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RESEARCH ARTICLE

Financial Strain and Prenatal Depression Among Pregnant Women in Ibadan, Nigeria

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Introduction: Although mothers' mental health is receiving more attention, little remain known about the impact that financial strain may have on the mental health of expectant mothers. This is crucial in low- and middle-income countries because vulnerable populations are disproportionately affected by high rates of poverty, insufficient social safety nets, and unstable economies.
Aims: This study examined the potential role that financial strain may play in prenatal depression while also taking into account the potential mediating roles of food insecurity, intimate relationship violence, and social support.
Methods: To gather the data, a cross-sectional survey of 519 pregnant women in the second and third trimesters were selected methodically from a pool of women awaiting routine antenatal care from one primary health care center in each of the five urban local government areas of Ibadan metropolis. The Edinburgh Postnatal Depression Scale was used to measure prenatal depression. Using parallel and serial mediation models, the relationship between the variables – financial strain, intimate partner violence, food insecurity, social support, and prenatal depression – was examined.
Results: Of the participants in this study, 28.1% reported having symptoms of depression during their pregnancy. The results also show that prenatal depression and financial strain are related, with each of the three mediators operating in a parallel and sequential causal order. The results of the mediation point to a causal chain with moderate effects.
Conclusions: Interventions should evaluate the effects of integrating mental health services and social needs assessments into antenatal and primary health care.

Keywords: pregnancy, financial strain, depression, social support, psychosocial stressors

Introduction

Perinatal depression poses a considerable global health challenge given its adverse immediate and long-term effects on mothers and infants (Kariuki & Newton, 2022). Estimates indicate that pregnancy-related depressive disorders are more prevalent in nations with low or middle incomes than in higher income nations (WHO, 2017). The incidence of prenatal depression is estimated to be 26.3% in sub-Saharan Africa (Dadi et al., 2020), with estimates for Nigeria ranging from 14.1% to 26.6% (Thompson & Ajayi, 2016; Gadanaya et al., 2018; Adeoye et al., 2022; Wegbom et al., 2023). As a result, knowing what factors contribute to the risk of prenatal depression remains crucial for developing effective interventions. Severe and mild bouts of depression in gestation (prenatal/antenatal depression) or within a year after birth (postnatal depression) are called perinatal depression. This study examines prenatal depression.

According to the U.S. National Institute of Mental Health (2020), perinatal depression causes intense feelings of despair, unworthiness, anxiety, and fatigue. It severely impacts daily tasks, self-care, and caregiving for others. The

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condition is linked to symptoms such as cognitive impairment, difficulty concentrating, memory loss, and difficulty making decisions. Furthermore, sleep issues, such as difficulty falling asleep or excessive sleep duration, are common, as is abnormal eating, which leads to overeating or loss of appetite, according to Van Niel and Payne (2020).

The findings of the studies by Shamblaw et al. (2019), James-Hawkins et al. (2019), Luo et al. (2022), and Yang et al. (2022) highlight several key predicting variables associated with depressive symptoms during the perinatal period. As Shamblaw et al. (2019) emphasize, abuse emerges as a consistent predictor. Financial difficulties and a decrease in the perception of general support are recurring themes in James-Hawkins et al. (2019), Luo et al.'s (2022) and Yang et al.'s (2022) systematic reviews and meta-analyses. All studies highlight that the adverse effects of financial strain and a lack of social support regarding perinatal mental health increases the risk of both anxiety and PD. A Nigerian study by Adeoye et al. (2022) also identified low income as a predictor of antepartum depression.

James-Hawkins et al. (2019), Luo et al. (2022) and Yang et al. (2022) identify various unique predictors besides these standard variables. James-Hawkins et al. (2019) study suggests a negative association between education and prenatal depression. According to Luo et al. (2022), specific risk factors for prenatal depression include under-education, unemployment during pregnancy, chronic physical illness before pregnancy, and smoking. Meanwhile, Yang et al. (2022) expand the list of correlated factors to include educational level, family economic status, a history of mental illness, perinatal smoking or drinking, and multiparity.

The studies quoted above identify negative and stressful life experiences, such as socioeconomic disadvantage and deprivation in relation to maternal depression during pregnancy. Financial strain, in particular, is recognized as a stressor exposure separate from the effect of poverty, with significant effects on mental and physical health (Lange et al., 2017; Marshal et al., 2021). This present study conceptualizes financial strain as perceived difficulties in making ends meet and paying bills for necessities (French & Vigne, 2018). The empirical literature interchangeably employs the terms financial/economic strain, financial/economic difficulties, and financial/economic hardship.

One of the explanations for the association between socioeconomic deprivation and mental health problems is the social causation theory (Wickham et al., 2017; Lund & Cois, 2018) which argues that conditions of poverty may cause new depressive symptoms or worsen existing depression. The link between low income and maternal depression may be influenced by social and psychological factors, according to relevant empirical literature (James-Hawkins et al., 2019; Adeoye et al. 2022; Luo et al., 2022).

Individuals experiencing poverty are vulnerable to additional social stressors such as food insecurity, intimate partner violence, inadequate social support, higher risks of complications during pregnancy, and traumatic experiences (Bedaso et al., 2021; Yenerall & Jensen, 2021; Umukoro & Okurame, 2022). The above additional social stressors add to the financial burden that pregnant women already face. These factors can potentially exacerbate stress levels, foster a sense of helplessness and anxiety, and even elevate the likelihood of mental health conditions, including prenatal depressive symptoms (Mitchell & Christian, 2017; Abrahams et al., 2018).

In 2016, Nigeria experienced a recession, and the COVID-19 outbreak with its associated aftermath caused a further economic decline (Adam et al., 2020; Folayan et al., 2021). Due to extensive economic hardship and little social protection to strengthen economic resilience, many Nigerians find themselves in dire straits (World Bank, 2020). Data from the Nigerian Bureau of Statistics for 2018–19 and 2022 indicate that many Nigerian families face financial strain and vulnerability. The report estimates that 40.1% (4 in 10) and 63.0% (133 million) Nigerians – many of whom are women – are considered to be poor; moreover multidimensionally poor (National Bureau of Statistics, 2020; 2022). Rising food and energy inflation as well as a pervasive insecurity in the country have intensified problems with food security, public health, and employment, especially impacting people experiencing poverty and the vulnerable (Mitchell & Christian, 2017; Ladan & Badaru, 2021). Through an examination of the various pathways by which financial strain impacts the mental well-being of pregnant women, we can expand our understanding and make valuable contributions to the creation of focused interventions that address the intricate obstacles that these women encounter in resource-limited environments.

