



## Article

# Determinants of Depression, Anxiety, and Stress among Pregnant Women Attending Tertiary Hospitals in Urban Centers, Nigeria

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**Abstract:** Most times, pregnancy is considered a joyous event, but it also heightens a woman's emotional and psychological state. Globally, some women suffer mental disorders, especially in developing nations. In Nigeria, there is evidence for a high prevalence of depression, anxiety, and stress during pregnancy. Therefore, this study aimed to estimate the severity and factors associated with depression, anxiety, and stress among pregnant women in Port Harcourt, Nigeria. A facility-based cross-sectional survey was carried out in the two tertiary hospitals in Port Harcourt city between September and October 2022 using the Depression Anxiety and Stress Scale-21 (DASS-21). Univariate, bivariate, and multivariate analyses were performed using STATA 16. The proportional odds model (POM) was used, and the statistical significance was set at  $p \leq 0.05$ . A total of 413 respondents participated in the study, of whom 9.5%, 26.6%, and 17.3% had at least moderate depression, anxiety, and stress, respectively. Marital status, educational levels, and employment status were significantly associated with depression. Marital status, religion, and trimester were significantly associated with anxiety, while age, marital status, educational level, religion, income, trimester, and previous abortions/miscarriages were significantly related to stress. This study showed evidence of moderate-to-extremely severe anxiety, stress, and depression, as well as factors associated with these disorders. Our findings have implications for strengthening mental health policies as they pertain to antenatal care.

**Keywords:** pregnant women; depression; anxiety; stress; determinants



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## 1. Introduction

The onset of pregnancy in most women is seen as a joyous occasion [1]. However, the initial joy is not capable of shielding a woman from certain psychological burdens; rather, it may make her more susceptible to a plethora of associated disorders [2]. Pregnancy is not considered a pathological state, though it may heighten a woman's vulnerability to emotional and psychological states, such as stress, anxiety, and depression [3]. Pregnancy may initiate a cascade of emotional, psychological, and even traumatic events that spans from the perinatal to postpartum periods [4].

Globally, approximately 10% to 16% of pregnant women suffer from a mental disorder, especially depression, with underdeveloped countries recording numbers above average (16%) [5]. In the past few years, there has been an increase in evidence that many pregnant women suffer from psychiatric disorders. Perinatal mental health poses an important public health problem, significantly impacting mothers, families, partners, and babies' cognitive development [1].

Depression, anxiety, and stress are reported to be the most common symptoms of psychological disorders associated with pregnancy [6]. These disorders can occur individually or in combination [7]. According to the DSM-V, a depressive disorder is characterized by distinct episodes that last at least 2 weeks. A person suffering from this may display sharp changes in cognitive, affective, and neurovegetative functions and inter-episodic remissions [8]. People suffering from this display higher levels of sadness, emptiness, or irritability, including some somatic and cognitive changes that may heavily impact the functioning of an individual.

The DSM-V associates anxiety disorders with excessive fear, anxiety, and related behavioral disturbances [8]. They differ from temporary fear or anxiety by being persistent, usually lasting at least 6 months. The most pronounced symptoms of anxiety disorders are prolonged and extreme anxiety. The individual may also become restless or on edge, easily fatigued, easily distracted, more irritable, and sleep deprived. The DSM-V describes acute stress disorder as the development of specific fear behaviors that may span from 3 days to a month after a traumatic event [8].

Stress disorders require exposure to a traumatic or stressful event and the enlistment of such during diagnosis. Some stress disorders include reactive attachment disorder, disinhibited social engagement disorder, post-traumatic stress disorder (PTSD), acute stress disorder, and adjustment disorders. Distinctions had to be drawn between stress and anxiety due to the definitions of the terms used. We viewed anxiety through the lens of autonomic arousal, skeletal muscle effects, situational anxiety, and the subjective experience of anxious affect. Stress was viewed as difficulty in relaxing, nervous arousal, and extreme irritability as opposed to reactivity and impatience.

