

Mental distress and food insecurity in pregnancy

Sofrimento mental e insegurança alimentar na gestação

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Abstract Food insecurity is a source of daily stress, especially in women. The aim was to investigate the association between mental distress and food insecurity in pregnant women. Cross-sectional study with pregnant women from the public health service, regardless risk stratification, or gestational trimester in Colombo-PR, Brazil. Poisson regression models were progressively adjusted for exposure variables. Results: Among the participating pregnant women (N=513) the prevalence of mental distress was 50.1%; associated with mild food insecurity (PR 1.34, 95%CI 1.12; 1.61) and moderate/severe food insecurity (PR 1.70, 95%CI 1.33; 2.19). The variable that most changed the association between the outcome and mild food insecurity was income (-4.48%) and, for moderate/severe food insecurity, education (-7.60%). For mild and moderate/severe food insecurity, the greatest reduction occurred with socioeconomic variables 4.5% (PR 1.27, 95%CI 1.05; 1.53) and 8.0% (PR 1.50, 95% CI 1.17; 1.93), respectively. The association between food insecurity and mental distress was consistent, and increased with the degree of food insecurity, with a greater reduction for socioeconomic variables.

Key words Pregnancy, Mental health, Food and nutrition security, Cross-sectional studies

Resumo A insegurança alimentar é fonte de estresse diário, especialmente nas mulheres. Objetivou-se investigar associação entre sofrimento mental e insegurança alimentar em gestantes. Estudo transversal com gestantes do serviço público de saúde, independentemente do trimestre ou estratificação do risco gestacional em Colombo-PR, Brasil. Modelos de regressão de Poisson foram ajustados progressivamente para variáveis de exposição. A prevalência de sofrimento mental, entre os participantes (N=513) foi de 50,1%, e esteve associada à insegurança alimentar leve (RP 1,34, IC95% 1,12; 1,61) e moderada/grave (RP 1,70, IC95% 1,33; 2,19). A variável que mais alterou a associação entre o desfecho e insegurança alimentar leve foi renda (-4,48%) e, para insegurança alimentar moderada/grave, escolaridade (-7,60%). Para insegurança alimentar leve e moderada/ grave, a maior redução ocorreu com as variáveis socioeconômicas 4,5% (RP 1,27, IC95% 1,05; 1,53) e 8,0% (RP 1,50, IC95% 1,17; 1,93), respectivamente. A associação entre insegurança alimentar e sofrimento mental foi consistente, e aumentou com o grau de insegurança alimentar, com maior redução para as variáveis socioeconômicas.

Palavras-chave Gravidez, Saúde mental, Segurança alimentar e nutricional,

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Introduction

Food Insecurity refers to the violation of the right to be free from hunger and includes uncertainties about regular and permanent access to food of a sufficient quality and quantity, without compromising access to other fundamental needs¹.

Food insecurity when assessed by the Brazilian Food Insecurity Scale can be classified into severity levels: mild indicates concern with an upcoming shortage of food; moderate indicates that the food is now restricted in terms of sufficient quality and quantity, and severe food insecurity is characterized by hunger^{2,3}.

Worldwide, the prevalence of food insecurity at the moderate/severe level in 2019 was estimated at 25.9%, approximately two billion people⁴. In Brazil, according to the 2017-2018 Family Budget Survey, out of the 68.9 million households in the country, 36.7% had food insecurity, reaching 84.9 million Brazilians⁵. In a systematic review conducted with pregnant women, the prevalence of food insecurity varied widely, ranged from 5.2 to 87% from studies in North Carolina and South Africa, respectively^{6,7}.

Food insecurity affects the quality of food and can lead to malnutrition⁸. During pregnancy, the resulting malnutrition can compromise the body's systems and interfere with birth weight⁹ and is associated with a higher prevalence of inadequate blood pressure and blood sugar levels¹⁰.