Previous research on financial strain has focused on outcomes such as health-related quality of life (Garey et al., 2017), infant birth weight, and fetal growth (Mitchell & Christian, 2017; Goin et al., 2021), psychological distress among U.S. adults (Ryu & Fan, 2022), as well as parenting and mental health (Marcil et al., 2020). The author was able to locate one study that investigated financial stress as a primary predictor of prenatal depression: Thayer and Gildner (2021) investigated the possibility of a link between financial strain caused by the COVID-19 pandemic and an increased likelihood of prenatal depression in the United States. According to their findings, 43.0% of the participants reported financial stress due to the pandemic, while 24.0% had clinically significant depression scores. The authors discovered an association between COVID-19-related financial stress and an increased likelihood of obtaining a clinically significant depression score. This association remained even after controlling for various covariates, such as the participants' educational and income levels. The author could

not identify other studies that have examined the mediator variables of food insecurity, intimate partner violence, and social support in the pathway of financial strain and prenatal depression.

Present Study

To contextualize this study, previous research has shown that a correlation exists between financial strain and unfavorable health consequences in females, such as heightened mental distress, an increased risk of malnourishment, diminished self-assessed health, and recurrent cardiovascular incidents (Samuel et al., 2012; Mitchell & Christian, 2017; Marshall & Tucker-Seeley, 2018). In addition, according to van Heyningen et al. (2016), maternal depressive disorder is mainly due to social rather than biological factors. Unwanted pregnancies, low education and social support, lack of the partner's financial support and poverty are contributing factors.

In Sub-Saharan Africa, notably Nigeria, several studies have examined the occurrence of sociodemographic factors influencing depressive symptoms in pregnant women. However, as far as the author knows, no studies have investigated the mechanism that connects financial strain and the risk of developing prenatal depressive symptoms. This holds particular significance in nations with low and medium income levels where poverty rates are elevated, social safety nets are insufficient or absent, and economic instability disproportionately impacts vulnerable populations. The results of this study are also potentially relevant particularly for Nigeria, where a large gap exists between the availability and demand for mental health care services.

The present study is significant because it remains imperative to investigate the mechanisms of financial strain in populations beyond Western societies to evaluate whether the causal pathways linking financial strain and mental health outcomes are comparable or distinctive in other social contexts. Notably, by simultaneously investigating the effects of multiple psychosocial factors, this study seeks to elucidate the significant risk factors associated with financial strain and the risk of prenatal depressive symptoms among women living in social contexts characterized by endemic poverty. It is noteworthy that several Nigerian studies on prenatal depression fail to account for the impact of food insecurity (Thompson & Ajayi, 2016; Gadanaya et al., 2018; Adeoye et al., 2022; Wegbom et al., 2023).

The present study therefore endeavored to examine the variations in maternal depressive symptoms associated with the experience of financial strain, and test the mediating effects of food insecurity (FI), intimate partner violence (IPV), and social support (SS) in the pathway from financial strain (FS) to prenatal depression (PD) symptoms among a cohort of pregnant women.

Methods

Study Design and Participants

This cross-sectional research study was conducted in Ibadan, the state capital of Oyo, in southwestern Nigeria. Ibadan is the capital and largest city of Oyo State, Nigeria. With an estimated total population of 3,756,000 as of 2022 (Macrotrends, 2023), it is Nigeria's third-largest city by population after Lagos and Kano. Ibadan is a diverse city with a Yoruba majority and clusters of people from other tribes, such as Igbo and Hausa. Ibadan serves as home to Nigeria's premier higher education institution, The University of Ibadan, and several other institutions. Ibadan's economic activities include agriculture, commerce, handicrafts, manufacturing, and service industries.

Study participants were selected from a pool of pregnant women awaiting routine antenatal care from Primary Health Care (PHC) centers located in the metropolis's five urban local government areas (LGAs). The author chose one health facility from each LGA using a simple random selection technique through balloting. The roster of primary health care facilities was inscribed on small slips of paper that were subsequently placed in a hat and shuffled. The hand drawing technique was employed to randomly select one sheet of paper for each LGA, after which the corresponding healthcare facilities were visited to gather data.

The minimum sample size was calculated utilizing a single proportion formula, incorporating a proportion of 50.0%, a margin of error of 5.0%, a non-response rate of 10.0%, and a confidence interval of 95.0%. The minimum number of participants required was 421; the final number of participants was 519.

Pregnant women were enrolled in the study using a k = 3 sample frame. Utilizing the assistance of nursing staff, a participant was selected randomly from a roster of women who received antenatal care during the researcher's visits to the study site. Subsequently, every third female on the roster was selected for further participation. The inclusion criteria included: aged ≥ 18 years, women ≥ 14 weeks' gestation without severe health problems, women

carrying single fetuses, and having the ability to complete the questionnaire. Eligible pregnant women were informed of the study's objectives and procedures and allowed to withdraw from the interview at any time.

Enrolment and data collection was carried out between 14 March and 21 April 2022. The confidentiality and privacy of all participants who gave verbal or written informed consent was maintained using an anonymous questionnaire and conducting the interviews in a secluded room. The questionnaire was prepared in English and translated to the local Yoruba language and back-translated into English. It was administered in the English language for the majority of the women except for the few who favored the local language. The questionnaire was self-administered except for participants who indicated the need for assistance from the research team. This study adhered to the principles established in the Declaration of Helsinki. This study protocol was approved by the Redeemer's University Ethical Review Committee (REC/30/08/2021/RUN/11). The Oyo State Ministry of Health and participating Primary Health Care centers permitted the author to conduct the study.

