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ORIGINAL ARTICLE

Prevalence and correlates of depression among pregnant adolescents in primary maternal care in Nigeria

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Abstract

To examine the prevalence as well as the clinical and psychosocial factors associated with depression and depression severity in pregnant adolescents. Participants were consecutively registered pregnant adolescents presenting to 30 selected primary maternal and child healthcare centers in Ibadan, Nigeria, who were screened for enrolment into an intervention trial for perinatal depression (depression defined as a score of ≥ 12 on the Edinburg Postnatal Depression Scale [EPDS] and met the DSM-IV diagnostic criteria for depression). Of the 1359 pregnant adolescents screened, 246 (18.1%) had depression. Mean age was 18.4 (sd 1.00), 58.9% were either married or cohabiting, 91.4% were primipara, and the mean gestational age was 23.8 weeks (sd 5.4 weeks). Food insecurity (going to bed hungry at least once in the previous week because there was no food to eat) was reported by 13.3%. In bivariate analysis, younger age, not living with a partner, unemployment, and food insecurity were associated with depression. In bivariate analysis, younger age, not living with a partner, unemployment and food insecurity were associated with depression, while younger age, being single and food insecurity were independently associated with being depressed in multivariate analysis. Severity of depression was related to age, higher anxiety and disability scores, lower quality of life scores across all domains and poorer attitudes towards pregnancy. Depression was associated with indices of higher social disadvantage among adolescents. Delaying childbearing and measures aimed at alleviating poverty may be important in preventing depression in this vulnerable group.

Keywords Adolescent pregnancy · Perinatal depression · Primary care · Low- and middle-income country

Introduction

The rate of adolescent pregnancy remains high in many low- and middle-income countries. In Nigeria, for example, by the age of 19 years, 19% of adolescents have given birth to their first babies; with rates higher in rural dwelling adolescents (27%) compared to the urban dwellers (8%) (National Population Commission (NPC) Nigeria and ICF 2019). Adolescent pregnancy is a major public health concern as it is often associated with adverse maternal and infant outcomes. The World Health Organization notes that complications arising from pregnancy and childbirth are the leading causea of death for 15- to 19-year-old girls globally (WHO 2016). Childbearing in adolescence retards educational attainment, leading to lower skills and fewer opportunities for employment and thereby perpetuating the cycle of poverty (World Bank 2017).

Another important correlate of adolescent pregnancy is the occurrence of mental disorders. Pregnant adolescents are at significantly higher risk for depression compared with older women and their non-pregnant peers (Oladeji et al. 2019; Siegel and Brandon 2014). The rates of depression in pregnant adolescents are often double than in older pregnant women, with the prevalence of depression in adolescent mothers ranging from 8 to 51% compared to 7 to 17% in adult mothers (Dinwiddie et al. 2018; Figueiredo et al. 2007; Siegel and Brandon 2014). Most of the previous studies examining the occurrence and associated factors of perinatal mental disorders in adolescents have been conducted in the USA and other developed countries. However, the few recent studies emerging from sub-Sahara Africa (SSA)

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also report higher rates of depression in adolescent mothers compared to adults. Such studies have reported rates of perinatal depression ranging between 11 and 33% in adolescents compared to 8 to 30% among adults (Nakku et al. 2006; Oladeji et al. 2019; Osok et al. 2018). Studies that specifically compared the rates of perinatal depression in adolescents (19 years and below) to those in older women within the same population have reported up to three-fold higher rates in the former (Dinwiddie et al. 2018; Figueiredo et al. 2007; Nakku et al. 2006; Oladeji et al. 2019).

Perinatal depression is commonly associated with adverse outcomes for both the mother and her infant. These negative consequences are even more pronounced in the adolescent compared to the adult mothers. Among adolescent mothers, such adverse outcomes include preterm delivery, lower birth weight, small for gestational age infants, poor infant growth and development, and poorer parenting skills (Gibbs et al. 2012; Oladeji et al. 2019). Longitudinal studies of children of adolescent mothers suggest that maternal postpartum depression is associated with problem behaviors and poor school performance in their children (Siegel and Brandon 2014). Perinatal depression places adolescent mothers at risk of getting pregnant again within 2 years of the last pregnancy (Barnet et al. 2008).

