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RESEARCH ARTICLE

Knowledge and factors influencing long acting reversible contraceptive use among women of reproductive age in Nigeria [version 1; peer review: 1 approved with reservations]

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Abstract

Background: Over a month when contraception is used, approximately 48% of unintended pregnancies occur as a result of human error, which is largely due to incorrect use, poor adherence and/or technology failure. Long-acting reversible contraceptive (LARC) methods have been developed to bridge this gap because it's not dependent on compliance with a pill-taking regimen; remembering to change patch or ring; or fixing an appointment with physicians. The main aim of this study is to examine the characteristics of women associated with use of LARC and also to examine the relationship between knowledge of LARC and its current use.
Methods: This study assessed the PMA2020 secondary dataset using female datasets from PMA 2016 (Round 3) exercise. PMA 2016 was a survey carried out in seven states of Nigeria. The target population for this study was women of reproductive age (15-49 years) currently using any method of contraception prior to the survey. The weighted sample size of women meeting inclusion criteria in this study is 1927. The data were analyzed using frequency distribution, chi-square and logistic regression.
Results: The results showed that 21.0% of women were using traditional methods. Concerning LARC methods, the table showed that 14.8% of the sampled women were using LARC methods. Findings further revealed that at both levels of analysis there is a significant relationship (P<0.05 and P=0.00 for binary and multivariable logistic regression, respectively) between knowledge of LARCs and uses in this study. This means that the use of LARC is being influenced by its knowledge among women of reproductive age in Nigeria.
Conclusions: This study concludes that 14.8% of women using any methods of contraceptive were using LARC. Additionally, after controlling for other confounding factors, level of education, age of women, household wealth and number of living children were

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significantly associated with using LARC.

Keywords

Knowledge, Factors, LARC, Contraceptive use, Women, Reproductive age, Influencing, Nigeria.

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Introduction

The rising use of contraception in Nigeria has given women the ability to choose the number and spacing of their children. It has also presented them with various remarkable life-saving benefits, such as reduction in maternal and infant mortality, good child spacing and better postpartum health outcomes. Recently, the expansion in choice of contraceptives available has given women the option of adopting the use of Long-acting reversible contraceptives (LARCs) including implant and intra-uterine device contraceptive methods that are highly effective and convenient with an added advantage of being long-lasting, require little or no maintenance. It has much better compliance rates than other hormonal methods and is also cost effective. LARCs are ideal pregnancy prevention options for many women compared with shorter-term and user-dependent methods, both of which increase the risk of non-compliance related method failure[1–4].

Long-acting devices, when initiated, provide at least 3 years of continuous pregnancy protection for women, and can give up to 10 years of protection. These devices are 99% effective because they are not subject to errors in use, unlike short-acting methods[2]. Also LARC methods have the ability to bridge the gap between "typical use" and perfect use" failure rates[1]. Over a month when contraception is used, approximately 48% of unintended pregnancies occur as a result of human error, which is largely due to incorrect use, poor adherence and/or technology failure. This can be avoided with the use of LARC methods, because they are not dependent on compliance with a pill-taking regimen, remembering to change a patch or ring, or arranging an appointment with physicians[5,6].

Nigeria's total fertility rate (5.5) is one of the highest in sub-Saharan Africa and globally. This is due largely to her high unmet need for family planning of (21.8%). Use of contraception is relatively low (17.1%) and this also reflected in the number of women that subscribed to LARC despite being the most cost-effective contraceptives. In Nigeria, knowledge about LARC in terms of intrauterine device (IUD) and implant shows that 36.8% of women have knowledge of IUD and 49.5% of implants[7,8].

Despite the level of awareness about the efficacy and safety of LARC, the use is not widespread among women of reproductive age in Nigeria. Hence, this paper examined the relationship between women's knowledge of LARC, their characteristics and the use of LARC in order to guide policy makers.

This paper sought to examine the relationship between knowledge of LARC, characteristics of women using LARC currently among women of reproductive age in Nigeria.

