RESEARCH ARTICLE

REVISED **Community-level influences on women's experience of intimate partner violence and modern contraceptive use in Nigeria: a multilevel analysis of nationally representative survey** [version 2; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: Modern contraceptives (MC) are important strategies for reducing unwanted pregnancies, unsafe abortion and maternal mortality, but MC remains low at 18% in Nigeria. Similarly, while there is increasing prevalence of intimate partner violence (IPV) in Nigeria, its effects on contraceptive use remain unclear. This study examined the influence of IPV on MC use, while adjusting for individual- and community-level confounders.

Methods: The study utilized 2018 Nigeria Demographic and Health Survey data. We performed multilevel binary logistic regression analysis on 24,973 married women aged 15-49 49 (nested within 1,400 communities), who were sexually active and were not pregnant at the time of the survey.

Results: Findings show that use of MC was higher among married women who reported experience of IPV than those without IPV exposure. After adjusting for individual-level and contextual factors, the odds of using MC was significantly higher among women who experienced any form of IPV (OR: 1.61, 95% CI: 1.17-2.21, $p < 0.005$) compared to those who reported no IPV experience. Around one-quarter of the total variance in contraceptive use with respect to the different types of IPV could be explained at the community level.

Conclusion: The study provides empirical evidence that there is

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significant community effect on IPV exposure and women's contraceptive uptake. Attention must therefore be given to the context-specific social and gender norms that affect women's sexual and reproductive health in Nigeria.

Keywords

Contraceptives use, intimate partner violence, community contexts, Nigeria

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We have further discussed and substantiated our findings with evidence from the extant literature. Specifically, we provide detailed explanation from the literature that women in abusive relationship possibly resort to covert contraceptive use due to their experience of intimate partner violence and the need to limit fertility in an abusive relationship. We included additional information that after incorporating community-level variables into our multilevel model, the relationship between intimate partner violence and contraceptive use became statistically insignificant. Further, we acknowledged the limitation of not exploring community socio-cultural norms because they are not available in the analysed dataset. We provided clarity/information in the method section that the experience of intimate partner violence specifically relates to the most recent partner/husband. Information on the level two units (1400 clusters (proxy for communities) was included in the revised paper. We also did some editing and correction in the tables and the prose.

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

Introduction

Modern contraceptive is one of the most important means of reducing unwanted pregnancies, abortions and maternal mortality. It also serves as a good strategy for women to achieve their fertility intentions and improve their socio-economic status^{1,2}. Despite the numerous benefits of contraception, recent data shows that modern contraceptive prevalence rate (mCPR) remains low at 18% in Nigeria³. Nigeria's mCPR is by far lower than that of many sub-Saharan African countries like Malawi, Rwanda, and South Africa, which have mCPR of 50% or higher⁴. A recent analysis that used three consecutive Nigeria DHS datasets revealed that in 2003 (91.8%), 2008 (90.6%) and 2013 (88.6%), most women of reproductive ages were not using contraceptives, and unmet needs for family planning fluctuate between 14% and 20% in the past 15 years⁵. As a result of this, total fertility rate (TFR) remains high at 5.5 children per woman, with a sub-national TFR which is as high as 7.7 in some regions of the country³.

The decision to use modern contraceptives by married women in developing countries, particularly those in an abusive relationship is a complex^{6,7} one. For instance, payment of bride price reinforces the belief that a woman is required to provide sexual satisfaction for her partner and also bear children. On the other hand, literature has established that men often express anxiety and belief that link sexual infidelity to the practice of modern contraception among women⁸. Such beliefs can serve as a precursor for gender-based violence. There is some significant evidence in the literature that family planning and contraceptive use may exacerbate tension in gender relations^{9,10}. In many societies where culture and religion are predominantly adhered to, women are subjected to seeking spousal or partner consents on their sexual and reproductive health decision. This has resulted to patriarchal control which is one of the important underlying barriers for family planning program in developing countries^{11,12}. The decision to use contraceptives have been found to be better where couples agree¹³⁻¹⁶. Further, the consensus on decision to use

contraceptives might not be easily reached in cases where fertility desire of either the husband or wife are yet to be met, this could lead to disagreement or even intimate partner violence.

Further, prior research shows that women who are exposed to sexual and emotional violence are most likely to be denied access to emergency contraceptives^{17,18}. It is very important to emphasize that intimate partner violence worsens women's decision-making capacity for herself¹⁹ and her children particularly due to lack of control over socioeconomic resources²⁰. Although many studies have explored the influence of intimate partner violence on contraceptive use, available evidence on the relationship between the two phenomena is mixed. For instance, Pallitto & Campbell²¹, found that women who experienced IPV were less likely to negotiate contraceptive use and safer sex than those without such experience. In addition, a study by 22 and 23 established IPV as a barrier to contraceptive use, while in contrast²⁴, found that women who experienced IPV had higher likelihood of using contraceptives than those who had no exposure to IPV. Moreover, there is little systematic evidence on how community structure affects IPV and modern contraceptive uptake; whereas community-level factors are critical to women's reproductive health²⁵. This is because certain gendered norms and traditional cultural values tend to inhibit usage of modern contraception²⁶. Besides, IPV is contextually and socially derived from entrenched gender norm and traditional cultural values^{27,28}. Thus, the key research question for this study was: 'to what extent does married women's experience of IPV (net of individual- and community-level characteristics) influence contraceptive use in Nigeria?

Some theoretical perspectives on IPV and contraceptive use

The study is guided by the theory of gender and power (TGP). Postulated by Connell²⁹ TGP hypothesizes that sexual inequality between men and women articulates gender-based inequities within the structure and institutions of the societies. It also assumed that though gender inequity may be external to the individual, it plays a role in individual action that is beyond his/her control. The theory described some risk factors linked to male dominance and power imbalances that adversely affect women's health by identifying three major structures. The three major structures, which deal with constraints experienced by women in the society, are sexual division of labour, sexual division of power, and structure of cathexis. The sexual division of labour is on the unequal allocation of occupations and positions for women when compared to their men counterparts. Consequently, the economic imbalance is created and women are forced to depend on men for financial assistance since several compensated responsibilities are structurally and institutionally designed in favour of men at the detriment of the women.

