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Effectiveness of a Theory-Based Health Education on Knowledge of Long-Acting Reversible Contraceptives (LARC) among Women Attending Antenatal Clinics in Katsina State, Nigeria

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Abstract

This study assessed how a theory-based health education intervention affected pregnant women in Katsina State, Nigeria, in terms of their increased awareness of and intention to use long-acting reversible contraceptives (LARC). 796 women were first enrolled and randomized into intervention and control groups using a randomized controlled trial methodology. There were 685 responders in the final analysis. Data was gathered at baseline, three months, and six months after the intervention, and an organized educational module based on the Health Belief Model (HBM) was given. The effectiveness of theory-driven education in promoting reproductive health was confirmed by the intervention's notable improvements in LARC knowledge, health beliefs, and intention to use LARC.

Keywords: *Antenatal Women, Contraception, Health Education, Health Belief Model, Knowledge, LARC, Nigeria.*

Introduction

Increasing demand, access and uptake of contraception are key interventions to improve maternal health outcomes and ultimately reduce maternal deaths [1]. According to an estimate by Ahmed et al (2012) [2], family planning use averted almost 272,000 maternal deaths, globally and LARC methods are the most effective pregnancy preventing option for women of all ages [3, 4]. Studies in the US had suggested that much of the recent decline in adolescent pregnancy was attributable to improved contraceptive usage of the modern and more effective contraceptive methods [5].

Intrauterine devices (IUDs) and subdermal implants are examples of long-acting reversible contraceptives (LARC), which are known for their ease and reliability in preventing unintended births [6, 7]. Due to enduring obstacles such cultural misunderstandings, poor provider-client communication, and low knowledge, LARC use is still quite low in sub-Saharan Africa [8, 9]. This issue is reflected in Nigeria, which has high rates of maternal death and unmet contraceptive requirement [10]. Educational programs based on behavioral theory could influence contraceptive behavior [10].

A study by Johnson and his colleagues in 2003 identify lack of patient education, ineffective contraceptive methods, inconsistent use of contraception, unplanned sexual activity, and contraceptive failure as factors influencing unintended pregnancy. In the study, Johnson and his colleagues did not give any statistics

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regarding how knowledge on contraceptive method influences the rate of unintended pregnancies by negating bad contraceptive choice and inconsistent contraceptive leading to contraceptive failure [11].

In their Cochrane Database of Systematic Reviews, Hiller and his colleagues in 2010 concluded that there are no enough randomized controlled trials to establish effectiveness of LARC contraception education use [12]. They also concluded that this type of education may be effective in increasing the short-term use of contraception rather than permanent behavior change. Many women would have liked to delay their next pregnancy for up to 2 years, but unfortunately, too few leave obstetrical delivery services having received no or little counselling about postpartum family planning or contraceptive methods [13]

Knowledge of contraception is the ability of women to clearly understand the various types of contraceptives. Good knowledge of the various methods of contraceptive and how they work will clear misconceptions with regards to contraceptives and help in inform decision [14]. Nsubuga et al. 2016 in their study assess the contraceptive use, knowledge, attitude, perceptions and sexual behaviour among female University students in Uganda found that knowledge of conceptive in high but utilization is low.

A study to assess knowledge and utilization of LARC among health care works in South Wollo zone hospitals, Northeast, Ethiopia revealed that utilization of long-acting contraceptive methods among female healthcare providers was found to be 33.6% (95%, CI 29–39). Knowledge of respondent and ability to discuss with partner are determinant for use of LARC, and users of long acting and permanent contraceptives increased with higher knowledge among respondents [15].

Another study in South Africa by Hlongwa and Hlongwane, 2021 [16] among health care workers confirms that women with some little backgrounds of education were more likely to use contraceptives than their counterparts with no education. A study in Nigeria among 330 respondents revealed that though the knowledge of contraceptives was high (83.3%), only 15% of respondents use modern contraceptive method [17].

A study in southern Nigeria, tertiary hospitals show high utilization rate of LARC methods (65.6%) and implants accounted for 75% of LARC used. Higher education, more than 3 living children, previous use of LARC, good knowledge, and positive attitude of the women about LARC were significant determinants of utilization among the women. Desired family size was the highest reason for contraception among LARC users, while spouse disapproval, fear of procedure and side effects were reasons for non utilization [18].

