

Effect of peer education on knowledge, attitude and completeness of childhood routine immunization in a rural community of Plateau State.

*Banwat ME.¹, Lar LA.¹, Abok IA.², Yiltok ES.²

Original Article

Abstract

Objectives: Routine immunization in rural settings is usually accessed at the Primary Health Care centers. However, lack of completion of initiated vaccination, is an ongoing challenge. This has been attributed to the poor knowledge and inappropriate attitudes of caregivers to routine immunization. This study set out to access the effect of peer education on knowledge, attitude and completeness of routine immunization, in North-Central Nigeria.

Methods: The study was conducted in two rural communities in north-central Nigeria. Mother-Child pairs were sampled using multistage sampling technique. Data was collected using questionnaires pre- and post-intervention of peer education. A p-value of ≤ 0.05 was considered statistically significant and logistic regression was used to assess predictive factors for good knowledge.

Results: The mean age of the respondents was 27.25 ± 6.69 years in the study group and 29.39 ± 7.71 years in the control group. Majority of the respondents in both study (61.95) and control groups (54.1%) were aged between 20 and 29 years of age and had attained secondary level of education. The mean knowledge scores in the intervention community improved significantly post-intervention from 3.39 to 5.10 (out of 8 scores). Highest predictors for good knowledge in this study were maternal age 30 – 39 years ($p = 0.020$). Mean attitudinal score in the study group increased significantly from 4.17 pre-intervention to 5.16 post-intervention. The proportion of fully immunized children in the study group increased from 57.3% pre-intervention to 70.7% after peer education.

Conclusion: Peer education is an effective way of improving knowledge, attitude and completeness of routine immunization. It should be extensively used by health workers in areas with low immunization coverages.

Key Words: Peer education, immunization, knowledge.

Corresponding Author: Dr Mathilda E. Banwat, Email: mathildabanwat@yahoo.com

¹Department of Community Medicine, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

²Department of Paediatrics, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

Effet de l'éducation par les pairs sur la connaissance, l'attitude et l'exhaustivité de l'enfance la vaccination de routine dans une communauté rurale de l'État de Plateau.

*Banwat ME.¹, Lar LA.¹, Abok IA.², Yiltok ES.²

Article original

Résumé

Objectifs: La vaccination de routine en milieu rural est généralement accessible dans les centres de soins de santé primaires. Cependant, le manque d'achèvement de la vaccination lancée, est un défi permanent. Ceci a été attribué à la connaissance et inappropriées pauvres attitudes des soignants à la vaccination de routine. Cette étude visait à accéder à l'effet de l'éducation par les pairs sur la connaissance, l'attitude et l'exhaustivité de la vaccination de routine, dans le centre-nord du Nigeria.

Méthodes: L'étude a été menée dans deux communautés rurales dans le nord-centre du Nigeria. Paires mère-enfant ont été échantillonnées en utilisant la technique d'échantillonnage en plusieurs étapes. Les données ont été recueillies à l'aide de questionnaires pré et post-intervention de l'éducation par les pairs. Une valeur de $p < 0,05$ a été considérée comme statistiquement significative et une régression logistique a été utilisée pour évaluer les facteurs prédictifs de bonne connaissance.

Résultats: L'âge moyen des répondants était $27.25 \pm 6,69$ années dans le groupe d'étude et $29.39 \pm 7,71$ années dans le groupe de contrôle. La majorité des répondants des deux études (61,95) et les groupes de contrôle (54,1%) étaient âgés entre 20 et 29 ans et avait atteint le niveau de l'enseignement secondaire. Les scores de connaissances moyennes dans la communauté d'intervention améliorées de manière significative après l'intervention de 3,39 à 5,10 (sur 8 partitions). Les plus hauts prédicteurs de bonnes connaissances dans cette étude étaient l'âge maternel 30 - 39 ans ($p = 0,020$). Score moyen d'attitude dans le groupe d'étude a augmenté de manière significative de 4,17 avant l'intervention à 5,16 après l'intervention. La proportion d'enfants complètement vaccinés dans le groupe d'étude est passée de 57,3% avant l'intervention à 70,7% après l'éducation par les pairs.