Lack of safe access to food, concerns about food and hunger are sources of daily stress, especially for women. Food insecurity involves feelings of despair, shame, anguish, hopelessness, continuous anxiety, which can intensify mental distress¹¹. Thus, food insecurity can be considered an important health factor, associated with a higher risk of mental distress¹².

Pregnancy is considered a vulnerable period to the effects of food insecurity on the mental health condition, considering its association with depression, anxiety and stress¹³. Mental distress can be defined as a set of symptoms characterized by tiredness, lack of memory, irritability, insomnia, difficulty concentrating and symptoms that are not characterized by psychiatric diagnostic criteria^{12,14}. This set of symptoms has been referred to as Common Mental Disorders (CMD)¹⁴.

Adverse events throughout life, such as high stress, social exclusion, inadequate access to health care, malnutrition and sudden changes in income may be some of the explanations for the relationship between CMD and unfavorable

socioeconomic conditions¹⁰. This situation contributes to the occurrence of food insecurity, which is a stressful event and has direct effects on mental health and quality of life. Women, especially those with low income and education levels, are more susceptible to depression and anxiety¹¹.

Although depression, anxiety and stress are frequent outcomes in relation to food insecurity in pregnancy, the literature about the relation with mental distress is more sparse¹³ concentrated in African continent^{12,15}. In this way, the objective of this study was to investigate the association between mental distress and food insecurity in pregnant women undergoing prenatal care at the Brazilian Unified Health System (SUS).

Methods

Cross-sectional study with pregnant women undergoing prenatal care at SUS, the Brazilian Unified Health System, in the Primary Health Units in Colombo, Paraná, in the southern region of Brazil, carried out between March 2018 and September 2019. The municipality of Colombo belongs to the metropolitan region of Curitiba, capital of the state of Paraná, with an estimated population of 246,540 habitants¹⁶.

The study population was estimated based on the number of registrations in the 2016 Pregnant Women Monitoring System, which totaled 3,807 pregnant women. The sample calculations considered the prevalence of the outcome to be 50%, for the major study, with other outcomes beyond mental distress, because this is one where the highest variability could be expected, resulting in larger sample; margin of error of four percentage points and 95% confidence level; with that, a minimum sample of 520 participants was obtained. Adding the percentage of 30% for losses and refusals in longitudinal studies resulted in 676 pregnant women to be invited. During the consolidation of the fieldwork, incomplete questionnaires for variables were identified, and additional 59 (11.3%) pregnant women were selected to increase the power of the study (N=735), distributed proportionally in relation to the number of pregnant women in each Unit. For the analysis of this study, pregnant women who had complete data for all variables were included using the listwise deletion procedure. Considering the analytical sample of the study (N=513), maintaining a 95% confidence level, 80% power of the study, the prevalence of the outcome (mental distress)

in the unexposed of 42.6%, it would be possible to identify a prevalence ratio of at least 1.29, relative the prevalence of 54.9% among exposed individuals.

The variables were investigated by means of a questionnaire composed of: age group (in years, less than or equal to 19, 20 to 29 and 30 or more), self-declared color/race (white and yellow, or black and brown), marital status (with a partner, without a partner), education in years of study (0-7, 8-10, 11 or more), family income per capita, divided into tertiles (1st-BRL 0.00-BRL 475.00; 2nd-BRL 476.00-BRL 750.00; 3rd-BRL 751.00-BRL 3,000.00), the value of the Brazilian minimum wage in 2019 was R\$ 998.00¹⁷ and the value of the dollar at that time was R\$ 4.16¹⁸; paid work (yes, no), physical activity through the Physical Activity Questionnaire for Pregnant Women (QAFG), in its translated and validated version¹⁹ and classified as sedentary in mild, moderate and intense levels; smoking (yes, no), alcohol consumption in the last 12 months (consumed, did not consume), number of pregnancies (one, two or three), pregnancy planning (yes, no), gestational trimester (0-13, 14 -26, 27 weeks or more).