Measures

Edinburgh Postnatal Depression Scale (EPDS)

Prenatal depression was ascertained using the Edinburgh Postnatal Depression Scale (EPDS) by Cox et al. (1987). The EPDS is a ten-item self-reporting tool used primarily to evaluate prenatal depression and anxiety symptoms (Levis et al., 2020). Responses are rated 0, 1, 2, or 3 according to the increasing severity of the symptoms. Women are required to respond to each question based on their experiences throughout the previous seven days. Items 3 through 10 are scored in reverse (i.e., 3, 2, 1, and 0). The cumulative score, calculated by summing the individual scores for each of the 10 items, resulted in a total score that can range from 0 to 30. A score ≥ 12 indicates prenatal depression, as specified in another Nigerian study (Adeoye et al., 2022). The internal consistency of the EPDS was determined to be 0.89 using Cronbach's α.

Financial strain

The key independent variable was financial strain. The index comprises six items adapted from earlier research (Conger & Elder, 1994). Participants were asked if, at any point within the preceding year, they or their household had experienced difficulties paying for basic needs such as 1) utilities; 2) childcare expenses; 3) housing costs; 4) medical care; and 5) maintaining the standard of living. An additional question asked 6) how often participants borrowed money from family or friends to help pay bills. The financial strain variable was created by summing responses rated on a Likert-type scale from 0 (never) to 4 (frequently) having a total range of 0 to 24, with higher scores indicating greater financial strain. This scale's Cronbach's α coefficient was 0.81.

Household Food Insecurity and Access Scale (HFIAS)

Household food insecurity was ascertained using the Household Food Insecurity and Access Scale (Coates et al., 2007), widely used in countries with low or middle incomes. The tool consists of nine questions, each with a recall span of one month. Participants rate the frequency of the corresponding event on a Likert-type scale of 0 to 3, with 3 being the most frequent occurrence. Cronbach's coefficient of the scale was 0.92. The overall scale score ranges from 0 to 27, with higher scores indicating households having greater food insecurity. As a categorical variable, households are categorized as food secure (0-1), mildly food insecure (2-7), moderately food insecure (8-14), or severely food insecure (15-27).

Hurt, Insult, Threaten, Scream (HITS) Instrument for Intimate Partner Violence

The HITS instrument for Intimate Partner Violence screening created by Sherin et al. (1998) was used to assess intimate partner violence. It is a basic instrument with four questions answered on a Likert-type scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = fairly often, and 5 = frequently. The questions inquire about the frequency with which respondents experience physical hurt, insults, threats of harm, and screaming from their partner. There is no recall span indicated for the scale. The overall scores on this scale vary from 1 to 20, with a score above 10 indicating intimate partner violence. However, because the range of scores for this study was 0-10, the sores were dichotomized into "no" and "yes" groups. This corresponds to women who scored "0" across all items and those who scored ≥1. Cronbach's α coefficient for this instrument was 0.78.

Social support

Social support was assessed using seven questions adapted from Nguyen et al. (2018). Four questions measured instrumental support, one measured informational support, and two measured emotional support for the women since the start of their pregnancy. Each item included five response options ranging from 1 = never, 2 = rarely, 3 = some of the time, 4 = most of the time, and 5 = always. The total score of seven questions (0 to 35) was computed, and according to the scale's authors, adequate social support is determined if the participant scored at least 28. Cronbach's α for this instrument was determined to be 0.88.

Statistical Analysis

The **s**tatistical analysis was performed using the SPSS version 25. Outliers and normalcy were initially studied in data from 579 people. Univariate outliers (z scores greater than 3.29 and less than -3.29) were omitted from analyses (n = 32), as were participants with missing values (n = 28), yielding a sample of 519 participants. Collinearity was evaluated before conducting the regression test, and none of the variables had a variance inflation factor (VIF) greater than 4 or a tolerance value greater than 0.25 (Tabachnick & Fidell, 2013).

The descriptive statistics summarized the prevalence of prenatal depression symptoms and the participants' sociodemographic characteristics. Independent sample t tests were also used to examine the statistical significance between means of continuous variables. The bivariate analysis used the chi square (χ^2) test to compare the proportions of women who experienced symptoms of prenatal depression and those who did not. Depression symptoms during pregnancy constituted the dependent variable in the multivariate analysis. The odds ratios (ORs) for prenatal depression risk variables were calculated and provided in their crude and adjusted forms, along with their 95% confidence intervals.

The PROCESS macro for SPSS version 4.2 was utilized to conduct the mediation analyses (Hayes, 2022). Models 4 and 6 were used for the parallel and serial multiple mediations. In these analyses, mediation is considered significant should zero not fall between the lower and upper boundaries of the 95% bias-corrected and accelerated CIs for the indirect effect (IE). Parallel and serial mediation studies are statistical techniques used in mediation analysis to explore the relationships between variables and the mechanisms by which they influence one another.

When examining the relationship between an explanatory independent variable (IV) and a response dependent variable (DV), parallel mediation analysis considers several mediators that function independently along the causal pathway while controlling for others. The critical assumption is that the effects of any one mediator are independent of the others and that they operate simultaneously. This clarifies the relative contributions of each mediator in explaining the relationship between the IV and DV. Serial mediation analysis, on the other hand, entails a series of mediators in which the effect of the IV on the DV is transmitted via multiple mediators in a causal chain. Each mediator in the chain has the potential to influence the next, establishing a sequential or serial relationship. In summary, parallel mediation analysis presumes the simultaneous operation of independent mediators, whereas serial mediation analysis presumes the sequential operation of dependent mediators.

Confounding variables were considered in all mediation models: marital status, educational level, income, maternal and partner work status, and pregnancy wantedness. Statistical significance was defined as a p-value below .050.

Results

Sociodemographic and Psychosocial Characteristics of Participants

Tables 1 and 2 display the socio-demographic and psychosocial characteristics of the participants based on the prevalence of prenatal depression (PD) symptoms. The mean age stood at 28.14 (SD = 5.19) years, the mean parity came to 2.72 (SD = 1.33) children, and 70.9% of the women were in their second trimester. As shown in Table 1, the prevalence of PD symptoms in this study was 28.1%. The study findings indicate a statistically significant association between PD symptoms and certain demographic factors, specifically, an unmarried status (50.0%), maternal unemployment (55.3%), and lowest income levels (57.8%). It was also found that PD prevalence decreases with each higher level of schooling.