Conclusion: l'éducation par les pairs est un moyen efficace d'améliorer les connaissances, l'attitude et l'exhaustivité de la vaccination de routine. Il devrait être largement utilisé par les travailleurs de la santé dans les zones à faibles couvertures vaccinales.

Mots clés: Education par les pairs, la vaccination, la connaissance.

Auteur correspondant: Dr Mathilda E. Banwat, Email: mathildabanwat@yahoo.com

¹Department of Community Medicine, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

²Department of Paediatrics, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

INTRODUCTION

Immunization is the cornerstone for survival, growth and development for current and succeeding generations. Human beings have benefited from the disease preventive ability of immunization for more than two centuries now (1). Perhaps the World Health Organization's (WHO) most spectacular achievement in disease prevention was the smallpox campaign of the 1960s and 1970s which culminated in the last naturally occurring case of smallpox in Somalia in 1977 (2). Today this example of success serves as a beacon of encouragement for international health workers involved in ongoing and challenging immunization campaigns against Poliomyelitis, Ebola virus disease, and other vaccine preventable diseases.

These vaccines are usually distributed at the first contact of individuals with health care services; at Primary Health Care centers. However, the delivery and acceptance of recommended vaccinations is an ongoing challenge for health-care providers and public health systems despite the availability of safe and effective vaccines (3,4). This can be attributed to poor knowledge of the devastating health effects of these diseases by care givers, misconceptions by parents and caregivers that these childhood diseases are 'normal' components of childhood and misconceptions about vaccination, among other reasons.

Reasons given by mothers for not completing immunization for their children as reported by an African study included lack of knowledge about the number of immunization sessions required to complete the schedule, perception that the child did not need particular vaccines and past history of side effects (5). These could easily and best be addressed by health education. Poor knowledge is more common among mothers who did not attend Antenatal care where health education was provided, had no access to mass media, had more children and had no formal education (5). Peer education has extensively been used in the health sector to improve use of contraceptives, HIV Counseling and testing and in behavior change in drug addiction and has been found to be an effective method of health education (6,7).

Routine immunization (national average) coverage rates for DPT3 in Nigeria for the years 2005, 2010 and 2011 were 30%, 74% and 59% respectively; comparable to the regional average but far below the globally recommended average of 90% (6,7). Immunization rates in Northern Nigeria are some of the lowest in the world despite the increased level of effort and resources devoted to the immunization program in Nigeria. A lot of efforts have especially been channeled to Poliomyelitis eradication in Northern Nigeria by all levels of the Nigerian government and donor partners. Full immunization rates range from 0.0% to 5.7% and rates for OPV-3 range from 12% to 21% despite multiple supplemental poliomyelitis vaccine campaigns each year since 2003 (6,7).

False beliefs or malicious rumors keep people from using immunization services (8,9). Other categories of problems that prevent immunization coverage from improving are: dropouts, missed opportunities, children and women who never use the health services and lack of geographic access (10,11,12). This study therefore set out to assess the effect of Peer education on knowledge, attitude to and completeness of childhood routine immunization among mothers of children less than two years of age in two rural communities in North-Central Nigeria.

MATERIALS AND METHODS

STUDY AREA

The study was conducted in two separate communities (Gindiri and Zarazong) located within two different Local Government Areas (LGAs) of Plateau State, North-Central Nigeria, namely Mangu (study) and Jos East (control) LGAs, respectively.