Depression, anxiety, and stress may worsen due to a perceived lack of support from the husband, low education, and insufficient financial capabilities [9].

A study in Nigeria has shown higher levels of depression and anxiety during pregnancy [10]. A meta-analysis conducted worldwide reported the prevalence of antenatal depression ranging from 0.5% to 51% [11], although a similar study from low- and middle-income countries also showed a mean weighted prevalence of common mental disorders during pregnancy of 15.6% [12]. The magnitude of depression during pregnancy varies across different countries in Africa, and studies have shown the prevalence to be between 8.3% and 78.2% [13–15].

Women are known to be at a higher risk of depression than men [16]. Depression during pregnancy is a risk factor for low birth weight, preterm birth, infant undernutrition, perinatal complications, and maternal mortality [17]. In a recent systematic meta-analysis on the prevalence of antenatal depression in Africa, the total prevalence stood at 26.3% [18].

A study in Rwanda identified a non-psychotic depression episode that occurs in the last trimester of a pregnancy and is characterized by mild-to-severe symptoms that may occur during pregnancy [19]. This non-psychotic depression is associated with unpleasant features, such as sadness, hopelessness, sleep disturbance, fatigue, change in appetite, suicidal ideation, a feeling of worthlessness, a lack of concentration, reduced self-esteem, and a plunge in confidence [1].

During pregnancy, depression has a negative impact on both the course of a pregnancy and on the fetal and neonatal outcomes. The growing interest in the field of neonatal programming has triggered more research on depression among pregnant women [20]. Anxiety and depression are major problems all over the world, especially during pregnancy [21]. Anxiety is a natural response to stress that manifests as a feeling of fear, apprehension, and

nervousness about the present or future [8,22]. Studies show that children of highly anxious mothers have twice the risk of attention deficit hyperactivity disorder (ADHD) [23].

The prevalence of depression, anxiety, and stress among pregnant women in their first trimester was shown to be 45.5%, 47.4%, and 51.8%, respectively, in an Iceland study [24]. Another study reported the prevalence of depression, anxiety, and stress among antenatal women in New Delhi at 25.5%, 63%, and 23%, respectively, in the study area [25]. In China, the prevalence of prenatal anxiety has been reported at 15.8% and 25% [26,27] and at 31.7% in the postpartum period [28].

In Nigeria, studies revealed a very high prevalence of depression, anxiety, and stress during pregnancy. For instance, in Kano, the prevalence of anxiety and depression among pregnant women was found to be 23.2% and 26.6%, respectively. A study in Abakaliki, eastern Nigeria, showed 13.6%, 11%, and 39.7% prevalence of depression, anxiety, and stress, respectively, among pregnant women during the COVID-19 lockdown [29].

Understanding the magnitude of depression, anxiety, and stress, as well as their associated factors, among pregnant women could provide important information that could aid in the mitigation of the poor mental health experienced by this group of women. The objectives of this study were to determine the prevalence of depression, anxiety, and stress symptoms and identify the factors associated with these symptoms among pregnant women attending antenatal clinics in two tertiary hospitals in Port Harcourt, Nigeria. There is also a paucity of studies on factors affecting mental disorders among pregnant women in Rivers State.

## 2. Methods

### 2.1. Study Design and Participants

An institutional-based cross-sectional study was conducted among pregnant women attending antenatal clinics at the University of Port Harcourt Teaching Hospital (UPTH) and Rivers State University Teaching Hospital (RSUTH) Port Harcourt between September and October 2022 using a two-stage sampling method. A total of 384 (192 from each facility) pregnant women participated in the study. This was calculated using the Cochran formula for cross-sectional studies at a 95% confidence level, a 5% error margin, and a 50% prevalence. We selected every sixth antenatal attendee at the two settings until the calculated required sample size for our study was reached.

Physically challenged women and women with a known mental disorder were excluded from the study. We made the assumption (perhaps wrongly) that these subgroups of pregnant women would be extra vulnerable to depression and anxiety, whereas we wanted to see whether pregnancy itself was associated with mental health sequelae.

