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RESEARCH ARTICLE

REVISED Knowledge and factors influencing long-acting reversible contraceptives use among women of reproductive age in Nigeria [version 3; peer review: 1 approved, 2 approved with reservations]

Previously titled: Knowledge and factors influencing long acting reversible contraceptive use among women of reproductive age in Nigeria

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Abstract

Background: Approximately 48% of unintended pregnancies occur as a result of contraceptives failure around the world, which is mostly due to incorrect use, poor adherence, and/or technology failure. Long-acting reversible contraceptive (LARC) methods have been developed to close this gap. The main aim of this study is to identify factors associated with the use of LARCs among women of reproductive age and to examine the relationship between knowledge of LARCs and the current use of LARCs in Nigeria.

Methods: This study assessed the PMA2020 methodology and secondary dataset using female datasets from PMA 2016 (Round 3) exercise. The survey was conducted out in seven states of Nigeria. The target population for this study was women of reproductive age (15-49 years) currently using contraception prior to the survey. The sample size of women that met the inclusion criteria was 1927. The data were analyzed using frequency distribution, chi-square, and logistic regression at a 5% level of significance.

Results: The results showed that 21.0% of women were using traditional methods. 14.8% of the sampled women were using LARCs methods. Findings further showed that at both levels of analyses, there is a significant relationship (P<0.05 and P=0.00 for binary and logistic regression, respectively) between knowledge of LARCs and the use of LARCs. This means that knowledge of LARCs and socio-demographic variables among women of reproductive age in Nigeria can influence the use of LARCs.

Open Peer Review

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Conclusions: We concluded in this study that 14.8% of women using contraception were using LARCs. Additionally, the level of education, age of women, household wealth, and the number of living children were significantly associated with using LARCs in Nigeria. Also, when discussing contraception with women, health care practitioners should discuss the risks and benefits of LARCs with women of reproductive age and recommend them as a first-line method.

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

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Any reports and responses or comments on the article can be found at the end of the article.

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REVISED **Amendments from Version 2**

Basic English was edited and a change in graph style of Figure 1 was implemented.

Any further responses from the reviewers can be found at the end of the article

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 the reduction in maternal and infant mortality, proper 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), which are implant and intrauterine 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 three 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 can reduce the gap between "typical use" and perfect use" failure rates[1]. Approximately 48% of unintended pregnancies occur as a result of contraceptives failure around the world[5], which is mostly 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[6,7].

Several studies have established that women in sub-Saharan Africa are often unable to obtain or use modern contraception, particularly the long-acting methods, for many reasons associated with both supply and demand-side[8,9]. Nigeria is not particularly exempted from Long-Acting Contraceptives Prevalent use of 3.1%[10].

'Nigeria's total fertility rate (5.5) is one of the lowest in sub-Saharan Africa and globally. This is primarily due to her high unmet need for family planning of (21.8%). The use of contraception is relatively low (17.1%), and this also reflected in the number of women that subscribed to LARCs despite being the most cost-effective contraceptives. In Nigeria, knowledge about LARCs in terms of an intrauterine device (IUD) and implant shows that 36.8% of women have knowledge of IUD and 49.5% of implants[11,12], which is also low.

Despite the efficacy and safety of LARCs, the use is not widespread among women of reproductive age in Nigeria. Hence, this paper examined the relationship between women's knowledge of LARCs and factors influencing the use of LARCs among women of reproductive age in Nigeria to guide policymakers' decisions.

This research paper sought to identify the relationship between knowledge and factors influencing the use of LARCs among women of reproductive age in Nigeria.

Methods

Data source

The study employed secondary data and methodology from Performance Monitoring and Accountability (PMA) 2016 dataset[12,13]. PMA 2016 was a cross-sectional 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 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 to randomly select households for an interview in each selected EAs. The enumerators administered all females of reproductive age (15–49 years) living within the household chosen a female questionnaire. The 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[14].