Gindiri is a community under Gindiri district of Mangu LGA in Plateau state Nigeria with an estimated population of about 2548 people (13). The people practice mainly Christianity or Islam. There was an estimated population of 297 children who were less than one year of age (13). There is one government owned PHC center in Gindiri, which offers routine immunization services for both children and pregnant women once a two weeks. Farming and trading are the

two main occupations of the people. Most of the populace was Pyem or Hausa by tribe. Zarazong is a rural community in Jos East LGA with an estimated total population of 1,926 and estimated 319 children less than one year of age.(13) It is a rural community of Jarawa indigenes who were mainly farmers, producing crops like yam, millet, maize and guinea corn. There were two health care facilities within the community, both offer routine immunization services weekly, one of which was owned by the LGA Government (13).

STUDY DESIGN

This was a Community-based interventional study with pre- and post-intervention components.

STUDY POPULATION;

This consisted of mothers of children one year old and less in both Gindiri and Zarazong communities.

Inclusion criteria: All mothers of children one year old and less were eligible for inclusion in both study and control populations provided they had been resident in the locality for at least six months. This was to ensure that they understood and were part of the cultural structure of the community and had same or similar perceptions and attitudes regarding routine immunization. Women in their third trimester of pregnancy were also included in the study as they would have had their babies and commenced routine immunization during the course of the study.

Exclusion criteria: Visitors in the community who were not likely to be in the area until the end of the study and migrant populations (Fulani herdsmen) were excluded from the study.

SAMPLE SIZE DETERMINATION

The minimum sample size (per group) was estimated using the formula

$$N = \frac{(Z_1 + Z_2)^2 \times 2 \times p(1-p)}{d^2} \quad (14)$$

Where

N= minimum sample size per group

Z₁ =95% confidence level = 1.96

Z₂ =20% B error (80% power) = 0.84

P= the proportion in the target population,

the state coverage rate at the time of the study was 63% (13).

d= expected difference between experimental group and the control group post-intervention which is 15%.

$$N = \frac{(1.96 + 0.84)^2 \times 2 \times 0.63(1 - 0.63)}{0.15^2}$$

$$N = 162$$

Making adjustment for attrition of 10%, the minimum sample size was

176 mother-child pairs

The minimum sample size per group was therefore 176 mothers/child pairs.

SAMPLING TECHNIQUE

Selection of subjects was done using multistage sampling technique. This was done in three stages.

Stage I

From the list of the five (5) LGAs in Plateau state, with the lowest immunization coverage rates (Mangu; 41%, Jos East; 46%, Pankshin; 50%, Langtang South; 51% and Shendam; 51%), Mangu and Jos East were purposively selected being the LGAs with the least immunization coverage rates in the state. Mangu was selected using simple random sampling technique by balloting and allotted as the study LGA while Jos East was allotted the control LGA.

Stage II

In each of the LGAs selected, all the (politica) wards were listed out to form the sampling frame (19 wards in Mangu LGA, 5 wards in Jos East LGA) and one ward in each LGA was selected by simple random sampling technique using the balloting system: Gindiri ward in Mangu LGA and Laminga ward in Jos East LGA.

Stage III

From a list of the 3 communities in Gindiri ward and the 4 communities in Laminga ward, one community each was selected by simple random sampling method. This was done by balloting. "Gindiri town" was selected as the study while Zarazong was selected as the control community. All the households in the study and the control communities were visited and all the mothers with children less than one year of age and pregnant women in their third trimester were recruited as a cluster to form the study and control populations.

SELECTION AND TRAINING OF PEER-EDUCATORS

Five respected, female members of the study community whose children are fully immunized were nominated in each community to serve as Peer educators. Criteria for their nomination included: being literate in Hausa or English, ability to communicate fluently in Hausa and the local dialect, being resident in the community for at least 2 years. One each was selected to represent each of the five 'Unguwas' in the community. They were nominated with the help of the health worker in charge of the PHC in the community, the Village head and the social mobilization representative of the community. The Peer educators were trained regarding Routine immunization: its importance to the health of children under one year of age, the vaccine preventable diseases, misconceptions about immunization, the immunization schedule and the importance of completing the immunization schedule. They were trained during a two-day session organized in the Community's PHC clinic by the researcher.