Methods

Data source

The study employed secondary data, which was extracted from the Performance Monitoring and Accountability (PMA) 2016

dataset[8]. PMA 2016 was a survey carried out in 7 states of Nigeria, Anambra, Kaduna, Kano, Lagos Nasarawa, Rivers and Taraba States between the 4th day of May to the 31st day of June, 2016. The survey used aboriginal enumerators who were familiar with the enumeration areas and also had a good command of the local language. A multistage sampling technique was employed, first to select enumeration areas (EAs) in each local government (LG) of the state, and also to randomly select households for an interview in each selected EAs. All females of reproductive age (15–49 years) living within the selected household were administered a female questionnaire by the enumerators. Information recorded on the questionnaires included the eligible female's background information, birth history, fertility preference, use of family planning methods and their reproductive health information among others. A total of 11,177 women were interviewed. The questionnaires used are available on OSF[9].

Scope of study

This study was limited to the PMA2020 secondary dataset using female datasets from PMA 2016 (Round 3) exercise[8]. It is expected to provide further insight into factors contributing to use of long acting contraception in Nigeria. The target population for this study was women of reproductive age (15–49) who are currently using any method of contraception prior to the survey. Accordingly, for women who met the inclusion criteria, the weighted sample size was 1927.

Operational definitions and study variables

In this study, the primary outcome of interest was LARC use among all contraceptive users at the time of the interview. The study focused specifically on contraceptive users rather than all of those at risk for unintended pregnancy. Current use of a LARC method is defined here as use of the contraceptive implant or the IUD during the month of the interview.

Knowledge of LARC was assessed by whether respondent have heard of implant or IUD. Respondents were considered as having knowledge if they responded "Yes" to the question "Have you ever heard of implant or IUD" at the time of interview. Source of information about family planning was also included in the study.

In order to assess women's demographic characteristics likely to influence LARC use, selected demographic characteristics that are theoretically related to use of LARC were included in the analyses. These include women's level of education, household wealth index, number of birth at first use of contraceptive, place of residence, age and marital status.

To answer the stated objectives, we first present frequency distribution of all the variables used in the study. Pattern of LARC use was assessed by the proportion of all contraceptive users using LARC methods by selected demographic characteristics. Knowledge of LARC was cross tabulated by use of LARC to show the relationship between the two variables and chi-square

test was used to show this relationship. Lastly, binary logistic regression was used to estimate odd ratios adjusting for demographic factors influencing the use of LARC.

Data processing and analysis

Data was exported to Stata version 14 for analysis. Descriptive statistics, including frequencies and proportions were used to summarize the variables. Binary logistic regression was used. adjusted odd ratios (AOR) with 95% confidence interval was estimated to show the strengths of associations. Finally, a p-value of less than 0.05 in the multivariable logistic regression analysis was used to identify variables significantly associated with long acting and reversible family planning method utilization.

Results

Table 1 shows the distribution of respondents that are currently using any method of contraceptives by selected socio-demographic characteristics. A total of 1,927 females were found to be currently using any method of contraception in the study. The mean age of respondents was 31.3 years and more than 40% of the current users fell within the age range of 25–34 years. Concerning the level of education, almost half (49.7%) of females had attended secondary education and 24.1% had proceeded to higher education. Marital status shows that majority (76.6%) of the respondents were currently married at the time of interview. More than half (59%) of the respondents reside in urban areas while 41% reside in rural areas. Regarding wealth index, the table shows that 43.1% were from rich households, 35.6% from poor household and 21.3% were from middle household. More than half (52.6%) of the respondents had 1–4 children before they started using any method of contraceptive. Raw data are available on OSF[9].

Table 2 presents respondent's contraceptives awareness and knowledge of LARC methods. The table shows that 28.5% read about family planning in newspaper/magazine, 49.7% heard about it on television and 67.2% heard on radio. Concerning awareness at health facility and from health worker, 53.6% of the respondents reported that they were talked to about family planning at the health facility and only 18.5% heard about family planning when visited by health worker in the last 12 months. Knowledge about LARC shows that 70.3% of women in the study had knowledge of the contraceptive implant and 55.5% female had knowledge of the IUD.