The Self-Reporting Questionnaire (SRQ-20) was used for evaluating mental distress. The questionnaire was recommended by the World Health Organization (WHO) for studies carried out in primary health care, and comprises 20 questions with a dichotomous answer (yes or no), and each affirmative answer is equivalent to one point²⁰. The cutoff point used was equal to or greater than seven points used in other studies with pregnant women, which indicate the presence of common mental disorder or mental distress^{12,21,22}.

Food insecurity was investigated using the Brazilian Food Insecurity Scale (EBIA)² which classifies the household situation in the last three months, with different cutoff points for households under 18 years old. Food insecurity can be classified as: mild, moderate, or severe². For this study, due to the low small number of pregnant women classified as having severe food insecurity (N=12; 2.34%), it was grouped with moderate food insecurity for analysis.

The collection instrument underwent a pre-test and test with adjustments to improve understanding and reduce the filling time. A pilot study was carried out comprising all research stages. Quality control was carried out with 11.6% (N=64) of interviews with a subsequent telephone contact to check information. Data was entered twice for checking purposes.

Descriptive analyses were performed with absolute (N) and relative (%) frequencies and the respective 95% confidence interval (CI). Prevalence ratios (PR) of the association of the outcome – mental distress – and food insecurity – the main exposition variable – were estimated using Poisson Regression with a robust adjustment of variance. This approach allows more adequate estimates of the measure of effect in cross-sectional studies, considering outcomes with a high prevalence – as mental distress in the evaluated population – when compared to the use of Logistic Regression, with Odds Ratio estimative. The robust adjustment of the variance allows to adjust the scale of the dichotomous variable for the use of Poisson regression^{23,24}.

The percentage of PR modification after the insertion of each variable was calculated. Subsequently, progressive models were adjusted for blocks of variables: demographic, socioeconomic, health-related behavior and obstetric characteristics. The percentage of difference in the adjusted PR between each model and from the initial model to the final model was calculated. In each block all variables were kept for adjustment independently of the p-value. The adjustment of the models was investigated through the goodness of fit deviance. The collinearity between the variables in the final model was investigated using the VIF – variance inflation factor. The analyses were performed using the Stata 14 program (STATA Corp. College Station, Texas, USA).

This research was approved by the Ethics Committee on Research with Human Beings at UFPR under the opinion number 2405347 (11/29/2017). Pregnant women over the age of 18 who agreed to participate signed the Informed Consent Form (ICF), and those under the age of 18 signed the Informed Acceptance Form (IAF) and their legal guardians signed the ICF.

Results

Among the 735 invited pregnant women, 605 accepted, and 513 had complete data for the variables. The average age of pregnant women with complete data was 26.2 (95%CI 25.7; 26.7) and did not differ from those who refused to participate (26.6 years, 95%CI 25.7; 27.5). Most lived with a partner (81.3%); 41.1% perform paid work; 40.9% were in their first pregnancy; 34.7% planned the pregnancy and 49.3% were in the third trimester. The prevalence of the outcome - mental distress was 50.1% (95%CI 45.8; 54.4),

while for the main exposition variable mild food insecurity 38.2% (95%CI 34.1; 42.5) and for moderate/severe food insecurity 6.4 % (95% CI 4.6; 8.9%) (Table 1).

The prevalence of mental distress was higher for pregnant women with mild food insecurity

(PR 1.34, 95%CI 1.12; 1.61) and moderate/severe food insecurity (PR 1.71, 95%CI 1.33; 2.19). Also, among women who lived without a partner, who smoked, who consumed alcohol, were in their third pregnancy and in the third trimester. On the other hand, it was lower among those who had 11 or more years of study, higher income levels, and that planned their pregnancy (PR 0.82, 95%CI 0.68; 0.99) (Table 2).

Individually, income was the variable that most attenuated the PR between mental distress and mild food insecurity (-4.48%); for moderate/severe food insecurity, schooling (-7.60%), parity (-6.43%) and marital status (-4.78%) further reduced the strength of association (Table 3).