The sexual division of power is on the social mechanisms put in place by men to exercise control and influence over women. Men dominate critical societal issues, depending on the matters to which authority and control are to be exercised³⁰. Relative to women's power in the household, their powers

are constrained by the social mechanisms of patriarchy to disempower and subjugate them, which may have implications on the abuse of women socially and sexually. While the sexual divisions of labour, and power seem to focus on economic and decision-making process, the structure of cathexis tends to address issues around affective attachments and social norms. It is mainly concerned with the dictate of appropriate sexual behaviour for women as characterized by their emotions and sexual attachments with men. In this regard, women are constrained by the social norms that shape their sexual behaviour in such a manner that deny them from exercising their sexual and reproductive rights³⁰ This further suggests that women who are more receptive to the social norms are more likely to experience IPV

In applying this theory, women are to subject themselves to the desire of men in any matter related to modern contraceptive method because of low economic power to make a choice. In a situation where men are not supportive of women's use of contraceptive, there may be a likelihood of the risk of IPV and covert use or none use of contraceptives.

Also, the sexual division of power between men and women could be a risk factor for IPV and contraceptive use. This is where power imbalances are often used to describe how partner abuse emerge^{30,31}. This is because sexual division of power accentuates authority and influence vested in men. Consequently, women are expected to submit to men's authority and control on sexual matters. The culturally-laden social norms on intimate partner relationship reinforces women's perception in traditional societies that denying husband's sex is culturally and religiously unacceptable³². This could be one of the justifications for the prevalence of marital rape in most sub-Saharan African countries which are not always reported for prosecution^{33,34}.

While the first two components of Connell's (1987) TGP – *structure of division of labour and power* - seem to illustrate the risk factors of IPV as applied to this study, the structure of cathexis tends to focus more on the social norms that may serve as constraints to the use of contraceptive among women. These constraints may include the age of partners in marital relationship, emotions, belief systems about the use of contraception, fertility intentions of both partners, family influence and availability of family planning methods. For example, there are evidences in some African countries that women who initiate the use of modern contraceptive may be accused of promiscuity by their spouse^{35,36}. This may mostly restrain most women from making contraceptive use decision or else seek the approval of their spouses. It is covertly used where no approval is given³⁷, and such a woman may stand the risk of IPV. This implies that both structures of TGP are interwoven in the explanations of IPV and contraceptive use. The occurrence of imbalances in both structures of TGP could be critical risk factors of IPV, and consequently, none use or covert use of contraception. These have policy implications for gender equality and empowerment.

Methods

The study employed secondary data extracted from the individual recode file of 2018 Nigeria Demographic and Health Survey (NDHS). The sampling frame for the survey was the list of enumeration areas (EAs) prepared for the 2006 Population and Housing Census of Nigeria, provided by the National Population Commission. The sample was selected using a stratified two-stage cluster design consisting of 1400 clusters with enumeration areas (EAs) as the sampling units for the first stage. A sample of 42,000 households was selected for the survey, with 99.3% and 99.5% response rate in urban and rural areas, respectively. The unit of analysis for the present study was currently married women aged 15–49 years; however, those who had never had sex or were pregnant at the time of the survey were excluded from the analysis. A weighted sample of 24973 women aged 15–49 (nested within 1,400 communities) was the analytic sample for the study.

Variables measurements

Outcome variable. The outcome variable for this study was contraceptive use. This was defined as current use of modern method of contraception (at the time of the survey) by married women aged 15–49 years. The variable was categorized into two: (i) currently using at least one modern method of contraception, categorized as '1', and (ii) not using any modern method, categorized as '0'.

Explanatory variables. In terms of exposure, our key explanatory variable was intimate partner violence (IPV). IPV was defined as ever-experience of domestic violence (in terms of physical, sexual and emotional violence) from intimate partner or spouse. This variable was recorded in the domestic violence module of 2018 NDHS, using different dimensions. We generated IPV using the three different dimensions of violence captured in the domestic violence module of the survey as shown below:

(A). A woman is said to have experienced physical violence if there was a "yes" response to any of the seven questions below:

Does (did) your (last) husband/partner ever do any of the following things to you?

i) Push you, shake you, or throw something at you? ii) Slap you? iii) Twist your arm or pull your hair? iv) Punch you with his fist or with something that could hurt you? v) Kick you, drag you, or beat you up? vi) Try to choke you or burn you on purpose? vii) Threaten or attack you with a knife, gun, or any other weapon?

(B). There is evidence of sexual violence if a woman responded "yes" to any of the three questions below:

Does (did) your (last) husband/partner ever do any of the following things to you:

i) Ever been physically forced into unwanted sex by husband/partner

ii) *Ever forced into other unwanted sexual acts by husband/partner*

iii) *Ever been physically forced to perform sexual acts respondent didn't want to*

(C). A woman is said to have experienced emotional violence if there is at least one “yes” answer to any of the following three questions:

Does (did) your (last) husband/partner ever do any of the following things to you?

i) *Say or do something to humiliate you in front of others?*
 ii) *Threaten to hurt or harm you or someone close to you?* iii) *Insult you or make you feel bad about yourself?*

Physical violence was examined using items Ai-Avii (Cronbach's $\alpha=0.75$); sexual violence was assessed by items Bi-Biii (Cronbach's $\alpha=0.74$); while emotional violence was examined based on items Ci-Ciii (Cronbach's $\alpha=0.64$). Ever-experience any form of IPV was measured by all the 13 items (Cronbach's $\alpha=0.81$).

Other explanatory variables controlled for in the analysis were selected based on the guidance from the reviewed literature and theoretical underpinning for the study. The variables included individual level characteristics— current age (15–24; 24–34; and 35 above), level of education (no education; primary, secondary, and higher education), children ever born (<5 and 5+), religion (Islam, Christianity, and others); ethnicity (Hausa, Igbo, Yoruba and others); age at marriage (<18, 18–24 and 25+); occupation (formal, informal and manual labour) and wealth status (poorest, poorer, rich, richer and richest). The selected community level variables include region of residence (North Central, North East, North West, South-South and South West); place of residence (rural/urban residence), ethnic diversity (the extent of diversity in the community where respondents live in terms of ethnic composition, categorized as homogeneous, mixed and heterogeneous); community level of education (proportion of women who had at least secondary education in the community, grouped as low, medium and high); community media access (proportion of women who had access to newspaper/magazine, radio and television — low, medium and high); and community poverty level (proportion of women with low income level in the community, categorized as low, medium and high). Most of the level two variables were generated by aggregating the individual-level variables at the level of primary sampling units (PSUs).