Table 3 presents practice of contraceptives among female who are currently using any method of contraceptives. The table shows that (76.5%) female that are currently using any method of contraceptive were using modern contraceptives (e.g. condoms, hormonal pill), and 14.8% of respondents were using LARC.

Table 4 presents pattern of LARC use among current user of contraceptive by selected socio-demographic characteristics. The table revealed that LARC use increases as the respondent's reproductive age increases. More women who reside in urban areas were using LARCs compared to those in rural areas. More women with secondary education used LARC methods

compared to women with no education, primary and higher education. Marital status shows that married women prefer LARC compared to divorced/separated, widow and never married. With respect to the household wealth index, the table shows that more women from poor households subscribed to LARC method compared to women from middle and rich household. Lastly, number of children at the time respondent started using contraceptive shows that more women that had 1–4 children subscribed to LARC methods compare to women with no child and women with more than four children.

Table 5 presents the association between knowledge of LARC and use of LARC methods among women that are currently using any method of contraceptives. The table revealed that at both levels of analysis (binary and multivariable logistic regression) there is a significant relationship (P<0.05 and

Table 1. Socio-demographic characteristics of respondents.

Variables	Percentage of respondents (N=1927)
Age group	
15–24	22.4
25–34	41.0
35+	36.6
Mean (SD)	**31.3 (7.9)**
Highest level of education	
Never attended	9.1
Primary	17.1
Secondary	49.7
Higher	24.1
Marital status	
Currently married	76.6
Divorced or separated	2.4
Widow	1.7
Never married	19.3
Place of residence	
Urban	59.0
Rural	41.0
Wealth index	
Poor	35.6
Middle	21.3
Rich	43.1
Number of children at first use of family planning	
None	31.2
1–4	52.6
5+	16.2

Table 2. Awareness of contraceptive methods and knowledge of long-acting contraceptive methods.

Variables	Percentage of respondents (N=1927)
Read about FP in newspaper/ magazine	
No	71.5
Yes	28.5
Heard about FP on television	
No	50.3
Yes	49.7
Heard about FP on radio	
No	32.8
Yes	67.2
Talked to about FP at health facility	
No	46.4
Yes	53.6
Visited by health worker about FP last 12 months	
No	81.5
Yes	18.5
Ever heard of implants	
No	29.7
Yes	70.3
Ever heard of intrauterine device	
No	44.5
Yes	55.5

FP, family planning.

Table 3. Contraceptive use.

Variables	Percentage of respondents (N=1927)
Current use of modern contraceptive method	
No	23.5
Yes	76.5
Current use of traditional contraceptive method	
No	79.0
Yes	21.0
Current use of long acting reversible contraceptive method	
No	85.2
Yes	14.8

Table 4. Pattern of use (long-acting reversible contraceptive method).

Variables	Percentage of respondents (N=285)
Age group	
15–24	9.8
25–34	44.6
35+	45.6
Place of residence	
Urban	51.6
Rural	48.4
Highest level of education	
Never attended	8.8
Primary	20.0
Secondary	48.4
Higher	22.8
Marital status	
Currently married	93.7
Divorced or separated	2.1
Widow	2.5
Never married	1.7
Household Wealth index	
Poor	43.5
Middle	18.3
Rich	38.2
Number of children at first use of family planning	
None	6.0
1–4	66.3
5+	27.7

Table 5. Association between knowledge and use of long-acting reversible contraceptives (LARCs).

Variables	Use of LARCs		
Ever heard of implant	No, % (n=1,642)	Yes, % (n=285)	Total, % (N=1,927)
No	34.4	3.2	29.7
Yes	65.6	96.8	70.3
	X^2=113.1, P=0.000*		
Ever heard of IUD			
No	47.0	30.2	44.5
Yes	53.0	69.8	55.5
	X^2=27.9, P=0.000*		

*Significant at $P < 0.05$. IUD, intrauterine device.

P=0.00, respectively) between knowledge of LARC and it uses in this study. This means that the use of LARC depends solely on the knowledge among women of reproductive age in Nigeria.

