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Determinants of Short Birth Intervals in Northern and Southern Nigeria: Analysis of Demographic and Health Survey Data

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ABSTRACT

A Short birth interval (SBI) is a reproductive and public health problem in Nigeria and other developing nations. This is because of its adverse effects on mothers and their children. SBI might differ in Northern and Southern Nigeria due to variations in the socio-demographic construct and socio-cultural practices. The adolescent birth and total fertility rates are higher in the North than in the South. Also, early childbearing is higher in the North than in the South. This study aimed to estimate the magnitude and determinants of SBI in Northern and Southern Nigeria. This study utilized the 2018 Nigeria Demographic and Health Survey (2018 NDHS). Statistical analyses were descriptive analysis and binary logistic models. The association between outcome and predictors was estimated using odds ratio and 95% confidence interval (CI). A p-value of ≤ 0.05 was considered statistically significant. The prevalence of SBI Northern Nigeria was 20.6% (95% CI=19.8% - 22.1%), while that of the Southern region was 20.5% (95% CI= 19.2% - 21.9%). After controlling for other factors, the age of women, religion, education level, marital status, employment status and the number of children ever born were significantly associated with SBI in northern and southern Nigeria, whereas the number of antenatal care (ANC) visits was only significant in Northern Nigeria. There was no regional inequality in short birth interval between southern and northern Nigeria as regards the prevalence and factors. We recommend that public health professionals should involve religious leaders in their deliberations and campaign for modern contraception. Also, exclusive breastfeeding should be encouraged as a natural spacer among mothers across the two regions in the first few months of delivery for their health and that of the children. The use of local means of communication in communities without access to modern means of communication like television and radio should also be encouraged. Women in the northern region will benefit from health education related to antenatal care.

Keywords: Birth interval; determinants; regional inequalities; women of reproductive age; Nigeria

1. INTRODUCTION

According to the World Health Organization (WHO), birth interval is the time from a live birth to a successive pregnancy, and the recommended period is at least 24 months [1]. A birth interval is

short when the period is less than 24 months, and long when the period between the live births exceeds 60 months [1-3]. A short or prolonged birth interval has serious implication for maternal and child health. When pregnancy starts in less than 18 months after birth, the initiation of antenatal care is likely to be delayed as some women may be reluctant to attend because of fear of abuse by health care workers for not practicing adequate birth spacing. Such delays may lead to an increased risk of maternal mortality, miscarriages, and adverse birth outcomes, including preterm births, stillbirths, low birth weight, neonatal morbidity, and under-five mortality [4-6]. Short birth intervals can also have economic implications for families. Having children too close together can strain a family's financial resources, as the cost of raising and caring for multiple children can be high. Additionally, short birth spacing could deplete a woman's nutrient stores from the pregnancy and breastfeeding. An increase in competition among the children for nutrition and less access to resources, could negatively impact the health of the mother and the healthy development of the child. Deliveries that are adequately spaced can help women recover from macro- and micronutrient depletions associated with pregnancy and lactation, thereby helping to improve the outcome of subsequent pregnancies [7]. The high fertility rate in Nigeria and other sub-Saharan African countries has effect on the population size. The consequence is a negative impact on the economy, maternal and child health. The degree of impact associated with short birth interval on individuals and the communities is dependent on their access to health facilities and family planning services, illness behaviour, and socio-cultural practices. The factors affecting birth intervals within, and outside Nigeria are mainly socio-demographic in nature, and they include maternal education, place of residence, occupation, income, maternal age at first birth, current age of mothers, survival status of previous child and maternal age at marriage [8-10].

Short birth interval (SBI) has been observed to be commoner in low- and middle-income countries (LMICs) where the unmet need for family planning among married women of reproductive age is estimated at 17% [11]. For instance, the Nigeria Demographic and Health Survey (NDHS) 2018 report showed that 19% of married women had unmet family planning needs [12]. The NDHS 2013 found that 23% of women had a birth interval of less than 24 months for their last two births while 62% had an interval of less than 36 months [13,14]. However, Nigeria has recorded a significant improvement in birth spacing between 2001 and 2018.