Despite the higher rates of depression in adolescent mothers, very little is known about the risk factors for this condition in this vulnerable population (Recto and Champion 2017). While some identified associated factors appear to be similar to those in adults, there is evidence suggesting that some others are peculiar to adolescents. For example, in a large survey conducted in the USA, the factors associated with perinatal depression that were reported to be common to both the adult and adolescent mothers included marital status, maternal morbidity, and stressors. However, adolescent postpartum depression was more associated with lack of social support, while adult depression was related to intention to get pregnant, stress, and economic status (Nunes and Phipps 2013). Other studies have similarly reported the inverse relationship between social support and adolescent perinatal depression (Barnet et al. 1996; deCastro et al. 2011; Logsdon et al. 2005; Meltzer-Brody et al. 2013). Other previously identified risk factors for adolescent perinatal depression include preexisting depression, high level of family criticism, low self-esteem, self-efficacy, and a history of physical or sexual abuse (Recto and Champion 2017).

Most previous studies have examined risk factors associated with postpartum depression and not depression during pregnancy. However, there is some evidence that risk factors may have differential association with depression in the pre- or post-partum period. For example, even though social support is an important correlate of perinatal depression, its association with depressive symptoms pre- and post-partum might be determined by who provides the support. Edwards et al. report that parental support was related to fewer depressive symptoms in the postpartum period, while support from the father of the baby was associated with lower levels of depression in pregnancy (Edwards et al. 2012).

While certain risk factors for adolescent perinatal depression have been identified, the factors related to measures of depression severity in perinatal adolescents are less consistent in the literature. While some studies have found no significant association between depression severity (determined by scores on rating instruments) and known risk factors for depression in pregnant adolescents, others have reported some association. In general, depression severity has not been associated with sociodemographic factors such as age, years of education, employment, income, and marital/ cohabitation status as well as obstetric factors including primiparity, previous births or miscarriages, and premature births (Koleva and Stuart 2014; Marcus 2009; Recto and Champion 2017). Severity of depression has however been associated with a history of alcohol use and sexual or physical abuse (Tzilos et al. 2012).

Considering that depression is more common in pregnant adolescents and there are suggestions that it is associated with worse outcomes compared to adult perinatal depression, identifying factors that increases the risk for depression and depression severity in adolescents could enable early identification and the possibility of targeting potentially modifiable factors to reduce its occurrence. This study aimed at examining the prevalence as well as the clinical and psychosocial factors associated with depression and depression severity in pregnant adolescents from a resource poor setting.

Methods

Study design

This cross-sectional study is based on the screening and baseline data collected prior to recruiting participants into a randomized controlled trial of interventions for perinatal depression in adolescents. The Responding to the Challenge of Adolescents Perinatal Depression (RAPiD) trial is a Hybrid Type I Implementation Trial comparing the effectiveness of an intervention package specifically designed to relieve symptoms of adolescent perinatal depression and to improve parenting skills in adolescents, to usual care (Gureje et al. 2020). The study also collected data that could enable the exploration of factors that may facilitate the routine use of this intervention in primary maternal healthcare.

Participants

The study was conducted in 30 selected primary maternal and child healthcare centers in Ibadan, Nigeria. Data on which this report is based was collected between 15 May 2018 and 22 December 2019. The parent study is a cluster randomized controlled trial where the unit of allocation was the primary maternal and child healthcare clinics. The 132 available primary healthcare clinics in the 11 local government areas (LGA) in and around Ibadan the capital of Oyo State, Nigeria, were assessed for eligibility. Eligible clinics were those that (i) were not involved in other ongoing trials of mental health interventions, (ii) offer the full range of maternal and child healthcare services, and (iii) had an adequate complement of staff and (iv) had staff who were willing and provided consent to participate in the study. Thirty out of the eligible fifty-six clinics were randomly allocated into either trial or control arm; allocation was balanced by taking into consideration the LGA (rural vs urban) where the clinic was allocated and the patient flow (high vs low). Ethics approval was obtained from the University of Ibadan/University College Hospital Ethics Review Committee.

All consecutive newly registered women presenting for antenatal care with age 20 years or less were approached by trained research staff while waiting in the clinic lounge or reception to see the maternal care provider. Women who provided written informed consent were screened for depression using the Edinburgh Postnatal Depression Scale (EPDS) and were also administered a sociodemographic questionnaire.