Scope of study

This study was limited to the PMA2020 secondary dataset using female datasets from PMA 2016 (Round 3) exercise[12]. It is expected to provide further insight into factors contributing to the use of long-acting contraception in Nigeria. The target population for this study was women of reproductive age (15–49) who are currently using contraception prior to the survey. Accordingly, for women who met the inclusion criteria, the sample size was 1927.

Operational definitions and study variables

In this study, the primary outcome of interest was LARCs use among current contraceptives users (This is defined as women of reproductive age (15–49 years) that are currently using contraception or whose partner are using at the time of the survey). The study focused specifically on contraceptives users rather than all of those at risk for unintended pregnancy. The current use of a LARCs method is defined here as the use of the contraceptives implant or the IUD during the month of the interview.

Knowledge of LARCs was assessed by whether the respondent has 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. A Source of information about family planning was also included in the study.

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

To answer the stated objectives, we first present the frequency distribution of all the variables used in the study. The pattern of LARCs use was assessed by the proportion of all contraceptives users using LARCs methods by selected demographic characteristics. Knowledge of LARCs was cross-tabulated by the use of LARCs to show the relationship between the two variables, and the chi-square test was used to show this relationship. Lastly, binary logistic regression was used to estimate the odds ratio adjusting for demographic factors influencing the use of LARCs.

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 odds ratio (AOR) with a 95% confidence interval were 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 contraception by selected socio-demographic characteristics. A total of 1,927 females were found to be currently using 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 while 24.1% had higher education. Marital status shows that the majority (76.6%) of the respondents were currently married at the time of the interview. More than half (59%) of the respondents reside in urban areas, while 41% live in rural areas.

Regarding the wealth index, the table shows that 43.1% were from wealthy households, 35.6% from a poor household, and 21.3% were from the middle household. More than half (52.6%) of the respondents had 1–4 children before they started using contraception. Raw data are available on OSF[14].

The method mix of the respondents and percentage distribution is shown in Figure 1. Respondents included those who were married to or living with a man at the time of the survey and were currently using contraception.

Table 2 presents the LARCs use frequency and 95% Confidence Interval (CI) of the respondents. A total observation of 1927 was considered with 0.15 mean, 0.0081 standard error, 14.8% prevalence use of LARCs, and a confidence interval of 0.1320 - 0.1638.

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 3 presents the 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 the radio. Concerning awareness at a health facility and from a 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 a health worker in the last 12 months. Knowledge about LARCs shows that 70.3% of women in the study had knowledge of the contraceptives implant, and 55.5% of females had knowledge of the IUD.

Table 4 presents the practice of contraceptives among females who are currently using any method of contraception. The