The psychosocial stress variables had a dose–response relationship with the PD status (Table 2). The prevalence of PD symptoms declined for women who reported low financial strain (84.8%) and no experience of intimate

Table 1. Sociodemographic characteristics of participants' by their depressive status (*N* = 519)

Characteristics		Prenatal symptoms	Depression	Unadjusted results			Adjusted results		
	Total (519) *n* (%)	No *n* = 373 (71.9%)	Yes *n* = 146 (28.1%)	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Maternal age									
<25	145 (27.9)	105 (72.4)	40 (27.6)	0.91	0.48, 1.69	.760	1.02	0.41,	.970
25-34	303 (58.4)	218 (71.9)	85 (28.1)	0.93	0.53, 1.64	.798	1.07	2.25	.849
≥ 35	71 (13.7)	50 (70.4)	21 (29.6)	1			1	0.52,	
M*(SD)*	28.14*(5.19)*	28.19*(5.15)*	28.00*(5.33)*					2.23	
χ^2 *p* = .953									
Marital status									
Married	451 (86.9)	329 (75.2)	112 (24.8)	1	1.79, 5.09	.000	1	0.78, 3.05	.215
Single	68 (13.1)	34 (50.0)	34 (50.0)	3.03			1.54		
χ^2 *p* = .000									
Maternal Education									
Primary	101 (19.5)	44 (43.6)	57 (56.4)	1	0.17, 0.43	.000	1	0.31, 1.33	.231
Secondary	275 (53.0)	204 (74.2)	71 (25.8)	0.27	0.06, 0.21	.000	0.64	0.29, 1.96	.569
Tertiary	143 (27.6)	125 (87.4)	18 (12.6)	0.11			0.76		
χ^2 *p* = .000									
Maternal Work									
Employed	443 (85.4)	339 (77.9)	104 (23.5)	1	2.44, 6.66	.000	1	0.66, 2.36	.489
Unemployed	76 (14.6)	34 (44.7)	42 (55.3)	4.03			1.25		
χ^2 *p* = .000									
Partner Work									
Regular	417 (80.3)	325 (77.9)	92 (22.1)	1	2.53, 6.25	.000	1	0.52, 2.16	.879
Irregular	102 (19.7)	48 (47.1)	54 (52.9)	3.97			1.06		
χ^2 *p* = .000									
Family Size									
1 – 4	334 (64.4)	267 (79.9)	67 (20.1)	1	1.99, 4.41	.000	1	0.49, 1.44	.529
≥ 5	185 (35.6)	106 (57.3)	79 (42.7)	2.97			0.84		
χ^2 *p* = .000									
Household income									
<NGN50, 000	192 (37.0)	81 (42.2)	111 (57.8)	1	0.07, 0.19	.000	1	0.09, 0.26	.000
NGN50,001 – NGN100,000	221 (42.6)	190 (86.0)	31 (14.0)	0.12	0.01, 0.08	.000	0.15	0.01, 0.11	.000
>NGN100,000	106 (20.4)	102 (96.2)	4 (3.8)	0.03			0.04		
χ^2 *p* = .000									
Gestation									
Second	151 (29.1)	116 (76.8)	35 (23.2)	1	0.92, 2.22	.109	1	0.66, 1.90	.681
Third	368 (70.9)	257 (69.8)	111 (30.2)	1.43			1.12		
χ^2 *p* = .000									
Parity									
0	54 (10.4)	40 (74.1)	14 (25.9)	1	0.48, 1.80	.837	1	0.43, 2.71	.879
1 – 3	329 (63.4)	248 (75.4)	81 (24.6)	0.93	0.85, 3.45	.132	1.07	0.47, 4.03	.563
≥4	136 (26.2)	85 (62.5)	51 (37.5)	1.71			1.37		
M*(SD)*	2.72*(1.33)*	2.61*(1.24)*	3.01*(1.51)*						
χ^2 *p* = .018									
Want pregnancy									
Yes	413 (79.6)	319 (77.2)	94 (22.8)	1	2.09, 5.09	.000	1	0.77, 2.48	.278
No	106 (20.4)	54 (50.9)	52 (49.1)	3.27			1.38		
χ^2 *p* = .000									

Note: Chi-square test (χ^2) was conducted to assess differences in prenatal depression scores across sociodemographic variables, and all tests were statistically significant except for maternal age.
M Mean; SD Standard deviation; CI Confidence interval; 1 Reference Category
Each adjusted odds ratio displayed is adjusted for all the other variables listed on the table except for the variable currently being examined.

Table 2. Distribution of psychosocial stressors by participants' depressive status (*N* = 519)

Characteristics		Prenatal symptoms	Depression	Unadjusted results			Adjusted results		
	Total (519) *n* (%)	No *n* = 373 (71.9%)	Yes *n* = 146 (28.1%)	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Financial strain									
Low	328 (63.2)	278 (84.8)	50 (15.2)	1			1		.677
High	191 (36.8)	95 (49.7)	96 (50.3)	5.62	3.72, 8.49	.000	1.13	0.63, 2.03	
M(SD)	7.91*(3.66)*	6.94*(3.22)*	10.38*(3.56)*						
χ^2 p = .000									
Food insecurity									
Secure	92 (17.7)	91 (98.9)	1 (1.1)	0.004	0.001, 0.03	.000	0.08	0.08, 0.92	.042
Mildly insecure	165 (31.8)	147 (89.1)	18 (10.9)	0.05	0.02, 0.10	.000	0.17	0.06, 0.46	.000
Moderately insecure	198 (38.2)	117 (59.1)	81 (40.9)	0.27	0.15, 0.50	.000	0.35	0.17, 0.69	.003
Severely insecure	64 (12.3)	18 (28.1)	46 (71.9)	1			1		
M(SD)	8.00*(5.74)*	6.23*(5.12)*	12.54*(4.65)*						
χ^2 p = .000									
IPV									
No	211 (40.7)	186 (88.2)	25 (11.8)	1			1		
Yes	308 (59.3)	187 (60.7)	121 (39.3)	4.81	2.99, 7.75	.000	1.19	0.65, 2.17	.578
M(SD)	2.16*(2.47)*	1.60*(2.08)*	3.58*(2.81)*						
χ^2 p = .000									
Social support									
Low	292 (56.3)	149 (51.0)	143 (49.0)	1			1		
Adequate	227 (43.7)	224 (98.7)	3 (1.3)	0.01	0.004, 0.05	.000	.03	0.01, 0.12	.000
M(SD)	24.56*(5.31)*	25.99*(5.08)*	20.90*(3.94)*						
χ^2 p = .000									