Risk to participants: the risks to participants for this part of the study reported here are no more than that for a cross-sectional study; this could include distress or getting overwhelmed with responding to sensitive questions. Participants were well informed about their rights to decline answering any of the questions they were uncomfortable with or withdraw their participation at any time they felt a need to. The study research assistants were well trained and have considerable experience with conducting such interviews. They were trained to identify signs of distress in study participants and to discontinue interviews if participant got overwhelmed or chose to discontinue at any point. In addition, all at-risk participants (presence of severe mental disorders or suicidality) identified were appropriately linked to the trained healthcare workers in the clinic. In addition, in line with the study protocol, all participants who screened positive to depression were appropriately reviewed by the primary healthcare workers. There were no reports of overt distress in any of the consenting participants or refusal to respond to any of the study questions.

Measures

Sociodemographic data collected included respondents' date of birth, marital status, number of years of education, employment status, gestational age, and number of previous pregnancies. In addition, the partner's level of education and employment status as well as that of the respondent's mother were collected. Another indicator of social disadvantage assessed was food insecurity defined as the number of days the respondent had gone to bed hungry in the previous 7 days because there was no food to eat.

Depression was assessed using the Edinburg Postnatal Depression (EPDS). The EPDS is a 10-item screening instrument for depression, developed for screening women in the perinatal period. Each item is scored on a scale of 0–3 giving a maximum score of 30 with higher scores indicative of more severe depression. The EPDS is a widely used instrument for assessing perinatal depression; it has been validated for use across several cultures including that in which this study was conducted (Uwakwe 2003). For this study, probable depression was defined as EPDS score of 12 or more. To ensure that participants included in the intervention trial met the DSM-IV criteria for depression (symptoms present for at least 2 weeks with associated functional impairment), those who screened positive on the EPDS were assessed further with a set of questions derived from the short version of the Composite International Diagnostic Interview (CIDI)(Kessler et al. 2013). Participants who met diagnostic criteria for depression and provided further consent to participate in the trial were administered the baseline study instruments. The severity of depression was determined using the EPDS score; the higher the score, the more severe the depressive symptoms.

Baseline assessment included the 7-item generalized anxiety disorder scale (GAD-7), the WHO Quality of Life Instrument (WHOQOL), and the WHO Disability Assessment Schedule (WHODAS).

The 7-item generalized anxiety disorder scale (GAD-7) (Spitzer et al. 2006) was used to screen for the presence of anxiety symptoms. The GAD is a 7-item questionnaire for screening for symptoms of generalized anxiety over the 2-week period prior to the interview.

The WHO Disability Assessment Schedule (WHODAS) (Von Korff et al. 2008) was used to assess the presence of and the severity of impairment in functioning. As a further measure of the severity of impairment in functioning, we considered the number of days the participants reported experiencing the disability as well as the number of days they either had to cut back or were totally unable to carry out their usual activities. Participants' quality of life was assessed using the WHO Quality of Life Instrument (WHOQOL)(The WHOQOL Group 1998). The WHOQOL-Bref is a cross-culturally applicable tool designed to assess

individuals' perception of their well-being. It is a 26-item instrument that examines QOL across 4 domains: physical, psychological, social relationships, and environment. Each domain comprises items that are scored on a 5-point Likert-type scale to generate domain scores.

Adjustment to pregnancy was assessed with the attitude to pregnancy and baby subscale of the Maternal Adjustment and Maternal Attitudes Questionnaire (MAMA)(Kumar et al. 1984). This subscale includes questions such as "have you been worrying you might not be a good mother?" and "Have you been looking forward to caring for your baby's needs?". Each item is scored on a 4-point Likert scale (with negatively worded items reverse scored). In our scoring and analysis, higher scores denoted poorer maternal attitudes. This subscale was used in this study as a proxy for parenting, providing a measure of the woman's preparedness for the transition to parenthood.

Participant recruitment and screening for depression along with the collection of the sociodemographic and clinical variables were conducted in the clinic by trained research assistants. Baseline assessments for participants enrolled into the trial were carried out in the participants' homes or other places convenient for them within 72 h of recruitment in the clinic by a different set of research assistants. The minimum academic qualification for all research staff was a college degree.