Nigeria is a multi-ethnic country with many variations in the socio-demographic construct and socio-cultural practices in the different regions of the country which may influence the pattern of birth interval among its people. Antenatal care coverage is higher in the South than in the North. Also, literacy among young women is higher in the South than in the North. Women have better opportunity to get salary earning jobs and are better empowered to seek for family planning services on their own in the South. There is extreme difference in the quality of life within the population because of inequality in wealth distribution. Variations exist in economic indices for the different regions of the country and among the different social classes in these regions [15-17]. A report has shown that a significant association exist between wealth index and birth interval, Privileged women were demonstrated to have less odds of having short birth interval compared to the underprivileged ones [8].

Understanding determinants of SBI separately in the northern and southern regions of Nigeria could be crucial in crafting policies to address the consequences of abnormal birth intervals in the two regions. However, studies using nationally representative data are sparse in Nigeria. The few studies available were

institution-based and only limited to the town in which the institution is located [18-20]. Furthermore, previous study that used a national data to determine the rural-urban disparity in SBI in Nigeria, revealed a statistically significant association between SBI and place of residence [8]. Therefore, this study aimed to determine the prevalence and factors associated with SBI in the northern and southern regions of Nigeria.

2. METHODS

2.1. Study Design, Data and Data Source

This study utilized a retrospective cross-sectional survey design by analyzing a national representative data. The data for this study involved 41,821 women residing in Northern and Southern Nigeria and was extracted from the 2018 Nigeria Demographic and Health Survey [12] conducted by the National Population Commission (NPC) and ICF international. The survey collected information from men and women in the reproductive age in the 36 states and Federal Capital Territory (FCT) Abuja through a stratified two-stage sampling method.

2.2. Study variables

The outcome variable in this study was preceding birth interval coded as <24 months and ≥ 24 months based on the WHO recommendation [1]. The explanatory variables were selected sociodemographic and health care seeking characteristics based on previous study [4,8, 11]. The variables were as follows: mother's age (<20/20-29/30-39/≥40 years); Child's gender (male/female); mother's educational level (None/primary/secondary/higher); employment status (employed/unemployed); marital status religion (Christianity/ Islam/ Other); place of residence (urban/rural); wealth index (poor/middle/rich); number of antenatal care visits (None/1-3/4-7/>7 visits); and number of children ever born (0-2/ 3-4/ > 4).

2.3. Data analysis and statistical technique

Data with a single characteristic was analyzed using univariate analysis to determine proportions, whereas chi-square test was used to ascertain the association between two different variables. The significant variables derived from the chi-square test were included in the multivariate binary logistic regression model to identify factors that were significantly associated with SBI in the northern and southern regions of Nigeria.

Sampling weight, clustering, and stratification were adjusted to account for the complex nature of the DHS data. The measure of associations was the adjusted odds ratio and was reported in the result with its 95% confidence interval. Statistical significance was set P-value<0.05. Stata version 16 (Stata Corp, College Station, TX) was used to perform all analyses.

3. RESULTS

Table 1, which was adapted from previous study [8] shows the characteristics of participants, proportion of birth intervals, and association of respondents with birth interval in Nigeria. The result showed a statistically significant association between birth intervals and the factors, excepting the gender of a previous child (P=0.749).

Table 1. Distribution of participants and proportion of birth intervals in Nigeria.