Statistical analysis

The study employed descriptive and inferential statistics in data analysis, including frequency and percentage distribution (univariate analysis); cross-tabulation and Chi-square test (bivariate analysis); and multilevel binary logistic regression (multivariable analysis). Leveraging on the hierarchical nature of the NDHS data, we – specified a 2-level multilevel modelling (individual- and contextual-levels) for the binary outcome (use or non-use of modern contraception). Crude models examined the effect of IPV type on the use of modern

contraceptives, while the adjusted models incorporated the individual (level 1) and contextual (level 2) variables. Influence of IPV was examined on modern contraceptive use (the outcome variable). We have 4 different sub-samples for the explanatory variable – (i) physical IPV sub-sample (ii) sexual IPV sub-sample (iii) emotional IPV sub-sample and (iv) respondents who reported any IPV. Different models focus on each of these 4 sub-samples.

The fixed effects (that is, measures of association) were expressed as odds ratios (ORs) with 95% confidence intervals (95% CIs). The random effects which were regarded as measures of variations in intimate partner violence and contraceptive use across communities were expressed as intra-class correlation (ICC) (or variance partition coefficient (VPC)), and proportional change in variance (PCV). To determine the goodness of fit of the consecutive models, regression diagnostic was done using Akaike Information Criteria (AIC). Evidence suggests that the lower value of AIC indicates a better fit (Boco 2010). All analysis was done using Stata (version 13.0).

Results

Prevalence of contraceptive use by IPV types and selected characteristics

Table 1 presents the percentage distribution of individual level characteristics by contraceptive use and according to IPV types. The table shows that 35.6% of women reported experience of any form of violence, 30.9% experienced emotional violence, 18.8% had suffered physical violence and 6.3% reported experience of sexual violence. Relative to other married women, use of modern contraceptives was higher among women who had less than 5 children (14.4%), were aged 25–34 years (15.9%), were Christian (22.3%), were Yorubas (27.5%), married between 18–24 years (20.0%), had higher education (25.7%), had formal employment (21.1) and were from the richest households (24.9%). The use of modern contraceptive was also higher among married women who reported experience of IPV than those who did not have IPV exposure. The percentage was 19.1% for those who had experienced any form of violence; and 18.7%, 20.4% and 18.0% among those who reported emotional violence, physical violence, and sexual violence, respectively.

Percentage distribution of community-level characteristics of the study population by contraceptive use was presented in Table 2. At the community level, contraceptive use was highest among women residing in the South-West region (26.7%). It was also significantly ($p<0.005$) higher in communities with a high proportion of educated women (23.1%), urban areas (20.8), rich communities (20.0%), heterogeneous communities (19.9%), and communities with high media exposure (19.2%).

Multivariable analysis of relationship between contraceptive use, IPV types and selected individual- and community-level characteristics

Table 3 shows the fixed and random effects for the crude and adjusted ORs exploring the relationship between contraceptive use and different IPV types (net of selected

Table 1. Percentage distribution of individual-level characteristics of the study population by contraceptive use (NDHS 2018).

Variables	Contraceptive use		Total N (%)	P Value	χ^2
	Yes N (%)	No N (%)			
Physical violence					
No physical violence	929 (15.8)	4937 (84.2)	5866 (81.2)	0.000	16.2614
Experienced physical violence	276 (20.4)	1079 (79.6)	1355 (18.8)		
Sexual violence					
No sexual violence	1123 (16.6)	5645 (83.4)	6767 (93.7)	0.416	0.6604
Experienced sexual violence	82 (18.0)	372 (82.0)	454 (6.3)		
Emotional violence					
No emotional violence	787 (15.8)	4201 (84.2)	4988 (69.1)	0.002	9.5986
Experienced emotional violence	418 (18.7)	1815 (81.3)	2233 (30.9)		
Any form of violence					
None of the three forms	717 (15.4)	3936 (84.6)	4652 (64.4)	0.000	15.3138
Experienced any of the three forms	488 (19.0)	2081 (81.0)	2569 (35.6)		
Children ever born					
<5 children	2160 (14.4)	12825 (85.6)	14985 (60.0)	0.031	4.6729
5+ children	1343 (13.4)	8646 (86.6)	9988 (40.0)		
Religion					
Christianity	1771 (22.3)	6160 (77.7)	7931 (31.8)	0.000	750.0
Islam	1342 (9.2)	13299 (90.8)	14641 (58.6)		
Others	390 (16.2)	2012 (83.8)	2402 (9.6)		
Current age					
15–24	402 (8.3)	4467 (91.7)	4870 (19.5)	0.000	169.0925
25–34	1509 (15.9)	8005 (84.1)	9515 (38.1)		
35 and above	1591 (15.0)	8998 (85.0)	10588 (42.4)		
Ethnicity					
Hausa	977 (7.9)	11394 (92.1)	12371 (49.6)	0.000	1.0e+03
Igbo	571 (17.3)	2742 (82.8)	3313 (13.3)		
Yoruba	1030 (27.5)	2720 (72.5)	3750 (15.0)		
Others	922 (16.7)	4600 (83.3)	5522 (22.1)		
Educational Level					
No education	556 (5.1)	10357 (94.9)	10913 (43.7)	0.000	1.1e+03
Primary	646 (16.0)	3406 (84.0)	4053 (16.2)		
Secondary	1667 (22.1)	5872 (77.9)	7539 (30.2)		
Higher	633 (25.7)	1835 (74.3)	2468 (9.9)		

Variables	Contraceptive use				
	Yes N (%)	No N (%)	Total N (%)	P Value	χ ²
Age at first marriage					
<18	1206 (9.3)	11710 (90.7)	12916 (51.7)	0.000	510.8156
18–24	1726 (20.0)	6937 (80.0)	8670 (34.7)		
25+	563 (16.6)	2824 (83.4)	3386 (13.6)		
Wealth index					
Poorest	221 (4.4)	4797 (95.6)	5018 (20.1)	0.000	1.2e+03
Poorer	390 (7.5)	4822 (92.5)	5212 (20.9)		
Middle	628 (13.2)	4136 (86.8)	4763 (19.1)		
Richer	1005 (20.4)	3918 (79.6)	4923 (19.7)		
Richest	1259 (24.9)	3798 (75.1)	5027 (20.3)		
Occupation					
No employment					
Formal	712 (21.1)	2667 (78.9)	3379 (17.9)	0.000	88.7756
Informal	2123 (14.6)	12473 (85.5)	14596 (77.5)		
Manual labour	149 (17.1)	723 (82.9)	872 (4.6)		

Table 2. Percentage distribution of community-level characteristics of the study population by contraceptive use (NDHS 2018).