### 2.2. Data Collection Instruments and Procedures

Data were collected using an interviewer-administrated questionnaire that consisted of the following two parts: sociodemographic characteristics and the Depression Anxiety and Stress Scale-21 (DASS-21).

The sociodemographic variables were as follows: age (<25, 25–34, ≥35) in years; marital status (not married, married); educational level (≤secondary, >secondary); employment status (unemployed, employed); religion (Christianity, Islam); monthly income (<100, 100–200, >200) in US dollars; gravidity (first timer, 2–4, ≥5); trimester (first, second, third); previous abortion/miscarriage (No, Yes).

The DASS-21 is a standard questionnaire containing 21 items that are used to assess the severity of depression, anxiety, and stress. The questionnaire contains 7 items each for depression, anxiety, and stress, and it has been used previously in different populations to assess the severity of depression, anxiety, and stress symptoms among pregnant women [29,30]. The respondents were asked to indicate the symptoms that apply to them and to rate the items on a scale from 0 to 3. From the scale, 0 indicates “did not apply to me at all”, 1 indicates “applied to me to some degree or some of the time”, 2 indicates “applied to me to a considerable degree or a good part of the time”, and 3 indicates “applied to me

very much or most of the time". Each score was multiplied by 2 to assess the DASS severity ratings, which are shown in Table 1.

**Table 1.** Scoring the severity of depression, anxiety, and stress.

Level	Depression	Anxiety	Stress
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely Severe	28+	20+	34+

The Cronbach's alpha (CA) was calculated to assess the reliability and internal consistency of the scale/items in our instrument. The CA was 0.70, 0.69, and 0.81 for depression, anxiety, and stress, respectively, while the CA for all the symptoms combined was calculated to be 0.85.

### 2.3. Statistical Analysis

We used descriptive statistics of frequency, percentage, and mean with a standard deviation, a chi-square test, and an ordinal logistic regression model to analyze the data for this study. The descriptive statistics were used to present the prevalence of depression, anxiety, and stress severity. The chi-square test was used to determine the relationship between the sociodemographic variables and the severity of depression, anxiety, and stress. The ordinal logistic regression models were used to identify the determinants of the severity of depression, anxiety, and stress among pregnant women attending the clinics.

For the ordinal regression modeling, the severity of the DASS was coded as normal = 0, mild = 1, and  $\geq$ moderate = 2. Variables that were statistically significant at  $p \leq 0.05$  in the bivariate analyses were included in the multivariable ordinal logistic regression model. The proportional odds model (POM) with a 95% confidence interval (95% CI) was reported. The proportional odds model (POM) assumption was tested using the Brant test. The proportionality assumption tested is valid if the Brant test is insignificant at a 5% level of significance. All of the data analyses were performed using the Stata statistical software, version 16.

