectively.

This explains that adults from the age of ≥ 30 years are capable of responding rationally to any given question from to his/her wealth of experience.

Parents of infants aged 0-1 year need to be significantly aware of the immunization services and its benefits. Being aware of these benefits and services require a minimum literacy level. Over 50% of men in this study had at least secondary education. This indicates that the population studied was literate. These findings were similar to studies in [11,14] that 68.2%, 54.5% and 81.2% of respondents have had their secondary educational level. This probably explains why majority could say why children are immunized and believe that every child needs immunization.

Majority of the respondents are married, which is also similar to studies [15-17] this indicates that couple have children in marriage. There are also studies [14] where most of the respondents are single, this is because it is not a crime to have children in that environment without marriage.

In knowledge of Immunization, the initial sources of information among men with children aged 0-1 year was found to be mainly media. This is similar to a study in [18] where 91.8% of mothers heard from radio, which might indicate that respondents had access to Medias. In the other hand, Majority of the respondents in a study

[16,19] got their initial information from Health workers; this is because they are women who go for ante natal visits during pregnancy unlike men that do not visit hospitals often.

With regards to men's attitude, vast majority of the respondents strongly agreed and agreed to the fact that immunization prevents childhood diseases which shows that the respondents have positive attitude towards immunization.

In practice of immunization, a good number of the respondents have not taken their children for immunization and some could not tick correctly the right vaccines for immunization. This indicates that they leave the immunization responsibilities for their wives. Unlike in studies [11,13,20] where mothers of children usually takes their children for immunization and were able to mention correctly the right vaccines for immunization and at the stipulated time each would be given.

Concerning of factors affecting the involvement of men during their children immunization, almost all the respondents claimed that it is women's responsibility for a child to get vaccinated. This is similar to study in [17], it simply indicates that men do not involve themselves in the immunization of their children; instead they shift the responsibility to women alone.

High levels of incomplete doses and not vaccinated were another reason for concern. This is a clear indication that the programme needs to focus not only on initiating immunization, but that it should also concentrate on encouraging men to be involved and participate fully in their children immunization and also in motivating parents to complete the schedule.

However, men in this study displayed good knowledge based on my grading $\geq 50\%$ of the respondents on the various vaccines as outlined by the Expanded Programme on Immunization, the fact that some men could not tick correctly the vaccine that was administered to their children like kwashiorkor vaccine is worrisome, but the option was actually added to ascertain their knowledge level. This indicates the need for improved health education during ante-natal care and immunization activities and encouraging women to come to next visit in accompanying of their husband, improved community participation, mass mobilization, and retraining of community health workers.

5. CONCLUSIONS

Immunization for children is the effective, safe and efficient public health interventions to prevent childhood morbidity and mortality. Findings of this study found that most men studied had good knowledge, positive attitude with poor practice and involvement of immunization. There is a need to increase awareness about the benefits and importance of vaccination, as well as the harmful consequences of non-complete immunization.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical clearance was obtained from the University of Nigeria Teaching Hospital (UNTH) Health Research Ethics Committee (see below for evidence); approval was also obtained from President Ogbete Main Market Traders Association (OMMTA) in which the study was carried out. Explanation on what the study was all about was given by the researcher and/or research assistants before data collection. People's right and dignity was respected throughout this study through complete confidentiality.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Adeyinka D, Oladimeji FE, Adeyinka C. Uptake of childhood immunization among mothers of under-five in Southwestern