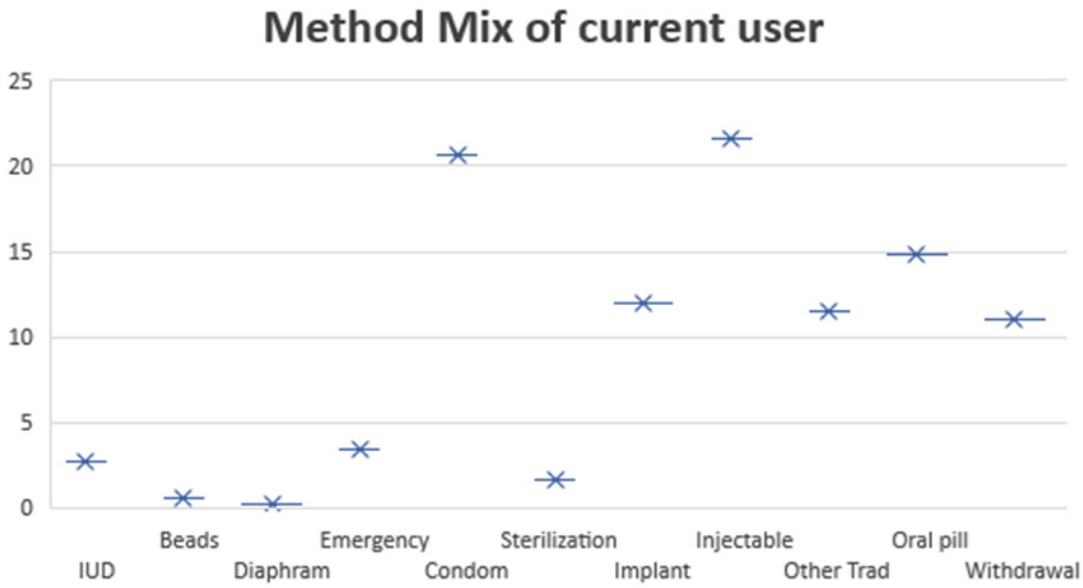

Figure 1. **Method Mix of the current user.**

Table 2. **LARCs use frequency and 95% Confidence Interval.**

Variable	Observation	Mean	Std.Err.	Prevalence of use	95% CI
LARCs use	1927	0.15	0.0081	14.8%	0.1320 – 0.1638

Table 3. **Awareness of contraceptives 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 a 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 4. Contraceptives use.

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

table shows that (76.5%) females that are currently using any method of contraception were using modern contraceptives (e.g., condoms, hormonal pill), and 14.8% of respondents were using LARCs.

Table 5 presents the pattern of LARCs use among the current user of contraceptives by selected socio-demographic characteristics. The table showed that LARCs 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 LARCs compared to divorced/separated, widow, and never married. Concerning the household wealth index, the table shows that more women from poor households subscribed to the LARC methods compared to women from a middle and wealthy household. Lastly, the number of children at the time respondent started using contraceptives 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 6 presents the association between knowledge of LARCs and the use of LARC methods among women that are currently using contraception. The table showed that at both levels of analyses (binary and multivariable logistic regression), there is a significant relationship (P<0.05 and P=0.00, respectively) between knowledge of LARCs and the use of LARCs in this study. This means that the use of LARCs can be influenced by knowledge of LARCs among women of reproductive age in Nigeria.

Logistic regression was employed to assess the net effect of the selected variable theoretically related to the use of LARC methods in Table 7. The result of logistic regression showed that women who were 25 years and above, women with secondary

Table 5. The Pattern of use (long-acting reversible contraceptive methods).

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 6. 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.

Table 7. Factors influencing the use of long-acting reversible contraceptive methods.

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 a facility (RC=No)			
Yes	1.38	0.06	0.9832-1.9499
Visited by a health worker (RC=No)			
Yes	0.82	0.32	0.5617-1.2041
Constant	**0.00**	**0.00**	**0.0011-0.0177**

RC, recode.

and higher education, currently married and widow, women from rich households and women with one or more children were significantly associated with the 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 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.

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.

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

Discussion

This paper assessed knowledge of LARCs and factors influencing the use of LARCs among women that are currently using contraception in Nigeria. The study showed that LARCs were largely under-used among women that are currently using any contraception. To properly harness socio-economic opportunities and better child spacing, the low use of LARCs should be tackled because of its integral benefit of meeting women's reproductive needs in a context where women are redefining their reproductive lifestyle[4,15].

This study shows that there was an association between 'women's knowledge of LARCs and the use of LARCs among women that are currently using contraception. 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 methods[3,6,7,16–20]. Another study also affirmed that women's reproductive life plans are being altered as a result of misinformation, and this prompt woman to adopt methods not suitable for themselves[21].

Besides, the level of education was found to be associated with the use of LARCs. The possibility of women with at least 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 LARCs. Previous studies also corroborate this point that better-educated women have access to information on modern contraceptives, which may trigger their interest in the use of LARCs[6,18,19,22–26].

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 the age of mothers was found to be associated with the use of LARCs because the prevalence of LARC uses increased with age[3,4,23,24,26].

The number of living children at the time of contraceptives use was significantly associated with LARCs 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 LARCs. 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[4,22,23,27].

Furthermore, women from rich households were less likely to use LARCs. This is contrary to other studies, which found that household wealth has a positive association with the use, and wealthier women were more likely to use LARCs than poorer women[4,23,24].