The researcher drew up an action plan to be implemented by the peer educators in the study community; it consisted of regular (at least monthly) one-on-one visits by peer educators to each caregiver/pregnant woman in their 'Unguwa' in order to enquire about their children's immunization status as well as give counseling on the benefits of routine childhood immunization and growth monitoring using the immunization cards. They also followed up each expectant mother and inquired about her immunization appointments and that of the newborn (after the delivery). The peer educators also used available avenues like women's meetings in worship places and social groups to re-enforce health education given in "Unguwas".

Regular monthly visits were paid to the Peer educators in the study community by the researcher to ensure success of the implementation of the action plan. At each visit, they presented a list of the women they had visited and a separate list of women who still resisted giving their children routine immunization for discussion with the village head. They were called on phone a week before

the monthly visits to hear of their progress and any difficulties they were encountering. Peer educators were given monthly monetary incentives.

STUDY INSTRUMENTS

A semi-structured interviewer-administered questionnaire consisting of three sections was formulated based on the objectives of the study and used in quantitative data collection for the study. The questionnaire was pre-tested in Langai village, a village with similar demographic characteristics with the study population, before administration in the communities, to aid in detecting any difficulty and ambiguity in the questionnaires, needing necessary correction. The questionnaire was structured into sections:

Section A; Socio-demographic profile of respondents

Section B; Knowledge and Attitude of caregivers regarding routine immunization.

Section C; Immunization status of children less than one year of age.

Data analysis

A child was termed "Fully immunized" if he/she was fully immunized for his age and immunization coverage was calculated based on the number of children who were fully immunized for their age in that community. Knowledge was graded as good or bad, while attitude was graded as appropriate or inappropriate based on the response of subjects to questions that assessed such.

Statistical analyses

The Student's T-test was used to assess difference in mean knowledge and attitudinal scores pre- and post-intervention. Logistic regression was also done to evaluate predictive factors for a mother to have good knowledge and attitude and for her child being fully immunized. The variables used for Logistic regression were only those that had shown statistically significant association using chi-square test. A confidence interval of 95% was used in this study and a p-value of 0.05 was considered significant.

Ethical considerations: Ethical clearance was obtained from the Jos University Teaching Hospital (JUTH) Ethical Committee before the study commenced. A written permission was obtained from the Local Government Chairmen and the village heads of both the study and control communities. Written informed consent was also sought and obtained from each study and control subject before enrollment into the study. They were assured of confidentiality of any information they gave and each subject was given the option to opt out of the study if they so wished and the refusal of participation did not attract any punishment or denial of benefit due them.

Limitations of the study: The protracted strike of Local Government Workers in Plateau state made access to immunization increasingly difficult for the mothers and may have affected the immunization coverage.

RESULTS

The mean age of the respondents was 27.25 ± 6.69 years in the study group and 29.39 ± 7.71 years in the control group; Their ages ranged between 18 and 48 years in both groups. Majority of the respondents in both study (61.95) and control groups (54.1%) were aged between 20 and 29 years of age, had attained secondary level of education, lived less than 30minutes trekking distance from the PHC center offering Routine Immunization in their locality and had index children aged between 4 and 7months of age. (Table 1)

Mean knowledge score of respondents in the study group increased from 3.39 out of 8 pre-intervention to 5.10 out of 8 after peer education. This difference was statistically significant with a p-value less than 0.0001. There was also a statistically significant difference in mean knowledge scores in the control group. (Table 2)

Logistic regression showed that good knowledge about routine immunization was more likely in respondents who were from the age groups 20–29years ($p = 0.036$) and 30–39 years, ($p = 0.020$), and were other tribes apart from Pyem, Jarawa or Hausa/Fulani ($p = 0.040$). Being aged 30–39 years had the most predictive role in this study. (Table 3)

Mean attitudinal score of subjects in the study group increased significantly from 4.17 pre-intervention to 5.16 post-intervention. There was no statistically significant difference in mean attitudinal scores in the control group (3.99 ± 1.52 to 3.80 ± 0.93). (Table 4)

The proportion of fully immunized (for age) children in the study group increased from 57.3% pre-intervention to 70.7% after peer education; however, this difference was not statistically significant ($p = 0.149$). The proportion of index children not fully immunized for age in the control group increased from 39.8% to 44.1% post intervention. (Table 5).