Logistic regression was employed to assess the net effect of selected variable theoretically related to use of LARC methods in Table 6. The result of logistic regression revealed that women who were 25 years and above, women with secondary and higher education, currently married and widow, women from rich household and women with one or more children were significantly associated with use of LARC methods.

Women who fall between the ages of 25 and 34 years were 1.67 times more likely to use LARC methods than those who aged 15–24 years, and those women that 35 years and above were 1.73 times more likely to use LARC methods than those aged 15–24 years.

Table 6. Factors influencing use of long acting reversible contraceptive method.

Variables	Odds ratio	P-value	Confidence interval
Age group (RC=15–24)			
25–34	1.67	0.05	0.9864-2.8171
35+	1.73	0.05	0.9849-3.0308
Place of residence (RC=Rural)			
Urban	0.92	0.70	0.6088-1.3919
Highest level of education (RC=Never attended)			
Primary	1.68	0.11	0.8826-3.2143
Secondary	2.64	0.00	1.4122-4.9475
Higher	3.30	0.00	1.5973-6.8293
Marital status (RC=Never married)			
Currently married	4.61	0.01	1.3566-15.6591
Divorced/separated	2.41	0.32	0.4298-13.5370
Widow	7.16	0.01	1.4163-36.2025
Household wealth (RC=Poor)			
Middle	0.88	0.61	0.5327-1.4458
Rich	0.57	0.03	0.3432-0.9442
Number of children at first use of family planning (RC=None)			
1–4	4.28	0.00	2.2500-8.1412
5+	6.08	0.00	2.9560-12.5079
Family planning discussion at facility (RC=No)			
Yes	1.38	0.06	0.9832-1.9499
Visited by health worker (RC=No)			
Yes	0.82	0.32	0.5617-1.2041
Constant	**0.00**	**0.00**	**0.0011-0.0177**

RC, recode.

Level of education shows that women with secondary school education were 2.64 times more likely to use LARC methods than those that never attended school and those women with higher education were 3.30 times more likely to use LARC methods than those that never attended school in the study. Concerning marital status, the results show that married women were 4.61 times more likely to use LARC methods than those that never married and widowed women were 7.16 times more likely to use LARC methods than those that never married.

With respect to household wealth index, women from rich households were 0.57 times less likely to use LARC methods than women from poor households. In addition, women with 1–4 children at the time of contraceptive use were 4.28 times more likely to use LARC methods than women with no child and women with more than 4 children at the time of contraceptive use were 6.08 times more likely to use LARC methods than women with no child. Lastly, women who heard about family planning at health facility were 1.38 times more likely to use LARC methods than those that heard it elsewhere.

Discussion
This paper assessed the relationship between the use of LARC among women that are currently using any method of contraceptive and both women's knowledge of LARC and the characteristics of women using LARC. The study revealed that LARCs were largely under-used among women that are currently using any method of contraceptives. To properly harness socio-economic opportunities and better child spacing the low use of LARC should be tackled because of its integral benefit of meeting women's reproductive needs in a context where woman are redefining their reproductive life style[4,10].

This study shows that there was an association between women's knowledge of LARCs and use of LARCs among women that are currently using any method of contraceptives. This is because women's knowledge about the efficacy and safety of LARC methods may strongly influence both the selection and decision to continue to use the selected method over time. These findings were in line with previous studies that say women will opt for LARC methods as their contraceptive method of choice when they have knowledge of the method[3,5,6,11–15]. Another study also affirmed that women reproductive life plans are being altered as result of misinformation and this prompt woman to adopt methods not suitable for themselves[16].

In addition, level of education was found to be associated with the use of LARC. The possibility of women with atleast secondary school education to control her reproductive need is very high. The higher the education of women the higher the propensity that they will adopt the use of LARC. Previous studies also corroborate this point that better educated women have access to information on modern contraceptive which may trigger their interest in the use of LARC[5,13,14,17–21].

Women aged 25 years and above were more likely to use LARC methods as compared to women aged 15–24 years. This result is in line with previous studies, which reported that

age of mothers was found to be associated with the use of LARC because the prevalence of LARC use increased with age[3,4,18,19,21].

