Discover Public Health

RESEARCH Open Access

The role of healthcare access in the association between intimate partner violence and pregnancy loss in Nigeria

Adegbenga M. Sunmola[1*], Luqman A. Morakinyo[2], Funlade T. Sunmola[3] and Olusegun A. Mayungbo[4]

*Correspondence:
Adegbenga M. Sunmola
gbsunmola@gmail.com
[1]Department of Psychology, Faculty of the Social Sciences, University of Ibadan, Ibadan, Nigeria
[2]Department of Psychology, Lead City University, Ibadan, Nigeria
[3]School of Physics, Engineering and Computer Science, University of Hertfordshire, College Lane, Hatfield, Hertfordshire, UK
[4]Department of Psychology, Chrisland University, Abeokuta, Nigeria

Abstract

Background Intimate partner violence (IPV) remains a critical public health issue with adverse consequences for women's reproductive health, including pregnancy loss. In Nigeria, high rates of both IPV and maternal health challenges underscore the need to examine how structural factors, such as healthcare access, may influence these outcomes. This study investigates whether access to healthcare moderates the relationship between IPV and pregnancy loss among Nigerian women.

Methods This study analyzed data from the 2018 Nigeria Demographic and Health Survey (NDHS), a nationally representative cross-sectional survey using a stratified two-stage cluster sampling design. The analytic sample included 8,217 ever-pregnant women who completed the domestic violence module and provided valid responses on IPV, pregnancy loss, and healthcare access. Moderated binary logistic regression was used to assess the independent and interactive effects of physical and sexual IPV on pregnancy loss, with healthcare access examined as a potential moderator.

Results The respondents' ages ranged from 15 to 49 years (M = 32.48, SD = 8.23). Sexual IPV significantly increased the odds of pregnancy loss (B = 0.29, AOR = 1.34, 95% CI [1.05, 1.73], p = .002), while also physical IPV showed a significant positive association ((B = 0.19, AOR = 1.03, 95% CI [0.82, 1.19], p = .003)). Access to healthcare was also significantly positively associated with pregnancy loss (B = 0.17, AOR = 1.15, 95% CI [1.03, 1.17], p = .001), possibly reflecting reverse causality. Importantly, healthcare access moderated the relationship between sexual IPV and pregnancy loss (B = -0.31, AOR = 0.84, 95% CI [0.66, 0.94], p < .001), suggesting a buffering effect. Slope analysis confirmed that sexual IPV remained a risk factor across access levels but was less pronounced when access was high. No moderating effect was observed for physical IPV (p = .216).

Conclusions The findings highlight that both physical and sexual IPV significantly increase the risk of pregnancy loss among Nigerian women. Notably, access to healthcare moderated these associations, suggesting that improving healthcare access may mitigate the harmful reproductive health consequences of IPV. These results underscore the importance of integrated interventions addressing both violence prevention and structural healthcare barriers.

Keywords Intimate partner violence (IPV), Pregnancy loss, Healthcare access, Resilience theory, Nigeria

1 IPV and pregnancy loss

Intimate partner violence (IPV) is a significant public health concern in sub-Saharan Africa and Nigeria, where it contributes to adverse reproductive outcomes, including pregnancy loss such as miscarriage, stillbirth, and induced abortion. In Nigeria, 20.3% of ever-married women aged 15–49 have experienced at least one form of IPV, whether sexual, physical, or emotional, and 14.6% reported such experiences in the past year (NDHS, 2019 NPC/NDHS, 2018). Pregnancy loss, defined as the death of an embryo or fetus before birth, encompasses miscarriage (the spontaneous loss before the 24th week; [36]), stillbirth (loss after 20 weeks), and abortion (deliberate termination). In Nigeria, 5% of pregnant women meet the WHO definition of recurrent pregnancy loss, which is three consecutive losses including nonvisualized pregnancies [10]. Both physical and sexual IPV contribute to negative pregnancy outcomes through direct trauma and chronic stress, compromising maternal health, affecting fetal development, and raising the likelihood of miscarriage, preterm birth, and low birth weight [7, 25, 44]. The consequences of pregnancy loss include physical pain, medical complications, and serious psychological effects such as grief, depression, anxiety, PTSD, societal stigma, and suicide risk [34], with long-term impacts on women's well-being. Given the high IPV prevalence and reproductive challenges in Nigeria, efforts to mitigate IPV's impact on pregnancy loss are urgently needed.

The association between IPV and pregnancy loss is well documented in sub-Saharan Africa. In Tanzania, women who experienced IPV were found to be 1.6 times more likely to report a pregnancy loss [39, 40]. Similarly, in Ethiopia, a significant association between IPV and pregnancy loss was observed even after adjusting for confounders [43]. A community-based study in Northern Nigeria identified multiple forms of IPV during pregnancy, such as physical assault, sexual coercion, and controlling behaviors, which are linked to adverse reproductive health outcomes including pregnancy loss and missed antenatal care [4, 18]. Evidence across sub-Saharan Africa consistently demonstrates a significant association between IPV and negative maternal health outcomes [39, 40, 43], highlighting the urgent need for IPV prevention and intervention within reproductive health programs [7].

1.1 Access to health care and pregnancy loss

Pregnant women's access to health care refers to their ability to obtain timely, affordable, and appropriate medical services during pregnancy, childbirth, and the postpartum period. This includes antenatal care (ANC), skilled birth attendance, emergency obstetric care, and postnatal services. It also involves access to health education and respectful, culturally sensitive care [30, 45]. Despite growing awareness of the importance of maternal health services, ANC coverage in Nigeria remains critically low (National Population Commission [NPC] & [29]. A 2018 nationally representative survey revealed that only 20% of pregnant women met the updated WHO guideline of at least eight ANC visits, while 25% of women did not attend any ANC visits during pregnancy [3, 10, 14]. Women in Nigeria, as in much of sub-Saharan Africa, encounter numerous barriers to

accessing healthcare during pregnancy [17, 19], and key determinants include limited access to health facilities, financial constraints, cultural beliefs, and lack of autonomy in health-related decision-making [3, 6, 12]. When these barriers are addressed and access to healthcare is improved, the quality of pregnancy care can be significantly enhanced. Ensuring continuous, comprehensive care throughout pregnancy is essential to reducing pregnancy-related complications and adverse outcomes [37].

Elsewhere in sub-Saharan Africa, several studies have established a strong association between inadequate access to healthcare and increased risk of pregnancy loss. A mixed-methods study conducted across 22 sub-Saharan African countries revealed that 23.5% of adolescent mothers experienced adverse birth outcomes. Importantly, access to high-quality ANC was linked to a 28% reduction in the risk of such outcomes, underscoring the critical role of ANC quality in improving maternal and neonatal health in the region [44]. Strengthening ANC services is essential for early risk detection and prevention of adverse outcomes in the region. Pregnant women who receive adequate ANC are more likely to experience healthier pregnancies and safer deliveries [15, 45]. Taken together, the literature highlights that access to healthcare remains limited in Nigeria and across sub-Saharan Africa due to persistent barriers, despite the fact that antenatal care is vital for preventing pregnancy loss through early detection and management of complications.

1.2 Theoretical synthesis: moderating role of access to healthcare

Pregnant women who experience IPV face an elevated risk of adverse outcomes such as miscarriage and abortion. However, not all IPV-exposed women experience pregnancy loss, suggesting that certain protective factors may mitigate these risks. Prior studies indicate that access to healthcare may serve as a significant protective factor, potentially buffering the adverse effects of IPV during pregnancy [25]. Despite this potential, it is not empirically clear how the interaction between IPV and access to healthcare influences pregnancy loss. This gap may be attributed to several factors, such as a predominant focus in the literature on direct effects rather than interactive or moderating mechanisms, methodological challenges in testing moderation effects using cross-sectional data, and limited availability of datasets that concurrently measure IPV exposure, healthcare access, and pregnancy outcomes. As a result, the empirical conditions under which healthcare access moderates the IPV–pregnancy loss relationship remain underexplored. Advancing knowledge in the context of IPV is therefore a critical aim within prevention research.