DISCUSSION

Majority of the studied respondents were aged between 20 and 29 years of age in both groups. This finding is in consonance with that of the National Demographic Health Survey in 2008 which showed that 47% of Nigerian women would have given birth by the age of 20 years (15). The highest proportion of women in both groups had attained secondary education; some completing it but most dropped out at various levels. This result also corresponds to the finding of the National survey which found that over 30% of women had either completed or dropped out of secondary school in the North Central zone of the country; with rural women less likely to be educated than their urban peers (15). Other studies among a similar population in other parts of the country, sub-Saharan Africa and other developing counties had similar findings (16,17,18). Education, particularly for women of child-bearing age, increases chances of having knowledge about health promotive activities like immunization and also the financial access to such services for herself and her family.

There was a statistically significant difference in the mean knowledge score of respondents in the study group (pre- and post-intervention); unlike that of the control group. This shows the value of peer education in improving knowledge of routine immunization coverage (19,20). A study in Pakistan showed that health education improved timing of immunization, mothers' knowledge about immunization and reduced missed immunization

episodes in a rural community (21). Another study in Oyo state suggests that provision of health information on immunization to expectant mothers during Antenatal clinic visits will improve awareness about immunization (22).

A logistic regression to assess predictive factors for good knowledge about RI among mothers showed that being aged between 20 and 39 years as well as being other tribes apart from Jarawa, Pyem or Hausa-Fulani were the only significant factors. Maternal age of 30-39 years was noted to have the highest predictive value in this study. Maternal age has been concluded by other researchers to be the one most influential maternal determinant of childhood immunization status and maternal knowledge regarding VPDs (23,24).

In this study, Peer educators were used as 'reminders' to mothers to keep immunization clinic appointments. This they did by two-weekly or monthly visits to clients' homes, discussions with women groups in worship places and during daily interactions. They acted as potent motivators to mothers as well since they were well respected members of the community. Post-intervention, they were the main source of information on immunization to study subjects. Other researchers have used other patient reminder systems and improved immunization coverage appreciably (25). Reminder systems are an effective method of improving immunization coverage since a significant proportion of caregivers have been researched to miss immunization appointments due to forgetfulness (26).

Mean attitudinal scores were good (above 50% of available scores) pre- and post-intervention in both study and control groups; however there was a statistically significant difference in the mean attitudinal scores pre- and post-intervention in the study group only. This fairly good attitude explains the fairly high immunization coverage in the studied communities. A poor attitude, holding of misconceptions and beliefs regarding immunization has been a major reason for the needlessly slow pace of Nigeria's polio-eradication programme and acceptance of routine and supplementary immunization services in

most of northern Nigeria (4,5,12).

Attitude to routine immunization assessed by a study in Lagos showed that the attitude of mothers to immunization was fair and significantly associated to immunization status of their children (26). A national survey in the United States of America showed that caregivers' attitudes, beliefs and misconceptions towards immunization are a strong predictor of whether or not a child is under-vaccinated and suggested that these poor attitudes should be the focus of health education intervention to improve vaccine coverage (25). Healthcare Service delivery related issues that make care-givers develop negative attitudes could range from misconceptions regarding the content of vaccines to the prolonged waiting time, the child's reaction to vaccination, unfriendly attitude of staff in the immunization.