Number of living children at the time of contraceptive use was significantly associated with LARC use. Suggesting that women wanted to space or limit childbirth as the number of surviving children increases. The higher the number of living children the higher the possibility of adopting LARC. The desire to limit the number of children will automatically come to play when women believe they have sufficient numbers of children so rather than adopting short-lasting, long-lasting methods will be preferred[4,17,18,22].

Furthermore, women from rich households were less likely to use LARCs. This is in contrary with other studies, which found that household wealth has a positive association with the use and wealthier women were more likely to use LARC than poorer women.[4,18,19].

Lastly, the study found that married women were more likely to use LARC methods. This is consistent with previous studies that showed that married women have good attitudes towards using LARC methods[12,19,23].

Limitations
This study was conducted among women of reproductive age who are currently using any method of contraceptive, which might not reflect a holistic view of all women of reproductive age in Nigeria. The study excluded women of reproductive age who are not using any method of contraceptive at the time of the survey.

Future suggestions
LARCs were largely under used among women that are currently using any method of contraceptives. The study revealed that LARCs were largely under-used among women that are currently using any method of contraceptives in Nigeria. To properly harness socio-economic opportunities and better child spacing, the low use of LARC should be tackled because of its integral benefit of meeting women's reproductive needs in a context where woman are redefining their reproductive life style. Therefore, women with lower educational level, high wealth index, and higher number of living children should be targeted by program strategies to control childbearing. Also, there is need for a communication strategy that would provide correct

information about LARC safety and effectiveness among women of reproductive age. Lastly, when discussing contraception with women, health care practitioners should discuss the risks and benefits of LARCs with women of all ages and recommend them as a first line method.

Conclusions
In conclusion, the findings of this study showed that 14.8% of women in Nigeria that are currently using any methods of contraceptive were using LARC methods. Additionally, after controlling other confounding factors, level of education, age of women, household wealth and number of living children as at the time of contraceptive use were significantly associated with using LARC. Also, knowledge of LARC was significantly associated with use of LARC. To effectively control the child bearing in Nigeria women with lower education, high wealth index and high number of living children should be the target audience among the women of reproductive age in Nigeria. Also, there is need for a communication strategy that would provide correct information about LARC safety and effectiveness among women of reproductive age. Lastly, when discussing contraception with women, health care practitioners should discuss the risks and benefits of LARC with women of all ages and recommend them as a first-line method.

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The authors address contraceptive use; a very important pillar in reproductive health. They focus on long acting reversible contraception among current contraceptive users. As already stated by the authors, long acting reversible contraceptives (LARC) are associated with higher contraceptive efficacy (less than 1 % failure rates) and higher rates of contraceptive continuity. Its contribution in shifting the contraceptive method mix to an ideal position in every population is significant and therefore a knowledge of some factors that can influence their uptake is vital.

The authors evaluate the knowledge of reproductive age women on LARCs and go further to identify some factors associated to LARC use. Globally the manuscript is well drafted with presented results responding only partially to the set objectives.

One key word in the title of the paper is knowledge but it is unclear if actually the knowledge was evaluated. Having heard of something does not necessary mean you know about it. We must be a little careful; using something gives you the opportunity to know about it. We are of the belief that use can influence knowledge and knowledge can also influence use. For example, you cannot be using IUD and say that you have never heard of it. The key question is what did you know about it before deciding to use? Also, "reproductive age" features as a key word in the title when the study was carried out among contraceptive users. From these analyses, we think the title of the paper should be changed because of its misleading nature. "Factors influencing adoption of LARCs among contraceptive users in Nigeria" is a possible title.

The write up still requires serious English editing and corrections for a scientific paper (it should probably be edited by a native English speaker). Further statistical analyses are indispensable. Our

comments are presented below section wise.

Abstract
Please correct the English thoroughly and make sure the tenses are adapted.