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[17,24,28].

Limitations

This study was conducted among women of reproductive age who are currently using contraception, which might not reflect a holistic view of all women of reproductive age in Nigeria. Also, the cross-sectional design used to collect the data comes with major limitations allowing us with mere hypotheses than real cause-effect relationships.

Future suggestions

The study showed that LARCs were largely under-used among women that are currently using contraception in Nigeria. To properly harness socio-economic opportunities and better child spacing, the low use of LARCs should be tackled because of its integral benefit of meeting 'women's reproductive needs in a context where women are redefining their reproductive lifestyle. Therefore, women with lower educational levels, high wealth index, and a higher number of living children should be targeted by program strategies to control childbearing. Also, there is a need for a communication strategy that would provide correct information about LARCs' 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, findings from this study showed that 14.8% of women in Nigeria that are currently using contraception were using LARCs. Additionally, the level of education, age of women, household wealth, and several living children at the time of contraceptives use were significantly associated with the use of LARCs. Also, knowledge of LARCs was significantly associated with LARCs use. To effectively control the childbearing in Nigeria, women with lower education, high wealth index, and a high number of living children should be the target audience among the women of reproductive age in Nigeria. Also, there is a need for a communication strategy that would provide correct information about LARCs 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 reproductive age and recommend them as a first-line method.

Data availability

Underlying data

Raw data associated with this study are available on OSF. DOI: https://doi.org/10.17605/OSF.IO/C5YGV[14].

Extended data

Questionnaires used in this study are available on OSF. DOI: https://doi.org/10.17605/OSF.IO/C5YGV[14].

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

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Reference Source

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Reference Source

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PubMed Abstract | Publisher Full Text

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Publisher Full Text

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Open Peer Review

Current Peer Review Status: ? ✔ ?

Version 3

Reviewer Report 30 July 2020

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?

Anita L. Nelson
Western University of Health Sciences COMP-Northwest, Lebanon, OR, USA

This paper is a secondary analysis of the subset of data collected in 2016 which included married or cohabiting women in seven states in Nigeria who were using some method of birth control at the time. The authors sought to find associations between basic demographic data collected in the survey and use of implants and IUDs. More curiously, they also tried to determine if having heard about an IUD or an implant was associated with a higher likelihood that the woman would use one of those methods. The purpose of this work was to inform public policy to help decision makers design more targeted educational programs to increase use of implants and IUDs.

Previous reviewers commented on the tautology represented by the primary study objective, but apparently the authors did not understand how much of a showstopper this is. It is perfectly clear that women cannot choose methods they have never heard about. No one needs to read a publication to come to that conclusion. However, the authors could review their data and provide better insights into what they characterized as “underutilization” of these methods. For example, 70.39% of women had heard of implants and 55.2% of women had heard of IUDs, but only 14.8% of women used an IUD or an implant. The vast majority of women who had heard about IUDs and implants decided NOT to use them. The more interesting research and policy question would be why did they not select one of these methods?

Some of the answers may come from what the authors know, but did not share in the article. Do women have barriers to access to IUDs and implants? Are there financial barriers? (One might suspect not in view of the fact that it was women in lower income brackets that more frequently used these methods than the wealthier women) Are there some limitations on the sites and are all providers able to place the IUDs and implants? Are there any issues of trust with the medical system that limit women’s enthusiasm for the methods? Specifically, are they confident that doctors will remove their IUD or the implant if they have problems or want it out for other reasons?

The authors present information about where women heard about family planning but do not use it in any of their recommendations. Radio seems to be the most common medium recalled by the

women. Clearly a multi-media educational program may be helpful, but it appears radio might be a first choice for getting word out.