The intersection of IPV, healthcare access, and pregnancy loss can be comprehensively understood by integrating Resilience Theory and Feminist Theory. Resilience Theory posits that individuals facing adversity, such as IPV, can maintain or regain well-being through protective resources, with access to healthcare serving as a crucial structural resilience factor [16, 26]. In this context, healthcare access may moderate the detrimental effects of IPV on pregnancy outcomes by enabling early detection and management of pregnancy complications, providing psychosocial support, and facilitating referrals to comprehensive services, thereby reducing the risk of pregnancy loss among IPV-exposed women. Conversely, Feminist Theory contextualizes IPV as a manifestation of deeply rooted male dominance and control over women's bodies and reproductive autonomy within sub-Saharan African societies [9, 21]. Pregnancy may challenge traditional gender

roles by increasing women's access to healthcare and social networks, which some male partners interpret as threats to their authority, potentially triggering violence as a means to reassert control [23]. Moreover, prevailing cultural norms that legitimize violence, economic dependence on men, and weak institutional protections create environments where IPV persists and is often overlooked. By combining these perspectives, it becomes clear that healthcare access can buffer the physiological and psychological harms of IPV through a resilience process. However, this buffering is situated within broader gendered power structures that perpetuate IPV and limit women's autonomy. Therefore, addressing pregnancy loss among IPV-affected women requires integrated interventions that not only enhance healthcare access to build resilience but also challenge harmful gender norms and promote women's empowerment, as underscored by feminist theory. This integrated approach highlights the complex interplay between structural supports and sociocultural determinants in moderating the IPV–pregnancy loss relationship.

1.3 The current study

The present study investigates the association between IPV and pregnancy loss among a nationally representative sample of ever-pregnant women in Nigeria, with specific emphasis on the potential moderating role of access to healthcare. The study focuses on two primary forms of IPV, which are physical and sexual, independent variables. Pregnancy loss is the primary outcome variable, while access to healthcare is examined as both an independent predictor and a moderator of the IPV–pregnancy loss relationship. The analysis adjusts for a set of relevant covariates, including maternal age and husband's controlling behavior, to ensure robust estimation of the hypothesized relationships.

Four hypotheses guide the study. First, it is hypothesized that exposure to physical and sexual IPV will be positively associated with pregnancy loss (H1), while greater access to healthcare will be negatively associated with pregnancy loss (H2). Second, it is hypothesized that healthcare access will moderate the relationship between physical IPV and pregnancy loss (H3), and between sexual IPV and pregnancy loss (H4), such that the adverse effects of IPV will be attenuated among women with higher levels of healthcare access. By testing these hypotheses, the study aims to contribute to the understanding of how structural supports such as healthcare access can buffer the reproductive health consequences of IPV, particularly in resource-limited settings like Nigeria.

1.4 Participants and procedure

The present study utilized data from the 2018 Nigeria Demographic and Health Survey (NDHS), a nationally representative cross-sectional survey designed to collect comprehensive information on key demographic and health indicators. The NDHS employed a stratified two-stage cluster sampling design. In the first stage, 1,400 enumeration areas (EAs) were selected from the national sampling frame, serving as primary sampling units. In the second stage, a complete listing of households within each EA was conducted, from which households were randomly selected for participation. The target population for the NDHS included women aged 15–49 residing in the selected households. Approximately 42,000 households participated in the survey, yielding interviews with 41,821 eligible women.

A subsample of these households was randomly selected for the domestic violence module, in which one eligible woman per selected household was randomly chosen to

respond to questions on intimate partner violence (IPV). The present analysis focuses on 8,217 ever-pregnant women who met the following criteria: (1) they completed the domestic violence module; (2) they reported having ever been pregnant; and (3) they provided complete responses on IPV, pregnancy loss, and healthcare access. These women were identified from within the domestic violence module sample using reproductive health and fertility history variables.

The 2018 Nigeria Demographic and Health Survey (NDHS) received ethical approval from the Institutional Review Board (IRB) of ICF International, USA (IRB Protocol Number: FWA00000845) and the National Health Research Ethics Committee of Nigeria (NHREC/01/01/2007). Informed consent was obtained from all participants prior to data collection. The data used in this study were de-identified and publicly available, and permission to access and analyze the dataset was obtained from the DHS Program (National Population Commission (NPC) [Nigeria] & [29]).

1.5 Measures

Physical Violence: Women's lifetime experiences of physical IPV were assessed using a seven-item scale developed by the National Population Commission and ICF International (2014), capturing specific acts such as being punched or hit. Responses were binary (Yes/No) and recoded into a single dichotomous variable indicating exposure to any physical IPV. Women reporting at least one act were coded as 1 (exposed), while others were coded 0 (not exposed). Given the non-normal distribution of this physical IPV indicator, this binary classification was appropriate. This approach also enabled the use of logistic regression models, which do not assume normality of predictors or outcome variables. The scale demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.76$).

Sexual Violence. Sexual intimate partner violence (IPV) was measured using three dichotomous items assessing women's life-time experiences of sexual coercion by their husbands, including forced intercourse and threats. Responses were recoded into a binary variable, with women reporting at least one incident coded as 1 (exposed) and others as 0 (not exposed). Given the non-normal distribution of this sexual IPV indicator, this binary classification was appropriate. The scale ranged from 0 to 3, reflecting the number of coercive experiences. It demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.70$).

Access to Healthcare. Women's access to healthcare was assessed using four binary items evaluating perceived barriers to obtaining medical care, such as permission, cost, distance, and lack of companionship. Responses were summed to create a composite score (0–4), where lower scores indicated greater barriers. This index captured structural and social constraints to healthcare access. The scale demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.76$).

Husband's Controlling Behavior. Women's experiences of spousal controlling behavior were measured using a five-item scale assessing jealousy, accusations of infidelity, social isolation, surveillance, and financial distrust. Each item was coded as 0 (No) or 1 (Yes), and responses were summed to produce a total score ranging from 0 to 5, with higher scores indicating more controlling behavior. This measure captured key aspects of coercive control in intimate relationships. The scale showed acceptable internal consistency (Cronbach's $\alpha = 0.70$).

1.6 Sociodemographic and contextual characteristics

Sociodemographic and contextual characteristics were derived from the 2018 Nigeria Demographic and Health Survey (NDHS), a nationally representative dataset (National Population Commission & [29]). Respondents' educational attainment was categorized into three levels: no education (reference category), primary education, and secondary education or higher. Religious affiliation was grouped into Christian (reference category), Muslim, and other religions. Additional covariates included employment status (employed vs. not employed, with "not employed" as the reference) and place of residence (urban vs. rural, with urban as the reference). The household wealth index, constructed from an analysis of household assets, was categorized into low (poorest/poorer; reference group), middle, and high (richer/richest). Media access was defined by the frequency of exposure to newspapers, radio, or television and was dichotomized as "has access" vs. "no access" (reference). Husband's alcohol use was assessed as a binary variable (yes vs. no, with "no" as the reference). The primary outcome variable, pregnancy loss, was based on self-reported experience of miscarriage, abortion, or stillbirth. It was dichotomized as "yes" (experienced any form of pregnancy loss) and "no" (reference), indicating whether the respondent had experienced at least one adverse pregnancy outcome.

1.7 Analytic technique

Descriptive and bivariate analyses were conducted to explore variable distributions and associations. Preliminary analyses showed that key sociodemographic factors of age and husband's controlling behavior were significantly linked to pregnancy loss and thus included as covariates in the multivariate models. Covariate selection was guided by theory and prior research on potential confounders. Cases with missing data (< 5%) were excluded using listwise deletion, as the missingness was minimal and exhibited no systematic pattern.