The association between mental distress and food insecurity remained significant even after adjusting for all blocks of variables. Socioeconomic characteristics were those that most reduced the association between mild food insecurity and mental distress (4.5%) (PR 1.27, 95%CI 1.05; 1.53), followed by health-related behaviors (3.2%) (PR 1.23, 95%CI 1.02; 1.48) and obstetric characteristics (2.4%) (PR 1.20, 95%CI 1.00; 1.45) and finally, demographic variables (0.8%) (PR 1.33, 95%CI 1.11; 1.59). Whereas for moderate/severe food insecurity, the greatest reduction occurred with the inclusion of socioeconomic variables (8.0%) (PR 1.50, 95%CI 1.17; 1.93), followed by demographic 4.1% (PR 1.63, 95%CI 1.28; 2.08), health-related behaviors (2.7%) (PR 1.46, 95%CI 1.16; 1.87), and finally, for obstetric characteristics (2,1%) (PR 1.43, 95%CI 1.12; 1.83).

Table 1. Distribution of characteristics of pregnant women in pre-natal care in health units in Colombo-PR. 2018-2019 (N=513).

Variables	N	%
Demographic		
Age group (years)		
≤19	80	15.6
20-29	320	62.4
≥30	113	22.0
Marital status		
Lives with a partner	417	81.3
Lives without a partner	96	18.7
Self-declared color/race		
White/yellow	282	55.0
Black/brown	231	45.0
Socioeconomic		
Schooling (years of education)		
0-7	89	17.4
8-10	191	37.2
≥11	233	45.4
Household income per capita (Tertile)		
1 st tertile (BRL 0.00-475.00)	173	33.7
2 nd tertile (BRL 476.00-750.00)	172	33.5
3 rd tertile (BRL 751.00-3000.00)	168	32.8
Paid work		
No	302	58.9
Yes	211	41.1
Health-related behaviors		
Physical activity		
Sedentary	91	17.7
Mild	234	45.6
Moderate or intense	188	36.7
Smoking		
Didn't smoke	472	92.0
Smoked	41	8.0
Alcohol consumption in the last 12 months		
Did not consume	400	78.0
Consumed	113	22.0
Obstetric		
Number of pregnancies		
1	210	40.9
2	165	32.2
3	138	26.9

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Table 1. Distribution of characteristics of pregnant women in pre-natal care in health units in Colombo-PR. 2018-2019 (N=513).

Variables	N	%
Planned pregnancy		
No	335	65.3
Yes	178	34.7
Gestational trimester		
0-13 weeks	86	16.8
14-26 weeks	174	33.9
27 or more weeks	253	49.3
Food Insecurity		
No Food Insecurity	284	55.4
Mild	196	38.2
Moderate/Severe	33	6.4
Mental Distress		
No	256	49.9
Yes	257	50.1

Source: Authors.

Table 2. Prevalence of mental distress regarding characteristics of pregnant women in pre-natal care in health units in Colombo-PR, 2018-2019 (N=513).