Knowledge of contraceptive/contraceptive education is generally a standard component of postpartum care, although the effectiveness is seldom examined [19]. According to theory-based interventions of contraception, although the use of theories has been widely used in interventions, but such interventions have no theoretical bases. In other words, no single theory can address contraceptive behaviour. The review included 25 randomized controlled trials (RCTs) that were based on different theoretical approaches on both determining contraceptive choice and contraceptive use. The review found nine trials to be of moderate to high quality evidence and a form of an intervention effect. Five out of the nine were based on Social Cognitive Theory (although the duration of the interventions varied) while the remaining four used motivational interviewing (MI). The Social Cognitive Theory trials mainly focused on adolescents with multiple but longer sessions while those that based on social motivational interviewing had a wider age range and targeted specific populations. The review concluded that interventions should be designed based on available resources, environment setting and target clients. Also, the

longer the intervention, the better the outcome [20].

A Systematic Reviews of Cochrane Database also concluded that the effectiveness of LARC education use has not yet been established in randomized controlled trials [21]. However, Health service integration has ¾come an important topic of discussion in global health which intuitively, moving from vertically administered services to an integrated platform, has the potential to improve service delivery efficiency, access, and uptake [22]. Even though integrated family planning and infant immunization services have been implemented over years, however, limited evidence exists to support its effectiveness [23].

Many interventions and programs aimed to improve rate of LARC use among women in low- and middle-income countries including access to clinical and community maternal, Neonatal, Women's Health Services and studies were conducted to assessed intervention strategies to increase the use of contraception in the immediate and extended postpartum periods [24].

Contraceptive use in Nigeria consists primarily of relatively less effective short-term family planning (FP) methods, despite extensive research showing effectiveness and acceptability of long-acting reversible contraceptives with the resultant high fertility that contributes to high maternal mortality in Nigeria. Despite that Nigeria has only 2% of the global population, it was estimated that it contributes a disproportionate estimate of 20% to the global burden of annual maternal deaths [25]. Factors that would facilitate efforts to increase the contraceptive use among Nigerian women will include deeper knowledge and understanding of which Nigerian women would choose contraception if affordable and acceptable methods available.

According to the Nigeria multiple indicator survey MICS 2021, the percentage of women who are married or in union and are currently using modern contraceptive in Katsina State is only 7.6; with only 0.2 and 2.2% using IUD and implants respectively. Percentage of unmet need for Family planning is 24.2% [26].

Various interventions employing various theories have been employed to change health behaviour but educational intervention addressing contraception usually have no explicit theoretical base hence the need to scan various theories to see which encourage or improve contraceptive use most in each situation [19]. However, it has been shown that interventions that aimed at improving woman's self-confidence (empowerment), particularly with reference to their own health, increase uptake of contraception especially in urban context [27].

Therefore, this study evaluates the effectiveness of Theory-Based Health Educational Intervention program on the knowledge and attitude regarding LARCs' family planning and contraception's Among Women Attending Antenatal Clinics in Katsina State, Nigeria.

Research Question

1. What is the effect of theory-based health education intervention on the knowledge of LARCs' family planning Among Women Attending Antenatal Clinics in Katsina State, Nigeria?

Significance of Study

Results from this study if positive, will help in the strengthening the evidence of effectiveness of theory-based health education interventions towards curbing the high prevalence of unintended pregnancies and increase in uptake of LARCs. It will also improve on the counselling skills and techniques of the service providers by demonstrating to them that counselling is a critical part of family planning because the more knowledgeable a woman is about the efficacy and side effects of contraceptive methods, the more likely that she will initiate

and maintain a given method that suits her lifestyle and needs.

Also, the modules, if effective, will serve as reference guides and tools for further studies on new strategies to increase contraception especially of LARC among women of childbearing age. The findings from this study will contribute to the current body of knowledge on theories associated with behavioral modification interventions and provide information on the effectiveness of such theories in real life situations.