To test the study's hypotheses, a moderated binary logistic regression analysis was employed, with pregnancy loss serving as the binary dependent variable. The key independent variables were physical and sexual IPV, and access to healthcare was assessed as a potential moderating variable. Given the differing prevalence and mechanisms of physical and sexual IPV, the analysis was conducted using two separate models, in which one was on physical IPV and its interaction with healthcare access, and another on sexual IPV and its interaction with healthcare access. Accordingly, the interaction terms were tested in separate models, not simultaneously. This modeling strategy allowed for clearer interpretation of moderation effects and minimized potential collinearity between the two IPV types. Each model was structured into three hierarchical steps. In the first step, only control variables were entered to account for sociodemographic and contextual factors. The second step introduced the main effects of the focal IPV types and healthcare access. The third and final step added the interaction term between the IPV variable and healthcare access to test for moderation effects on pregnancy loss. Model stability and statistical power were assessed using the events-per-variable (EPV) criterion. With 1333 pregnancy loss events and 9 predictors, including the independent variable, moderator, interaction term, and covariates. The EPV was approximately 148.1. This exceeds the recommended threshold of 10, indicating sufficient power to detect meaningful associations, even for low-prevalence exposures such as sexual IPV. To address the increased

risk of Type I error due to multiple comparisons, a Bonferroni correction was applied during the bivariate analyses. A total of 11 predictor variables were each tested twice, once using chi-square tests (for categorical associations) and once using bivariate logistic regression (for odds estimation with the binary outcome). Although this resulted in 22 statistical tests, the correction was applied based on the 11 unique predictors. Therefore, the significance threshold was adjusted to $p < 0.0045$ (i.e., 0.05/11). Only associations meeting a stricter significance threshold were interpreted in bivariate analysis and multivariate or moderated models. Predictor and moderator variables in interaction terms were mean-centered to reduce multicollinearity and aid interpretation. Variance Inflation Factor (VIF) scores were assessed, all falling below 5, indicating no multicollinearity concerns. Simple slopes analysis was conducted to interpret significant interaction effects.

1.8 Sample

The formulation of the research hypotheses guided the selection of the appropriate analytical sample from the complete dataset. To ensure that the analysis was focused on individuals for whom the outcome variable of pregnancy loss was applicable, the variable "ever pregnant" was used to identify relevant cases. This filtering process resulted in a total sample of 8217 respondents. Among these, 1333 individuals reported having experienced at least one pregnancy loss, while 6,884 indicated they had not. This classification ensured that the analysis targeted the subpopulation most relevant to the study's objectives. Although the IPV module was administered to a subsample of the full NDHS sample, the subsample selection was random and stratified, thereby maintaining the representativeness of the broader population across key demographic and geographic variables. Moreover, the application of sampling weights provided in the NDHS ensures that estimates derived from the subsample remain nationally representative when analyzing associations among ever-pregnant women. This analytical approach aligns with DHS guidance on analyzing specialized modules.

2 Result

2.1 Descriptive statistics

Descriptive statistics were computed for key continuous and categorical variables. The respondents' ages ranged from 15 to 49 years ($M = 32.48$, $SD = 8.23$), based on data from 8,217 participants. The access to healthcare score ranged from 0 to 4, ($M = 2.99$, $SD = 1.23$), indicating a moderate level of healthcare access overall. Regarding pregnancy loss, 16.2% of participants reported having experienced at least one pregnancy loss ($M = 0.16$, $SD = 0.37$), based on binary coding (0 = no loss, 1 = any loss), which reflects the dispersion of this outcome in the sample. As shown in Table 1, the largest proportion of respondents were aged 25–34 years (40.7%) and resided in rural areas (55.3%). Islam was the most common religion (53.2%), followed by other Christian denominations (36.3%). Most participants were employed (72.7%) and had attained only primary education or less (56.3%). Wealth distribution favored those in the higher-income category (62.5%), and just over half (51.4%) reported exposure to media. Regarding partner behaviors, 77.2% reported that their partners did not consume alcohol, while 59.3% indicated experiences of controlling behavior. Physical IPV was reported by 11.7% of respondents, and

Table 1 Frequency and percentage distribution of sample characteristics: Intimate partner violence, healthcare access, and pregnancy loss *(N = 8,217)*

Variable	Frequency (n)	Percentage (%)
Age group		
15–24	1449	17.6
25–34	3341	40.7
35–44	2513	30.6
45 +	914	11.1
Type of place of residence		
Urban	3670	44.7
Rural	4547	55.3
Religion		
Catholic	814	9.9
Other Christian	2983	36.3
Islam	4374	53.2
Traditionalist	35	0.4
Other	11	0.1
Currently working		
Not employed	2241	27.3
Employed	5976	72.7
Education		
Primary education and below	4627	56.3
Secondary education and above	3590	43.7
Wealth		
Poor	3079	37.5
Rich	5138	62.5
Exposure to media		
No	3991	48.6
Yes	4226	51.4
Husband/partner drinks alcohol		
No	6345	77.2
Yes	1873	22.8
Husband's controlling behaviour		
No	3344	40.7
Yes	4873	59.3
Physical IPV		
No	7,256	88.3
Yes	961	11.7
Sexual IPV		
No	7847	95.5
Yes	370	4.5

Frequencies are unweighted. Percentages may not total 100% due to rounding

4.5% experienced sexual IPV. These frequencies contribute to a comprehensive demographic and psychosocial profile for contextualizing the study.

2.2 Bivariate associations between key variables and pregnancy loss

Bivariate associations between study variables and pregnancy loss are presented in Table 2. In addition to Chi-square statistics, effect sizes were reported using Phi (for 2×2 tables) and Cramér's V (for variables with more than two categories). These measures offer insight into the strength of associations, which is particularly important in large samples where statistically significant p-values may not indicate meaningful effects. Age group was significantly associated with pregnancy loss, $\chi^2(3) = 32.194$, $p < 0.001$, Cramér's $V = 0.062$. Wealth status also showed a statistically significant association, $\chi^2(1) = 10.132$,

Table 2 Bivariate correlations among study variables: Intimate partner violence, healthcare access, and pregnancy loss (N = 8217)

Variable	% No Pregnancy Loss	% Pregnancy Loss	Chi-square (df)	p-value	Phi/Cramér's V
Age groups			$\chi^2 = 32.194$ (3)	.000	.062
15–24	18.5%	13.0%			
25–34	40.4%	42.2%			
35–44	29.8%	34.9%			
≥ 45	11.4%	9.8%			
Type of residence			$\chi^2 = 2.131$ (1)	.144	.016 (Φ)
Urban	44.3%	46.5%			
Rural	55.7%	53.5%			
Exposure to media			$\chi^2 = 5.734$ (1)	.017	.026 (Φ)
No	49.2%	54.4%			
Yes	50.8%	45.6%			
Partner drinks alcohol			$\chi^2 = 2.845$ (1)	.092	.019 (Φ)
No	76.1%	78.3%			
Yes	23.9%	21.7%			
Currently working			$\chi^2 = 7.422$ (1)	.006	.030 (Φ)
Not employed	72.1%	75.8%			
Employed	27.9%	24.2%			
Education level			$\chi^2 = 6.610$ (1)	.010	.028 (Φ)
≤ Primary	56.9%	53.1%			
≥ Secondary	43.1%	46.9%			
Wealth status			$\chi^2 = 10.132$ (1)	.001	.035 (Φ)
Poor	38.2%	66.4%			
Rich	61.8%	33.6%			
Religion			$\chi^2 = 3.736$ (4)	.443	.021 (Cramér's V)
Catholic	9.9%	10.0%			
Other Christian	36.3%	36.1%			
Islam	53.1%	53.7%			
Traditionalist	0.5%	0.2%			
Other	0.2%	0.0%			
Physical IPV			$\chi^2 = 9.366$ (1)	.010	.027 (Φ)
No	88.1%	87.5%			
Yes	8.9%	12.5%			
Sexual IPV			$\chi^2 = 28.857$ (1)	.000	.060 (Φ)
No	95.9%	92.4%			
Yes	4.1%	7.6%			
Husband's controlling behaviour			$\chi^2 = 12.619$ (1)	.000	.039 (Φ)
No	41.5%	36.3%			
Yes	58.5%	63.7%			

The table presents percentages of participants with and without pregnancy loss across sociodemographic and behavioral variables. Chi-square (χ^2) tests assess group differences, with degrees of freedom (df) in parentheses. Phi (Φ) and Cramér's V indicate effect sizes for 2 × 2 and larger contingency tables

$p = 0.001$, $\Phi = 0.035$. Sexual IPV, $\chi^2(1) = 28.857$, $p < 0.001$, $\Phi = 0.060$, and husband's controlling behavior, $\chi^2(1) = 12.619$, $p < 0.001$, $\Phi = 0.039$, were significantly associated with pregnancy loss, with moderate effect sizes. Physical IPV was also significantly associated, $\chi^2(1) = 9.366$, $p = 0.004$, $\Phi = 0.027$, meeting the Bonferroni-adjusted significance threshold ($p < 0.0045$). Other variables including media exposure, employment, education, and religion were not statistically significant under the adjusted threshold, although

some showed small effect sizes ($\Phi < 0.04$). Type of residence and partner's alcohol use were not significantly associated with pregnancy loss.