Variables	N (%)	PR (95%CI)	P-value*
Demographic			
Age group (years)			0.275
≤19	45 (56.3)	1.00	
20-29	158 (49.4)	0.88 (0.70; 1.10)	
≥30	54 (47.8)	0.85 (0.65; 1.12)	
Marital status			0.001
Lives with a partner	196 (47.0)	1.00	
Lives without a partner	61 (63.5)	1.35 (1.13; 1.62)	
Self-declared color/race			0.561
White/yellow	138 (48.9)	55.0	
Black/brown	119 (51.5)	1.05 (0.89; 1.25)	
Socioeconomic			
Schooling (years of education)			0.001
0-7	54 (60.7)	1.00	
8-10	104 (54.5)	0.90 (0.73; 1.11)	
≥11	99 (42.5)	0.70 (0.56; 0.88)	
Household income per capita (Tertile)			0.002
1 st tertile (BRL 0.00-475.00)	105 (60.7)	1.00	
2 nd tertile (BRL 476.00-750.00)	78 (45.4)	0.75 (0.61; 0.92)	
3 rd tertile (BRL 751.00-3000.00)	74 (44.1)	0.73 (0.59; 0.89)	
Paid work			0.124
No	160 (53.0)	1.00	
Yes	97 (46.0)	0.87 (0.72; 1.04)	
Health-related behaviors			
Physical activity			0.362
Sedentary	43 (47.3)	1.00	
Mild	115 (49.2)	1.04 (0.81; 1.34)	
Moderate or intense	99 (52.7)	1.11 (0.86; 1.44)	
Smoking			0.043
Did not smoke	231 (48.9)	1.00	
Smoked	26 (63.4)	1.30 (1.00; 1.66)	
Alcoholic beverages consumed in the last 12 months			0.004
Did not consume	188 (47.0)	1.00	
Consumed	69 (61.0)	1.30 (1.08; 1.56)	
Obstetric			
Number of pregnancies			0.008
1	99 (47.1)	1.00	
2	71 (43.0)	0.91 (0.73; 1.15)	
3	87 (63.0)	1.34 (1.10; 1.62)	
Planned pregnancy			0.045
No	179 (53.4)	1.00	
Yes	78 (43.8)	0.82 (0.68; 0.99)	
Gestational trimester			0.006
0-13 weeks	33 (38.4)	1.00	
14-26 weeks	83 (47.7)	1.24 (0.91; 1.69)	
27 or more weeks	141 (55.7)	1.45 (1.09; 1.94)	
Food Insecurity			
			<0.001*
No Food Insecurity	121 (42.6)	1.00	
Mild	112 (57.1)	1.34 (1.12; 1.61)	
Moderate/Severe	24 (72.7)	1.71 (1.33; 2.19)	

PR: Prevalence ratio; CI: Confidence Interval; IA: Food Insecurity. *Poisson Regression with robust adjust of variance.

Source: Authors.

Table 3. Prevalence ratio of mental distress by food insecurity status and percentage of change regarding variables of pregnant women in pre-natal care in health units in Colombo-PR. 2018-2019 (N=513).

Variables	Mental distress		% PR change not adjusted**	Mental distress		P-value*
	Mild Insecurity PR (95%CI)			Moderate/Severe Insecurity PR (95%CI)	% PR change not adjusted**	
Not adjusted	1.34 (1.12; 1.61)		-	1.71 (1.33; 2.19)	-	<0.001
Age range	1.34 (1.12; 1.61)		0	1.70 (1.33; 2.19)	-0.58	<0.001
Marital status	1.33 (1.11; 1.59)		-0.75	1.63 (1.28; 2.09)	-4.78	<0.001
Self-declared color/race	1.34 (1.12; 1.61)		0	1.70 (1.33; 2.18)	-0.58	<0.001
Education	1.31 (1.09; 1.57)		-2.24	1.58 (1.23; 2.04)	-7.60	<0.001
Household income per capita	1.28 (1.06; 1.54)		-4.48	1.65 (1.29; 2.11)	-3.51	<0.001
Paid work	1.34 (1.11; 1.60)		0	1.68 (1.31; 2.16)	-1.75	<0.001
Smoking	1.34 (1.12; 1.61)		0	1.70 (1.33; 2.18)	-0.58	<0.001
Alcohol consumption	1.31 (1.09; 1.57)		-2.24	1.67 (1.30; 2.14)	-2.34	<0.001
Physical activity	1.34 (1.11; 1.60)		0	1.70 (1.33; 2.18)	-0.58	<0.001
Number of pregnancies	1.32 (1.10; 1.58)		- 1.49	1.60 (1.24; 2.05)	-6.43	<0.001
Planned pregnancy	1.33 (1.11; 1.59)		-0.75	1.70 (1.33; 2.18)	-0.58	<0.001
Gestational trimester	1.33 (1.11; 1.59)		-0.75	1.70 (1.33; 2.17)	-0.58	<0.001

*Wald's test for linearity, through Poisson regression with robust adjustment of variance association among mental distress and food insecurity. **Percentage difference in relation to the unadjusted PR of mental distress and food insecurity with the addition of the variable. PR=Prevalence Ratio; 95%CI=95% confidence interval.