Characteristics	Total Number (%)	≥24 months Number (%)	< 24 months Number (%)	P-value	95% CI for Prevalence
Overall	**41821 (100)**	**20084 (79.4)**	**5196 (20.6)**		
Place of Residence				0.000	
Rural	24837 (59.4)	12625 (79.3)	3299 (20.7)		19.5-21.1
Urban	16984 (40.6)	7459 (79.7%)	1897 (20.3)		20.1-21.4
Maternal age (years)				0.000	
<20	8423 (20.1)	156 (65.0)	84 (35.0)		29.2-41.3
20-29	14047 (33.6)	5862 (75.7)	1878 (24.3)		23.3-25.2
30-39	11403 (27.3)	8008 (80.9)	1896 (19.1)		18.4-19.9
≥40	7948 (19.0)	6058 (81.9)	1338 (18.1)		17.2-19.0
Child gender					

Male	15345 (51.2)	10249(79.4)	2663 (20.6)	0.749	19.1-21.5
Female	14647 (48.8)	9835 (79.5)	2533 (20.5)		18.3-21.2
Religion				0.014	
Christianity	20506 (49.0)	8919 (79.7)	2269 (20.3)		19.2-21.4
Islam	20959 (50.1)	10990 (79.3)	2869 (20.7)		19.6-21.8
Others	356 (0.9)	175 (75.1)	58 (24.9)		23.4-25.2
Region				0.000	
Northern	25540 (61.1)	12920 (79.4)	3352 (20.6)		19.8-22.1
Southern	16281 (38.9)	7164 (79.5)	1844 (20.5)		19.2-21.9
Educational level				0.004	
No education	14398 (34.4)	8759 (78.9)	2345 (21.1)		20.6-22.4
Primary	6383 (15.3)	3915 (81.3)	900 (18.7)		17.6-19.8
Secondary	16698 (39.9)	5808 (79.0)	1542 (21.0)		20.6-22.3
Higher	4342 (10.4)	1602 (79.7)	409 (20.3)		19.6-21.1
Marital status				0.018	
Not married	28888 (69.1)	18392 (79.3)	4811 (20.7)		19.6-21.6
Married	12933 (30.9)	1692 (81.5)	385 (18.5)		17.7-19.3
Employment status				0.000	
Unemployed	14766 (35.3)	5042 (76.8)	1522 (23.2)		22.1-24.7
Employed	27055 (64.7)	15042 (80.4)	3674 (19.3)		18.7-20.5
Wealth index				0.002	
Poor	16093 (38.5)	8684 (79.1)	2295 (20.9)		20.1-21.7
Middle	8859 (21.2)	4259 (79.1)	1123 (20.9)		19.8-21.9
Rich	16869 (40.3)	7141 (80.1)	1778 (19.9)		19.1-20.8
Number of children ever born				0.001	
0-2	21237 (50.8)	3685 (78.5)	1011 (21.5)		20.8-22.2
3-4	8493 (20.3)	6798 (80.0)	1695 (20.0)		19.7-20.9
>4	12091 (28.9)	9601 (79.4)	2490 (20.6)		19.8 – 21.0
Antenatal care visits				0.002	
None	5365 (24.6)	3674 (79.0)	975 (21.0)		20.5 - 21.9
1-3	3793 (17.4)	2490 (77.9)	705 (22.1)		21.8-22.8
4-7	8210 (37.7)	5414 (80.5)	1309 (19.5)		18.9-20.4
>7	4424 (20.3)	2820 (81.2)	652 (18.8)		17.9-19.4