Both pre- and post-intervention, in both study and control groups, more than half of the studied subjects' children were fully immunized for age. This finding is comparable to the findings of the Nigerian national survey for the North-Central Zone of the country where the study area is located (27). In contrast, it was reported from a studies in South-Western Nigeria, that there was a low immunization status (for age) among studied subjects (28,29). This can be attributed to the fact that immunization coverage in this study was based on whether a child was fully immunized for age based on documentation from the immunization card unlike the other study which based coverage on hospital records or on coverage of specific vaccines like the Pentavalent vaccines or MCV.

CONCLUSION

This study therefore concludes that peer education is effective in improving Knowledge and attitude of caregivers on routine immunization, as well as completeness of immunization of their infants. It is therefore recommended that the use of Peer educators should be expanded by rural health workers in areas with poor immunization uptake, lateness of immunization and low immunization coverage in the country.

Conflict of interest: No conflicts of interest declared.

REFERENCES

1. Stern, AM and Markel, H. The History of Vaccines and Immunization: Familiar Patterns, New Challenges. *Health Affairs*, 2005; 24(3): 611 – 621, Available at www.healthaffairs.org. Accessed 12/3/12.
2. United States Agency for International Development (USAID), *Essentials of Immunization; A Practical Field Guide*. USAID Washington DC. 2005, 27-54.
3. Brown, DW, Burton, A, Gacic-Dobo, M, Karimov, R. A summary of global routine immunization coverage through 2010. *The open infectious diseases Journal*, 2011; 5:115-117.
4. Jombo, G.T.A., Enenebeaku, M.N.O., Salako, A., Nimzing, L., Egah, D.Z., Kandakai, O. Beliefs and perceptions about poliomyelitis among adult women in a Nigerian city: Implications for global polio eradication early 21st Century. *The Internet Journal of Pediatrics and Neonatology*; 2008;8(1).
5. Wiysonge CS, Uthman OA, Ndumbe PM, Hussey GD (2012) Individual and Contextual Factors Associated with Low Childhood Immunization Coverage in Sub-Saharan Africa: A Multilevel Analysis. *PLoS ONE* 7 (5) : e 3 7 9 0 5 . doi:10.1371/journal.pone.0037905
6. Center for Disease Control, Global routine vaccination coverage, 2010, *Morbidity and Mortality Weekly Report*, 2011;60:1520-1522
7. Center for Disease Control, *Vaccine-Preventable Diseases: Improving vaccination coverage in children, adolescents, and adult*. M M W R A v a i l a b l e a t www.cdc.gov/mmwr/pdf/rr/rr4808.pdf Accessed 16/4/11.
8. Mapatano M.A., Kayembe K., Piripiri L., Nyandwe K., Immunisation-related knowledge, attitudes and practices of mothers in Kinshasa, Democratic Republic of the Congo. *South African Family Practitioner*, 2008;50(2):61-69.
9. Bernsen, R.M., Al-Zahmi, F.R., Al-Ali, N.A., Hamoudi, R.O., Ali, N.A., Schneider, J., Al-Mutawa, J., Grivna, M. 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.
10. Rosenthal JO, Rodewald LA, McCauley MA, et al; Immunization coverage levels among 19- to 35-month-old children in 4 diverse, medically underserved areas of the United States. *Pediatrics*: 2004; 113(4) 296-302.
11. Usman HR, Akhtar SA, Habib FA. Redesigned immunization card and center-based education to reduce childhood immunization dropouts in urban Pakistan: A randomized controlled trial . Available at <http://www.ncbi.nlm.nih.gov>. Last assessed 5/4/2009.
12. Kunle-Olowu, A., Kunle-Olowu, O.E., Emeka, U.M. Immunization coverage of antenatal and immunization clinics attendees in the Niger Delta University Teaching Hospital. *Journal of Public Health and Epidemiology* Vol. 3(3), pp. 90-93, March 2011
13. Plateau State National Programme on Immunization Office. Plateau State Epidemiological Unit. 2007-2009 data.
14. Araoye, MO (2005). Ch 7, 'Sampling techniques', In: *Research methodology with statistics*, Ilorin, Nigeria: University Press, 68 –91.
15. National Population Commission (NPC) {Nigeria} and ICF Macro. 2009. Nigeria Demographic and Health Survey 2008. Abuja, Nigeria: National Population Commission and ICF Macro.
16. Bhuiya, A., Byuiya, I., Chowdhury, M. Factors affecting acceptance of immunization among children in rural Bangladesh. *Oxford Journals, Health Policy Plan*, 1995; 510(3):304 – 312
17. Oche, M.O., Umar, A.S., Ibrahim, M.T.O. and Sabitu, K. An assessment of the impact of health education on maternal knowledge and practice of childhood immunization in Kware, Sokoto State. *Journal of Public Health and Epidemiology*, 2011;3(10), 440-447, Available at <http://www.academicjournals.org/JPHE>. ISSN 2141-2316 ©2011. Accessed 12/1/13.