Variables	Contraceptive use				
	Yes N (%)	No N (%)	Total N (%)	P Value	χ ²
Regions					
North Central	563 (16.2)	2912 (83.8)	3475 (13.9)	0.000	974.8783
North East	379 (9.4)	3673 (90.6)	4052 (16.2)		
North West	613 (7.5)	7562 (92.5)	8175 (32.7)		
South East	373 (14.7)	2162 (85.3)	2535 (10.2)		
South South	438 (17.6)	2051 (82.4)	2488 (10.0)		
South West	1137 (26.7)	3111 (73.2)	4247 (17.0)		
Place of residence					
Urban	2151 (20.8)	8194 (79.2)	10345 (41.4)	0.000	670.3257
Rural	1352 (9.2)	13277 (90.8)	14628 (58.6)		
Ethnic diversity					
Homogenous	733 (7.6)	8873 (92.4)	9606 (38.5)	0.000	576.4625
Mixed	1212 (16.1)	6330 (83.9)	7541 (30.2)		
Heterogeneous	1558 (19.9)	6268 (80.1)	7825 (31.3)		

Variables	Contraceptive use		Total N (%)	P Value	χ^2
	Yes N (%)	No N (%)			
Community poverty					
Low	1946 (20.0)	7757 (80.0)	9703 (38.9)	0.000	654.9937
Medium	1043 (14.0)	6399 (86.0)	7442 (29.8)		
High	513 (6.6)	7314 (93.4)	7828 (31.3)		
Community level of education					
Low	480 (4.6)	9856 (95.4)	10336 (41.4)	0.000	1.4e+03
Middle	1140 (17.6)	5351 (82.4)	6491 (26.0)		
High	1882 (23.1)	6263 (76.9)	8145 (32.6)		
Community media access					
Low	752 (11.2)	5958 (88.8)	6710 (26.9)	0.000	341.4524
Middle	934 (10.6)	7879 (89.4)	8814 (26.9)		
High	1816 (19.2)	7633 (80.8)	9449 (37.8)		

Table 3. Results from multilevel logistic regression showing the influence of intimate partner violence on contraceptive use among married women in Nigeria (NDHS 2018).

Characteristics	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Physical IPV								
Yes (No = ref)	1.79* (1.21-2.63)	1.34 (0.96-1.87)						
Sexual IPV								
Yes (No = ref)			1.34 (0.79-2.26)	1.31 (0.77-2.22)				
Emotional IPV								
Yes (No = ref)					1.44* (1.05-1.99)	1.50 (0.53-1.67)		
Any of the three forms of IPV								
Yes (No = ref)							1.64* (1.18-2.30)	1.61* (1.17-2.21)
Children ever born								
5+ children (<5 children=ref)		2.88* (1.79-4.63)		2.89* (1.80-4.65)		2.90* (1.80-4.62)		2.89* (1.80-4.62)
Religion								
Islam (Christianity=ref)		0.34* (0.20-0.57)		0.33* (0.19-0.55)		0.34* (1.80-4.62)		2.89* (1.80-4.62)
Others		1.12 (0.73-1.73)		1.12 (0.73-1.73)		1.12 (0.72-1.72)		1.11 (0.72-1.72)

Characteristics	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	OR (95% CI)
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Current age								
25–34 (15–24=ref)		1.25 (0.79–2.00)		1.26 (0.79–2.01)		1.23 (0.77–1.96)		1.23 (0.77–1.96)
35 and above		0.92 (0.54–1.55)		0.92 (0.55–1.55)		0.90 (0.53–1.53)		0.90 (0.53–1.53)
Ethnicity								
Igbo (Hausa=ref)		2.20* (1.01–4.79)		2.20* (1.01–4.79)		2.27* (1.02–4.89)		2.24* (1.02–4.90)
Yoruba		3.75* (1.69–8.30)		3.81* (1.71–8.46)		3.82* (1.71–8.42)		3.80* (1.71–8.42)
Others		2.01* (1.14–3.55)		2.02* (1.14–3.57)		2.04* (1.14–3.57)		2.02* (1.14–3.57)
Educational Level								
Primary (No education=ref)		2.19* (1.28–3.76)		2.18* (1.27–3.73)		2.18* (1.02–4.89)		2.18* (1.27–3.75)
Secondary		4.44* (2.28–8.68)		4.42* (2.27–8.63)		4.46* (2.27–8.57)		4.42* (2.28–8.58)
Higher		5.37* (2.38–11.79)		5.25* (2.33–11.79)		5.42* (2.41–12.2)		5.44* (2.41–12.3)
Age at marriage								
18–24 (<18=ref)		0.94 (0.68–1.30)		0.94 (0.68–1.30)		0.94 (0.68–1.30)		0.94 (0.68–1.30)
25+		0.35* (0.20–0.62)		0.34* (0.19–0.61)		0.35* (0.20–0.63)		0.35* (0.20–0.62)
Wealth index								
Poorer (Poorest=ref)		1.01 (0.56–1.83)		1.01 (0.56–1.83)		1.01* (0.56–1.83)		1.01 (0.56–1.83)
Middle		1.46 (0.79–2.75)		1.49 (0.79–2.73)		1.48 (0.80–2.79)		1.49 (0.80–2.79)
Richer		1.84 (0.93–3.70)		1.89 (0.92–3.68)		1.89 (0.94–3.79)		1.89 (0.94–3.79)
Richest		2.24* (1.04–4.95)		2.33* (1.03–4.88)		2.29* (1.06–5.10)		2.33* (1.06–5.10)
Occupation								
Informal (Formal=ref)		1.44 (0.99–2.12)		1.44 (0.99–2.11)		1.45 (0.99–2.1)		1.46 (0.99–2.13)
Manual labour		1.50 (0.78–2.88)		1.51 (0.78–2.89)		1.51 (0.78–2.91)		1.51 (0.78–2.91)
Regions								
North East (North Central)		0.92 (0.52–1.62)		0.90 (0.51–1.60)		0.89 (0.50–1.59)		0.90 (0.50–1.59)
North West		0.96 (0.52–1.81)		0.95 (0.50–1.77)		0.96 (0.52–1.86)		0.98 (0.52–1.85)
South East		0.17* (0.07–0.44)		0.17* (0.07–0.45)		0.17* (0.07–1.86)		0.17* (0.07–0.45)