Significant at P<0.05

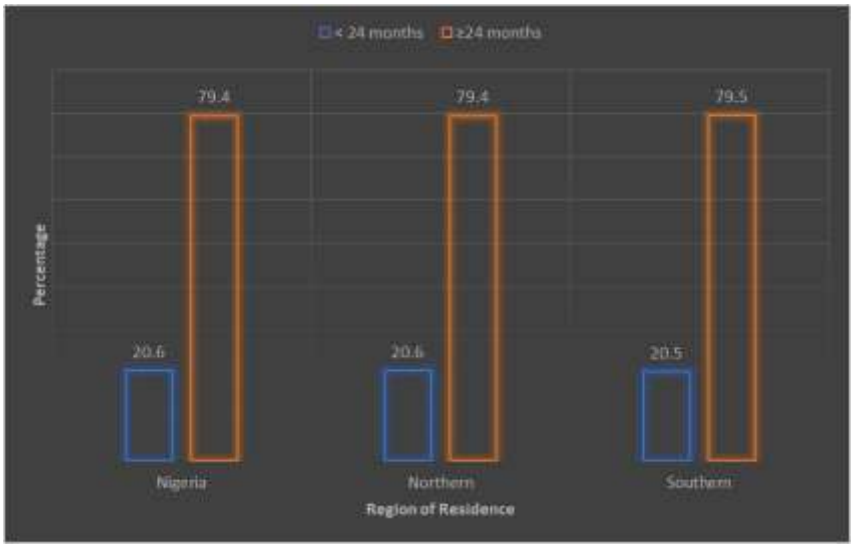

Figure 1. Prevalence of Short Birth Interval based on the region of residence.

The regional prevalence of short birth interval showed that the Northern region of Nigeria had a prevalence of 20.6% while the Southern region had a prevalence of 20.5%.

Table 2. Factors associated with short birth interval in Northern and Southern Nigeria.

Factors	**Northern Nigeria**				**Southern Nigeria**			
	COR (95% CI)	**P-value**	**AOR (95% CI)**	**P-value**	**COR (95% CI)**	**P-value**	**AOR (95% CI)**	**P-value**
Place of residence								
Urban	1.00		1.00		1.00		1.00	
Rural	1.08 (1.01-1.16)	0.03	1.01 (0.90-1.11)	0.99	1.03 (0.95-1.12)	0.49	1.06 (0.95-1.09)	0.49

Maternal age (years)								
<20	1.00		1.00		1.00		1.00	
20-29	0.50 (0.35-0.71)	0.00	0.48 (0.34-0.69)	0.00	0.21 (0.06-0.70)	0.01	0.18 (0.05-0.58)	0.00
30-39	0.30 (0.22-0.43)	0.00	0.24 (0.17-0.35)	0.00	0.12 (0.04-0.41)	0.00	0.08 (0.02-0.27)	0.00
≥40	0.25 (0.18-0.36)	0.00	0.15 (0.11-0.23)	0.00	0.08 (0.02-0.25)	0.00	0.03 (0.01-0.29)	0.00
Religion								
Christianity			1.00		1.00		1.00	
Islam	1.45 (1.35-1.56)	0.00	1.31 (1.18-1.46)	0.00	1.35 (1.28-1.57)	0.00	1.24 (1.15-1.37)	0.00
Others	2.00 (1.23-3.27)	0.01	2.02 (1.11-3.67)	0.02	1.26 (0.91-1.74)	0.16	1.18 (0.97-1.36)	0.74
Educational level								
Higher	1.00		1.00		1.00		1.00	
Secondary	0.82 (0.75-0.90)	0.00	0.97 (0.87-1.08)	0.60	0.93 (0.79-1.09)	0.35	1.01 (0.80-1.28)	0.93
Primary	0.96 (0.88-1.05)	0.35	1.18 (1.04-1.33)	0.01	1.10 (0.95-1.27)	0.21	1.13 (0.90-1.42)	0.30
No education	0.74 (0.64-0.85)	0.00	1.24 (1.00-1.53)	0.04	1.27 (1.06-1.52)	0.01	2.03 (1.53-2.68)	0.00
Marital status								
Never married	1.00		1.00		1.00		1.00	
Married	0.79 (0.70-0.91)	0.00	0.80 (0.65-0.98)	0.03	0.77 (0.68-0.87)	0.00	0.79 (0.63-0.99)	0.04
Employment status								
Unemployed	1.00		1.00		1.00			
Employed	0.76 (0.63-0.87)	0.00	0.72 (0.68-0.80)	0.00	0.76 (0.67-0.89)	0.00	0.94 (0.76-0.98)	0.02
Wealth index								
Poor	1.00		1.00		1.00		1.00	
Middle	0.90 (0.83-0.97)	0.01	0.98 (0.89-1.09)	0.73	1.04 (0.91-1.19)	0.52	1.07 (0.89-1.28)	0.48
Rich	0.87 (0.80-0.94)	0.00	1.06 (0.94-1.21)	0.34	0.95 (0.84-1.06)	0.35	0.88 (0.74-1.05)	0.16
Number of children ever born								
0-2	1.00		1.00		1.00		1.00	
3-4	0.84 (0.76-0.92)	0.00	0.95 (0.85-1.07)	0.39	0.98 (0.88-1.09)	0.72	1.31 (1.13-1.51)	0.00
> 4	0.81 (0.74-0.89)	0.00	1.34 (1.18-1.53)	0.00	0.95 (0.85-1.06)	0.33	1.98 (1.66-2.35)	0.00
Antenatal care visits								
None	1.00		1.00		1.00		1.00	
1-3	0.97 (0.88-1.07)	0.55	0.94 (0.85-1.04)	0.22	1.22 (0.96-1.56)	0.11	1.13 (0.88-1.46)	0.34
4-7	0.85 (0.78-0.93)	0.00	0.86 (0.78-0.94)	0.00	1.11 (0.92-1.33)	0.27	1.14 (0.94-1.39)	0.19
>7	0.78 (0.67-0.90)	0.00	0.85 (0.72-1.00)	0.05	0.96 (0.80-1.14)	0.63	1.03 (0.84-1.25)	0.80