2.3 Logistic regression results

2.3.1 Overall model fit and predictive power

The final logistic regression model predicting pregnancy loss was statistically significant, $\chi^2(13) = 111.15$, $p < 0.001$, indicating that the set of independent variables reliably distinguished between women who reported pregnancy loss and those who did not. The Pseudo-R^2 values indicated that the model explained between 1.8% (Cox & Snell R^2) and 3.9% (Nagelkerke R^2) of the variance in pregnancy loss. The Hosmer–Lemeshow goodness-of-fit test was non-significant ($\chi^2 = 19.194$, df = 8, $p = 0.07$), suggesting that the model fits the data well. While the Pseudo-R^2 values reflect modest predictive capacity, the model's statistical significance and acceptable fit support the relevance of the included predictors. This also underscores the complexity of pregnancy loss and the likely influence of additional unmeasured factors.

2.4 Bivariate logistics and covariates associated with pregnancy loss

Table 3 shows bivariate logistic regression results predicting pregnancy loss. After applying a Bonferroni-adjusted significance threshold of $p < 0.0045$, several predictors retained statistical significance. Compared to women aged over 45, those aged 15–24 had a significantly negative relationship with experiencing pregnancy loss (OR = 0.572, 95% CI [0.439, 0.746], $p < 0.001$). Physical IPV (OR = 1.254, 95% CI [1.019, 1.360], $p = 0.004$), sexual IPV (OR = 1.516, 95% CI [1.020, 1.665], $p < 0.001$), and husband's controlling behavior (OR = 1.629, 95% CI [1.402, 1.943], $p = 0.004$) were all positively associated with higher odds of pregnancy loss. Associations for employment status (OR = 0.815, 95% CI [0.706, 0.940], $p = 0.005$), education (OR = 0.856, 95% CI [0.761, 0.963], $p = 0.010$), and wealth (OR = 0.840, 95% CI [0.738, 0.956], $p = 0.008$) were statistically significant at the conventional $p < 0.05$ level but not under the Bonferroni-adjusted threshold. Other predictors, including age 25–34, urban residence, alcohol use, and media exposure, were not significantly associated with pregnancy loss.

Table 3 Bivariate Logistic Regression Analyses Predicting Pregnancy Loss

Predictor	B	SE	Wald	df	p	Exp(B)	95% CI for Exp(B)
Age groups (ref: > 45)			62.008	3	< .001		
Age 15–24	-0.558	0.135	16.971	1	< .001	0.572	0.439 – 0.746
Age 25–34	0.078	0.112	0.491	1	.484	1.082	0.868 – 1.347
Age 35–44	0.271	0.114	5.641	1	.018	1.311	1.049 – 1.640
Place of residence (Urban)	0.093	0.064	2.084	1	.149	1.097	0.967 – 1.245
Husband/partner drinks alcohol (Yes)	0.085	0.080	1.127	1	.288	1.089	0.931 – 1.274
Employment status (Employed)	-0.205	0.073	7.874	1	.005	0.815	0.706 – 0.940
Education (Primary or less)	-0.156	0.060	6.709	1	.010	0.856	0.761 – 0.963
Wealth (Poor)	-0.174	0.066	6.952	1	.008	0.840	0.738 – 0.956
Exposure to media (Yes)	-0.128	0.064	3.991	1	.046	0.880	0.776 – 0.998
Physical IPV (Yes)	0.247	0.100	0.525	1	.004	1.254	1.019 – 1.360
Sexual IPV (Yes)	0.662	0.130	26.064	1	< .001	1.516	1.020 – 1.665
Husband controlling behavior (Yes)	0.188	0.066	8.186	1	.004	1.629	1.402 – 1.943

Note. Results are from bivariate logistic regression models predicting pregnancy loss. Odds ratios (Exp(B)) greater than 1 indicate increased odds of pregnancy loss, while values less than 1 indicate decreased odds. Reference categories: Age group > 45 years, rural residence, husband/partner does not drink alcohol, unemployed, secondary/higher education, middle/rich wealth status, no media exposure, no physical IPV, no sexual IPV, and no controlling behavior. Statistical significance was evaluated using a Bonferroni-adjusted threshold of $p < .0045$ to account for multiple comparisons

2.4.1 Impact of intimate partner violence (IPV) and healthcare access

Table 4 shows adjusted binary logistic regression results predicting pregnancy loss. Results indicate that women's age had a significantly positive relationship with pregnancy loss in both models. Compared to women aged 15–19, those aged 20–24 had higher odds of experiencing pregnancy loss (Model 1: B = 0.42, AOR = 1.51, 95% CI [1.23, 1.79], p < 0.001; Model 2: B = 0.44, AOR = 1.53, 95% CI [1.21, 1.76], p < 0.001), as did those aged 25–34 (Model 1: B = 0.60, AOR = 1.82, 95% CI [1.47, 2.18], p < 0.001; Model 2: B = 0.60, AOR = 1.74, 95% CI [1.50, 2.15], p < 0.001). These associations met the Bonferroni-adjusted significance threshold. However, the association for women aged 35–49 (Model 1: B = 0.28, AOR = 1.36, 95% CI [1.11, 1.79], p = 0.022; Model 2: B = 0.26, AOR = 1.33, 95% CI [1.09, 1.81], p = 0.030) did not meet the adjusted threshold (p < 0.0045). Husband's controlling behavior was positively associated with pregnancy loss (Model 1: B = 0.21, AOR = 1.27, 95% CI [1.09, 1.36], p = 0.003; Model 2: B = 0.24, AOR = 1.29, 95% CI [1.03, 1.34], p = 0.002). Access to healthcare was significantly positively associated with higher odds of pregnancy loss in both models, with results meeting the adjusted significance threshold (Model 1: B = 0.13, AOR = 1.11, 95% CI [1.01, 1.19], p < 0.001; Model 2: B = 0.17, AOR = 1.15, 95% CI [1.03, 1.17], p < 0.001). Although counterintuitive, the positive association between healthcare access and pregnancy loss may reflect reverse causality, where women seek care following complications, rather than prior access preventing loss. Physical IPV showed a significant positive association in Model 1 (B = 0.19, AOR = 1.03, 95% CI [1.02, 1.14], p = 0.003). Similarly, in Model 2, sexual IPV showed a statistically significant positive association with pregnancy loss (B = 0.29, AOR = 1.34, 95% CI [1.05, 1.73], p = 0.002), meeting the Bonferroni-adjusted threshold.