Source: Authors.

The PR difference between the unadjusted model and the final model was 10.5% for mild food insecurity, and 15.9% for moderate/severe food insecurity. (Graphs 1 and 2). Progressive reductions in deviance were observed in relation to the initial model, with values of $p=1,000$ in all models, which indicates the good fit of the models. The global value of the VIF was 1.16, ranging from 1.02 for the trimester of pregnancy to 1.44 for parity, which indicates an absence of collinearity between the variables.

Discussion

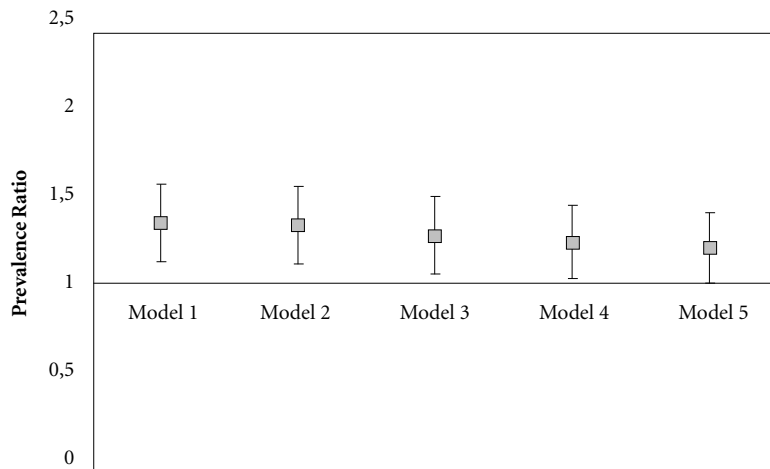
The prevalence of food insecurity in pregnant women was similar to that observed in other national studies carried out with pregnant women: 42.7% in Maceió, being, 24.8% with mild food insecurity, 9.9% with moderate food insecurity and 8% with severe food insecurity¹⁰ and 45.1% (95%CI 39.6; 50.6) in Colombo, which employed the short scale, which does not differentiate food insecurity levels²⁵. In Brazil, according to the 2017-2018 Family Budget Survey, out of the 68.9 million households in the country, 36.7% had food insecurity, reaching 84.9 million Brazilians⁵. Despite this, it is important to highlight that the

prevalence of severe food insecurity was lower (2.3%) among the pregnant women evaluated in this study, compared with Maceió (8%)¹⁰ and the Brazilian prevalence (4.6%)⁵.

The prevalence of mental distress was 50.1%. In national studies carried out with pregnant women and using the same screening instrument, a prevalence of 41.4% was found in Pelotas in Rio Grande do Sul²¹ and in a medium-sized municipality in Central Brazil (57.1%, 95%CI 51.7; 62.6)²².

Socioeconomic characteristics were those that most reduced the association between mild food insecurity and mental suffering, followed by health-related behaviours and obstetric characteristics and finally, demographic variables. While for moderate/severe food insecurity the greatest reduction occurred with the inclusion of socioeconomic variables, followed by demographic, health-related behaviours, and finally, for obstetric characteristics.

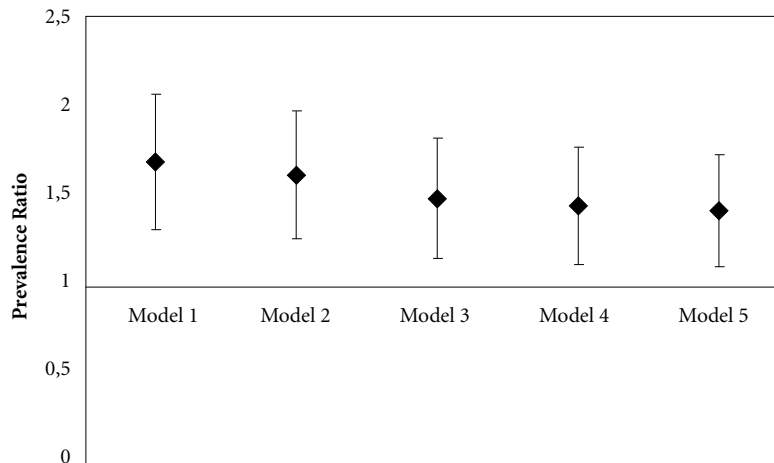
Pregnant women with food insecurity had a higher prevalence of mental distress, and the strength of association was greater for moderate/severe food insecurity. A study carried out in Ethiopia (2013) with pregnant women found that the prevalence of CMD was higher in pregnant women with food insecurity (48.3%), com-