Study Objectives

The general objective of this study was to develop and evaluate the effectiveness of a theory-based health educational intervention on Knowledge of LARC among women attending antenatal clinics Katsina State, Nigeria.

Specific Objectives

The specific objectives of this study are:

1. To determine the Socio-demographic characteristics and reproductive history of women attending ante-natal clinic in Katsina State
2. To compare the Socio-demographic characteristics and reproductive history between the intervention and control groups
3. To identify the effectiveness of theory base health education on improving knowledge of LARC among women attending ante natal clinic in Katsina State

Study Hypotheses

The following hypotheses were formulated which guided the conduct of the study Hypotheses:

H_1: There are no significant differences in the socio-demographic characteristics and reproductive health history between the intervention and control group.

H_2: There is no mean difference in the level of knowledge regarding LARCs' family among intervention and control group at baseline and post intervention.

Materials and Methods

The study was conducted in Katsina State. The state is in northwestern geopolitical zone of Nigeria. It was created in 1987 from Kaduna state, Katsina is bordered by the Republic of Niger to the north and by the Nigerian states of Jigawa and Kano state to the east, Kaduna State to the south, and Zamfara to the west. As of 2025 the state has estimated population of 11,574,249. The state is a centre for Agriculture producing peanuts, cotton, millet, hides and guinea corn.

The study was a double blinded randomized controlled trial conducted in 6 selected Primary Health Facilities that provide antenatal care services across Katsina State. The two proportions formula by Lwanga and Lome show (1991) was used to calculate the required number (n) required for each group:

$$n=\frac{((Z1-\alpha/2\sqrt{(2P(1-P)}+Z1-\beta\sqrt{(P1(1-P1)+P2(1-P2))^2}}{(P1-P2)^2}$$

A total of 796 participants were randomized into two groups: 398 in the intervention group and 398 in the control group. The intervention group received health educational intervention program on LARC based on HBM via group counselling while control group received health education on immunization and breastfeeding. Pre-tested questionnaires were administered at baseline, 3 months and 6 months post-intervention.

The study population were women attending ante-natal clinics in selected Primary Health centers in Katsina state. The baseline (pre-intervention) data was collected from both the intervention and control groups in their respective facility using the data collection instruments. Questionnaires were administered by a trained enumerator at the study location via face-to-face interviews as some of the study participants could not read in Hausa language. The Questionnaire when tested for 263 pregnant women attending antenatal care

selected randomly shows good reliability with Chronbach's alpha values for Knowledge, perception and cue to action as 0.84, 0.74 and 0.79. Content validity was assessed using an expert group. The supervisory committee will go through the questionnaire to ensure that wordings of its items are clear and that they represent each content domain

List of women attending antenatal care in the selected primary health care facility. Participants were recruited on weekly basis. The lists of women coming for a first visit to the clinic and those attending for the first time was utilized to screen attendees for eligibility using a checklist containing a list of all the exclusion factors of the study. Informed consent was obtained from them and those who refused together with those who are ineligible would be excluded from the list. The remaining list of clients would form the sampling frame for 2 weeks.

A multistage cluster sampling method was used. With each of the primary health center serving as cluster.

Stage 1: The researcher adopts Katsina State Political zone namely Katsina, Daura and Funtua zone.

Stage 2: Two zones were selected from the 3 zones through a simple random sampling technique using roll pieces of paper carrying the names of the 3 zones enclosed for the research assistant to pick two from the three-zone.

Stage 3: One Local Government Authority (LGA) was selected randomly selected from each zone using table of random numbers

Stage 4: One health care facility that provides ante natal care was also selected from LGA each through a simple random sampling technique.

Stage 5: Participants for the study were randomly selected from the facility during ANC visit.

The inclusion criteria for the study was pregnant women between the ages of 15-49 years attending ante-natal clinics in a primary health centre irrespective of marital status, women who have never used any LARC method before, women who have no any medical, psychological, Obstetric or Gynecological conditions that are considered as contra-indicated (WHO guideline) to the use of LARC and women who are indigenes of Katsina State and reside in the respective ward/wards being served by the corresponding primary health centre. While the Exclusion Criteria for the study include women less than the ages of 15 years irrespective of marital status, women who were using LARC method prior to index pregnancy and are willing to continue, women with any condition (medical, psychological, Obstetric and Gynecological) that makes use of LARC contra-indicated (WHO guideline) and pregnant women that came to the who do not reside in Katsina were also excluded from the study.