## 3. Results

### 3.1. Characteristics of Study Participants

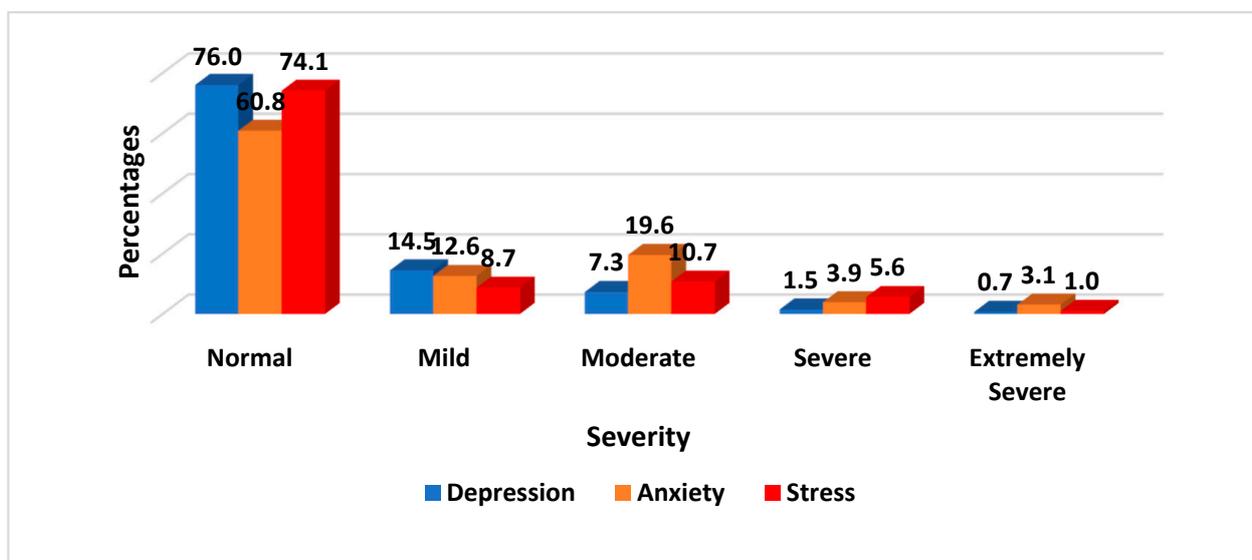
From Table 2, about 53.3% and 46.7% of the 413 respondents studied were attending UPTH and RSUTH, respectively. The mean age and standard deviation of the patients who attended antenatal clinics in Port Harcourt were reported to be  $29.7 \pm 5.6$ . Two-thirds (65.7%) were aged 25–34 years. Over 89% of the patients were married, 66.8% attained at least secondary education, 71.1% were employed, 96.6% were Christians, and over 50% earned less than \$100 per month. Additionally, more than half of the respondents were multigravida and in their third trimester, while 76.9% had no previous abortions/miscarriages.

### 3.2. Severity of Depression, Anxiety, and Stress among Pregnant Women

The severity of depression, anxiety, and stress is shown in Figure 1. The figure revealed varying degrees of depression among the pregnant women as follows: 78.0% were normal, 14.5% were mild, 7.3% were moderate, 1.5% were severe, and 0.7% were extremely severe depression cases. Regarding anxiety, 60.8% were normal, 12.6% were mild, 19.6% were moderate, 3.9% were severe, and 3.1% were extreme. Additionally, 74.1%, 8.7%, 10.7%, 5.6%, and 1.0% were normal, mild, moderate, severe, and extremely severe stress cases, respectively.

**Table 2.** Characteristics of the respondents.

Characteristics	n (%)
<b>Facility</b>	
UPTH	220 (53.3)
RSUTH	193 (46.3)
<b>Age (years)</b>	
<25	65 (16.2)
25–34	264 (65.7)
≥35	73 (18.2)
<b>Mean (SD)</b>	29.7 (5.6)
<b>Marital Status</b>	
Not Married	43 (10.4)
Married	370 (89.6)
<b>Educational Level</b>	
≤Secondary	137 (33.2)
>Secondary	276 (66.8)
<b>Employment Status</b>	
Unemployed	118 (28.9)
Employed	291 (71.1)
<b>Religion</b>	
Christianity	399 (96.6)
Islam	14 (3.4)
<b>Income (Dollars) per month</b>	
<100	219 (58.4)
100–200	75 (20.0)
>200	81 (21.6)
<b>Gravidity</b>	
First Timer	196 (47.5)
2–4	185 (44.8)
≥5	32 (7.7)
<b>Trimester</b>	
First Trimester	42 (10.4)
Second Trimester	160 (39.5)
Third Trimester	203 (50.1)
<b>Previous Abortion/Miscarriage</b>	
No	310 (76.9)
Yes	93 (23.1)



**Figure 1.** Degrees of depression, anxiety, and stress among the pregnant women.

Tables 3–5 reveal that the respondents’ age, marital status, educational levels, and employment status were significantly associated with depression. Marital status, religion, and trimester were significantly associated with anxiety, while age, marital status, educational level, religion, income, trimester, and previous abortions/miscarriages were significantly related to stress at  $p < 0.05$ .