Even more fundamentally, the premise of the project is that utilization rates of implants and IUDs should be higher. It is not clear why policy makers values and preferences should replace those of the woman in choosing what method she (and her partner) will use. From an ethical standpoint, it is clear that women need to know what all their options are before they can make informed choices. And all methods should be first line choices, except the ones to which the woman has medical contraindications. The authors claim throughout the paper that LARCs are largely underutilized among currently contracepting women. However, the basis for that claim "underutilized" is not substantiated, what percent to the authors think would be adequate? How was that target decided? And the authors claim that IUDs and implants are "ideal pregnancy prevention options for many women", but clearly, they cannot be ideal if the vast majority of women decide they do not want to use those methods.

There are many errors in terminology and extensive unnecessary duplication in the text. One example is that the authors say that Nigeria has one of the lowest fertility rates (5.5%) in Sub-Saharan Africa and globally. And they attribute that low fertility rate to high unmet need for family planning. These slip-ups can be addressed later if the authors are able to redraft this work to refocus it on the other findings they have.

I would suggest Figure 1 be converted to a table with actual numbers. What percent of women used implants and what percent used IUDs? Which IUDs were most popular? Table 6 was extremely confusing; as I understood it, 3.2% of women who had ever heard about the implant used a LARC (presumably an IUD?) and 30.2% of women who never heard of an IUD used a LARC (presumably an implant?). I do not understand what it adds to the article.

The discussion section only repeats findings and states if they are consistent with what other authors have reported. There is no work done to try to explain the differences – different access, different study populations, etc. There is no explanation offered of why women 15-24 years were less likely to use these methods compared to older women. The authors could try to explain that finding (are women seeking pregnancy in their early 20's? or providers do not use in teens or nulliparous women?). Such conjecture can help the reader decide whether these findings are at all relevant to his situation.

The real problem with this paper as it is currently drafted is that is a really local issue and may be better placed in a regional journal. Unless the authors can describe how their system works to provide to these methods, readers cannot learn lessons they can apply to their own situations. This journal is very supportive of local work, but the authors really need to consider what it is about their work that would interest other readers.

If the authors would like to reorient the focus of their work, I would be happy to review their next version and to work with them on the English language challenges.

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?

No

Are sufficient details of methods and analysis provided to allow replication by others?
No

If applicable, is the statistical analysis and its interpretation appropriate?
No

Are all the source data underlying the results available to ensure full reproducibility?
No

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: Grants/Research: Agile Pharmaceutical, EvoFem, Merck, Mithra, Sebela Pharmaceutical Honoraria/Speakers Bureau: American Regent, Bayer HealthCare, Merck, TherapeuticsMD Consultant/Advisory Board: Agile Pharmaceutical, AMAG, American Regent, Bayer HealthCare, Merck, Sebela Pharmaceutical, TherapeuticsMD

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

Reviewer Report 01 June 2020

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Ronald Anguzu
Public and Community Health Program, Institute for Health and Equity, Medical College of Wisconsin (MCW), Milwaukee, WI, USA

The authors responses are satisfactory and I approve indexing of their manuscript.

Is the work clearly and accurately presented and does it cite the current literature?
No

Is the study design appropriate and is the work technically sound?
No

Are sufficient details of methods and analysis provided to allow replication by others?
No

If applicable, is the statistical analysis and its interpretation appropriate?
No

Are all the source data underlying the results available to ensure full reproducibility?
No

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 2

Reviewer Report 12 May 2020

https://doi.org/10.21956/gatesopenres.14313.r28811

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?

Ronald Anguzu
Public and Community Health Program, Institute for Health and Equity, Medical College of Wisconsin (MCW), Milwaukee, WI, USA

This article is important in the field of prevention of unintended pregnancies as a public health problem both globally and specifically in Nigeria as the authors demonstrated. Implementation efforts to increase utility of long-acting reversible contraception is being encouraged.

Abstract
Several grammatical errors need to be addressed throughout the manuscript and abstract. Some examples include;

1. The main aim of this study is to identify the factors **influencing the women** associated with use of LARC and to examine the relationship between knowledge of LARC and its current use.