SPSS version 26 was used for data analysis and *p*-value of less than 0.05 was taken as significant. Descriptive analysis was performed first to explore the baseline characteristics of the respondents as well as to explore their socio-demographic and reproductive and obstetric history. Measures of central tendencies and dispersion were used for continuous data and percentages for categorical data.

The descriptive analysis was followed by normality test, which enabled us to decide which test to conduct that is parametric or non-parametric. Chi-square test was performed to explore the homogeneity of participants' socio-demographic and health belief model components at baseline between the health education intervention and the control groups. McNemar's test was conducted to assess the effect of Health education intervention on categorical scores of knowledges, perception and self-efficacy towards LARC. The test was conducted to explore the changes that occurred within the respective groups between baseline and three months, and baseline and six post intervention. Independent t-test was conducted

to determine the mean difference between the intervention and the control groups at different times of the study and Mixed design repeated measures ANOVA was conducted to explore the difference between and within group pre and post intervention as well as interactions.

Results

Response Rate

Seven Hundred and Ninety-Six (796) were enrolled into the study with 398 participants in each arm of intervention and control groups. Of these, 56 participants were lost to follow-up in two months: 31 among the intervention group and 26 among the control group. The response rate for two months was 92.9% overall with 92.2 % and 93.5% for intervention and control groups respectively. Similarly, the response rate at six months was 86.1% overall with 85.1% and 86.9% for intervention and control groups respectively. Figure 1 below shows the participant recruitment process until the end of the study.

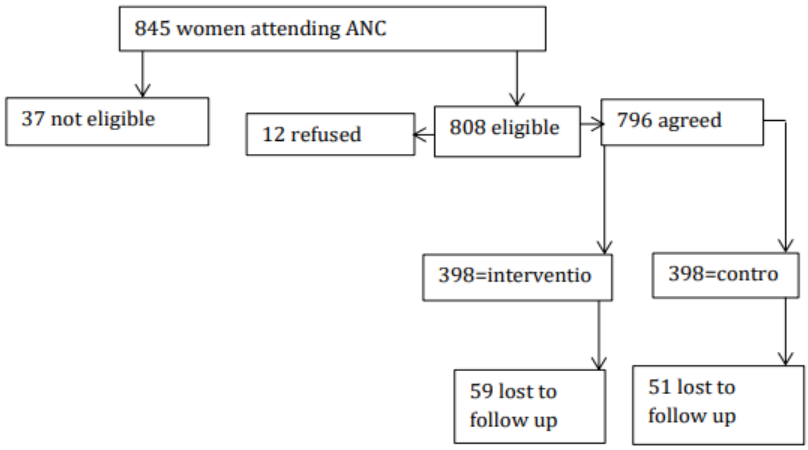

Figure 1. Flow Chart of Recruitment of Respondents

Socio-demographic Findings

Table 1 shows the distribution of respondents according to their socio-demographic characteristics, all the respondents 685 (100%) were females. Age of the respondents ranged between 15 to 49 years, with mean ± S.D age of 26.94 ± 4.622 and a median of 25 years. More than half of the respondents 356 (52.0%) had their ages within the range 20-29; 214(31.2%) had their ages within range 30-39; 75(10.9%) had age within 15-19, and only 40(5.8%) had their age ranges within 40- 49.

Hausa constituted most of the respondents 640 making (93.4%) of the ethnic group, followed by Fulani38 (5.5%); only 4(0.6%) were Yoruba and 3(0.4%) were Igbos. Majority of the respondents 678 (99.0%) were married; 5(0.7%) were widowed and only 4 (0.3%) were single. More than half of the respondents were married in a monogamous setting 479(68.9%0 and remaining were married in a polygamous setting 206(30.1%).