Characteristics	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	OR (95% CI)
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
South South		0.35* (0.19-0.66)		0.35* (0.19-0.66)		0.36* (0.19-0.67)		0.36* (0.19-0.67)
South West		0.87 (0.48-1.58)		0.85 (0.47-1.54)		0.94 (0.52-1.74)		0.96 (0.52-1.75)
Place of residence								
Rural (Urban=ref)		0.67* (0.46-0.98)		0.66* (0.46-0.97)		0.67* (0.46-0.98)		0.67* (0.46-0.98)
Ethnic diversity								
Mixed (Homogenous=ref)		0.85 (0.53-1.39)		0.86 (0.53-1.39)		0.84 (0.52-1.37)		0.84 (0.52-1.37)
Heterogeneous		0.84 (0.48-1.49)		0.85 (0.48-1.51)		0.83 (0.47-1.47)		0.83 (0.47-1.47)
Community poverty								
Medium (Low=ref)		0.90 (0.56-1.46)		0.91 (0.56-1.47)		0.89 (0.47-1.47)		0.88 (0.55-1.43)
High		1.41 (0.71-2.77)		1.0 (0.71-2.76)		1.40 (0.72-2.82)		1.42 (0.72-2.81)
Community level of education								
Middle		2.12* (1.23-3.65)		2.13* (1.23-3.68)		2.10* (1.23-3.67)		2.13* (1.23-3.67)
High		3.24* (1.56-6.73)		3.26* (1.57-6.77)		3.21 (1.55-6.67)		3.22* (1.55-6.67)
Community media access								
Middle (Low=ref)		0.95 (0.62-1.46)		0.95 (0.62-1.45)		0.96 (0.62-1.46)		0.95 (0.62-1.47)
High		0.85 (0.50-1.45)		0.85 (0.50-1.46)		0.87 (0.50-1.46)		0.86 (0.50-1.46)
Random effects		Physical IPV sub-sample		Sexual IPV sub-sample		Emotional IPV sub-sample		Any IPV sub-sample
Community-level								
Variance (SE)	4.13 (1.86)	1.09(0.45)	4.36 (1.93)	1.11(0.45)	4.32 (1.92)	1.10(0.44)	4.28(1.91)	1.11(0.44)
VPC=ICC (%)	55.7	24.9	57.0	25.2	56.8	25.1	56.5	25.2
Explained variation (PCV) %	Reference	73.6	Reference	74.5	Reference	74.5	Reference	74.1
Individual-level								
Variance (SE)	7.29 (4.18)	5.79 (2.79)	7.63 (4.15)	5.81 (2.78)	7.54 (4.16)	5.85 (2.76)	7.48 (4.17)	5.88 (2.75)
Explained variation (PCV) %	Reference	20.6	Reference	23.9	Reference	22.4	Reference	21.4
Log likelihood	-3047.89	-2251.11	-3053.59	-2256.20	-3051.09	-2253.03	-3048.09	-2251.36
Model fit statistics								
AIC	6103.79	4584.23	6115.18	4586.39	6110.18	4580.05	6104.18	4576.72
BIC	6131.30	4828.29	6142.67	4830.46	6137.67	4824.12	6131.67	4820.78

individual- and community-level characteristics). In the crude models, all the IPV types (with the exception of sexual IPV) were significantly associated with women's use of contraception ($p < 0.005$). Among married women, the odds of using modern contraceptive was 1.79 times higher among those who experienced physical violence, and 1.44 times higher among those who experienced emotional violence than those who reported otherwise. Irrespective of the type of violence, the likelihood of using contraceptive was higher among married women who had experienced any form of IPV than those who had no experience of IPV.

After adjusting for individual-level and contextual factors, the odds of using modern contraceptives, though slightly reduced, remained significantly higher among women who experienced any form of IPV (OR: 1.61, 95% CI: 1.17-2.21, $p < 0.005$) compared to those who reported no IPV experience. However, there were no significant relationships between different types of IPV and contraceptives after adjusting for individual and community factors.

In the the adjusted models for all IPV types, there was a significant relationship between contraceptive use and a number of individual- and community-level factors. These factors are CEB, religion, ethnicity, education, age at marriage, wealth index, region, place of residence, and community level of education ($p < 0.005$).

The models show significant variances ranging from 5.79 to 7.63 across individual level, and 1.09 to 4.36 across community level. This thus justifies the use of multilevel modeling in our analysis. The VPC (or ICC), which is the estimate of relatedness or variance in women's use of contraceptives across communities indicates that contraceptive use was not homogenous across different contexts. The ICC for contraceptive use in the adjusted models was 24.9% for physical IPV, 25.2% for sexual IPV, 25.1% for emotional IPV, and 25.2% for any type of IPV. These findings show that around one-quarter of the total variance in contraceptive use with respect to the different types of IPV could be explained at the community level. The estimates from AICs which are the goodness of fit for the adjusted model were smaller than those of crude models, hence they present the better fits.

Discussion

Intimate partner violence is a leading public health concern with grave consequences for women's physical, mental, sexual and reproductive health. Our results established that more than one-third of married women experienced at least one form of IPV. This suggests an increase in IPV prevalence as compared with previous study that established 23% IPV prevalence among married women from analysis of 2013 Nigeria DHS²⁷. Interestingly, we found that women who experienced different forms of IPV reported higher uptake of contraceptives than those who experienced no IPV. Previous studies have established similar findings. A study in Democratic

Republic of the Congo established a positive association between IPV and modern contraceptive use³⁸. Also, a multi-country study of 6 sub-Saharan African countries established that women who experienced IPV had significantly higher odds of using contraceptives than those who reported no experience of IPV²⁴. This result has implication for women's fertility intention and preference. Plausible explanation for high contraceptive use among women who experienced IPV is that occurrence of gender imbalances and exposures to the risk of violence in a marital dyad may force women to resort to a covert use of contraception^{37,39} in order to prevent having many children in an abusive union. Covert contraception (CC), which is the practice of using a family planning method without a partner's knowledge, is a common practice among women in SSA⁴⁰. Scholars have adduced that CC reflects the degree of how much autonomy a woman is able to exercise regarding her reproductive choices^{41,42}. Further, contraceptive use could trigger violence within a marital union that has palpable gender inequality. Given that women in some parts of Nigeria typically desire smaller families than their husbands/partners⁴³, such desire may be accentuated by women's exposure to spousal violence.