Statistically significant at P<0.05.

Table 2 shows the results of the analysis of association between short birth interval and the women characteristics using bivariable and multivariable logistic regression. The result reveals the influence of some variables on short birth interval in Northern and Southern Nigeria. The result indicated a higher odds of short birth interval in rural areas compared to urban areas in both Northern region (AOR=1.01, 95% CI=0.90–1.11) and Southern region (AOR=1.06, 95% CI=0.95–1.09). Though the results are not statistically significant. The result also showed a significant decrease in odds of short birth interval with increased maternal age in Northern region (20–29 years: AOR=0.48, 95% CI=0.34–0.69; 30–39 years: AOR=0.24, 95% CI=0.17–0.35; ≥40 years: AOR=0.15, 95% CI=0.11–0.23); and Southern region (20–29 years: AOR=0.18, 95% CI=0.05–0.58; 30–39 years: AOR= 0.08, 95% CI = 0.02–0.27; ≥ 40 years: AOR= 0.03, 95% CI = 0.01–0.29). Islamic women and those practicing other religion residing in the Northern region had significantly higher odds of having a short birth interval compared to the Christian women: Islamic women (AOR=1.31, 95% CI=1.18–1.46) and other religions (AOR=2.02, 95% CI=1.11–3.67). Similarly, Islamic women living in the Southern region had significantly higher odds of having short birth interval (AOR = 1.24, 95% CI = 1.15–1.37) compared to women practicing Christianity. Women who had no formal education and secondary had 18% (AOR=1.18, 95% CI=1.04–1.33) and 24% (AOR=1.24, 95% CI=1.00–1.53) respectively higher odds of having short birth interval than women with higher education in Northern Nigeria. Also, women who had no formal education were significantly 2.03 times more likely to have short birth interval (AOR=2.03, 95% CI=1.53–2.68) than women with higher education living in Southern Nigeria.

Employed women residing in the Northern region (AOR=0.72, 95% CI=0.68–0.80) and Southern region (AOR=0.94, 95% CI=0.76–0.98) had significantly lower odds of having short birth intervals than unemployed women. Married women were less likely to have SBI among those living in the Northern (AOR=0.80, 95% CI = 0.65-0.98) and Southern regions (AOR=0.79, 95% CI=0.63–0.99) compared to Never married women. Regarding the household wealth index, middle wealth index women living in Northern region were 0.98 times less likely to have short birth intervals compared to poor women (AOR=0.98, 95% CI =0.89–1.09). But in the Southern region, middle wealth index women had a higher odd of having short birth intervals (AOR=1.07, 95% CI=0.89–1.28) than the poor women. Though both were not statistically significant.