Majority of the respondents 248 (36.2%0 had secondary education, a total of 160(23.4%) had no formal education,181(26.4%) participants attended primary school, and only 96(14.0%) completed tertiary level of education. Similarly, Majority of the respondents Husband/Partner had either Primary, Secondary or no formal education 487(71.1%) with only 198(28.9%) that completed Tertiary education. Among the respondents 221(30.8%) were full time housewives, 11(1.6%) were students, 165(24.1%) were self-employed, 212(30.9) were employed by private sector and 86(12.6%) were government employee.

Table 1. Socio-demographic Characteristics of Participants (n=685)

Variables	Frequency and Percentage (%)			Type of test (value)	*p*-value
	Intervention	Control	Total		
Age group (years)					
15-19	36 (10.6)	39 (32)	75 (10.9)	χ^2 (0.347)	0.951
20-29	174 (51.3)	182 (52.6)	356 (52.1)		
30-39	108 (31.9)	106(30.6)	214 (31.2)		
40-49	21(6.2)	19(5.5)	40(5.8)		
Mean (SD)	27.67 (7.3)	26.71 (8.2)			
Ethnicity					
Hausa	317(93.5)	316 (91.3)	633 (92.4)	χ^2 (1.375)	0.503
Fulani	16 (4.7)	20 (5.8)	36(5.3)		
Others	6(1.8)	10(2.9)	16(2.3)		
Marital status					
Married	332(97.9)	341(98.6)	673(98.2)	χ^2 (0.382)	0.536
Widow/Divorcee	7(2.1)	5(1.4)	12(1.8)		
Educational status					
No formal educ.	96(28.3)	64(18.5)	160(23.4)	χ^2 (12.369)	0.006
Primary/no	92 (27.1)	89(25.7)	181 (26.4)		
Secondary	105 (31.0)	143(41.3)	248 (36.2)		
Tertiary	46 (13.6)	50(14.5)	96 (14.0)		
Husband Educ. status					
No formal educ.	60(17.7)	60(17.3)	120(17.5)	χ^2 (0.852)	0.837
Primary	80(23.6)	92(26.6)	172(25.1)		
Secondary	98(28.9)	97(28.8)	195(28.5)		
Tertiary	101(29.8)	97(28.0)	198(28.9)		
Employment					
Government	40 (11.8)	46 (13.3)	86(12.6)	χ^2 (13.816)	0.008
Others	299(88.2)	300(86.7)	599(87.4)		
Husband employ.					
Government	78 (23.0)	59 (17.1)	137(20.0)	χ^2 (11.720)	0.008
Others	261 (77.0)	290 (82.9)	551 (80.0)		

Reproductive and Obstetric History

Table 2 below shows reproductive and obstetric history of respondents. Majority of responds were married between 20-29 years of age (79.7%). Almost half of the respondents 168 (49.6%) in the intervention group and 182 (52.6%) of respondents in the intervention groups were gravida 1-3. Majority of the respondent 248(53.1%) in the intervention and 245(70.8%) of respondent have desired to have 5-8 children. Majority of the respondents both in the intervention and control group had their first delivery with the age group of 20-29yeras (53.1% and 60.4% respectively).

Majority of the respondents, 263 (77.6%) in the intervention and 268 (77.5) in the control group have previous history of contraceptive use. However, only 7.9% (5.4% and 2.5%) in the intervention and control group respectively used LARC. More than ninety percent (92.8%) of the respondents had no history of abortion.

Table 2. Reproductive and Obstetric History of Participants (n=685)