The very first statement of the abstract is unclear and seems to contradict science unless my reading and understanding is not that of the authors. Reading the statement as it is gives a wrong understanding to the reader. One will think the authors are suggesting a global contraceptive failure rate of 48%. Or do the authors mean "48% of unintended pregnancy that occur in contraceptive user is due to human error". Please totally rephrase to ease understanding. In addition the references used to state this rate down in your background (ref 5 and 6 are not adapted and have nothing to do with the declarations), please verify and correct.

Please try to reformulate the objective of the study and in doing so replace the word "examine" which does not seem adapted for this purpose.

In the method section, please try to include the survey type used to collect this data, include the threshold of significance of the p-value for the identification of the different factors associated with LARCs.

In the result section, one will want to see at least the mean age and the marital status of the considered population. In addition, you start by presenting the rate of use of traditional methods of contraception which responds to no set objective.

Major findings like the rate of use of LARCs should be presented with their 95% Confidence intervals.

Still in your results, you state "findings further revealed…" please avoid using this word revealed.

Concerning your conclusions, you state "This study concludes…." Please reformulate. You are the one concluding from the results of the study, not the study concluding. In addition, there is serious discordance between your results presented on the abstract and the conclusions. According to your results, LARC use is influenced by the level of knowledge of the women on LARCs but in your conclusion, you state that LARC use is affected by level of education, age of women, …after controlling for confounders which we don't know yet. Please correct accordingly

Introduction
Please edit and strengthen the English in this section.

Please reformulate the first sentence of paragraph one. It is not the rising use of contraception that is giving women the ability to choose, but the fact that modern contraception is becoming more and more available and accessible cost to the population.

Paragraph 2. The authors state "Also LARC methods have the ability to bridge the gap between "typical use" and perfect use" failure rates" Does the use of LARCs reduce or bridge the gap? The word bridge is confusing and makes the reader to wonder on the really message the authors wish to pass out here. Most importantly, the sentence just after the above mentioned sentence (the rest of the whole paragraph) should be reformulated and adequately referenced.

Paragraph 4. The authors state "despite the level of awareness...". I wish to remind the authors that the presented awareness rates of the IUD and implants are already low.

Some background information is lacking. What was the rate of LARC use in Nigeria according the NDHS data? What are some factors that have been identified in Nigeria, and sub-Saharan African or in Africa as a whole to influence the use of LARCs? What about the availability and accessibility of these methods in the study populations? Are they available and trained providers to administer these methods? Please complete this information because it might help understand your findings.

Your last paragraph should be totally reformulated and made clearer.

Methods
Is there a possibility to cite the methodology used? If yes, it will be better to cite the protocol if it was published.

What do the authors mean by a weighted sample size? Why a weighted sample size? Detailed information on how the weighted sample size was obtained is indispensable.

The authors should provide a definition for a current contraceptive user in this study. Because this definition affects the contraceptive method mix. For instance, a condom user who did not engage in sexual activity for a month before the study and therefore did not use a condom; where was she placed? Please a precise definition for a current user is needed.

The data analysis section is too scanty and difficult to follow. Binary logistic regression generates ORs which are adjusted (AOR) following multiple logistic regression[1]. What was the threshold of significance for both level of analyses. What criteria did you use to include variables in the multiple logistic regression model? What were the confounders you mentioned in your abstract? What criteria did you used to consider a variable a confounder? Please be more explicit[2].

In addition, as already stated above, analysis of the association of knowledge and use of LARCs is meaningless when the element of knowledge is just "have heard of it". What do we expect? To say that some women are using and have not heard of it? We really need to know what they know about each method or LARCs as a whole and it will be ideal to try to rather know what they knew about it before initiation of use. Also, the sources of information on the LARCs are good but we have to also know "when". For example, if you start using something, you can want to know more about it and when you know more by reading through the newspaper, the information you get can rather affect adherence or discontinuation.

Results
Please replace "women currently using any method of contraception or family planning" with women currently using contraception all through your text.

Please reformulate the sentence presenting the level of education of the participants in paragraph 1. One has the impression that those who are considered in higher education are from the proportion in secondary education, of which it is not the case.

Please what definition do you give to married here? Do you include only legally married or in this

group we have women in consensual unions? Please be precise.