The pattern of higher likelihood of contraceptive uptake among women who experienced IPV relative to those with no exposure to IPV also accords with evidence from a few previous studies^{9,44}, but contrasts others which found a lower likelihood of contraceptive use among women in abusive relationship than those in non-abusive union^{25,45}. The lack of consensus in literature perhaps reflect uniqueness in societal gender norms in relation to culture of violence and reproductive health practices on contraception across different contexts⁴⁴.

Our second hypothesis in this study was that contexts may play a significant role in the association between IPV and contraceptive uptake because domestic violence is a product of social context²⁵. Based on this hypothesis, we explored the roles of community-level factors on the relationship between IPV and contraceptive use. To the best of our knowledge, this is the first study to investigate this. Our findings provide some evidence that there are significant neighbourhood effects on the relationship between two measures of IPV (physical IPV and emotional IPV) and modern contraceptive use. After incorporating community-level variables into the multilevel model, the relationship between two measures of IPV (physical IPV and emotional IPV) and modern contraceptive use became statistically insignificant.

The study established significant community variances in contraceptive uptake. Our estimate of relatedness or variance in women's use of contraceptives shows that relationship between IPV and contraceptive use is not homogenous across communities. The findings show that around one-quarter of the total variance in contraceptive use with respect to the different types of IPV could be explained at the community level. This suggests that community contextual factors

play significant roles in the decision to use contraceptives among women exposed to IPV. For instance, IPV-exposed women who reside in communities with socio-economic and geographic isolations (such as rural settings or urban slums) may have limited opportunities for contraceptive uptake compared to individuals in settings with greater socio-economic advantage.

Conclusion

In conclusion, this study established that uptake of modern contraceptives was higher among women who had exposure to IPV compared to those with no IPV exposure. Although the study cannot establish a cause-effect link or direction of causality between domestic violence and contraceptive use, findings of our study, building on evidence from previous research, suggest a bi-directional relationship between IPV and contraceptive use. We found that IPV tends to influence contraceptive use, while previous study reported that women's use of contraception could lead to abuse and domestic violence⁴⁶ (Kaye *et al.*). This is indicative of the complexity of the relationship between the two variables, and the present study provides empirical evidence that there is significant community effect on IPV exposure and women's contraceptive uptake. The study established that a significant proportion of the total variance in contraceptive use with respect to the different types of IPV is explained at the community level, thus suggesting the important roles of community contexts in the decision to use contraceptives among women in abusive

union. Attention must therefore be given to the context-specific social and gender norms that affect women's sexual and reproductive health in Nigeria.

Strengths and limitations of study

While the study has some strengths, including the use of a large nationally representative sample, and simultaneous analysis of both individual- and community-level variables; there are some drawbacks that must be considered while interpreting findings of the study. The use of primary sampling unit as a proxy variable for community may misclassify respondents into incorrect administrative boundaries. The use of secondary data constrains analysis to only the available variables collected in the survey, thus, relevant variables on community socio-cultural norms and other pertinent variables (such as prior experience of partner or non-partner abuse, duration or frequency of IPV) could not be explored. Further, the study did not explore the reverse impact of contraceptive use on IPV. Also, being a cross-sectional design, we can only infer association. Finally, the study was based on self-reported data which may have some element of social desirability bias particularly regarding the reporting of domestic violence.

Data availability

The study used publicly available Demographic and Health Survey data, and is available on request on the website of DHS Program. To access the data, it is required to seek for permission from the DHS Program.

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Winfred A. Avogo

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The revised manuscript addressed my concerns well within the constraints of the dataset. I do not have any further comments.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Fertility and contraceptive use, social networks, social interaction and reproductive behavior, HIV/AIDS, migration and migrant health etc.

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 1

Reviewer Report 06 October 2021

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Fidelia A.A. Dake

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The topic is interesting and the authors generally articulate the issues quite well. The intersection of IPV and modern contraceptive use in marriage has not been explored much. The manuscript is

thus relevant. However, there are a number of issues that need to be addressed. Detailed comments are provided for each section.

Introduction:

- Paragraph 3, where papers are referenced include the names as well. For example, where it says "For instance 21, found that..." - It will be helpful to include the name(s) of the authors as well.
- Page 4 paragraph 2; The sentence, "Indeed, the assumption is that it ..." does not read well. The authors should reframe the sentence to make the meaning clearer.

Methods:

- Variables: There is a time sequencing issue in the measurement of the dependent and independent variable. Ever experienced IPV could have happened anytime in the past while current use of modern contraceptives in the current union is in a different time. Basically, you cannot relate a previous experience of IPV to current use of modern contraception especially if current contraceptive use is in a union that is different from a union in which they experienced IPV. The sample should be limited to women in a marriage where they experience IPV and are using modern contraceptives.
- IPV measure (B): the authors say the women who experience any two of the three questions asked but they appear to use all three questions. Please clarify.
- Other explanatory variables: Do they authors mean the average age at first marriage or just age at marriage? If a woman has been in more than one marriage and her current marriage is not her first marriage then which age at marriage is this study interested in?
- Statistical analysis: Please clarify this; how many level two units were there in the multilevel model?

Results:

Multivariable analysis:

- Table 1: The chi squared vales and the p-values seem to have been interchanged. It does not make sense to have a p-value of 510.8156 or 169.0925 and a chi squared value of 0.000. Please check and correct this.
- Table 2: This table does not show the number of level 2 units. The table simply distributes the number of women by contextual classifications. For example what proportion of the women live in urban areas versus rural areas rather than the number of rural or urban units. For a multilevel model it is important to know and measure the level 2 units accurately.
- Table 3 is confusing. The table headings seems to suggest that IPV is being regressed on IPV. The authors need to check this. Without this clarification, the whole of Table 3 is meaningless.
Again, the dependent variable per the methodology outlined is modern contraceptive use coded as Yes "1" or No "1". The predictor variable in Table 3 is not clear. Please clarify this. The table can further be made more compact by taking the several rows of 1s representing

the reference categories. Indicate the reference category for the explanatory variables like it was done with the IPV variables at the beginning of the Table.

- One limitation of this study is that it does not explore community socio-cultural norms. It will be helpful to have a measure of these socio-cultural measures. For example patriarchy and polygamous unions etc.
- Another limitation with the paper is that it fails to explore the reverse impact of CPR on IPV as alluded by the authors. This may be outside the scope of the current study but it is worth exploring.
- The discussion and conclusions may need to be revised given the issues raised with the methods and the results.