**Table 3.** Associations between the respondents’ characteristics and depression.

Variables	Severity of Depression			p-Value
	Normal n (%)	Mild n (%)	≥Moderate n (%)	
<b>Age (years)</b>				0.000
<25	38 (58.5)	10 (15.4)	17 (26.2)	
25–34	208 (78.8)	40 (15.2)	16 (6.1)	
≥35	59 (80.8)	9 (12.3)	5 (6.8)	
<b>Mean (SD)</b>				
<b>Marital Status</b>				0.000
Not Married	17 (39.5)	9 (20.9)	17 (39.5)	
Married	297 (80.3)	51 (13.8)	22 (5.9)	
<b>Educational Level</b>				0.002
≤Secondary	92 (67.2)	23 (16.8)	22 (16.1)	
>Secondary	222 (80.4)	37 (13.4)	17 (6.2)	
<b>Employment Status</b>				0.016
Unemployed	83 (70.3)	16 (13.6)	19 (16.1)	
Employed	228 (78.4)	43 (14.8)	20 (6.9)	
<b>Religion</b>				0.186
Christianity	306 (76.7)	57 (14.3)	36 (9.0)	
Islam	8 (57.1)	3 (21.4)	3 (21.4)	
<b>Income (Dollars) per month</b>				0.722
<100	171 (78.1)	32 (14.6)	16 (7.3)	
100–200	61 (81.3)	10 (13.3)	4 (5.3)	
>200	61 (75.3)	11 (13.6)	9 (11.1)	
<b>Gravidity</b>				0.197
First Timer	141 (71.9)	35 (17.9)	20 (10.2)	
2–4	145 (78.4)	24 (13.0)	16 (8.6)	
≥5	28 (87.5)	1 (3.1)	3 (9.4)	
<b>Trimester</b>				0.912
First Trimester	30 (71.4)	7 (16.7)	5 (11.9)	
Second Trimester	124 (77.5)	20 (12.5)	16 (10.0)	
Third Trimester	157 (77.3)	28 (13.8)	18 (8.9)	
<b>Previous Abortion/Miscarriage</b>				0.596
No	236 (76.1)	46 (14.8)	28 (9.0)	
Yes	71 (76.3)	11 (11.8)	11 (11.8)	

### 3.3. Determinants of Depression, Anxiety, and Stress among Pregnant Women

From the results of the multivariable POM in Table 6, only marital status was significantly related to depression. Marital status, religion, and trimester were significantly related to anxiety, whereas marital status, educational level, income, and trimester were significantly related to stress among the pregnant women attending the clinics at a 5% level of significance.

The findings showed that married women were significantly less likely to have a higher order of depression [aPOR = 0.20; 95% CI: 0.10–0.41], anxiety [aPOR = 0.35; 95% CI: 0.19–0.64], and stress [aPOR = 0.35; 95% CI: 0.14–0.84] compared with unmarried pregnant women. Similarly, the risk of having a higher order of anxiety and stress was significantly higher in the third trimester compared to the first trimester: anxiety [aPOR = 2.53; 95% CI: 1.20–5.33] and stress [aPOR = 5.46; 95% CI: 1.68–17.77]. The risk of having a higher order of anxiety was 3.02 times higher among Islamic expectant mothers compared to Christian mothers [aPOR = 3.02; 95% CI: 1.01–9.04].

Furthermore, mothers who attained more than secondary education had a lower risk of having a higher order of stress than those who had at most secondary education [aPOR = 0.56; 95% CI: 0.31–0.93]. Similarly, women who earned more in terms of monthly income, 100–200 [aPOR = 0.40; 95% CI: 0.17–0.93] and >200 [aPOR = 0.41; 95% CI: 0.18–0.89], were less likely to develop a higher order of stress compared to women who earned less than 100 US dollars per month.