I think if data on the full contraceptive method mix was available and presented here, it would make this a better manuscript. Please present this data before you focus on LARCs. In the proportion considered to be using LARCs, why was precise data on the IUCD and the implant not included? In addition add a 95% CI to the LARC rate.

Paragraph 5 from Table 5. Please include how knowledge affects use of LARCs; that is, the direction of association. The last sentence of this paragraph declaring that use of LARCs sole depends on knowledge should be taken off. If this is even true then there is no essence of testing for the other factors presented below. Or are the authors suggesting that all the other factors I see below are confounders?

The factors presented in this paper were evaluated by simple logistic regression with no confounders defined. The level of education of the participants can affect their wealth index, their number of children, family planning discussion and their likelihood to visit a health worker. Each of the considered factors should logically be controlled for other possible factors. Without this, this section is of no significant importance to the write-up.

Discussion
The whole discussion section has to be retaken. It seems more like a repetition of already presented results than analytically putting findings into context. Please do correct this section.

Limitations
Major limitations associated to this study have not been addressed. Method and design liked limitations have totally been left out. The cross sectional design used to collect the data comes with major limitations allowing us with mere hypotheses than real cause effect relationships. In addition, associations might just have been temporary.

Future suggestions
Your first two sentences are a repetition. Please correct.

Conclusions
The very first sentence of the conclusion has a problem. Please read carefully and correct.
The second sentence is not correct. No confounders were controlled in the statistical analysis. All the presented factors need to be reviewed after reanalysis.

References
1. Zhang Z: Model building strategy for logistic regression: purposeful selection.*Ann Transl Med*. 2016; **4** (6): 111 PubMed Abstract | Publisher Full Text
2. Brenner H, Blettner M: Controlling for continuous confounders in epidemiologic research. *Epidemiology*. 1997; **8** (4): 429-34 PubMed Abstract

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Reproductive Health, Public Health and Epidemiology, Clinical Medicine, Clinical Biochemistry.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Author Response 09 Apr 2020
Obasanjo Bolarinwa, Obafemi Awolowo University, Ile-Ife, Nigeria

Reply to comments
The authors evaluate the knowledge of reproductive age women on LARCs and go further to identify some factors associated to LARC use. Globally the manuscript is well drafted with "presented results responding only partially to the set objectives."

1. "One key word in the title of the paper is knowledge but it is unclear if the knowledge was Evaluated"- **We used ever "HEARD" as a proxy to Knowledge**

1. Abstract – "The very first statement of the abstract is unclear and seems to contradict science unless my reading and understanding is not that of the authors. Reading the statement as it is gives a wrong understanding to the reader. One will think the authors are suggesting a global contraceptive failure rate of 48%. Or do the authors mean "48% of unintended pregnancy that occur in contraceptive user is due to human error". Please totally rephrase to ease understanding. In addition the references used to state this rate down in your background (ref 5 and 6 are not adapted and have nothing to do with the declarations), please verify and correct". Accepted **– Abstract & Intro – Reference added.**

1. "Please try to reformulate the objective of the study and in doing so replace the word "examine" which does not seem adapted for this purpose". **Accepted – Changed the**

word examine in the objective to identify and re-arranged.

1. "In the method section, please try to include the survey type used to collect this data, include the threshold of significance of the p-value for the identification of the different factors associated with LARCs" .**Accepted- In the method section survey type included.**

1. "In the result section, one will want to see at least the mean age and the marital status of the considered population. In addition, you start by presenting the rate of use of traditional methods of contraception which responds to no set objective. – **Table 1 presented the mean age and marital status**

1. Major findings like the rate of use of LARCs should be presented with their 95% Confidence intervals. – **Done**
Use of LARC with their 95% Confidence intervals.
Variable Std. Err.95% CI

LARC use 0.1320 – 0.1638
1. "Still in your results, you state "findings further revealed…" please avoid using this word revealed. – **Acknowledged.**