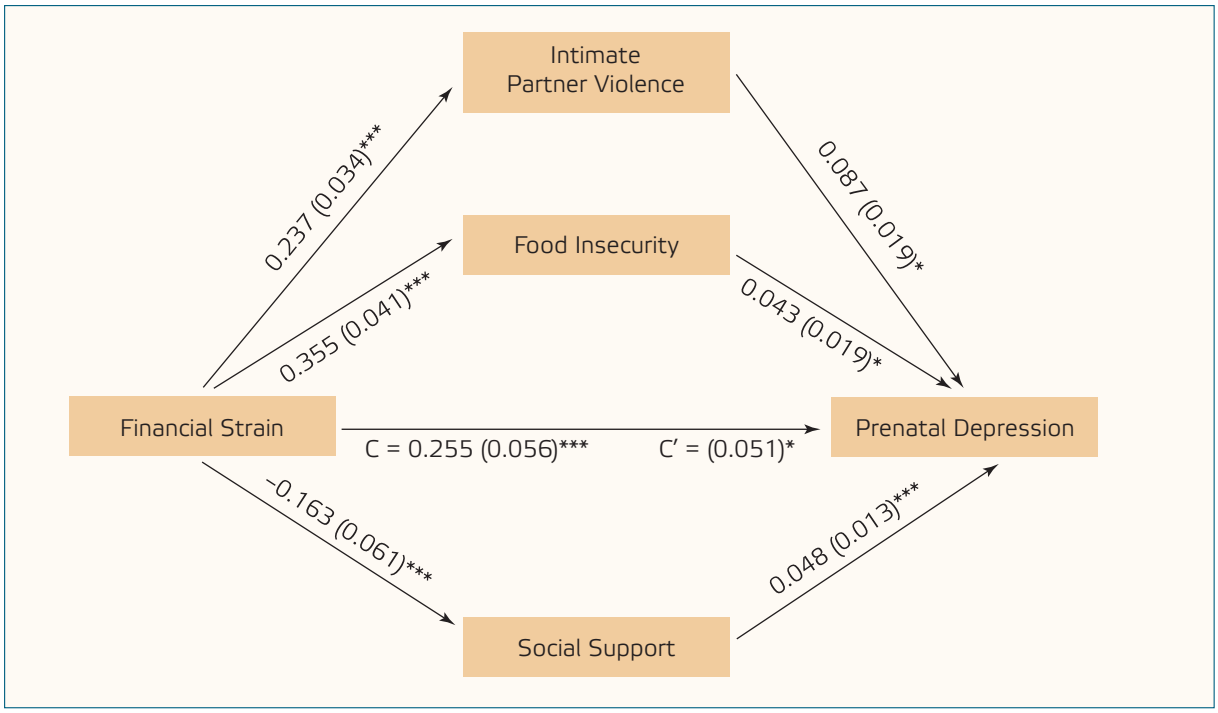
Note: Chi-square test (χ^2) was conducted to assess differences in prenatal depression scores across the psychosocial stress variables, and all tests were significant at $p < .001$.
SD Standard deviation; CI Confidence interval; 1 Reference Category; IPV Intimate partner violence.
Each AOR is adjusted for all the other variables listed on the table except for the variable currently being examined.

partner violence (IPV) (88.2%). Furthermore, PD symptoms increased with higher food insecurity (FI) and declined with better social support (SS). A supplementary one-way analysis of variance test was performed to compare the variations of PD symptoms across the different household income levels and the psychosocial variables (see Appendix). Overall, the data indicates a correlation between income levels and all psychosocial factors: Higher household income was typically linked to lesser financial strain, decreased occurrences of IPV, stronger social support, reduced food insecurity, and a lowered likelihood of PD symptoms**.**

Crude and Adjusted Predictors of Prenatal Depressive Symptoms

Table 1 and Table 2 also present crude and adjusted associations between maternal sociodemographic and psychosocial factors and the odds of reporting PD symptoms. The adjusted logistic regression model for Table 1 was statistically significant, χ^2 (15, N = 519) = 154.11, p = .000. The model explained 37.0% (Nagelkerke R^2) of the variance in PD symptoms and correctly classified 78.0% of the cases. Only household income remained statistically significant in the adjusted model: pregnant women reporting higher incomes indicated lower odds of PD symptoms respectively (*OR* = 0.15, 95% CI [0.09, 0.26] and *OR* = 0.04, 95% CI [0.01, 0.11]). When other variables were adjusted, the odds of reporting PD symptoms lowered with increasing food security and adequate social support (*OR* = 0.34, 95% CI [0.01, 0.12) as presented on Table 2. The adjusted logistic regression model for Table 2 was statistically significant, χ^2 (6, N = 519) = 209.62, p = .000. The model explained 48.0% (Nagelkerke R^2) of the variance in PD symptoms and correctly classified 77.0% of the cases.

Figure 1. Parallel mediation model (*N* = 519)



This figure illustrates the indirect effect of financial strain on prenatal depression through IPV, food insecurity, and social support. The model is controlled for covariates. Standardized effects are presented.
C′ is a direct effect of financial strain on depression; c is the total effect of financial strain on depression.
The mediation analysis is adjusted for marital status, educational level, income, maternal and partner employment status, and pregnancy intention.
*p < .050, ***p < .001.

Parallel Mediation Model

Based on 10,000 bootstrapped samples, the overall effect of financial strain (C = 0.26, SE = 0.06, p < .001) and the direct effect (C' = 0.12, SE = 0.05, p < .05) on PD were significant, and there are also indirect effects (Figure 1). The three mediators collectively partially mediate the relationship between financial strain and PD (IE_{total} = 0.18, 95% CI: LL = 0.12 to UL = 0.24), which implies that participants with higher financial strain scores also tend to experience more IPV, FI, less social support and symptoms of PD. All three mediators significantly contributed to the indirect effects. For example, financial strain and PD symptoms are statistically related indirectly through food insecurity (b_1 = 0.36, 95% CI: LL = 0.48 to UL = 0.64), such that participants reporting elevated levels of financial strain were more prone to experiencing food insecurity. As a result, it can be inferred that these women exhibited a tendency to report more PD symptoms.