2.4.2 Moderating role of healthcare access

Access to healthcare significantly moderated the relationship between sexual IPV and pregnancy loss. In Model 2, a significant interaction was observed between sexual IPV and access to healthcare (B = -0.31, AOR = 0.84, 95% CI [0.66, 0.94], p < 0.001), indicating that increased access to healthcare attenuates the adverse effect of sexual IPV on

Table 4 Adjusted Logistic Regression Predicting Pregnancy Loss by IPV Type, Healthcare Access, and Covariates (N = 8,217)

Predictor	B (Model 1)	AOR (Model 1)	95% CI for AOR (Model 1)	B (Model 2)	AOR (Model 2)	95% CI for AOR (Model 2)
	Physical IPV Model 1			Sexual IPV Model 2		
Age Group						
20–24 vs 15–19	0.42*	1.51	[1.23, 1.79]	0.44*	1.53	[1.21, 1.76]
25–34 vs 15–19	0.60*	1.82	[1.47, 2.18]	0.60*	1.74	[1.50, 2.15]
35–49 vs 15–19	0.28	1.36	[1.11, 1.79]	0.26	1.33	[1.09, 1.81]
Husband's Controlling Behavior	0.21*	1.27	[1.09, 1.36]	0.24*	1.29	[1.03, 1.34]
Physical IPV	0.19*	1.10	[1.02, 1.14]	–	–	–
Sexual IPV	–	–	–	0.29*	1.34	[1.05, 1.73]
Access to Healthcare	0.13*	1.11	[1.01, 1.19]	0.17*	1.15	[1.03, 1.17]
Physical IPV × Access	0.05	1.08	[0.90, 1.21]	–	–	–
Sexual IPV × Access	–	–	–	-0.31*	0.84	[0.66, 0.94]

Note. AOR = Adjusted Odds Ratio; CI = Confidence Interval; IPV = Intimate Partner Violence. Reference categories: age group (15–19), controlling behavior (no), access to healthcare (low), physical IPV (no), sexual IPV (no). Statistical significance was evaluated using a Bonferroni-adjusted threshold of *$p < .0045$ to account for multiple comparisons

pregnancy loss. In contrast, no significant moderating effect was found between physical IPV and healthcare access in Model 1 (B = 0.05, AOR = 1.08, 95% CI [0.90, 1.21], p = ns).

2.5 Slope analysis

Simple slope analyses revealed that sexual IPV was positively associated with pregnancy loss at both low and high levels of healthcare access. At low access, the association was stronger (B = 0.69, AOR = 2.00, 95% CI [1.63, 2.34], $p < 0.001$), whereas at high access, the association, though still significant, was attenuated (B = 0.43, AOR = 1.53, 95% CI [1.37, 1.78], p = 0.002). These results suggest that while sexual IPV elevates the risk of pregnancy loss, better access to healthcare may mitigate this risk (see Fig. 1). The moderation effect of healthcare access on the relationship between sexual IPV and pregnancy loss was partial, not full. That is, sexual IPV remained a significant risk factor for pregnancy loss even at high levels of healthcare access, although the strength of the association was attenuated. This indicates that while healthcare access offers some protective buffering, it does not entirely eliminate the adverse reproductive consequences of sexual IPV.

2.5.1 Moderation analysis and predicted probabilities of pregnancy loss

To better illustrate the practical implications of the statistical findings, predicted probabilities were computed (Table 5). These estimates reveal how healthcare access influences pregnancy loss risk across IPV exposure groups, highlighting the limited protective effect of healthcare access for women experiencing sexual IPV. Compared to women with no exposure to sexual IPV and low access to health care (6.7%), those exposed to sexual IPV had nearly double the probability of experiencing pregnancy loss, both under low access (12.5%) and high access (12.9%) conditions. While healthcare access was associated with a slight increase in predicted probability for women not exposed to IPV (from

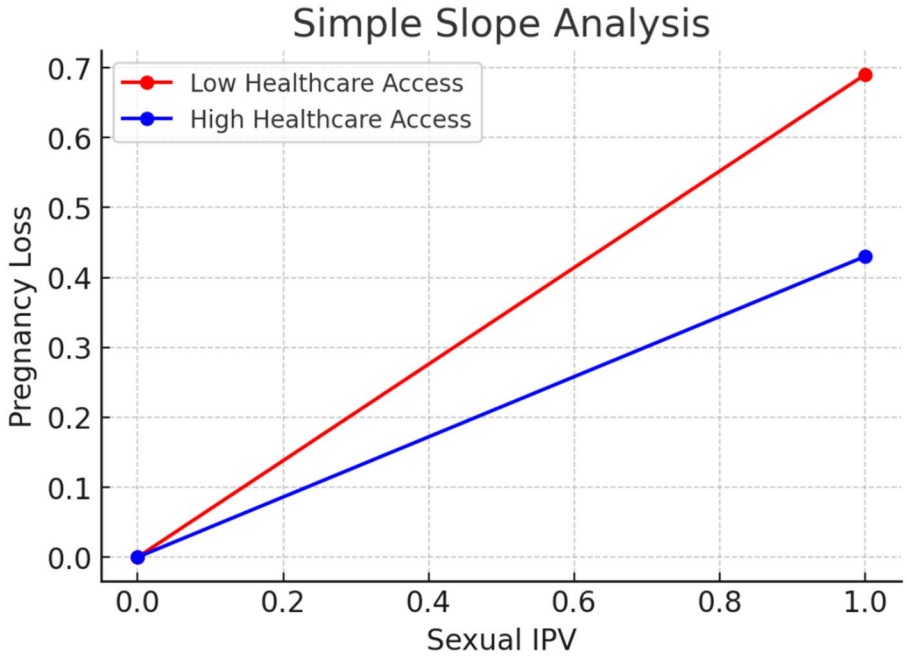

Fig. 1 Interaction Effect of Healthcare Access and Sexual IPV on Pregnancy Loss. Illustrates the predicted probability of pregnancy loss at varying levels of healthcare access, stratified by exposure to sexual IPV. The graph shows that among women exposed to sexual IPV, higher healthcare access is associated with a lower probability of pregnancy loss, highlighting a moderating (protective) effect

Table 5 Predicted Probability of Pregnancy Loss by Sexual IPV and Healthcare Access

Sexual IPV	Healthcare Access	Predicted Probability of Pregnancy Loss
No	Low	6.7%
Yes	Low	12.5%
No	High	7.4%
Yes	High	12.9%

Note: Marginal probabilities were calculated using the model's regression coefficients, adjusting for all control variables. The values reflect average predicted probabilities of pregnancy loss across different combinations of sexual IPV exposure and healthcare access

6.7% to 7.4%), it did not meaningfully reduce the heightened risk among those exposed to sexual IPV, confirming partial moderation. These predicted probabilities highlight the limited protective effect of healthcare access for women exposed to sexual IPV. Despite improved access, the risk of pregnancy loss remains markedly elevated, underscoring the need for integrated IPV screening and support within maternal health services.

3 Discussion

This study examined whether exposure to physical and sexual intimate partner violence (IPV) is positively associated with pregnancy loss and whether greater access to healthcare is negatively associated with pregnancy loss. Additionally, we explored whether receiving healthcare services could buffer (weaken) or amplify (strengthen) the impact of IPV on pregnancy loss. Recognizing that IPV does not occur in a vacuum, but within broader structural and institutional contexts, we investigated how access to healthcare might shape the effects of IPV on reproductive outcomes. While previous studies have primarily focused on the independent effects of IPV on pregnancy loss (e.g., [39, 40, 43]), our study extends this body of work by testing the interaction between IPV and healthcare access. This approach provides a more in-depth understanding of how health systems can mitigate, or potentially exacerbate the adverse consequences of IPV on maternal and fetal health outcomes. Findings revealed that both physical IPV and sexual IPV were independently associated with significantly higher odds of pregnancy loss, indicating that each form of violence poses a distinct risk to maternal health outcomes. Furthermore, access to healthcare moderated the relationship between sexual IPV and pregnancy loss, suggesting a protective or buffering effect. However, the interaction between physical IPV and healthcare access was not statistically significant. These findings underscore the potential of healthcare systems to play a critical protective role in reducing the reproductive health risks associated with sexual IPV.

The results from the logistic regression analyses support our first hypothesis and align with existing literature, which shows that IPV increases the risk of fetal loss [2, 13, 42]. There is growing awareness that IPV adversely affects both maternal and neonatal health. Specifically, IPV has been associated with an increased risk of miscarriage, stillbirth, preterm birth, low birth weight, and neonatal death. These outcomes often result from physical trauma, which is a leading cause of maternal mortality and has been identified as a principal contributor to pregnancy-related deaths among young women [20, 22]. Moreover, sexual IPV can elevate a woman's susceptibility to sexually transmitted infections (STIs), some of which are known to interfere with fetal development and increase the likelihood of miscarriage [39, 40].