2. Findings further showed that at both levels of analyses 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**.

3. Also, the authors should minimize or avoid use of “it” and instead describe it as “LARCs) as was described in the statement; “This means that knowledge of LARC & other socio-

demographic variables among women of reproductive age in Nigeria can influence the use of **it.**"

The authors should specify which "other socio-demographics" to describe in the abstract that are associated with LARC use.

Revise they conclusion into a total of 2-3 sentences to include the implications of this study on practice, policy and/or research. The authors described the implications in the conclusion of the main manuscript and so should do the same in the abstract

Main manuscript/document

Introduction
In the this section, include a citation for the sentence, "Recently, the expansion in choice of contraceptives available has given women the option of adopting the use of Long-acting reversible contraceptives (LARCs) which are implant and intrauterine device contraceptive methods that are highly effective and convenient with an added advantage of being long-lasting, require little or no maintenance.

Results
Table 2 is unusually brief with a single row of results. The authors should include the 14.8% prevalence of LARC users (frequency and 95%CI too in order to fit the columns titles already created)

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

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?
Yes

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

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

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Reproductive health epidemiology, Global Health and mixed methods research

I confirm that I have read this submission and believe that I have an appropriate level of

expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 16 May 2020

Obasanjo Bolarinwa, Obafemi Awolowo University, Ile-Ife, Nigeria

Hello,

Thanks for this awesome review, please find below my replies bolded.

Abstract

- **Several grammatical errors need to be addressed throughout the manuscript and abstract. Some**

examples include;

1. The main aim of this study is to identify the factors **influencing the women** associated with use of LARC and to examine the relationship between knowledge of LARC and its current use. - **All grammatical error has been corrected.**
2. Findings further showed that at both levels of analyses 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**. - **All grammatical error has been corrected.**
3. Also, the authors should minimize or avoid use of "it" and instead describe it as "LARCs) as was described in the statement; "This means that knowledge of LARC & other socio-demographic variables among women of reproductive age in Nigeria can influence the use of it." – **All grammatical error has been corrected.**

The authors should specify which "other socio-demographics" to describe in the abstract that are associated with LARC use. – **All socio-demographic factors associated has been listed out, there are no "other" socio-demographic factors**.

Revise they conclusion into a total of 2-3 sentences to include the implications of this study on practice, policy and/or research. The authors described the implications in the conclusion of the main manuscript and so should do the same in the abstract. – **This has been included**

Main manuscript/document

Introduction

In the this section, include a citation for the sentence, "Recently, the expansion in choice of contraceptives available has given women the option of adopting the use of Long-acting reversible contraceptives available has given women the option of adopting the use of Long-acting reversible contraceptives (LARCs) which are implant and intrauterine device contraceptive methods that are highly effective and convenient with an added advantage of being long-lasting, require little or no maintenance. **– The reference is the second on the reference list. "*Stoddard A, McNicholas C, Peipert JF: Efficacy and safety of long-acting reversible contraception. Drugs. 2011;71(8):969–980. 21668037 10.2165/11591290-000000000-00000 3662967*" All these references have been listed as 1-4 at the end of the first paragraph, citing "2" at the end of this sentence will distort the referencing style.**

Results

Table 2 is unusually brief with a single row of results. The authors should include the 14.8% prevalence of LARC users (frequency and 95%CI too in order to fit the columns titles already

created). – **This has been included.**

Competing Interests: None

Version 1

Reviewer Report 30 September 2019

https://doi.org/10.21956/gatesopenres.13998.r27839

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?

Martin Ndinakie Yakum
Medecins Sans Frontieres-Spain (MSF-OCBA), Maiduguri, Nigeria

Atem Bethel Ajong
[1] Department of Obstetrics and Gynaecology, Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, Yaoundé, Cameroon
[2] Department of Biochemistry, University of Dschang, West Region, Cameroon
[3] Department of mother and child health, Kekem District Hospital, West Region, Cameroon

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.**

1. 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. - **Acknowledged.**

1. 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. - **Acknowledged.**

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**

1. 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. - **Corrected**

1. 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. - **Corrected**

1. 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. **Done**

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