Serial Mediation Model

The findings demonstrate that a serial causal chain with no specified order of mediators partially mediates the association between financial strain and PD symptoms (IE_{total} = 0.27; 95% CI: LL = 0.12 to UL = 0.24). The overall indirect effect is the same as in the earlier-explored parallel mediation model. The three mediators generated six distinct causal order models, as presented in Table 3. The significant paths of each unique arrangement of the mediating variables created were compared across all six models. Of the seven possible paths, SMM 2 and 4 generated only four significant indirect paths, SMM 3 and 6 generated six significant paths, and SMM 1 and 5 generated seven.

All six models produced a significant (although weak) indirect path, including all three mediators in the chain of causation. The path Financial strain->FI→IPV→Social support→PD in SMM 2 yielded the highest indirect effect, 0.009 (95% CI 0.003 to 0.016) among the six models (Table 3). Five of the six SMMs had statistically significant results for the indirect paths involving social support and FI: The most robust findings were observed in SMM 2 and SMM 3.

Table 3. Standardized indirect effects for the paths on the Serial Mediation Models (*N* = 519)

Effect	B	Boot SE	Boot LLCI	Boot ULCI
SMM1: FS → IPV → SS → FI → PD				
FS →IPV → PD	0.09	0.02	0.05	0.13
FS → SS → PD	0.03	0.01	0.01	0.06
FS → FI → PD	0.04	0.02	0.01	0.07
FS → IPV → SS → PD	0.01	0.00	0.01	0.02
FS → IPV → FI → PD	0.01	0.00	0.00	0.01
FS → SS → FI → PD	0.00	0.00	0.00	0.00
FS → IPV → SS→ FI → PD	0.00	0.00	0.00	0.00
SMM2: FS → FI → IPV → SS → PD				
FS →FI → PD	0.04	0.02	0.01	0.08
FS → IPV → PD	0.02	0.02	-0.01	0.07
FS → SS → PD	0.02	0.01	-0.01	0.05
FS → FI→ IPV → PD	0.06	0.01	0.04	0.09
FS → FI → SS → PD	0.02	0.01	0.00	0.03
FS → IPV → SS → PD	0.00	0.00	-0.00	0.01
FS → FI → IPV→ SS → PD	0.01	0.00	0.00	0.02
SMM3: FS → IPV → FI → SS → PD				
FS → IPV → PD	0.09	0.02	0.05	0.13
FS → FI → PD	0.04	0.02	0.01	0.07
FS → SS → PD	0.02	0.01	-0.01	0.04
FS → IPV→ FI → PD	0.01	0.00	0.00	0.01
FS → IPV → SS → PD	0.01	0.00	0.01	0.02
FS → FI → SS → PD	0.02	0.01	0.00	0.03
FS → IPV→ FI→ SS → PD	0.00	0.00	0.00	0.00
SMM4: FS → FI→ SS→ IPV→ PD				
FS → FI → PD	0.04	0.02	0.01	0.08
FS → SS → PD	0.03	0.02	-0.01	0.05
FS → IPV → PD	0.02	0.02	-0.02	0.06
FS → FI→ SS → PD	0.03	0.01	0.01	0.04
FS → FI → IPV → PD	0.06	0.01	0.04	0.08
FS → SS → IPV→ PD	0.01	0.00	-0.00	0.01
FS → FI → SS → IPV → PD	0.01	0.00	0.00	0.01
SMM5: FS → SS → IPV→ FI → PD				
FS → SS → PD	0.05	0.01	0.02	0.07
FS → IPV → PD	0.07	0.02	0.04	0.11
FS → FI → PD	0.04	0.02	0.01	0.07
FS → SS → IPV → PD	0.01	0.01	0.01	0.02
FS → SS → FI → PD	0.00	0.00	0.00	0.00
FS → IPV → FI→ PD	0.00	0.00	0.00	0.01
FS → SS → IPV → FI → PD	0.00	0.00	0.00	0.00

(continued on the next page)

Table 3. continued

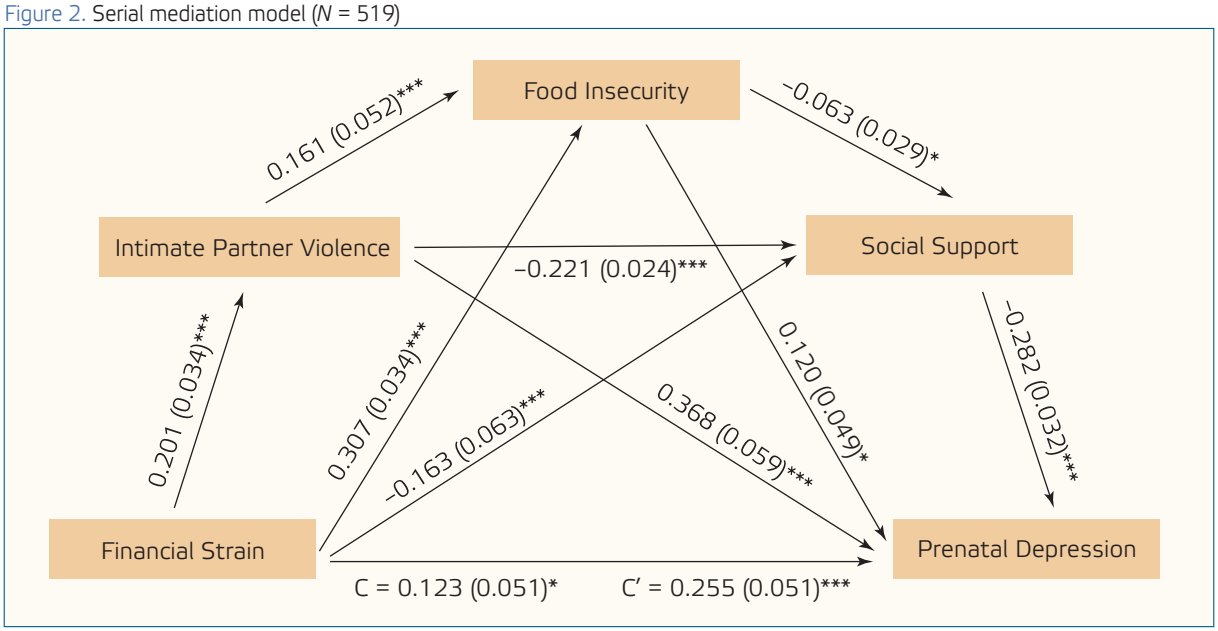
Effect	B	Boot SE	Boot LLCI	Boot ULCI
SMM6: FS → SS → FI → IPV→ PD				
FS → SS → PD	0.05	0.01	0.02	0.07
FS → FI → PD	0.04	0.02	0.01	0.08
FS → IPV → PD	0.02	0.02	-0.02	0.06
FS → SS → FI → PD	0.00	0.00	0.00	0.01
FS → SS → IPV→ PD	0.01	0.01	0.00	0.02
FS → FI → IPV → PD	0.05	0.01	0.04	0.08
FS → SS → FI→ IPV→ PD	0.00	0.00	0.00	0.01