Statistical analysis

Data collected using android tablet computers were saved and uploaded to a secure server and exported into the statistical software. Analysis was carried out using the STATA (version 15.0) software package. Associations between the demographic variables and depression were explored using *t* tests for continuous variables and chi-square test for categorical variables. Linear regression models were used to explore the clinical and demographic associations of depression severity among adolescents who screened positive to depression (β values along with their standard errors are presented). We explored the psychosocial associations of depression by comparing those who screen positive to depression (EPDS ≥ 12) to those with a negative screen. The correlates of depression severity were explored in the participants who met diagnostic criteria for depression. Level of significance was set at 0.05 two-tailed.

Results

Out of the 1449 adolescents approached, 1359 (93.8%) provided informed consent to participate in this part of the study. The sociodemographic characteristics of the sample and their association with depression are presented on Table 1. The median age for this sample of perinatal adolescents was 19 years (range 14–20 years; mean 18.4 (SD 1.0)). Most were educated beyond primary school (90.3%) and were carrying their first pregnancy (91.4%). About 60% of the adolescents reported that they were either married or cohabiting with a partner. About 13.3% of the pregnant adolescents reported that they had gone to bed hungry at least once in the previous 7 days because they lacked food. The mean gestational age of the adolescents at registration for antenatal care was 23.8 (sd 5.36) weeks.

The rate of perinatal depression in this population of adolescents was 18.1%. The mean age of adolescents with depression (18.03, sd 1.18) was significantly lower than that for adolescents without depression (18.42 sd-0.95) ($p < 0.001$). Adolescents who reported being single had significantly higher rates of depression ($p < 0.001$) compared to those who reported being married or cohabiting. Employment status of the adolescents and their partners was also significantly associated with depression with those who were unemployed overrepresented in the group with depression. The rate of depression was also significantly higher in adolescents with food insecurity compared to those without ($p < 0.001$). When these associations were controlled for, in multivariate regression models (Table 2), the factors that remained as independent predictors of adolescent depression were younger age, being single, and going hungry for a day or more in the previous week. The risk for depression in adolescents who reported food insecurity was more than twice that of adolescents without such report (OR 2.82, 95% CI 1.96, 4.05).

Severity of depression: The baseline parameters collected on the sample of participants with depression are as shown on Table 3. In simple linear regression models (Table 4), age was the only sociodemographic variable associated with depression symptom severity: the younger the adolescents, the more severe the depression symptoms. All the other sociodemographic or clinical variables explored (including education, gestational age of the pregnancy, and parity) were not associated with depression severity. The presence of comorbid anxiety (as indicated by higher GAD-7 scores), and poor maternal attitudes (higher scores on the MAMA scale) were also associated with the severity of depression. Similarly, in this sample, depression severity was associated with higher level of disability and poorer quality of life, with the latter being across all the four domains of the WHO quality of life instrument (Table 4).

However, in a multivariate regression model, only the presence of anxiety symptoms and poorer maternal attitudes remained as significant correlates of depression severity (Table 5).

Table 1 Sociodemographic and clinical correlates of adolescent perinatal depression

		Depression status		Total ($N=1359$) n (%)	p-value
		Not depressed $N=1113$ n (%)	Depressed $N=246$ n (%)		
Age	14 to 17 years	150 (13.5)	58 (23.6)	208 (15.3)	**< 0.001***
	18 to 20 years	963 (86.5)	188 (76.4)	1151 (84.7)	
Number of previous Births	None	1052 (94.5)	236 (95.9)	1288 (94.8)	0.367
	One birth or more	61 (5.5)	10 (4.1)	71 (5.2)	
Number of previous pregnancies (excluding this current one)	None	1018 (91.5)	224 (91.1)	1242 (91.4)	0.837
	One pregnancy or more	95 (8.5)	22 (8.9)	117 (8.6)	
Days gone hungry to bed in the previous week	None	991 (89.0)	187 (76.0)	1178 (86.7)	**< 0.001***
	A day or more	122 (11.0)	59 (24.0)	181 (13.3)	
Marital status	Single	423 (38.0)	136 (55.3)	559 (41.1)	**< 0.001***
	Married/cohabiting	690 (62.0)	110 (44.7)	800 (58.9)	
Level of education	Primary education or lower	103 (9.3)	29 (11.8)	132 (9.7)	0.224
	Secondary education or higher	1010 (90.7)	217 (88.2)	1227 (90.3)	
Employment status	Not employed	254 (22.8)	83 (33.7)	337 (24.8)	**< 0.001***
	Employed	859 (77.2)	163 (66.3)	1022 (75.2)	
Mother's level of education	Primary education or lower	398 (35.8)	92 (37.4)	490 (36.1)	0.628
	Secondary education or higher	715 (64.2)	154 (62.6)	869 (63.9)	
Partner's level of education	Primary education or lower	39 (3.5)	13 (5.3)	52 (3.8)	0.188
	Secondary education or higher	1074 (96.5)	233 (94.7)	1307 (96.2)	
Partner's employment status	Not employed	59 (5.3)	29 (11.8)	88 (6.5)	**<0.001***
	Employed	1054 (94.7)	217 (88.2)	1271 (93.5)	
Age (mean [sd])		18.42 (0.95)	18.03 (1.18)	18.35 (1.00)	**< 0.001***
Gestational age (mean [sd])		23.65 (5.32)	24.40 (5.54)	23.78 (5.36)	**0.046***
Parity (mean [sd])		0.06 (0.263)	0.04 (0.23)	0.06 (0.257)	0.392
Years of education (mean [sd])		10.67 (2.49)	10.32 (2.60)	10.60 (2.51)	**0.047***
Number of days got hungry (mean [sd])		0.17 (0.56)	0.43 (0.93)	0.22 (0.65)	**< 0.001***