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?

No

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

Yes

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

No

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: Demography, Quantitative analysis

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 27 Oct 2021

Sunday Sunday, Federal University Oye-Ekiti, Oye-Ekiti, Nigeria

Reviewer #2

Fidelia A.A. Dake

Comments:

The topic is interesting and the authors generally articulate the issues quite well. The intersection of IPV and modern contraceptive use in marriage has not been explored much. The manuscript is thus relevant. However, there are a number of issues that need to be addressed. Detailed comments are provided for each section.

Response:

Thank you.

Comments:**Introduction:**

Paragraph 3, where papers are referenced include the names as well. For example, where it says "For instance 21, found that..." - It will be helpful to include the name(s) of the authors as well.

Response:

Thank you for the comments. We have included the authors' name (Pallitto & Campbell) as advised.

Comments:

Page 4 paragraph 2; The sentence, "Indeed, the assumption is that it ..." does not read well. The authors should reframe the sentence to make the meaning clearer.

Response:

The sentence being referred to in paragraph 2 of page 4 has been properly rewritten as shown below:

Consequently, women are expected to submit to men's authority and control on sexual matters. The culturally-laden social norms on intimate partner relationship reinforces women's perception in the traditional societies that denying husbands sex is culturally and religiously unacceptable.

Comments:**Methods:**

Variables: There is a time sequencing issue in the measurement of the dependent and independent variable. Ever experienced IPV could have happened anytime in the past while current use of modern contraceptives in the current union is in a different time. Basically, you cannot relate a previous experience of IPV to current use of modern contraception especially if current contraceptive use is in a union that is different from a union in which they experienced IPV. The sample should be limited to women in a marriage where they experience IPV and are using modern contraceptives.

Response:

Thank you for the comments. The question on the experience of IPV specifically relates to the most recent partner/husband. The information on IPV was elicited from the

respondents by asking the question: “Does (did) your (last) husband/partner ever do any of the following things to you?”. This thus limits the sample only to women who experienced IPV in the recent union in which they used or didn’t not use modern contraceptives. This is clearly presented in the method section

Comments:

IPV measure (B): the authors say the women who experience any two of the three questions asked but they appear to use all three questions. Please clarify.

Response:

Thank you for the comments. We have corrected the phrase from ‘two questions’ to ‘three questions’.

Comments:

Other explanatory variables: Do the authors mean the average age at first marriage or just age at marriage? If a woman has been in more than one marriage and her current marriage is not her first marriage then which age at marriage is this study interested in?

Response:

The study specifically controlled for age at first marriage. We have used same terminology for this variable throughout the manuscript. The study adjusted for age at first marriage because previous studies have established generally poor reproductive health outcomes for women who married early, notwithstanding the number of unions they have had.

Comments:

Statistical analysis: Please clarify this; how many level two units were there in the multilevel model?

Response:

The level two of the multilevel analysis had 1,400 clusters (proxy for communities) across the country. This information has been included in the revised manuscript.

Comments:**Results:**

Multivariable analysis:

Table 1: The chi squared vales and the p-values seem to have been interchanged. It does not make sense to have a p-value of 510.8156 or 169.0925 and a chi squared value of 0.000. Please check and correct this.

Response:

Thank you for the comments. We have made the necessary corrections accordingly. All changes are tracked up.

Comments:

Table 2: This table does not show the number of level 2 units. The table simply distributes the number of women by contextual classifications. For example what proportion of the women live in urban areas versus rural areas rather than the number of rural or urban units. For a multilevel model it is important to know and measure the level 2 units accurately.

Response:

Table 2 basically presents descriptive analysis of the contextual variables. For instance, the proportion of women living in rural areas (58.6%) was more than their counterparts in urban areas (41.4%). Essentially, the contextual variables were mainly generated by aggregating the level one (individual-level) variables and thereafter we took the proportion of women who had a particular attribute at the community level (level 2). Put differently, the level two variables were mainly generated by aggregating the individual-level variables at the level of primary sampling units (PSUs). We have provided this clarification in the revised manuscript.

Comments:

Table 3 is confusing. The table headings seems to suggest that IPV is being regressed on IPV. The authors need to check this. Without this clarification, the whole of Table 3 is meaningless.

Response:

Thank you for the comments. IPV is the explanatory variable and was regressed on modern contraceptive use (the outcome variable). We have 4 different sub-samples for the explanatory variable – (i) Physical IPV sub-sample (ii) Sexual IPV sub-sample (iii) Emotional IPV sub-sample (iv) Respondents with Any IPV. Different models focus on each of these 4 sub-samples. We have provided this clarity in the table and the prose.

Comments:

Again, the dependent variable per the methodology outlined is modern contraceptive use coded as Yes "1" or No "1". The predictor variable in Table 3 is not clear. Please clarify this. The table can further be made more compact by taking the several rows of 1s representing the reference categories. Indicate the reference category for the explanatory variables like it was done with the IPV variables at the beginning of the Table.

Response:

As stated above, IPV is the explanatory variable and was regressed on modern contraceptive use (the outcome variable). We have 4 different sub-samples for the explanatory variable – (i) Physical IPV sub-sample (ii) Sexual IPV sub-sample (iii) Emotional IPV sub-sample (iv) Respondents with Any IPV. Different models focus on each of these 4 sub-samples. We have provided this clarity in the table and the prose. We have also made the table more compact by deleting rows of 1s representing the reference categories.

Comments:

One limitation of this study is that it does not explore community socio-cultural norms. It will be helpful to have a measure of these socio-cultural measures. For example patriarchy and polygamous unions etc.

Another limitation with the paper is that it fails to explore the reverse impact of CPR on IPV as alluded by the authors. This may be outside the scope of the current study but it is worth exploring.

Response:

We acknowledge that lack of relevant variables on community socio-cultural norms and not exploring the reverse impact of CPR on IPV are study limitations. While the former was not available in the analysed secondary dataset, the latter issue is beyond the scope of the current study. These limitations have been acknowledged.

Comments:

The discussion and conclusions may need to be revised given the issues raised with the methods and the results.

Response:

The discussion and conclusion have been revised accordingly.

Competing Interests: No competing interests were disclosed.