Graphic 1. Prevalence ratio of mental distress regarding mild food insecurity in pregnant women under pre-natal care in health units in Colombo-PR. 2018-2019 (N=513).

Poisson regression with robust variance adjustment considering mental distress as dependent variable, and food insecurity as main exposition. Model 1: not adjusted; Model 2: adjusted for age, partner and skin color; Model 3: adjusted for age, partner, skin color, education, income and paid work; Model 4: adjusted for age, companion, skin color, education, income, paid work, smoking, alcohol and physical activity; Model 5: adjusted for age, presence of partner, skin color, education, income, paid work, smoking, alcohol, physical activity, parity, pregnancy planning and gestational trimester.

Source: Authors.



Graphic 2. Prevalence ratio of mental distress regarding moderate/severe food insecurity after adjustments for demographic, socioeconomic variables, health-related behaviors and obstetric characteristics in pregnant women under pre-natal care in health units in Colombo-PR. 2018-2019 (N=513).

Poisson regression with robust variance adjustment considering mental distress as dependent variable, and food insecurity as main exposition. Model 1: not adjusted; Model 2: adjusted for age, partner and skin color; Model 3: adjusted for age, partner, skin color, education, income and paid work; Model 4: adjusted for age, companion, skin color, education, income, paid work, smoking, alcohol and physical activity; Model 5: adjusted for age, presence of partner, skin color, education, income, paid work, smoking, alcohol, physical activity, parity, pregnancy planning and gestational trimester.

Source: Authors.

pared to those with food security (19.9%)¹². The mechanisms of the association between mental distress and food insecurity are complex and multifactorial. Hunger and low nutrient intake can result in high stress, changes in body weight, embarrassment due to the situation, poor nutrition, factors directly linked to mental distress²⁶. The evidence points to the bidirectional action between the variables, that is, food insecurity can lead to mental distress, and mental distress can lead to food insecurity²⁷.

In the present study, the association between food insecurity and mental distress remained even after adjusting for all blocks of variables under study. Although the association between mental distress and food insecurity was consistent throughout the adjustments, the socioeconomic and demographic variables were those that most reduced the strength of the association between the variables, with the greatest impact on moderate/severe food insecurity. In fact, when analyzed individually, the variables with the highest percentage of change were income for mild food insecurity and education for moderate/severe food insecurity.

In general, low income is related to the difficulty of entering the labor market, uncertain living conditions and low self-worth. This association can lead to worse quality of life and reflects on mental distress²⁸. Situations such as adverse events throughout life, social exclusion, sudden changes in income, inadequate access to health care and stress, may be linked to the onset of CMD^{29,30}. Food insecurity is an expression of social inequality, and is directly related to socioeconomic factors, such as high food prices, low income, and unemployment³¹.

When analyzing the relationship of each variable with mental distress and moderate/severe food insecurity, it was found that education, parity, and the absence of a partner stood out as potential confounding factors. Lower possession of consumer goods, unemployment and low education are factors associated with moderate and severe food insecurity³². Higher education can indicate some protection against hunger, the most serious expression of food insecurity, by indicating better opportunities in the labor market and increased family income, as well as access to food³². In situations where the person responsible for the household has a low level of education, the tendency is that their children follow the same path with educational limitations, and thus, fewer opportunities, lower wages, contributing to the cycle of intergenerational poverty³³.