- Nigeria. The Internet Journal of Epidemiology. 2009;7(2):54-66. DOI:10.5580/f4:1-15
2. World Health Organization. Immunization. WHO; 2017. Available:<http://www.who.int/topics/immunization/en/>
 3. World Health Organization. United nations children fund. The state of the world's children. UNICEF Geneva. 2001;77-89.
 4. Immunization - Hospital.com.my [Internet]. Hospital.com.my. 2017 [accessed 25 July 2017]. Available:http://hospital.com.my/medical_procedures/immunization.htm
 5. Ophori EA, Tula MY, Azih AV, Okojie R, Ikpo PE. Current trends of immunization in Nigeria: Prospect and challenges. Tropical Medicine and Health: BioMed Central Journal. 2014;42(2):67-75. DOI:10.2149/tmh.2013-13
 6. World Health Organization. Immunization and vaccine development. WHO; 2015. Available:<http://www.afro.who.int/en/nigeria/country-programmes/immunization-and-vaccine-development.html>
 7. Sulaimon TA, Olalekan AU, Victor TA, Charles SW. Incomplete childhood immunization in Nigeria: A multilevel analysis of individual and contextual factors. Bio Med Central Public Health Journals. 2017;17:236. DOI:10.1186/s12889-017-4137-7
 8. World Health Organization. Immunization. WHO; 2017. [Accessed 25 July 2017]. Available:http://www.who.int/immunization/givs/Q_and_A_EN.pdf
 9. Tagbo BN, Uleanya ND, Nwokoye IC, Eze JC, Omotowo IB. Mothers' knowledge, perception and practice of childhood immunization in Enugu. Nigerian Journal of Paediatrics. 2012;39(3):90-96. DOI:<http://dx.doi.org/10.4314/njp.v39i3.1>.
 10. Jaykaran Charan, Tamoghna Biswas. How to calculate sample size for different study designs in medical research? 2013;5(2):121–126. DOI:10.4103/0253-7176.116232, PMID: 24049221
 11. Angelillo IF, Ricciardi IG, Rossi P, Pantisano P, Langiano E, Pavia M. Mothers and vaccination: Knowledge, attitudes, and behaviour in Italy. Pub Med Central Journal. 1999;77(3):224-229. PMID:PMC2557613
 12. Awadh Ai, Hassali MA, Al-Iela OQ, Bux SH, Elkalmi RM, Hadi H. Immunization knowledge and practice among Malaysian parents: A questionnaire development and pilot-testing. Bio Med Central Public Health Journal. 2014;14(11):7. Available:<http://www.biomedcentral.com/1471-2458/14/1107>.
 13. Bernsen RM, Al-Zahmi FR, Al-Ali NA, Hamoudi RO, Ali NA, Schneider J, et al. Knowledge, attitude and practice towards immunizations among mothers in a traditional city in the United Arab Emirates. Journal of Medical Sciences. 2011;4(3):114-121.
 14. Qutaiba BOA, Bahari MB, Al-Qazaz HK, Salih RM, Jamshed SQ, Elkalmi RM. Are parents' knowledge and practice regarding immunization related to pediatrics' immunization compliance: A mixed method study, Mosul; Iraq. Bio Med Central Public Health Journal. 2014;14:20. Available:<http://www.biomedcentral.com/1471-2431/14/20>.
 15. Ramavhoya TI, Maputle SM, Lebeso RT. Knowledge of mothers with regard to immunization of children in Vhembe District, Limpopo Province; South Africa: 2015;51(1,2):9-15.
 16. Legesse E, Dechasa W. An assessment of child immunization coverage and its determinants in Sinana District, Southeast Ethiopia. Bio Med Central Pediatrics. 2015;15:31. DOI: 10.1186/s12887-015-0345-4.
 17. Awodele O, Oreagba IA, Akinyede A, Awodele DF, Dolapo DC. The knowledge and attitude towards childhood immunization among mothers attending antenatal clinic in Lagos University Teaching Hospital, Nigeria: 2010. African Journals Online (Ajol): Tanzania Journal of Health Research. 2010;12(3):1-8. Available:<https://www.ajol.info/index.php/tjrb/article/view/51112>
 18. Kio JO, Agbede CO, Mkpuruoma EJ. Knowledge beliefs and practices regarding immunization among nursing mothers in Ogun State, Southwest Nigeria. Journal of Health, Medicine and Nursing: An International Peer-reviewed Journal. 2016;24(22):8419. Available:<http://iiste.org/Journals/index.php/JHMN/article/download/29709/30503>
 19. Njelita CU. Effects of socioeconomic and geographical factors in the utilisation of immunisation services in three selected

- local government areas of Anambra State, Nigeria. [master's thesis]. University of Nigeria. 2009;34.
20. Angadi MM, Arun PJ, Rekha U, Masali KA, Vijaya S. A study of knowledge, attitude and practices on immunization of children in Urban Slums of Bijapur City, Karnataka, India. *Journal of Clinical and Diagnostic Research*. 2013;7(12):2803–2806. DOI:10.7860/JCDR/2013/6565.3763.

© 2021 Agu et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/70467>