18. Stokes-Prindle,C., Wonodi,C., Aina,M., Oni,G., Olukowi,T., Ali Pate,M., Privor-Dumm,L. & Levine,O. Landscape analysis of routine immunization in Nigeria: identifying barriers and prioritizing interventions. International Vaccine Access Center (IVAC) Johns Hopkins Bloomberg School of Public Health Available at www.jhsph.edu/ivac Accessed 16/1/13
19. Alvade,S., Desai,S., Maternal education and child health: is there a strong causal relationship? *Demography*, 1998; 35 (1): 71-81
20. Nankabirwa,V., Tylleskar,T., Tumwine,J.K., Sommerfelt,H. Maternal education is associated with vaccination status of infants less than 6 months in Eastern Uganda: a cohort study, *BMC Pediatrics* 2010, 10:92 doi:10.1186/1471-2431-10-92. Available at <http://www.biomedcentral.com/1471-2431/10/92>. Accessed 16/12/12
21. World Health Organization. Childhood vaccination in Africa and Asia. Available at www.who.int/bulletin/volumes/86/6/07-047159/.../index.html Accessed 18/12/12.
22. Anjum Q, Omair A, Inam SN, Ahmed Y, Usman Y, Shaikh S. Improving vaccination status of children under five through health education. *The Journal of the Pakistan Medical Association*. 2004; 54(12):610-613.
23. Mabrouka A.M., Bofarraj.I., Knowledge, attitude and practices of mothers regarding immunization of infants and preschool children at Al-Beida City, Libya, Egypt. *Journal of Pediatric Allergy and Immunology*, 2011; 9(1):29-34.
24. Salmon, DA., Smith, PJ.,William, KY. Pan, WKY., Navar, AM., Omer, SB., Neal A. Halsey,NA. Disparities in preschool immunization coverage associated with maternal age. *Human Vaccines*, 2009; 5(8): 557 - 561 . A v a i l a b l e a t <http://www.landesbioscience.com/journals/vaccines/article/9009>. Accessed 17/12/12
25. Szilagyi PG, Bordley C, Vann JC, Chelminski A, Kraus RM, Margolis PA, Rodewald LE. Effect of patient reminder/recall interventions on immunization rates: a review. *The Journal of the American Medical Association*. 2000; 284(14):1820-1827
26. Awodele, O., Oreagba, IA., Akinyede, A., Awodele, DF., Dolapo, DC. The Knowledge and attitude towards childhood immunization amongst mothers attending antenatal clinic in Lagos University Teaching Hospital. *Tanzania Journal of Health Research*, 2010; 12(3): 65-69
27. National Population Commission (NPC) {Nigeria}and ICF Macro.2009.Nigeria Demographic and Health Survey 2008. Abuja, Nigeria: National Population Commission and ICF Macro.
28. Salako, AA., Oluwole, FA. An appraisal of immunisation in Nigeria: towards improving coverage. *Nigerian Hospital Practice*, 2009; 3 (3 - 4) . A v a i l a b l e a t www.ajol.info/index.php/nhp/article/view/45414. Accessed 22/12/12.
29. Adebayo BE., Oladokun, RE., Akinbami, FO. Immunization coverage in a rural community in Southwestern Nigeria. *Journal of Vaccines and Vaccination*, 2012;3(1):143. doi:10.4172/2157-7560.1000143.