**Table 4.** Associations between the respondents’ characteristics and anxiety.

Variables	Level of Anxiety			p-Value
	Normal n (%)	Mild n (%)	≥Moderate n (%)	
<b>Age (years)</b>				0.273
<25	35 (53.8)	9 (13.8)	21 (32.3)	
25–34	169 (64.0)	28 (10.6)	67 (25.4)	
≥35	39 (53.4)	13 (17.8)	21 (28.8)	
<b>Mean (SD)</b>				
<b>Marital Status</b>				0.001
Not Married	15 (34.9)	9 (20.9)	19 (44.2)	
Married	236 (63.8)	43 (11.6)	91 (24.6)	
<b>Educational Level</b>				0.127
≤Secondary	74 (54.0)	19 (13.9)	44 (32.1)	
>Secondary	177 (64.1)	33 (12.0)	66 (23.9)	
<b>Employment Status</b>				0.139
Unemployed	63 (53.4)	17 (14.4)	38 (32.2)	
Employed	186 (63.9)	34 (11.7)	71 (24.4)	
<b>Religion</b>				0.032
Christianity	246 (61.7)	51 (12.8)	102 (25.6)	
Islam	5 (35.7)	1 (7.1)	8 (57.1)	
<b>Income (Dollars) per month</b>				0.973
<100	136 (62.1)	27 (12.3)	56 (25.6)	
100–200	48 (64.0)	9 (12.0)	18 (24.0)	
>200	50 (61.7)	12 (14.8)	19 (23.5)	
<b>Gravidity</b>				0.725
First Timer	119 (60.7)	28 (14.3)	49 (25.0)	
2–4	111 (60.0)	11.9	52 (28.1)	
≥5	21 (65.6)	2 (6.3)	9 (28.1)	
<b>Trimester</b>				0.006
First Trimester	31 (73.8)	3 (7.1)	8 (19.0)	
Second Trimester	109 (68.1)	22 (13.8)	29 (18.1)	
Third Trimester	109 (53.7)	26 (12.8)	68 (33.5)	
<b>Previous Abortion/Miscarriage</b>				0.107
No	189 (61.0)	44 (14.2)	77 (24.8)	
Yes	55 (59.1)	7 (7.5)	31 (33.3)	

**Table 5.** Associations between the respondents’ characteristics and stress.

Variables	Level of Stress			p-Value
	Normal n (%)	Mild n (%)	≥Moderate n (%)	
<b>Age (years)</b>				0.001
<25	36 (55.4)	11 (16.9)	18 (27.7)	
25–34	211 (79.9)	16 (6.1)	37 (14.0)	
≥35	49 (67.1)	9 (12.3)	15 (20.5)	
<b>Mean (SD)</b>				
<b>Marital Status</b>				0.001
Not Married	22 (51.2)	5 (11.6)	16 (37.2)	
Married	284 (76.8)	31 (8.4)	55 (14.9)	

**Table 5.** *Cont.*

Variables	Level of Stress			p-Value
	Normal n (%)	Mild n (%)	≥Moderate n (%)	
<b>Educational Level</b>				0.000
≤Secondary	78 (56.9)	19 (13.9)	40 (29.2)	
>Secondary	228 (82.6)	17 (6.2)	31 (11.2)	
<b>Employment Status</b>				0.588
Unemployed	83 (70.3)	12 (10.2)	23 (19.5)	
Employed	219 (75.3)	24 (8.2)	48 (16.5)	
<b>Religion</b>				0.020
Christianity	299 (74.9)	32 (8.0)	68 (17.0)	
Islam	7 (50.0)	4 (28.6)	3 (21.4)	
<b>Income (Dollars) per month</b>				0.001
<100	151 (68.9)	22 (10.0)	46 (21.0)	
100–200	67 (89.3)	3 (4.0)	5 (6.7)	
>200	70 (86.4)	4 (4.9)	7 (8.6)	
<b>Gravidity</b>				0.233
First Timer	139 (70.9)	19 (9.7)	38 (19.4)	
2–4	142 (76.8)	17 (9.2)	26 (14.1)	
≥5	25 (78.1)	0 (0.0)	7 (21.9)	
<b>Trimester</b>				0.000
First Trimester	37 (88.1)	1 (2.4)	4 (9.5)	
Second Trimester	137 (85.6)	7 (4.4)	16 (10.0)	
Third Trimester	127 (62.6)	25 (12.3)	51 (25.1)	
<b>Previous Abortion/Miscarriage</b>				0.045
No	228 (73.5)	22 (7.1)	60 (19.4)	
Yes	69 (74.2)	13 (14.0)	11 (11.8)	