The bold emphasis was used to highlight the p values of the parameters that were significantly different between adolecsecents with or without depression

sd standard deviation

*Significant

Table 2 Sociodemographic corelates of adolescent depression after adjusting for other significant associations in multiple logistic regression models

Depression status		Odds ratio (95% CI)	p value
Age	14–17 years	1	
	18–20 years	0.58 (0.40, 0.82)	**0.003***
Number of days gone hungry	None	1	
	A day or more	2.82 (1.96, 4.05)	**< 0.001***
Marital status	Single	1	
	Married/cohabiting	0.49 (0.37, 0.65)	**< 0.001***
Employment status	Not employed	1	
	Employed	0.76 (0.55, 1.06)	0.107
Partner's employment status	Not employed	1	
	Employed	0.57 (0.34, 0.96)	**0.034***

The bold emphasis was used to highlight the p values of the parameters that were significantly different between adolecsecents with or without depression

sd standard deviation

*Significant

Table 3 Baseline measures in adolescents with perinatal depression ($N = 246$)

		Mean (SD)
7-item generalized anxiety disorder scale (GAD-7)	GAD score	5.51 (3.10)
WHO Disability Assessment Schedule (WHODAS)	WHODAS score	22.21 (7.33)
	Days difficulties were present	8.92 (6.89)
	Days totally unable to carryout usual activities	1.97 (3.46)
	Days of cutting back usual activities	4.39 (4.75)
Maternal Attitudes and Maternal Adjustment Schedule (attitudes to pregnancy and baby subscale)	MAMAS score	14.79 (5.48)
WHO Quality of Life Scale (WHOQOL-Bref)	Physical domain score	57.51 (16.30)
	Psychological domain score	41.89 (17.18)
	Social domain score	53.13 (23.23)
	Environmental domain score	51.05 (16.44)

sd standard deviation

*Significant

Table 4 Sociodemographic and clinic factors of depression severity in linear regression models

Variables	*B*	SE B	β	R^2	*t*	*p*-value
Age	−0.631	0.137	−0.124	0.015	−4.61	**< 0.001***
Years of education	−0.091	0.055	−0.045	0.001	−1.657	0.098
Gestational age	0.031	0.026	0.033	0.000	1.210	0.226
Parity	−0.826	0.539	−0.042	0.001	−1.531	0.126
GAD-7 score	0.153	0.043	0.224	0.046	3.583	**< 0.001***
WHODAS	0.070	0.018	0.241	0.054	3.851	**< 0.001***
Days difficulties were present	0.085	0.019	0.275	0.072	4.436	**< 0.001***
Days totally unable to carry out usual activities	0.133	0.039	0.217	0.043	3.439	**0.001***
Days of cutting back usual activities	0.083	0.028	0.185	0.030	2.913	**0.004***
MAMA	0.105	0.024	0.271	0.070	4.368	**< 0.001***
Physical QoL	−0.027	0.008	−0.205	0.038	−3.241	**0.001***
Psychological QoL	−0.030	0.008	−0.244	0.056	−3.899	**< 0.001***
Social QoL	−0.016	0.006	−0.174	0.026	−2.731	**0.007***
Environmental QoL	−0.018	0.008	−0.143	0.016	−2.231	**0.027***