An unexpected yet important finding in this study was the positive association between healthcare access and pregnancy loss, where greater access was linked to

higher odds of loss. While this appears counterintuitive, it may reflect reverse causality in which women are more likely to seek healthcare only after experiencing complications or adverse outcomes [32]. In contexts such as Nigeria, where healthcare access often increases in response to emergencies rather than as a preventive measure [1], this interpretation is plausible. It is also possible that women with poor reproductive histories are more engaged with the health system [31], which may inflate the association. Nevertheless, this pattern should be interpreted with caution. Given the cross-sectional nature of the data, the potential for reverse causality cannot be ruled out. It is plausible that pregnancy loss may have prompted increased healthcare-seeking behavior, rather than healthcare access preceding and influencing the loss. This possibility presents a key methodological limitation and underscores the need for longitudinal studies to clarify the directionality of these associations. Additionally previous studies have suggested that limited access to healthcare contributes to pregnancy loss due to several factors, including women's inability to independently seek medical attention, a reliance on traditional birth attendants, the stigma associated with unplanned pregnancies, and cultural norms that delay the disclosure of labor onset. Given that the healthcare access measure in this study reflects these barriers, such factors remain pervasive in limiting women's utilization of professional healthcare services across diverse communities in Nigeria. These challenges are likely further exacerbated in geographically remote areas with limited proximity to healthcare facilities [41].

Importantly, our findings also revealed that access to healthcare moderated the relationship between sexual IPV and pregnancy loss, partially supporting our hypotheses. Hypothesis 3, which anticipated a moderation effect for physical IPV, was not supported. In contrast, Hypothesis 4 predicting a moderating effect of healthcare access on the relationship between sexual IPV and pregnancy outcomes was supported. The lack of a significant moderation effect in the case of physical IPV suggests that access to healthcare alone may be insufficient to buffer its harmful consequences. The finding that healthcare access buffered the effect of sexual IPV on pregnancy loss, but not physical IPV, highlights important distinctions in how different forms of violence intersect with reproductive health. One possible explanation lies in the nature and visibility of the harm caused. Sexual IPV often results in direct reproductive consequences such as forced or traumatic intercourse, genital injuries, sexually transmitted infections, and unwanted pregnancies [7, 8], all of which may prompt survivors to seek gynecological or reproductive health services. This increased contact with health providers may create opportunities for timely medical intervention, risk reduction, or psychosocial support, thereby mitigating adverse outcomes like pregnancy loss. In contrast, the impact of physical IPV on pregnancy may be less directly connected to health-seeking behavior, especially in contexts where injuries are internal, normalized, or not perceived as urgent or an emergency by the survivor [1]. Additionally, the shame and silence surrounding sexual IPV [11] may make survivors more likely to disclose or access care only when pregnancy-related complications arise, creating a narrow but critical window for intervention. These distinctions underscore the need for differentiated approaches to IPV screening and trauma-informed care within reproductive health services.

However, among women exposed to sexual IPV, access to healthcare emerged as a resilience-enhancing factor. Specifically, sexual IPV was associated with a twofold increase in the odds of pregnancy loss among women with limited healthcare access, whereas

this effect was attenuated, though still statistically significant, among women with high access. These findings suggest that access to healthcare serves a buffering function, potentially through timely medical intervention and psychosocial support. According to Resilience Theory, individuals can adapt positively and recover from adversity when protective environmental factors are present [26]. In this context, healthcare access functions as a critical external protective resource that enhances women's resilience to the negative reproductive health effects of sexual IPV. Nevertheless, not all women may be equally positioned to benefit from available healthcare services due to structural, social, and psychological barriers. These may include financial constraints, geographic inaccessibility of healthcare facilities, limited autonomy in health-related decision-making, fear of stigma or retaliation, and prior negative experiences with healthcare providers. Such obstacles can inhibit the effective utilization of healthcare services, thereby diminishing their protective value [33]. In terms of area of residence, the current study did not find a significant association between urban–rural location and pregnancy loss. Unlike other studies that reported higher pregnancy loss in rural areas due to limited access to healthcare [27], our findings may reflect the role of other factors such as improvement in rural infrastructure, age or healthcare-seeking behavior which may play a more decisive role than geographic location alone. There is a need for further research to unpack the role of residence type in pregnancy outcomes within the Nigerian context.

Our finding that healthcare access moderates the relationship between sexual IPV and pregnancy loss is consistent with emerging evidence that institutional support can mitigate some of the negative health outcomes associated with IPV. Research conducted in sub-Saharan Africa and South Asia indicates that access to skilled maternal care can lower the risk of stillbirths and miscarriages among women exposed to IPV by facilitating early antenatal visits, STI management, and safer childbirth [24, 38]. Likewise, studies from the U.S. and Bangladesh report that women facing sexual IPV who had regular contact with healthcare providers were more likely to receive counseling and reproductive health services, helping to reduce pregnancy-related complications [5, 35]. These findings reinforce our interpretation that healthcare systems, when accessible, may provide a critical intervention point for addressing reproductive risks linked to sexual violence. This underscores the importance of integrating IPV screening and support services within maternal healthcare settings. Accessible systems not only facilitate early detection but also create opportunities for timely referrals and protective interventions. The lack of a similar protective effect for physical IPV in our data, however, suggests that healthcare alone may not be adequate to address the broader psychosocial and physiological consequences of physical abuse, underscoring the importance of integrated, multisectoral strategies.

Nevertheless, the interpretation of these findings must be approached with caution due to several limitations. First, the cross-sectional design limits causal inference, particularly regarding the temporal sequence between IPV exposure and pregnancy loss. Compounding this limitation is the absence of time-specific measures, as IPV was not assessed in direct relation to the timing of the pregnancy, making it unclear whether the violence occurred before, during, or after the loss. Consequently, it is unclear whether the reported IPV occurred before, during, or after the pregnancy loss, which limits causal inference. Related to this is the need to acknowledge that the IPV variables used in this study captured women's lifetime experiences of physical or sexual IPV, rather than

recent or pregnancy-specific exposure. This also limits temporal precision as the violence may have occurred long before the index pregnancy. Future studies should consider time-bound measures of IPV to better capture proximal risks to maternal health outcomes. Furthermore, reliance on self-reported measures introduces the possibility of reporting bias and socially desirable responding, particularly regarding sensitive topics such as IPV and reproductive loss. Future research should aim to replicate these findings using longitudinal data and mixed-methods approaches that incorporate medical records and qualitative insights to enhance validity and contextual understanding. A key limitation of this study is the use of a binary measure of IPV exposure (yes/no), which does not capture the frequency, duration, or severity of violence. Prior research suggests that more frequent or severe IPV may have a stronger association with adverse pregnancy outcomes, including pregnancy loss. However, due to the structure of the NDHS data, the non-normal distribution of IPV indicators, and the need for consistent coding across IPV types, we collapsed IPV experiences into a binary indicator to ensure analytical clarity, model stability, and sufficient statistical power. Future research should explore gradations of IPV exposure to better understand how the intensity and chronicity of violence influence reproductive health outcomes.The NDHS 2018 dataset lacks information on the timing of pregnancy loss, limiting the ability to determine whether the loss occurred before or after IPV exposure. This constrains causal inference and calls for future longitudinal research to clarify the directionality of associations. Related to this, is a possibility of underreporting of IPV due to social stigma and fear of disclosure, particularly in face-to-face interviews. This may have contributed to conservative estimates of IPV in the current study. Another limitation concerns the measurement of pregnancy loss. In this study, miscarriage, abortion, and stillbirth were aggregated into a single binary outcome variable representing any pregnancy loss. While this approach is consistent with prior studies using DHS data, it may conflate losses with different etiologies, including spontaneous losses (e.g., miscarriage or stillbirth) versus induced abortion, which may have distinct causes and implications. This aggregation may obscure differential associations with IPV exposure, and future research should aim to disentangle these categories where data availability allows. It is also important to note that our measure of healthcare access serves only as a proxy for reduced structural and financial barriers, rather than capturing actual utilization of services or the quality of care received. As such, the observed moderation effects should be interpreted with caution, as they may not fully reflect the protective impact of direct or high-quality healthcare engagement. Additionally, while healthcare access emerged as a significant moderator, other unmeasured factors may also influence the relationship between IPV and pregnancy loss. These include robust social support systems and women's economic empowerment, both of which can enhance coping capacity, improve access to care, and support informed health-seeking behaviors. Furthermore, community- and partner-focused interventions that challenge harmful gender norms and promote respectful relationships are vital in reducing IPV and its detrimental consequences. Future research should include qualitative follow-up studies to explore how women navigate experiences of IPV and access to healthcare, including the barriers they face, the strategies they use to seek support, and how cultural, social, and health system factors influence their decisions and outcomes. This type of research focus highlights the need for deeper contextual understanding beyond what quantitative analyses can provide.