Variables	Frequency and Percentage (%)			Type of test (value)	*p*-value
	Intervention	Control	Total		
Age at first marriage (years)					
15-19	30 (8.8)	23 (6.6)	53 (7.7)	χ^2 (7.040)	0.030
20-29	280 (82.6)	266 (76.9)	546 (79.7)		
30-39	29 (8.6)	57 (16.5)	86 (12.6)		
No of pregnancy including index					
1-3	168 (49.6)	182 (52.6)	350 (51.1)	χ^2 (4.950)	0.084
4-6	98 (28.9)	112 (32.4)	210 (30.7)		
7 and above	73 (21.5)	52 (15.0)	52 (18.2)		
No. of Deliveries					
0-4	252 (60.5)	221 (63.9)	473 (69.1)	χ^2 (4.961)	0.030
Above 4	134 (39.5)	125 (36.1)	259 (37.8)		
No of living children					
1-4	231 (68.1)	245 (70.8)	476 (69.5)	χ^2 (4.012)	0.045
More than 4	108 (31.9)	101 (25.7)	209 (30.5)		
Desired family size					
1-4	48(14.4)	61(17.9)	109 (16.1)	χ^2 (1.620)	0.445
5-8	248 (53.1)	245(26.6)	245 (71.8)		
More than 8	38 (11.4)	35 (10.3)	73910.8)		
Abortion history					
No	324 (95.6)	312 (90.2)	636 (92.8)	χ^2 (7.523)	0.006
Yes	15 (4.4)	34 (9.8)	49 (7.2)		
Contraceptive use history					
No	263 (77.6)	268 (77.5)	137 (20.0)	χ^2 (11.720)	0.008
Yes	76 (22.4)	78 (22.5)	551 (80.0)		
Method of contraception used					
LARC(Implant)	19 (5.6)	18 (5.2)	37 (5.4)	χ^2 (8.907)	0.063
LARC(IUD)	11 (3.2)	6 (1.7)	17 (2.5)		
None	76 (22.4)	110 (31.8)	186 (27.2)		
Short acting	217 (64.0)	200(57.8)	417 (60.9)		
Traditional method	16 (4.9)	12 (3.5)	28 4.1)		

Baseline Comparison of Knowledge between Intervention and Control Groups

The levels of knowledge for the participants in the intervention and control groups were compared using Chi-square test and no statistically significant difference was noted between the two groups in any of the variables as shown in Table 3 below.

Table 3. Baseline Knowledge (N=685)

Variables	Frequency n (%)			Type of test (value)	*p*-value
	Intervention	Control	Total		
Satisfactory knowledge					
Yes	97 (28.6)	78 (22.5)	175 (25.5)		
No	242 (71.4)	268 (77.5)	510 (74.5)	χ^2 (3.317)	0.069
Mean (SD)	11.14 (3.494)				

Change in Knowledge among Intervention and Control Groups

Tables 4. and 5 show the corresponding change in knowledge for LARC following intervention in the intervention and control groups.

Change in LARC Knowledge from Baseline to Three-Month Post-Intervention

The participants in the intervention group had a significant increase in the proportion of those with satisfactory LARC knowledge from baseline to three-month post intervention (*p*-value <0.001). However, there was no significant increase in the proportion of those with satisfactory knowledge among the control group (*p*-value=0.864), as indicated in Table 4 and 5 repetitively.

The participants in the intervention group had a significant increase in the proportion of those with satisfactory knowledge on LARC from baseline to six months post intervention (*p*-value <0.001), as shown in Table 4. But there was no significant increase in the proportion of those with satisfactory knowledge among the control group (*p*-value =0.402), as shown in Table 5.

There was no statistically significant increase in the proportion of those with satisfactory knowledge on LARC from three months to six months post intervention (*p*-value <0.120) among intervention group as shown in Table 4 below. Also, there was no significant increase in the proportion of those with satisfactory knowledge among the control group (*p*-value =0.525), as shown in Table 5.

Table 4. Change in Knowledge Following Intervention in Intervention Group (N=339)

Variables	Frequency (n) and Percentage (%)		Change	*p*-value
	Time 1	Time 2		
Satisfactory knowledge				
	Baseline	**3 Months post**		
Yes	97 (28.6)	321 (94.7)		
No	242 (71.4)	18 (5.3)	66.1	<0.001*
	Baseline	**6 Months post**		
Yes	97 (28.6)	312 (92.0)		
No	242 (71.4)	27 (8.0)	63.4	<0.001*

	3 Months post	6 Months post		
Yes	321 (94.7)	312 (92.0)		
No	18 (5.3)	27 (8.0)	-2.7	0.120

*p-value was calculated using McNemar's test. *Significant at <0.05*

Table 5. Change in Knowledge following Intervention in Control Group (N=346)