**Table 6.** Proportional odds model for factors affecting depression, anxiety, and stress among pregnant women.

Variable	Depression		Anxiety		Stress	
	POR (95% CI)	p-Value	POR (95% CI)	p-Value	POR (95% CI)	p-Value
<b>Age (years)</b>						
<25	Ref		-	-	Ref	
25–34	0.60 (0.30–1.17)	0.135	-	-	0.51 (0.23–1.10)	0.085
≥35	0.54 (0.23–1.26)	0.157	-	-	0.81 (0.32–2.01)	0.646
<b>Marital Status</b>						
Not Married	Ref		Ref		Ref	
Married	0.20 (0.10–0.41)	0.000	0.35 (0.19–0.64)	0.001	0.35 (0.14–0.84)	0.020
<b>Educational Level</b>						
≤Secondary	Ref				Ref	
>Secondary	0.68 (0.41–1.14)	0.15	-	-	0.56 (0.31–0.93)	0.054
<b>Employment Status</b>						
Unemployed	Ref				-	-
Employed	0.95 (0.55–1.66)		-	-	-	-
<b>Religion</b>						
Christianity	-	-	Ref		Ref	
Islam	-	-	3.02 (1.01–9.04)	0.048	1.38 (0.33–5.73)	0.543
<b>Income (Dollars) per month</b>						
<100	-	-	-		Ref	
100–200	-	-	-		0.40 (0.17–0.93)	0.034
>200	-	-	-		0.41 (0.18–0.89)	0.026
<b>Trimester</b>						
First Trimester	-	-	Ref		Ref	
Second Trimester	-	-	1.31 (0.61–2.83)	0.490	1.63 (0.49–5.44)	0.428
Third Trimester	-	-	2.53 (1.20–5.33)	0.015	5.46 (1.68–17.77)	0.005

Table 6. Cont.

Variable	Depression POR (95% CI)	<i>p</i> -Value	Anxiety POR (95% CI)	<i>p</i> -Value	Stress POR (95% CI)	<i>p</i> -Value
<b>Previous Abortion/Miscarriage</b>						
No	-	-	-	-	Ref	
Yes	-	-	-	-	1.16 (0.62–2.16)	0.636
Overall <i>p</i> -value from Brant test (testing POM assumption)	0.398		0.411		0.509	

#### 4. Discussion

In Nigeria, only a few studies address mental disorders such as depression, anxiety, and stress among pregnant women. In this study, a significant relationship was found between the three psychological problems investigated—depression, anxiety, and stress—and sociodemographic variables, such as age, educational level, marital status, occupation, and religion. These significant relationships were not established in a Jeddah study [31].

Previous studies around Africa have also suggested that the rates of antenatal depressive symptoms are higher in countries such as Rwanda, where one in four pregnant women scores in the depressive range. The current study also reveals a relatively high prevalence of depressive symptoms when compared with statistics from countries such as Malawi (19%) [32] and Ethiopia (16%) [33]. These findings are also similar to a recent 2020 systematic review on the prevalence of antenatal depression in Africa (26.3%) by the National Early Childhood Development Program (NECDP). The reason for this high prevalence in LMIC can be attributed to the fact that improved detection and treatment of antenatal depression are not prioritized in most LMIC health systems [34].