3.1 Policy and public health implications

Given the moderating role of healthcare access in the relationship between sexual IPV and pregnancy loss, targeted public health strategies are needed to expand equitable access to maternal care, including mobile clinics, trained midwives, and transportation support. To translate our findings into meaningful interventions, it is essential to clarify the forms of healthcare access that may offer protective benefits. Expanding mobile health clinics in underserved communities can bring essential maternal services closer to women experiencing IPV. Deploying trained midwives and community health workers who are sensitized to IPV can improve antenatal care quality and referral pathways. Additionally, transport voucher schemes or conditional cash transfers can reduce financial barriers and incentivize early and consistent maternal health service use. These approaches not only increase access but also provide critical touchpoints where providers can screen for IPV and offer discreet support or referrals, especially for women facing sexual violence. Additionally, healthcare providers should be trained to recognize the reproductive health risks associated with IPV, including complications such as miscarriage, stillbirth, and preterm birth, and to respond empathetically and confidentially, using trauma-informed approaches that prioritize women's safety, autonomy, and dignity, ensuring that affected women receive appropriate counseling, referrals, and support services. Similarly, targeted training should also focus on equipping midwives with the skills to overcome barriers to IPV screening. For instance, Musa-Maliki and Duma [28] identified key obstacles to routine screening during antenatal care, including provider discomfort, insufficient training, heavy workloads, and inadequate privacy for confidential disclosures. Community education programs, particularly those that engage both men and women through culturally sensitive messaging and participatory forums, should also be implemented to challenge and de-normalise the acceptance of IPV during pregnancy, promote respectful partner relationships, and raise awareness about the harmful effects of violence on maternal and fetal health. Future studies should consider using geospatial and multilevel modeling techniques to investigate how community-level healthcare infrastructure such as the availability, distribution, and quality of health facilities, shapes the relationship between IPV and pregnancy outcomes. These approaches can help disentangle individual versus contextual influences and identify geographic disparities in access and outcomes.

4 Conclusion

In conclusion, this study provides robust evidence linking physical and sexual IPV to increased risk of pregnancy loss among Nigerian women, while also demonstrating that access to healthcare can significantly attenuate this association between sexual IPV and pregnancy loss. The findings further reveal that younger women and those with limited access to healthcare are disproportionately affected, highlighting key areas for intervention. These insights call for integrated policy responses that prioritize IPV prevention, improve maternal healthcare access, especially in underserved areas, and address structural gender inequalities. Strengthening healthcare systems and empowering women through education and support services will be critical in safeguarding maternal health and reducing IPV-related adverse outcomes.

5 Competing interests

The authors declare no competing interests.

Author contributions

Author Contribution Adegbenga M. Sunmola conceptualized the study and drafted the manuscript. Luqman A. Morakinyo conducted the data analysis. Funlade T. Sunmola and Olusegun A. Mayungbo contributed to the study design and manuscript revision. All authors read and approved the final manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability

The dataset analyzed during the current study is available from the Demographic and Health Surveys (DHS) Program website at https://dhsprogram.com.

Declarations

Ethics approval and consent to participate

This study used data from the 2018 Nigeria Demographic and Health Survey (NDHS), a publicly available dataset. Ethical clearance for the NDHS was obtained by the National Health Research Ethics Committee of Nigeria and the Institutional Review Board of ICF International. All procedures followed were in accordance with the ethical standards of these institutions and the 1964 Helsinki Declaration and its later amendments.

Consent for publication

Not applicable.

Received: 5 June 2025 / Accepted: 27 August 2025

Published online: 19 September 2025

References

1. Adewole IF, Fapohunda OR, Okunlola MA, Sekoni A. Utilization of health care services by pregnant mothers during delivery: a community based study in Nigeria. Afr J Med Med Sci. 2010;39(3):213–22.
2. Alio AP, Nana PN, Salihu HM. Spousal violence and potentially preventable single and recurrent spontaneous fetal loss in an African setting: cross-sectional study. Lancet. 2009;373(9660):318–24. https://doi.org/10.1016/S0140-6736(08)61707-2.
3. Aliyu, A. A., & Dahiru, T. (2017). Predictors of delayed antenatal care (ANC) visits in Nigeria: secondary analysis of 2013 Nigeria Demographic and health survey (NDHS). *Pan Afr Med J, 26*, 124. https://doi.org/10.11604/pamj.2017.26.124.9869
4. Anikwe CL, Afolabi O, Oparah AC. Intimate partner violence and reproductive health outcomes among Nigerian women: a community-based study. J Public Health Africa. 2025;16(1):101–10. https://doi.org/10.4081/jphia.2025.101.
5. Bair-Merritt MH, Blackstone M, Feudtner C. Physical health outcomes of childhood exposure to intimate partner violence: a systematic review. Pediatrics. 2006;117(2):e278–90. https://doi.org/10.1542/peds.2005-1473.
6. Birmeta K, Dibaba Y, Woldeyohannes D. Determinants of maternal health care utilization in Holeta town, central Ethiopia. BMC Health Serv Res. 2013;13:256. https://doi.org/10.1186/1472-6963-13-256.
7. Campbell JC. Health consequences of intimate partner violence. Lancet. 2002;359(9314):1331–6. https://doi.org/10.1016/S0140-6736(02)08336-8.
8. Decker MR, Miller E, McCauley HL, Tancredi DJ, Levenson R, Waldman J, et al. Recent partner violence and sexual and drug-related STI/HIV risk among adolescent and young adult women attending family planning clinics. Sex Transmit Infect. 2014;90(2):145–9. https://doi.org/10.1136/sextrans-2013-051288.
9. Dobash RE, Dobash RP. Violence against wives: A case against the patriarchy. New York: Free Press; 1979.
10. Eleje GU, Ugwu EO, Igbodike EP, Malachy DE, Nwankwo EU, Ugboaja JO, et al. Prevalence and associated factors of recurrent pregnancy loss in Nigeria according to different national and international criteria (ASRM/ESHRE vs. WHO/RCOG). Front Reproduct Health. 2023;5:1049711. https://doi.org/10.3389/frph.2023.1049711.
11. Ellsberg M, Jansen HAFM, Heise L, Watts CH, García-Moreno C. Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. Lancet. 2008;371(9619):1165–72. https://doi.org/10.1016/S0140-6736(08)60522-X.
12. Ekpenyong, M. S., Bond, C., & Matheson, D. (2019). Challenges of maternal and prenatal care in Nigeria. *J Intens Critic Care, 5*(1), 1–6. https://doi.org/10.21767/2471-8505.100151
13. Emenike E, Lawoko S, Dalal K. Intimate partner violence and reproductive health of women in Kenya. Int Nurs Rev. 2008. https://doi.org/10.1111/j.1466-7657.2007.00580.x.
14. Fagbamigbe AF, Olaseinde O, Setlhare V. Sub-national analysis and determinants of numbers of antenatal care contacts in Nigeria: assessing the compliance with the WHO recommended standard guidelines. BMC Pregnancy and Childbirth. 2021;21:402. https://doi.org/10.1186/s12884-021-03837-y.
15. Fekadu GA, Kassa GM, Berhe AK, Muche AA, Katiso NA. The effect of antenatal care on institutional delivery service and postnatal care use in Ethiopia: a systematic review and meta-analysis. BMC Health Serv Res. 2018;18(1):1–11.
16. Fergus S, Zimmerman MA. Adolescent resilience: A framework for understanding healthy development in the face of risk. Annu Rev Public Health. 2005;26:399–419. https://doi.org/10.1146/annurev.publhealth.26.021304.144357
17. Grenier L, Suhowatsky S, Kabue MM, Noguchi LM, Mohan D, Karnad SR, et al. Impact of group antenatal care (G-ANC) versus individual antenatal care (ANC) on quality of care, ANC attendance and facility-based delivery: a pragmatic cluster-randomized controlled trial in Kenya and Nigeria. PLoS ONE. 2019;14(10):e0222177. https://doi.org/10.1371/journal.pone.0222177.