1. "Concerning your conclusions, you state "This study concludes…." Please reformulate. You are the one concluding from the results of the study, not the study concluding. In addition, there is serious discordance between your results presented on the abstract and the conclusions. According to your results, LARC use is influenced by the level of knowledge of the women on LARCs but in your conclusion, you state that LARC use is affected by level of education, age of women, …after controlling for confounders which we don't know yet. Please correct accordingly" – **Corrected**

1. Introduction - Please edit and strengthen the English in this section. - **Acknowledged.**

1. Please reformulate the first sentence of paragraph one. It is not the rising use of contraception that is giving women the ability to choose, but the fact that modern contraception is becoming more and more available and accessible cost to the population. - **Acknowledged.**

1. Paragraph 2. The authors state "Also LARC methods have the ability to bridge the gap between "typical use" and perfect use" failure rates" Does the use of LARCs reduce or bridge the gap? The word bridge is confusing and makes the reader to wonder on the really message the authors wish to pass out here. Most importantly, the sentence just after the above mentioned sentence (the rest of the whole paragraph) should be reformulated and adequately referenced. - **Acknowledged.**

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1. Your last paragraph should be totally reformulated and made clearer.- **Acknowledged.**

1. Methods - Is there a possibility to cite the methodology used? If yes, it will be better to cite the protocol if it was published.- **Done**

1. What do the authors mean by a weighted sample size? Why a weighted sample size? Detailed information on how the weighted sample size was obtained is indispensable. – **Acknowledged and corrected**

1. The authors should provide a definition for a current contraceptive user in this study. Because this definition affects the contraceptive method mix. For instance, a condom user who did not engage in sexual activity for a month before the study and therefore did not use a condom; where was she placed? Please a precise definition for a current user is needed. **– Done**

women ages 15–49 who are using (or whose partners are using) any contraceptive method at the time of the survey

1. The data analysis section is too scanty and difficult to follow. Binary logistic regression generates ORs which are adjusted (AOR) following multiple logistic regression . What was the threshold of significance for both level of analyses. What criteria did you use to include variables in the multiple logistic regression model? What were the confounders you mentioned in your abstract? What criteria did you used to consider a variable a confounder? Please be more explicit .In addition, as already stated above, analysis of the association of knowledge and use of LARCs is meaningless when the element of knowledge is just "have heard of it". What do we expect? To say that some women are using and have not heard of it? We really need to know what they know about each method or LARCs as a whole and it will be ideal to try to rather know what they knew about it before initiation of use. Also, the sources of information on the LARCs are good but we have to also know"when". For example, if you start using something, you can want to know more about it and when you

know more by reading through the newspaper, the information you get can rather affect adherence or discontinuation. – **Done**

The variable were added to logistic regression based on literature review and association at chi-square level. Knowledge of LARC and Use of LARC has been analyzed

(Check Table 5)

1. Results - Please replace "women currently using any method of contraception or family planning" with women currently using contraception all through your text. - **Acknowledged.**

1. Please reformulate the sentence presenting the level of education of the participants in paragraph 1. One has the impression that those who are considered in higher education are from the proportion in secondary education, of which it is not the case.- **Done**

1. Please what definition do you give to married here? Do you include only legally married or in this group we have women in consensual unions? Please be precise. I think if data on the full contraceptive method mix was available and presented here, it would make this a better manuscript. Please present this data before you focus on LARCs. In the proportion considered to be using LARCs, why was precise data on the IUCD and the implant not included? In addition add a 95% CI to the LARC rate.- **Done**

Method Mix of current user

Married includes married women and those who are living with a man

1. Paragraph 5 from Table 5. Please include how knowledge affects use of LARCs; that is, the direction of association. The last sentence of this paragraph declaring that use of LARCs sole depends on knowledge should be taken off. If this is even true then there is no essence of testing for the other factors presented below. Or are the authors suggesting that all the other factors I see below are confounders?- **Done**

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1. Future suggestions - Your first two sentences are a repetition. Please correct. **Corrected**

1. Conclusions - The very first sentence of the conclusion has a problem. Please read carefully and correct. The second sentence is not correct. No confounders were controlled in the statistical analysis. All the presented factors need to be reviewed after reanalysis. **Done**

Competing Interests: None