The table shows standardized indirect effects with bootstrapped SEs of the serial mediation models; Values in bold indicate significant bias-corrected bootstrap 95% confidence interval above zero. SMM: Serial multiple mediation; PD: Prenatal depression; FS: Financial strain; FI: Food insecurity; IPV: Intimate partner violence; SS: Social support; LL- Lower Limit; UL- Upper Limit.
The mediation analysis is adjusted for marital status, educational level, income, maternal and partner work status, and wantedness of pregnancy.

The indirect paths involving SS and IPV (in both directions) were statistically significant in all SMMs. This result means that higher FS lowers SS (increases IPV), which increases IPV (lowers SS), resulting in an increased likelihood of reporting PD symptoms. These two mediators had a significant causal effect in sequence, regardless of their order of occurrence. Moreover, the indirect paths involving IPV and FI (in rotation) were statistically significant in five SMMs. The paths with FI before IPV (SMM 4 and SMM 6) had the strongest indirect effect.

Figure 2 displays the direct pathways that link FS to the individual mediators and between all mediators from SMM 5. All direct and indirect effects achieved statistical significance. Positive signs of direct effects indicate increased IPV and FI caused by FS. Conversely, the negative sign of the direct effect indicates a lower SS resulting from a higher FS. The indirect paths from FS through IPV and FI to PD are positive, showing the increase in PD through the increase in the levels of the mediators. The indirect path through social support is negative, indicating that reduced social support increases PD. The results of SMM 5 show that higher financial strain lowers social support; low social support resulted in higher IPV, and higher IPV led to greater levels of FI, which in turn contributed to higher levels of PD symptoms.

Figure 2. Serial mediation model (N = 519)



This figure illustrates the serial mediation of IPV, food insecurity, and social support, in the relationship between financial strain and prenatal depression. Standardized effects are presented.
C′ is a direct effect of financial strain on depression; c is the total effect of financial strain on depression
The mediation analysis is adjusted for marital status, educational level, income, maternal and partner employment status, and pregnancy intention.
* $p < .050$, ***$p < .001$.

Discussion

This study examined expectant women to determine the prevalence of PD symptoms and the psychosocial factors contributing to its development. The findings show that pregnant women with symptoms of PD have a clustering of risk factors; including financial strain, low social support, intimate partner violence, and food insecurity. The finding suggests that these factors need to be addressed collectively by devising and implementing a comprehensive intervention plan to address socioeconomic disadvantages among pregnant women.

In this study, 28.1% of participants reported symptoms of PD. This prevalence was higher than that estimated for earlier Nigerian studies (Thompson & Ajayi, 2016; Gadanaya et al., 2018; Adeoye et al., 2022; Wegbom et al., 2023). However, some of the studies used different tools for measuring depression [the Mini International Neuropsychiatric Review (MINI 6.0) and the Depression, Anxiety, and Stress Scale (DASS) having varying thresholds for diagnosing depression. The study with the closest value was that of Gadanya et al. (2018), which reported a prevalence of 26.6%.

According to results from the parallel mediation analysis, the three mediators (IPV, SS, and FI) partially mediate the association between FS and PD symptoms. All three variables significantly contributed to the overall indirect effect. Serial mediation found a causal chain between single mediations of FI and SS and serial mediations of IPV through FI and SS, respectively, in the association between FS and PD symptoms. In accordance with empirical evidence from Western and other African societies, this study found that household FI, SS, and IPV contribute to the causative processes between FS and PD symptoms. It is also important to note that bidirectional links exist between participants reporting symptoms of PD, IPV, FI, and SS.

FS emerged as an essential stressor that directly and indirectly affected PD symptoms in the current study, even after controlling for participants' self-reported objective income status and other covariates. There is proof of a complex link between FS and IPV (Lucero et al., 2016; Umukoro & Okurame, 2022). Relationships and family dynamics may suffer from FS. Conflicts and tension about money management, financial responsibilities, and decision-making may become more frequent among families or couples going through financial hardship. These interpersonal stressors may produce a hostile or unwelcoming environment that affects the pregnant woman's mental health and the unborn child's overall well-being. Women are more likely to continue in violent relationships when they depend financially on their partners (Stylianou, 2018).

Furthermore, IPV can cause mental and physical health difficulties, making it harder for women to keep their jobs and contributing to the ongoing cycle of economic inequality between the genders (Breiding et al., 2014). It has been hypothesized that men living in impoverished conditions are prone to engaging in domestic violence because they lack the financial and social resources to deal with daily stressors. This dynamic takes on further significance in patriarchal societies like Nigeria, where males who fail to fulfill the conventional breadwinner role sometimes resort to violence to establish control (Benebo et al., 2018). Moreover, prior research has shown that women who encounter IPV are at an increased risk of experiencing depression compared to those who do not (Schneider et al., 2018; Woldetensay et al., 2018; Reesor-Oyer et al., 2021).

Studies have also shown that FI is a component of FS, suggesting that people vulnerable to FI are also exposed to other forms of FS, such as those associated with financial difficulties (Drewnowski, 2022). IPV also compromises the ability of a household to effectively manage its financial and material resources, which can contribute to FI (Awungafac et al., 2021). Thus, short-term and long-term exposure to FI can affect psychological and physiological well-being (Abrahams et al., 2018). Depression is also cited as a mediator between maternal exposure to IPV and FI (Hernandez et al., 2014; Barnett et al., 2019), which suggests that a woman who experiences IPV is more likely to be depressed, which in turn hinders her ability to guarantee household food security. This can be explained through how depression impairs a woman's resource management: Depression can make food shopping and preparation difficult, prevent women from working, and increase emotions of hopelessness associated with abuse, making it harder for women to discover, access, and seek SS.