18. Gyuse AO, Ushie BA. Patterns and forms of intimate partner violence during pregnancy in Northern Nigeria: Implications for maternal health. Nigerian Journal of Sociology and Anthropology. 2022;20(2):45–60.
19. Gurara MK, Draulans V, Van Geertruyden JP, et al. Determinants of maternal healthcare utilisation among pregnant women in Southern Ethiopia: a multi-level analysis. BMC Pregnancy Childbirth. 2023;23:96. https://doi.org/10.1186/s12884-023-05414-x.
20. Harris AR, Fisher GA, Thomas SH. Homicide as a medical outcome: racial disparity in deaths from assault in US level I and II trauma centers. J Trauma Acute Care Surg. 2012;72(3):773–82. https://doi.org/10.1097/TA.0b013e3182452b97.
21. Hooks B. Feminist theory: From margin to center. Cambridge, MA: South End Press; 2000.
22. Ikossi DG, Lazar AA, Morabito D, Fildes J, Knudson MM. Profile of mothers at risk: an analysis of injury and pregnancy loss in 1,195 trauma patients. J Am Coll Surg. 2005;200(1):49–56. https://doi.org/10.1016/j.jamcollsurg.2004.09.020.
23. Jewkes R, Levin J, Penn-Kekana L. Intimate partner violence: causes and prevention. Lancet. 2002;359(9315):1423–1429. https://doi.org/10.1016/S0140-6736(02)08357-5
24. Koenig MA, Stephenson R, Ahmed S, Jejeebhoy SJ, Campbell J. Individual and contextual determinants of domestic violence in North India. Am J Public Health. 2006;96(1):132–8. https://doi.org/10.2105/AJPH.2004.050872.
25. Metheny N, Stephenson R. Intimate partner violence and uptake of antenatal care: a scoping review of low- and middle-income country studies. Int Perspect Sex Reprod Health. 2017;43(4):163–71. https://doi.org/10.1363/43e4917.
26. Masten, A. S. (2001). Ordinary magic : Resilience processes in development. American Psychologist, 56(3), 227–238. https://doi.org/10.1037/0003-066X.56.3.227
27. Mekonnen B, Gebremariam A, Deyessa N, Cranmer JN. Intimate partner violence and maternal antenatal care utilization: is there a dose-response relationship? Findings from the Ethiopian National Demographic and Health Survey. Int Health. 2025;17(4):542–551. https://doi.org/10.1093/inthealth/ihaf003
28. Musa-Maliki AU, Duma SE. Barriers to routine screening for intimate partner violence during pregnancy in Nigeria. Heliyon. 2024;10(9):e30504. https://doi.org/10.1016/j.heliyon.2024.e30504
29. National Population Commission (NPC) [Nigeria], & ICF International. (2019). *Nigeria Demographic and Health Survey 2018*. Abuja, Nigeria, and Rockville, MD, USA
30. Okonofua FE, Gana MI, Olagbuji BT, Adeleye OA. Determinants of antenatal care use in Nigeria: evidence from the 2013 Nigeria demographic and health survey. Afr J Reprod Health. 2017;21(4):113–22.
31. Okoli U, Mbachu C, Onyeneho N, Umeokonkwo C, Inegbu A, Uguru N. Barriers to utilizing maternal health care services in Nigeria: implication for policy and programs. Niger J Med. 2018;27(3):224–31.
32. Onah MN, Govender V. Out-of-pocket payments, health care access and utilisation in South-eastern Nigeria: Evidence from a household survey. BMC Health Serv Res. 2014;14:632. https://doi.org/10.1186/s12913-014-0632-4.
33. Opara UC, Iheanacho PN, Petrucka P. Visible and invisible cultural patterns influencing women's use of maternal health services among Igala women in Nigeria: a focused ethnographic study. BMC Public Health. 2025;25:133. https://doi.org/10.1186/s12889-025-21275-9.
34. Quenby S, Gallos ID, Dhillon-Smith RK, et al. Miscarriage matters: the epidemiological, physical, psychological, and economic costs of early pregnancy loss. Lancet. 2021;397(10285):1658–67. https://doi.org/10.1016/S0140-6736(21)00682-6.
35. Rahman M, Nakamura K, Seino K, Kizuki M. Intimate partner violence and use of reproductive health services among married women: evidence from a national Bangladeshi sample. BMC Public Health. 2012;12:913.
36. Rosevear S. Bleeding in early pregnancy. In: James DK, Steer PJ, Weiner CP, Gonik B, editors. High risk pregnancy: management options. WB Saunders; 1999. p. 61–89.
37. Ronsmans C, Graham WJ, Lancet Maternal Survival Series steering group. Maternal mortality: who, when, where, and why. Lancet. 2006;368(9542):1189–200. https://doi.org/10.1016/S0140-6736(06)69380-X.
38. Silverman JG, Decker MR, Saggurti N, Balaiah D, Raj A. Intimate partner violence and HIV infection among married Indian women. JAMA. 2008;300(6):703–10. https://doi.org/10.1001/jama.300.6.703.
39. Stöckl H, Filippi V, Watts C, Mbwambo JK. Induced abortion, pregnancy loss and intimate partner violence in Tanzania: a population based study. BMC Pregnancy Childbirth. 2012;12(1):12. https://doi.org/10.1186/1471-2393-12-12.
40. Stöckl H, Devries K, Rotstein A, Kaplan I, Watts C. The global prevalence of intimate partner homicide: a systematic review. Lancet. 2012;379(9824):861–9. https://doi.org/10.1016/S0140-6736(11)61030-2.
41. Sumankuuro, J., Mahama, M. Y., Crockett, J., Wang, S., & Young, J. (2019). Narratives on why pregnant women delay seeking maternal health care during delivery and obstetric complications in rural Ghana. *BMC Pregnancy and Childbirth, 19*, Article 260. https://doi.org/10.1186/s12884-019-2375-1
42. Tiruneh FN, Chuang KY, Ntenda PAM, Chuang YC. Unwanted pregnancy, pregnancy loss, and other risk factors for intimate partner violence in the Democratic Republic of the Congo. Women Health. 2018;58(9):983–1000. https://doi.org/10.1080/03630242.2017.1330124.
43. Tiruye TY, Chojenta C, Harris ML, et al. Intimate partner violence against women and its association with pregnancy loss in Ethiopia: evidence from a national survey. BMC Womens Health. 2020;20:192. https://doi.org/10.1186/s12905-020-01028-z.
44. Tolossa T, Gold L, Lau EHY, Dheresa M, Abimanyi-Ochom J. Association between quality of antenatal care service utilisation and adverse birth outcomes among adolescent women in 22 Sub-Saharan African countries: A mixed-effects multilevel analysis. Sex Reproduct Healthcare. 2024. https://doi.org/10.1016/j.srhc.2024.10.
45. World Health Organization. (2016). WHO recommendations on antenatal care for a positive pregnancy experience. Geneva, Switzerland. https://www.who.int/publications/i/item/9789241549912

Publisher's Note