Variables	Frequency (n) and Percentage (%)		Change	*p*-value
	Time 1	Time 2		
Satisfactory knowledge				
	Baseline	**3 Month post**		
Yes	78 (22.5)	84 (24.3)		
No	268 (77.5)	262 (75,7)	2.2	0.864
	Baseline	**6 Months post**		
Yes	78 (22.5)	90 (26.0)		
No	268 (77.5)	256 (74.0)	3.5	0.402
	3 Months post	**6 Months post**		
Yes	84 (24.3)	90 (26.0)		
No	262 (75,7)	256 (74.0)	1.7	0.525

p-value was calculated using McNemar's test

Group simple effect on LARC Knowledge mean Scores

Independent t-test was performed to determine group simple effects for mean knowledge scores on LARC at baseline, three- and six-months post-intervention between the intervention and the control groups. The test shows that there was no statistically significant difference between the mean of the two groups at baseline (*p*-value =0.069). However, there was a statistically significant difference between the means of the two groups at three months post intervention (*p*-value <0.001) and six months post intervention (*p*-value <0.001) as shown in Table 6.

The findings show that participants in the intervention group had a significantly higher mean knowledge score than the control group. This finding indicates that there is an improvement in LARC knowledge of the participants in the intervention group compared with those in the control group. As such it can be said that the health education intervention is effective in improving LARC knowledge of the participants in this study. The null hypothesis is therefore rejected, indicating that health education significantly enhanced knowledge about LARC.

Table 6. Group Simple Effect on LARC Knowledge at Baseline, Three Months and Six Months Post-Intervention

Variables	Mean		*df*	t value	mean difference (95% CI)	*p*-value
Baseline	**Intervention=339**	**Control n=346**				
	10.82	11.12	683	-0.553	-0.300 [-1.370- 0.770]	0.069
	Intervention= 339	**Control n=346**				

3 months post	21.32	10.28	683	44.816	1.034 [10.545-11.518]	<0.001 *
6 months post	**Intervention= 339**	**Control n=346**				
	20.61	10.28	683	36.526	10.329 [9.874-10.885]	<0.001 *

*t-test was used to calculate the p-value. *Significant at <0.05*

Effect of Group, Time and their Interaction on LARC Knowledge Scores

A mixed design ANOVA on knowledge scores revealed significant main effects on time and group as well as time*group interaction as shown in table 7 below. Knowledge scores changed significantly across the time points. The intervention group had higher overall knowledge than the control group ($F(1, 678) = 1257.17$, p-value <0.001, $\eta^2 = 0.176$).

Moreover, there was statistically significant interaction between time and group ($F(2, 1366) = 764.31$, p-value <0.001, $\eta^2 = 0.370$) shown in Table 8 indicting that knowledge increase over time differently for the two groups. In the intervention group the mean increases from M=11.94 at baseline to M=21.32 at 3 months and remains high at 6 months at 20.6. In contrast, the control group mean score for knowledge remained essentially M=10.35,10.28, and 10.28 at baseline, 3month and 6 months respectively.

This indicates that educational intervention produced knowledge gain that was sustained at 6 months whereas the control group showed no improvement in unchanged finding means that the intervention and control groups exhibited knowledge differently pre and post intervention, which shows the intervention is working.

Table 7. Summary table of repeated measures ANOVA for mean LARC knowledge scores (Within and Between Group)

Source Variable						
LARC knowledge scores	**Type III sum of squares**	***df***	**Mean square**	**F**	***p*-value**	**Partial Eta η^2**
Time	9116.432	2	4558.21	738.644	<0.001*	0.118
Group*time	9433.267	2	4716.67	764.315	<0.001*	0.370
Error (time)	8367.961	1366	6.171			

Note: (*) – significant p< 0.05

Table 8. Summary table of repeated measures ANOVA for mean LARC knowledge scores (Between subject)

Source Variable						
LARC knowledge scores	**Type III sum of squares**	***df***	**Mean square**	**F**	***p*-value**	**Partial Eta η^2**
Intercept	407062.5	1	4558.21	1752.48	<0.001*	0.962
Group	29835.03	1	4716.67	1257.16	<0.001*	0.650
Error	16090.29	678	23.732			