The bold emphasis was used to highlight the *p* values of the parameters that were significantly different between adolecsecents with or without depression

Each row represents a separate linear regression model. Dependent variable: EPDS score at screening

GAD-7 generalized anxiety disorder 7-item scale

WHODAS WHO Disability Assessment Schedule

MAMA Maternal Adjustment and Maternal Attitudes Questionnaire

QOL quality of life (measured using the WHO Quality of Life (WHOQOL) instrument; scores were transformed to scale 0–100)

sd standard deviation

*Significant

Discussion

The factors identified to be associated with perinatal depression in this sample of pregnant adolescent were age, being single, unemployed, having a partner who was unemployed, and having gone to bed hungry for several days in the previous week. The rate of perinatal depression in this sample (18%) is similar to what we reported in an earlier study in the same setting and mirrors the report from several other studies indicating that pregnant adolescents are at an increased

Table 5 Factors associated with depression severity in multiple regression analysis

Variables	*B*	SE B	β	*t*	*p*-value
Age	−0.081	0.114	−0.044	−0.707	0.480
GAD-7	0.110	0.043	0.161	2.582	**0.010***
WHODAS	0.005	0.028	0.018	0.182	0.856
Days difficulties were present	0.037	0.026	0.119	1.388	0.167
Days totally unable to carry out usual activities	0.036	0.044	0.059	0.820	0.413
Days of cutting back usual activities	0.025	0.031	0.056	0.790	0.431
MAMA	0.065	0.030	0.167	2.164	**0.032***
Physical QoL	−0.003	0.011	−0.020	−0.232	0.817
Psychological QoL	−0.013	0.010	−0.107	−1.287	0.200
Social QoL	−0.003	0.007	−0.037	−0.499	0.619
Environmental QoL	0.015	0.011	0.118	1.392	0.165
$R^2 = 0.126$					

The bold emphasis was used to highlight the *p* values of the parameters that were significantly different between adolecsecents with or without depression

GAD-7 generalized anxiety disorder 7-item scale

WHODAS WHO Disability Assessment Schedule

QOL quality of Life (measured using the WHO Quality of Life (WHOQOL) instrument; scores were transformed to scale 0–100)

sd standard deviation

*Significant

risk for developing depression (Nakku et al. 2006; Oladeji et al. 2019). The association with age suggests that the younger the adolescent, the higher the likelihood of perinatal depression, underscoring the need not just to develop programs for universal screening for depression and to incorporate mental health services with maternal and childcare services but the additional need to pay particular attention to younger mothers. It also further serves to highlight the increased risk for adverse outcomes associated with adolescent pregnancy and the need for global concerted efforts to delay the onset of childbearing for adolescent girls. Several reports have drawn attention to potentially effective solutions which include prevention of child marriage and unwanted births, universal access to sexual and reproductive education, keeping adolescent girls in school, and empowering them to make the right choices for health and well-being (The Lancet 2014).

Being in a position where the father of the baby was involved (adolescents who reported being married or cohabiting) seems to protect the pregnant adolescent from having depression. While our study was not designed to explore possible explanations for this finding, earlier studies have reported that limited contact with the father of the baby and lack of social support from the father of the baby are important associations for perinatal depression in adolescent mothers (Buzi et al. 2015; Recto, 2017). Social support especially from the father of the baby during pregnancy which in earlier studies were described as provision of emotional support (encouragement or someone to talk to) as well as material support has been associated with lower depressive symptoms (Buzi et al. 2015; Recto and Champion 2017). In pregnant adolescents, not only does having good social support reduce depression risk, studies have found that positive support to pregnant or parenting adolescents is associated with better mental health, greater psychological well-being and mothering ability, and higher maternal competency behaviors and gratification in the maternal role (Buzi et al. 2015). However, some studies suggest that while partner social support may protect adolescents who are cohabiting from depression during pregnancy, cohabitation seems to increase the risk for depression after the baby's birth (Figueiredo et al. 2007).