Women in Northern Nigeria who have had more than four deliveries were more likely to have a short birth interval (AOR= 1.34, 95% CI=1.18–1.53) than those with two deliveries or less. In Southern Nigerian, women who had three to four children and above four children were significantly more likely to have a short birth interval than women who had two children or less (AOR=1.31, 95% CI =1.13–1.51) and (AOR=1.98, 95% CI =1.66–2.35) respectively. Women who attended at least four times antenatal care during pregnancy had lower odds of having short birth intervals in Northern Nigeria than those who did not attend at all: Four to seven ANC visits (AOR=0.86, 95% CI=0.78–0.94) and above seven ANC visits (AOR=0.85, 95% CI=0.72–1.00). None of the categories of ANC visits were significantly associated with SBI in the Southern Nigeria.

4. DISCUSSIONS

In seeking for more effective ways to achieve fertility control and improve maternal and child health through birth spacing in Nigeria, there is need to investigate factors that contribute to poor birth intervals, such as SBI. This study was designed to investigate the regional inequalities of SBI, and factors contributing to these inequalities.

The finding of this study revealed that there is essentially no difference in the prevalence of SBI in Northern (20.6%) and Southern (20.5%) regions of Nigeria. The finding is consistent with previous studies in Tanzania and Ethiopia, where as high as 48.7 and 57.6% of women had SBI respectively [21,22]. However, the figures are lower than what was previously reported for all the developing countries, where 68% of the women experienced SBI [23]. Moreso, the high prevalence of SBI in the Southern region of Nigeria could be triggered by the sex preference phenomena especially in the South-South and South-East where male gender is more preferred in the family for the sole reason of family or lineage continuation, and in the Northern region by polygamy which is permitted by the predominant religion in the region. [23].

The magnitude of SBI in the Northern and Southern regions of Nigeria could be due to religious beliefs and utilization of family planning (FP) methods. For instance, the northern region of Nigeria is predominantly Muslim, while the Southern region is predominantly Christian [24], there are documented evidence that Christian women tend to space births than Muslims. For example, studies done in Nigeria and abroad such as Bangladesh and Ethiopia revealed that Muslim women were more likely to have SBI than their Christian counterparts [8,25 -28]. The 2018 NDHS also showed these disparities in the utilization of FP between the Northern and Southern Nigeria where there is less use of FP methods among married women in the North compared to the South [12]. Studies that explored the variations in the use of FP methods in Nigeria revealed significant regional and religious variations with distinct north-south, and Muslim Christian divide [29-31]. However, this did not translate into a practical significant difference in the prevalence of SBI in the Northern and Southern regions of Nigeria.

The multivariable analysis revealed that women age, religion, educational level, marital status, employment status and number of children ever born were statistically significant for having SBI in both regions, while the number of ANC visits contributed significantly to having SBI in the Northern region only. These factors may be useful in predicting the high prevalence of SBI. in Nigeria. These results were consistent with previous studies that identified all or some of these factors as contributors to SBI in Nigeria and abroad. For example, a study that examined the rural-urban disparities of SBI in Nigeria showed that women age, wealth index, region, educational level, employment status, number of children ever born, and number of ANC visits were associated with the odds of having SBI [8]. Previous studies carried out in Nigeria, Uganda and Ethiopia, all agreed with these findings [7, 24, 29].