Note: (*) – significant p< 0.05

Discussion

This study evaluates the effectiveness of Theory-Based Health Educational Intervention program on the knowledge regarding LARCs' Among Women Attending Antenatal Clinics in Katsina State, Nigeria. The findings of this study revealed the following results: Statistical

significance exists in knowledge of long-acting reversible contraceptive after health education intervention program. The findings of the research questions showed that health education intervention Programme has impact on knowledge of LARC among the respondents because majority of the respondents' knowledge of LARCS has increased after the health education intervention Programme. The findings in this study agree with a study conducted by Aderibigbe et, al 2010 who conducted study on Effect of Health Education on Knowledge and Practice of Contraception among Students of Public Secondary Schools in Ilorin [9]. And found out that There was a statistically significant increase in the proportion of study respondents that came to know of contraception at post intervention. Similar results were observed by [29], who noted improved knowledge after structured contraceptive education programs. Similarly, contraceptive awareness improved following structured programs in a study by Seigh et al [29].

However, the study contradicts with others that have shown a low level of knowledge regarding pregnancy prevention in Sub-Saharan African adolescents [8]. A study conducted in Nigeria revealed that among adolescents enrolled in school, only 47% knew that pregnancy could occur from a first act of intercourse. Eighty-four percent reported that they believed sexuality education should be provided in school, but only 43% reported receiving any. Another study of Nigerian conducted by Bassey in 2025 on adolescents in school showed that 74% had misconceptions or negative attitudes about contraception, and that a positive attitude toward contraception was associated with use [14].

The finding also revealed that Statistical significance exists in intention to utilized LARCs family planning after health education intervention program this is similar to study conducted by Gebremariam in 2014 on intention to use long acting and permanent contraceptive methods and factors affecting it among married women in a Tigray town, Tigray, Northern Ethiopia, journal of reproductive health, who found out that there was statistically significant association of intention to use LARC among those who knew at least one method of LARCs compared to their counterpart [13].

These findings are similar with result of a study conducted by Berihun in 2022 on Women's intention to use long acting and permanent contraceptive methods and associated factors among family planning users in Addis Ababa, Ethiopia: found that the prevalence of intention to use LARCs was 60%. The most preferred method participants intend to use in the future was implants which account for 175(60.8%), followed by IUCD 106(36.8%) [14]. The study also shows that Respondents who had information of long acting and permanent methods were 3 times more likely to have intention to use contraception than their counterparts (AOR:2.89,95% CI:1.33-6.29) [30].

Conclusion

This study demonstrates that theory-based health education significantly enhances knowledge and health beliefs about LARC among antenatal women in Katsina State. Health education intervention programme was conducted using training manual developed by the researcher. Data from 685 respondents were duly completed and returned for data analysis. Frequency count and percentage were used to organize and describe the demographic characteristics of the respondents while Sub-hypotheses were tested using paired sample t-test and independent t-test. The entire hypotheses were tested at 0.05 level of confidence

Demographic data showed that most participants were Hausa (93.4%), married (99%), and within the age range of 20–29 years.

There were no significant differences between the intervention and control groups at baseline regarding knowledge and HBM components.

Following the intervention, the proportion of women with satisfactory knowledge of LARCs increased significantly in the intervention group from 28.6% at baseline to 94.7% at 3 months and 92.0% at 6 months ($p < 0.001$). No significant change occurred in the control group. Similarly, the mean knowledge scores in the intervention group rose from 10.82 to 21.32, while scores in the control group remained around 10.28. Repeated measures ANOVA confirmed a significant interaction between time and group ($F = 764.31$, $p < 0.001$, $\eta^2 = 0.370$).

This study concludes that a theory-based health education intervention significantly improves knowledge about LARCs among antenatal women. Such interventions should be integrated into routine antenatal services to enhance informed reproductive choices.

Recommendations

Health policymakers should incorporate structured, culturally appropriate educational modules into ANC services. Training of health educators and use of local languages are essential for effective communication. Future research should explore longitudinal outcomes and adapt the model to other Nigerian states.

Recommendations for further studies

- The following studies are recommended for future researchers'
- Impact of health education program on LARC utilization.
- Assessment of health education intervention implementation
- Future studies evaluating the role of men in the acceptance and utilization of LARC methods are encouraged.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this study. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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