The prevalence of mental distress is higher among women who have a greater number of children, a condition in which the overload of housework is greater, and social vulnerability is increased³⁴. Women, especially in the role of mothers and pregnant women, are vulnerable to social and gender inequality, burden and stigma in the exercise of motherhood³⁵. Reports of mothers who were unable to feed their children due to lack of food at home include feelings of sadness, worry, frustration, tiredness, headache and stomach aches resulting from the feeling of failure in fulfilling their social role³⁶. The strong association among gestational trimester and mental distress also highlight the importance of attention to those aspect with the advance of pregnancy.

In the absence of a partner, the responsibility for the provision of financial resources and care for the family falls more markedly on the woman, often the only one responsible for the family's income³⁷, without being able to share the financial issue³⁸. Women with a partner have a larger budget to increase the purchase of food at home³⁹. On the other hand, households headed by women have a higher prevalence of food insecurity. This is explained by the placement of women in the labor market, related to the perception of lower wages, occupation of less prestigious, in addition to what is still a traditional role as caregiver for children and homes, which implies that they are expected to stay at home and hinders the process of entering and establishing a career in the job market³⁷.

Food insecurity can cause feelings like anguish, despair, less social involvement, shame, nutritional deficiencies, as well as anxiety and depressive feelings. Pregnant women with depression are at a greater risk of remaining in poverty, and in a situation of food insecurity due to the increase in health expenses, social exclusion, reduced work opportunities and lower income. During pregnancy, considered a period of vulnerability, women's income potential decreases, and there is an increase in needs related to their own health and that of their children⁴⁰.

In the other blocks of the investigated variables, there was a reduction in the PR of mental distress in relation to food insecurity, albeit of a lesser magnitude. The adjustment for behavioral characteristics reduced the strength of association by 3.2% for mild food insecurity and 2.7% for moderate/severe food insecurity. The high stress that food insecurity causes can increase alcohol and tobacco consumption. In some cases, they are used as strategies to decrease appetite, which

results in inadequate food intake. In situations of insufficient food supply, part of the income can be used to buy tobacco and alcohol, instead of food⁴¹⁻⁴³.

Thus, it is important to observe data related to social, economic, behavioral, and cultural factors that are associated with mental distress in the creation of public policies allowing offer comprehensive health programs for pregnant women. The human right to proper food is contained in the Universal Declaration of Human Rights by the United Nations (UN) of 1948⁴⁴, and in Brazil, food is a basic right, recognized in the Brazilian Constitution since 2010⁴⁵.

Food insecurity is considered a determinant factor that can elevate mental distress. However, the mechanism of this association is not yet clearly understood. Prospective longitudinal studies are needed to investigate and understand this bidirectional relationship¹². In Brazil, it is essential that these studies be carried out and address the vulnerability to food insecurity among families with pregnant women, monitor and evaluate public policies and actions that guarantee food security for this population group and attempt to fight food insecurity¹⁰.

A systematic review corroborates the findings of this study, which highlights the importance of ensuring mental health in women with food insecurity, and attention to the social factors involved in this relationship that can lead to food insecurity and thus the prevention of depression, stress and anxiety¹³.

Although this study is innovative in the context of investigating the relationship between food insecurity and mental health and the association with a variety of determinants in pregnant women. Due to the cross-sectional design of this study, it was not possible to establish cause and effect inference between the variables. For future studies, we recommend applying longitudinal and qualitative research, which can investigate in depth the relationships and consequences of food insecurity and mental distress during pregnancy, and that health services, especially policies and public actions are attentive to this population group, so that pregnant women's health can be considered in full relation with the social context that promotes and maintains the conditions of vulnerability associated with mental distress and food insecurity.

Collaborations

B Harmel participated in the concept, data gathering, analysis and interpretation of the results, drafting and critically reviewing the manuscript. DA Höfelmann contributed to study design, analysis, and interpretation of results, critically reviewing the manuscript. All the authors have approved the final version of the manuscript and are responsible for all its aspects, including the guarantee of its accuracy and integrity.

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