The possible explanations for these associations could be biological, economic, education and awareness, access to family planning services, and cultural related factors. For instance, women who have their first child at a younger age may be more fertile and have shorter intervals between pregnancies. Age-related decline in fertility may affect birth interval in those who get their first child at a later age due to medical or socio-economic reasons. Young women who are unemployed, uneducated with less access to recreational activities may be more sexually active. They may have more children in a shorter period due to their fertility and a longer reproductive lifespan. Additionally, in cultures where having many children is considered desirable, women may be expected to have children soon after getting married to satisfy this cultural norm. In such circumstance it may result in women having shorter birth intervals. Furthermore, women who are employed may have more opportunities and financial resources that can enhance access to family planning counselling and services. Exposure to health promotion activities can empower these women to take control of their health and space their pregnancies adequately.

This study noted a significant disparity in the number of ANC visits, and a statistically significant relationship was observed between the number of ANC visits and the odds of having SBI in the Northern region alone. The result revealed that the odds of having SBI decreases as the number of ANC visits increases. The non-significance of this association in the southern region could be explained by increased utilization of antennal care services in the south compared to the north. A study in Nigeria on the factors affecting antenatal care services confirmed this assumption as the study noted a lower utilization of antenatal care services in the Northern region [26]. The possible explanation for this indirect relationship between SBI and ANC visits could be that ANC attendees have access to information about the health effects of short birth intervals, and the need to postpone pregnancy to desirable times [8].

Also, ANC attendees can benefit from health education sessions about the importance of breastfeeding for the health of the new-born, and its usefulness in delaying the return of ovulation in women who exclusively breastfeed. Breastfeeding is indeed a significant factor that can affect birth intervals. In Nigeria, breastfeeding has traditionally been the primary mode of infant feeding, and it has been widely recognized as an essential way to promote child health and nutrition. However, there have been changes in the attitude and practice of breastfeeding mothers in Nigeria. There is a decline in the prevalence of exclusive breastfeeding caused by an increase in the use of formula and other breast milk substitutes. According to 2018 NDHS, the prevalence of exclusive breastfeeding declined by 10%, from 39% in 2008 to 29% in 2018 [12]. This change in the breastfeeding practice of mothers in Nigeria could impact on birth interval, because women who do not exclusively breastfeed their infants may resume ovulation earlier, which could lead to pregnancy and shorter birth intervals.

Study Limitations and Strengths

The use of the most recent NDHS which is a nationally representative data collected through a standardized instrument and valid sampling procedures was the major strength of this study. However, the main study limitation was based on the inherent disadvantages associated with cross-sectional studies which was the design of the survey and recall bias since questions were based on events that took place years before the survey. Another limitation was the use of data collected in a survey conducted in 2018, a time before the global COVID-19 pandemic that impacted on the demographic data of all countries.

5. CONCLUSION

This study revealed no significant difference in the prevalence of short birth interval between the Northern and Southern regions of Nigeria. The multivariable analysis revealed that women age, religion, educational level, marital status, employment status and number of children ever born were statistically significant for having SBI in both regions, while the number of ANC visits contributed significantly to having SBI in the Northern region only. The government at all levels in Nigeria should intensify efforts to improve access to modern contraception and educate the population on proper birth spacing in both regions using natural spacer such as breastfeeding. Women residing in the Northern region should be educated by public health experts about the health benefits of antenatal care services to improve the health outcomes of mothers and children. To ensure that this information gets to individuals and communities, we recommend that public health professionals should engage religious leaders in their health promotion activities and campaign for family planning across the regions, and the use of local means of communication should be encouraged in communities without access to modern means of communication such as television and radio.

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Institutional Review Board Statement: Ethical review and approval were waived for this study because the authors utilized secondary data that was freely available in the public space. More information about DHS data and ethical standards can be found at: http://dhsprogram.com/data/available-datasets.cfm.

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Data Availability Statement: The dataset used and analyzed for this study were extracted from the 2018 Nigeria Demographic and Health Survey (2018 NDHS) conducted by the National Population Commission (NPC) and available in http://dhsprogram.com/data/available-datasets.cfm.

Declaration by Authors

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