Table 1: Socio- Demographic characteristics of Respondents (Pre-intervention)

Variable	Study (n= 176)		Control (n=181)		χ ²	P-Value
	Freq	%	Freq	%		
Age Group (Years)						
10 - 19	19	10.8	10	5.5	12.36	0.0062
20 – 29	109	61.9	98	54.1		
30 – 39	40	22.7	69	38.1		
40 – 49	8	4.6	4	2.3		
Highest Educational Status Attained						
None	27	15.4	22	12.2	3.19	0.3626
Primary	59	33.5	59	32.6		
Secondary	65	36.9	62	34.2		
Tertiary	25	14.2	38	21.0		
Tribe						
Indigenous tribe	77	43.8	88	48.6	2.76	0.2514
Others*	65	36.9	52	28.7		
Hausa/Fulani	34	19.3	41	22.7		
Distance From Phc						
< 30 minutes trek	106	60.2	98	54.1	17.36	0.0001
30 – 60 minutes trek	35	19.9	67	37.0		
>60 minutes trek	35	19.9	16	8.9		
Age of Index Child (Months)						
0 - 3	46	25.6	50	27.6	2.19	0.5334
4 – 7	48	27.4	51	28.2		
8 – 11	34	18.6	42	23.2		
12 – 15	48	27.4	38	21.0		

Others* = Igbo, Mwaghavul, Mupun, Berom, Rukuba.

Table 2: Mean knowledge scores of respondents

	Study Group		Control Group	
	Pre-intervention (n = 176)	Post - intervention (n = 163)	Beginning of study (n = 181)	End of study (n = 177)
Mean Knowledge Score±SD	3.39± 0.88	5.10± 1.74	4.16 ±1.26	4.58 ± 2.79
	Z test =-11.81;df = 337 ;p <0.0001 95% CI = -2.0001 to-1. 419		Z test =1.91;df = 356;p= 0.032 95% CI=0.868 to 0.028	

Table3: Logistic regression of factors associated with good knowledge

Exposure variables	Odds Ratio	95% CI	p – value
Age			
20-29	4.296	16.878	0.036
30 – 39	5.714	25.016	0.020
40 – 49	1.891	15.472	0.552
Education			
Primary	1.982	5.550	0.192
Secondary	1.425	4.175	0.517
Tertiary	2.993	10.928	0.097
Religion			
Muslim/Christian	0.627	1.462	0.280
Tribe			
Others	0.314	0.953	0.040
Pyem	0.732	1.830	0.620
Jarawa	0.819	0.486	0.525
Source of information			
Health personnel	2.834	14.274	0.2065
Media	1.862	12.462	0.5215

Table 4: Mean attitudinal score of respondents

	Study Group		Control Group	
	Pre - Intervention	Post - intervention	Beginning of study	End of study
Mean Attitudinal Score ± SD	4.17± 1.28	5.16 ± 1.98	3.99± 1.52	3.80 ± 0.93
	Z test =-5.49;df = 237;p <0.0001 95% CI = -1.344 to 0.636		Z test = 1.45;df =356 ;p = 0.1610 95% CI = -0.073 to 0.453	

Table5: Immunization Status of index Children

Immunization Status	Study group				Control Group			
	Pre - Intervention (n=176)		Post - intervention (n=163)		Beginning of study (n=181)		End of study (n=177)	
	Freq	%	Freq	%	Freq	%	Freq	%
Fully for age	101	57.3	106	70.7	109	60.2	99	55.9
Not fully	75	42.7	57	29.3	72	39.8	78	44.1
	$\chi^2=2.08$; df=1; p=0.149				$\chi^2=0.68$; df=1; p=0.411			