Food insecurity, which is a proxy marker for poverty, assessed in this study by asking for the number of days within the previous week that the respondent had gone to bed hungry because there was no food to eat, was significantly associated with depression. Earlier studies from sub-Saharan Africa have reported the relationship between food insecurity and depression in both adult and adolescent populations. Studies from high-income countries have similarly shown that pregnant women with food insecurity were at increased risk for depression, with some studies showing a dose response relationship between food insecurity and depression severity (Jessiman-Perreault and McIntyre 2017; Maynard et al. 2018). In households with children, mothers with food insecurity had higher rates of depression, and this was correlated with poor physical and mental health of the children (Maynard et al. 2018). A recent systematic

review showed that food insecurity is associated with children's behavioral, academic, and emotional problems from infancy to adolescence across western industrialized countries – even after controlling for confounders (Shankar et al. 2017). In adolescence, the major correlates of food insecurity are psychosocial. Adolescents from households with food insecurity were more likely to have difficulty getting along with peers and had increased risk of emotional problems, mental disorders including a diagnosis of mood and anxiety disorders, and of substance use disorders and suicidal behaviors (Alaimo et al. 2001, 2002; McLaughlin et al. 2012; Poole-Di Salvo et al. 2016; Shankar et al. 2017).

The implication of food insecurity is of particular concern in our study population of growing adolescents who are pregnant. Even after we controlled for other associated factors, there was a twofold increased risk of depression in pregnant adolescents with food insecurity. Heyningen et al. similarly reported that food insecurity increased the likelihood of depressive episode two and a half times in young adult women in the perinatal period in South Africa (Heyningen et al. 2016). Considering that both depression and food insecurity are independently associated with adverse maternal and infant health and developmental outcomes, this observation represents a major cause for concern for the pregnant adolescent and her unborn child. Food security represents a potentially modifiable risk factor for depression along with other associated untoward effects related to maternal undernutrition in this population.

Similar to reports from earlier studies, although sociodemographic and clinical factors were associated with the occurrence of adolescent perinatal depression, they were not significantly associated with the severity of depression symptoms (Koleva and Stuart 2014). In our study, younger adolescents were at increased risk for severe depression symptoms, however, when other factors were accounted for this association was attenuated. The main associations of depression severity were the co-occurrence of anxiety symptoms and poorer maternal attitudes towards pregnancy and the baby. Studies on adult women have similarly reported that poor maternal attitudes predicted the occurrence of depression and anxiety symptoms especially in first time mothers (Przybyła-Basista et al. 2020; Sockol et al. 2014). In our setting, we had earlier reported that adolescent mothers have significantly poorer maternal attitudes and parenting skills (plausibly a consequence of poor maternal attitude) compared to adult mothers, and this had significant impact on infant outcomes (Oladeji et al. 2019). This supports a need to not just provide universal screening for depression in all pregnant adolescents but an additional need for prompt age-appropriate interventions including support for parenting skills to prevent adverse obstetric and infant outcomes.

The findings of this study should serve to draw attention to potential risk factors for adolescent perinatal depression. However, we acknowledge the study limitations. First, several other important risk factors for depression and depression severity including a history of abuse, intimate partner violence, and previous history of depression were not explored. Second, both the risk factors and the diagnosis were based on self-report, and it is unclear how the presence of one could have influenced the other. For example, it is not clear whether adolescents with depression are more likely to report going to bed hungry mainly because of the symptoms of their depression. However, the findings that adolescents with depression had other attributes indicative of economic deprivation, including being more likely to be unemployed and to have spouses who were also unemployed, could indicate that an underlying social disadvantage was indeed a risk factor for the depression in this group.

Conclusion

This study highlights the important correlates of perinatal depression in adolescents that should be important targets for the prevention or the design of appropriate interventions for perinatal depression in adolescents. Early pregnancy portends a particular risk for depression and severity of depression symptoms, programs aimed at helping young girls to delay the onset of childbearing will be an important universal measure for preventing depression with the associated negative consequences in this vulnerable group. Designing interventions for adolescent perinatal depression needs to take into account the need to involve the father of the baby, attention to improving the adolescents' social circumstances, and interventions aimed at improving their attitudes towards their babies along with support for parenting skills.

Author contribution The original study was conceived by OG; this manuscript was drafted by BDO with input from OG and OA; data was analyzed by TB along with PI; all authors approved of the final version for publication.

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Data availability Data is available on request from the senior author.

Code availability Software codes used in analyzing data is available on request.

Declarations

Ethics approval Ethical approval was obtained from the University of Ibadan/ University College Hospital Ethics Committee.

Consent for publication Not applicable.

Conflict of interest/Competing interests The authors declare no competing interests.

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