Research further shows that the adverse effects of stressors like FS, FI, and IPV on health are mitigated by SS, which can take the form of tangible, informational, or emotional assistance (Lubbers et al., 2020). Current research results demonstrate that pregnant women with lower income and higher FS reported lower SS. These results corroborate earlier research that established an association between lower socioeconomic status and structural isolation stemming from inadequate SS (Schafer & Vargas, 2016).

Furthermore, research reveals that social networks are primarily homogeneous regarding socioeconomic status; this means that pressures impacting one lower SES person may affect others in his or her network (Riley & Eckenrode, 1986). Most poor and vulnerable Nigerians are not protected by social security nets (Shadare,

2022), and many have to rely on their kin and friends for informal support. Therefore, even if a woman has an extensive SS network, helpers may be unable to provide adequate practical assistance if they also have a low socioeconomic position, which may further isolate the pregnant woman from her SS network and exacerbate her depression symptoms. There is also a good chance that depressed people underestimate the help they can access because they tend to withdraw from their social circles and experience interpersonal difficulties (Bedaso et al., 2021).

Strengths and Limitations

This study's major limitation is its cross-sectional methodology; consequently, causation and a definitive model for the observed associations cannot be concluded. It is also probable that those who suffer mental health problems may be more prone to experience financial difficulties than the larger population (a phenomenon known as the "social selection effect"), which could lead to inaccurate estimates of their actual financial burdens. However, several Western studies support the social causation concept that FS affects mental health. Because the findings are based on self-reported data from study participants, they are susceptible to recall bias. Non-evaluation for the length of financial difficulties may also confound the study findings. Women's prenatal mental health may also have been negatively impacted by exposure to other material and life stressors not examined in the current study (i.e., neighborhood disadvantage or job strain). In addition, this research was restricted to a single geographical region in Nigeria, limiting its scope. The study sample was also concentrated in metropolitan healthcare facilities and only PHCs. Thus, the findings may not generalize to pregnant women in rural areas or women attending other categories of healthcare facilities (public tertiary and private health centers), who may possess different socioeconomic characteristics.

Despite its limitations, this may be the first indigenous study to test a three-mediator model for the relationship between different types of psychosocial stress and prenatal depression symptoms. The systematic sampling procedure adopted for this study is a significant strength, as it improves the study's representativeness and decreases selection bias, enhancing its methodological rigor. The study findings also represent a vital step toward identifying possible clinical and public health intervention targets and set the foundation for more robust empirical inquiries.

Conclusion, Implications, and Future Directions

The findings of this study have implications for programs in Nigeria aimed at preventing and treating prenatal depression. Accounting for potential confounding variables, this study found statistical evidence for FI, SS, and IPV as mediators in the causal pathway from FS to participants reporting PD symptoms. The data from this research indicates that these stressors interact cumulatively, increasing the potential for adverse outcomes regarding pregnant women. Policies and structural changes that address economic instability and household financial pressures like work, housing, food, and healthcare should be implemented as public health interventions to mitigate psychosocial distress. Research and interventions must evaluate the effects of integrating mental health services into antenatal care alongside the assistance for social needs like financial aid, food security, protection from domestic abuse, and family functioning in general. This is important as prenatal care visits could serve as crucial intervention points: By educating policymakers on their patients' experiences, healthcare professionals may help improve household financial security and maternal health. Also, multidisciplinary mental health teams (i.e., psychiatrists, psychologists, and social workers) should be integrated into local primary health care.

In order to determine the direction of causation between FS and PD symptoms, future research should employ longitudinal analyses to elucidate the temporal order of events. Other indicators of FS, such as asset ownership and debt profile, may provide additional information on the potential heterogeneity between FS and symptoms of PD. The researcher also recommends a similar study that would include women from rural communities in Nigeria where the incidence of socioeconomic disadvantage stands higher.

Abbreviations

PHC: Primary Health Care
PD: Prenatal depression
FS: Financial strain
IPV: Intimate partner violence
FI: Food insecurity

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Author contribution
Olubukola A. WELLINGTON: conceptualization, design, methodology, investigation, project administration, data management, formal analysis, interpretation, supervision, writing original draft, review and editing.

Declaration of interest statement
The author declares no conflict of interest.

Ethical statement
All participants engaged in the research voluntarily and anonymously.
The participants provided their written informed consent to participate in this study.
Their data are stored in coded materials and databases without personal data.
This study protocol was approved by the Redeemer's University Ethical Review Committee (REC/30/08/2021/RUN/11).

Data Availability Statement
The data supporting this study's findings are available to the public.
We have policies in place to manage and keep data secure.

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Appendix

Table 1. Descriptive characteristics of key study variables by maternal household income (*N* = 519)

Variables	Income level			*p*-value
	≤ NGN50,000 (*n* = 192)	NGN50,000 – NGN100,000 (*n* = 221)	> NGN100,000 (*n* = 106)	
	M*(SD)*	M*(SD)*	M*(SD)*	.000
Financial strain	10.13*(3.34)*	7.28*(3.15)*	5.20*(2.78)*	.000
Intimate Partner Violence	3.71(2.73)	1.64*(1.86)*	0.42*(1.17)*	.000
Social support	20.95(4.57)	25.35*(4.75)*	29.46*(2.03)*	.000
Food insecurity	12.92(4.29)	6.67(4.26)	1.89*(2.30)*	.000
Prenatal depression	12.45(4.56)	6.59(4.08)	1.89*(2.58)*	.000

The table shows standardized indirect effects with bootstrapped SEs of the serial mediation models; Values in bold indicate significant bias-corrected bootstrap 95% confidence interval above zero. SMM: Serial multiple mediation; PD: Prenatal depression; FS: Financial strain; FI: Food insecurity; IPV: Intimate partner violence; SS: Social support; LL- Lower Limit; UL- Upper Limit. The mediation analysis is adjusted for marital status, educational level, income, maternal and partner work status, and wantedness of pregnancy.