Reviewer Report 13 August 2021

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Winfred A. Avogo

Department of Sociology and Anthropology, Illinois State University, Normal, IL, USA

This study is on a topic of great concern to reproductive health of women in Sub-Saharan Africa. Contraceptive use is still low and Intimate Partner Violence (IPV) is high in the region and urgent measures are needed to reduce both to achieve Goal 5 of the Sustainable Development Goals on gender equality and empowerment of all women and girls.

However, the main conclusion that modern contraceptive use was highest among married women who reported experience of IPV than those who did not was counter intuitive and more importantly, its explanation is not well sustained by the chosen theoretical and conceptual framework - theory of gender and power and neighborhood factors.

As is explained in the manuscript, IPV is synonymous with women's reproductive coercion – unprotected sex, control over women's reproductive decision making, lack of negotiation skills etc. Perhaps one of the instances supporting contraceptive use among victims of IPV is when it is hidden from the male partner, but this study did not address the countervailing effects. Moreover, given this is a cross-sectional study rife with issues of temporality, I doubt how much credibility we should assign to this finding?

There are also several confounder effects that probably should be adjusted for if the DHS data permits, some of these include: prior experience of partner or non-partner abuse, IPV duration or frequency – persistent or sporadic, parity, fertility intentions etc.

The manuscript also references reverse causation - the possibility that use of contraceptives (covert or overt) may constitute a high risk of IPV - yet does not do more to test and rule out its effects.

More could also be done to link the use of aggregate community variables to the theory or conceptual framework of the study - what about community level of education mediate the relationship between IPV and contraceptive use? How about community media access and community level of poverty?

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?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Fertility and contraceptive use, social networks, social interaction and

reproductive behavior, HIV/AIDS, migration and migrant health etc.

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 27 Oct 2021

Sunday Sunday, Federal University Oye-Ekiti, Oye-Ekiti, Nigeria

Response to reviewers' comments

Prof Winfred A. Avogo

Comments:

This study is on a topic of great concern to reproductive health of women in Sub-Saharan Africa. Contraceptive use is still low and Intimate Partner Violence (IPV) is high in the region and urgent measures are needed to reduce both to achieve Goal 5 of the Sustainable Development Goals on gender equality and empowerment of all women and girls.

Response:

Thank you.

Comments:

However, the main conclusion that modern contraceptive use was highest among married women who reported experience of IPV than those who did not was counter intuitive and more importantly, its explanation is not well sustained by the chosen theoretical and conceptual framework - theory of gender and power and neighborhood factors. As is explained in the manuscript, IPV is synonymous with women's reproductive coercion – unprotected sex, control over women's reproductive decision making, lack of negotiation skills etc. Perhaps one of the instances supporting contraceptive use among victims of IPV is when it is hidden from the male partner, but this study did not address the countervailing effects.

Moreover, given this is a cross-sectional study rife with issues of temporality, I doubt how much credibility we should assign to this finding?

Response:

Thank you for the comments. The finding that modern contraceptive use was highest among married women who reported experience of IPV did not come as a surprise. Previous studies in sub-Saharan Africa have established similar findings. Perhaps we did not provide sufficient evidence from literature on this, however, we have now done some revision and made additional inputs. We also did a due diligence to verify this result by undertaking a rigorous analysis. This finding has been well supported by the previous studies, and drawing on the literature, we have provided detailed explanation that women in abusive relationship possibly resort to covert contraceptive use due to their experience of IPV. Some relevant information included in the manuscript is provided below. Although the use of cross-sectional data poses some limitation, we have acknowledged these in the revised manuscript. Further, our contribution to the existing knowledge is mainly to examine if community-level characteristics modify the relationship between IPV and

modern contraceptive use. We found that after incorporating community-level variables into the multilevel model, the relationship between IPV and contraceptive use became statistically insignificant. Some of the texts included in the revised manuscript are presented below:

Interestingly, we found that women who experienced different forms of IPV reported higher uptake of contraceptives than those who experienced no IPV. Previous studies have established similar findings. A study in Democratic Republic of the Congo that established a positive association between IPV and modern contraceptive use (Kidman et al, 2015). A multi-country study of 6 sub-Saharan African countries also established that women who experienced IPV had significantly higher odds of using contraceptives than those who had reported no experience of IPV (Alio et al, 2009). This result has implication for women's fertility intention and preference. Plausible explanation for high contraceptive use among women who experienced IPV is that occurrence of gender imbalances and exposures to the risk of violence in a marital dyad may force women to resort to a covert use of contraception [37, 38] in order to prevent having many children in an abusive union. Covert contraception (CC), which is the practice of using a family planning method without a partner's knowledge, is a common practice among women in SSA [39]. Scholars have adduced that CC reflects the degree of how much autonomy a woman is able to exercise regarding her reproductive choices [40, 41]. Further, contraceptive use could trigger violence within a marital union that has palpable gender inequality. Given that women in some parts of Nigeria typically desire smaller families than their husbands/partners [42], such desire may be accentuated by women's exposure to spousal violence.

Further, we explored the roles of community-level factors on the relationship between IPV and contraceptive use. To the best of our knowledge, this is the first study to investigate this. Our findings provide some evidence that there are significant neighbourhood effects on the relationship between IPV and modern contraceptive use. After incorporating community-level variables into the multilevel model, the relationship between two measures of IPV (physical IPV and emotional IPV) and modern contraceptive use became statistically insignificant.

Comments:

There are also several confounder effects that probably should be adjusted for if the DHS data permits, some of these include: prior experience of partner or non-partner abuse, IPV duration or frequency – persistent or sporadic, parity, fertility intentions etc. The manuscript also references reverse causation - the possibility that use of contraceptives (covert or overt) may constitute a high risk of IPV - yet does not do more to test and rule out its effects.

Response:

The variables suggested above are important for the study of this nature. However, these variables are not available in the dataset (except parity which has been included). We have acknowledged this limitation in the revised manuscript. The limitation of reverse causation has also been discussed in the revised manuscript.

Comments:

More could also be done to link the use of aggregate community variables to the theory or conceptual framework of the study - what about community level of education mediate the

relationship between IPV and contraceptive use? How about community media access and community level of poverty?

Response:

As advised, we have revised the manuscript accordingly. The manuscript's main contribution was to examine whether community-level characteristics modify the association between IPV and contraceptive use. The emerging findings have been discussed in the light of the literature and the theoretical framework for the study. All changes are tracked up.

Comments:

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?

Partly

Response:

Thank you.

Competing Interests: No competing interests were disclosed.