Our study also showed that depressive symptoms were significantly lower for married women compared to their counterparts, and this result agreed with a study performed in Abeokuta, Nigeria [35]. This is also supported by a study conducted in southern Ethiopia that found that the likelihood of developing antenatal depression in pregnancy was 84% lower among married women compared to unmarried women. The possible justification for this is the fact that the presence of a husband increases the woman's self-esteem and decreases stress [21].

Educational level was found to be associated with depression in our study. This agrees with a study in Saudi Arabia that found a relationship between depression and educational levels [36]. Maternal age was, however, not significantly associated with depression, and this finding was supported by a South African study [37].

Shrestha and Pun (2018) established a relationship between age and anxiety, and this study is contrary to our present study, which did not establish any relationship between age and anxiety [38].

A study conducted in southwest Nigeria reported that pregnancy-related anxiety was significantly associated with education. Women with a low level of education were more likely to suffer from anxiety [39]. The study agrees with ours, which also identified the level of education to be associated with anxiety, such that mothers who attained education above secondary school were less likely to suffer much from anxiety.

Regarding obstetrics, studies in Zhoushan, China, and Portugal found the levels of anxiety to be highest in the first trimester and lowest in the second trimester [40,41]. However, our study showed that women experienced their highest level of anxiety in the third trimester, which agrees with a study conducted in Turkey [42]. Such anxiety may result from the increased expectancy of the baby.

Pregnancy is a stressful event for women [43]. Pregnancy-associated stress was twice as much in women who gave birth preterm compared to women who gave birth at term [44]. Consistent with a previous study, the presence of stress is an important risk factor in early pregnancy [45]. Studies have been performed that evaluated the levels of stress in all trimesters of pregnancy, thus, showing variations in the degree of stress [46].

The prevalence of stress in pregnancy has been reported to be high during early pregnancy [6]. However, our study corresponds with that of other studies that reported increased stress levels in the third trimester [47,48]. The third trimester of a pregnancy is the critical time, as many physical and emotional changes occur before the birth of the baby [46]. These changes could trigger increased levels of stress in the mother.

The appearance of prenatal stress has also been related to working status. The workplace is a strong predictor of increased mental suffering and can lead to several related exposures, including a range of potential stress variables [46]. Housewives and women who are not earning income during pregnancy had a higher risk of stress than working women. The observations from our study differ from those reported by Rachita and others in 2022, which indicated that housewives and those employed in the private sector for indefinite periods had a high level of stress due to living conditions, busy schedules, and work responsibilities [46].

Education, or the educational level of the mother, is another factor that influences mental suffering. From our study, it was also observed that women who have higher levels of education above secondary school tend to experience less stress, while more stress was associated with lower levels of education between secondary school and lower. This is consistent with another study [49].

#### *Study Limitations and Strengths*

Our study has both limitations and strengths. It is based on self-report without confirmatory mental health evidence. Since there was no comparison group, we do not know if the rate of mental health problems is higher or lower than in a non-pregnant comparable population. Another limitation is that all of our participants came from urban tertiary health institutions, so the results may not directly apply to pregnant women living in rural settings. However, the strength of the study is that the results can be generalized to pregnant women in Nigeria cared for at urban tertiary health services.

## **5. Conclusions**

This study showed evidence of moderate-to-extremely severe stress, anxiety, and depression, as well as the significant factors associated with these disorders. We identified that age, marital status, educational levels, and employment levels were significantly associated with depression among pregnant women. Marital status, religion, and trimester were significantly associated with anxiety. Age, marital status, educational level, religion, income, gestational age, and history of previous abortions were associated with stress. Our findings have implications for strengthening mental health policies and the need to provide mental health services as part of antenatal care to screen, diagnose, and treat mental health concerns during pregnancy.

**Author Contributions:** A.I.W. and C.K.E. contributed to the conception and study design. Project administration and supervision were performed by B.O.O., A.M.H. and B.G.P. A.I.W. performed the statistical analysis. All authors interpreted the results. A.I.W. and A.A.O. performed the first drafting of the manuscript. A.F.F. reviewed the statistical analysis. All authors reviewed the draft. All authors have read and agreed to the published version of the manuscript.

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