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## Relationship between early introduction of complementary foods and postpartum depression in women with a history of depression during pregnancy

### *Relação entre introdução precoce de alimentos complementares e depressão pós-parto em mulheres com histórico de depressão na gravidez*

#### Resumo

#### Abstract

**Introduction.** Appropriate infant feeding practices to promote optimal growth and development include exclusive breastfeeding (EBF) for the first 6 months of life and introduction complementary foods at 6 months, with continued BF up to 2 years of age or older. Mothers experiencing postpartum depression (PPD) may show difficulties feeding their children. **Aims:** the aims of this analysis were 2-fold: to examine the association between PPD and early introduction of complementary foods (EICF) before 4 months of age and to describe the frequency of EICF among women with a history of depression during pregnancy. **Methods:** We used cross-sectional data from women enrolled in a community trial, collected between 6 to 9 months after childbirth. The presence of PPD was evaluated using the "Patient Health Questionnaire-9". Poisson regression models with robust variance were used to examine the association between PPD and EICF. Covariates included demographics, socioeconomic, maternal, and child factors. A total of 326 mother-infant dyads were included. **Results:** The overall prevalence of EICF was 75.8%. There were no differences in EICF regarding maternal depression status. Lower prevalence of EICF was associated with continuity of BF at 6 months, working outside of the home, and lower family income. The food items that were introduced more commonly before 4 months included: water, tea, milk, and cookies, with no differences regarding maternal depression status. **Conclusions:** Interventions to prevent EICF should not prioritize maternal emotional status during the postpartum period, but breastfeeding and social aspects such as family income and the women's external work.

**Keywords:** Child Nutrition. Postpartum Depression. Postnatal Care. Breastfeeding. Public Health.

#### Resumo

**Introdução.** As práticas apropriadas de alimentação infantil para promoção do crescimento e desenvolvimento incluem o aleitamento materno (AM) exclusivo nos primeiros 6 meses de vida e a introdução de novos alimentos aos 6 meses, com AM contínuo até os 2 anos de idade ou mais. Mães com depressão no pós-parto (DPP) podem mostrar dificuldades para alimentar seus bebês. **Objetivos:** nossos objetivos são: examinar a associação entre DPP e introdução precoce de alimentos complementares (IPAC) antes dos 4 meses de idade e descrever a frequência de IPAC em mulheres com histórico de depressão durante a gravidez. **Métodos.** Usamos dados

transversais de mulheres inscritas em ensaio comunitário, coletados entre 6 a 9 meses após o parto. A DPP foi avaliada por meio do *Patient Health Questionnaire-9*. Modelos de regressão de Poisson com variância robusta foram usados para examinar a associação entre DPP e IPAC. As covariáveis incluíram fatores demográficos, socioeconômicos, maternos e infantis. Um total de 326 díades mãe-bebê foram incluídas. **Resultados.** A prevalência geral de IPAC foi de 75,8%. Não houve diferenças na IPAC em relação à presença de DPP. A prevalência mais baixa de IPAC se associou à continuidade do AM aos 6 meses, trabalhar fora de casa e menor renda familiar. Os alimentos introduzidos mais comumente incluíram: água, chá, leite e biscoitos, sem diferenças em relação à depressão materna. **Conclusão.** Intervenções para prevenir a IPAC não devem priorizar a condição emocional materna no período pós-parto, mas a prática da amamentação e aspectos sociais como renda familiar e trabalho externo da mulher.

**Palavras-chave:** Nutrição da Criança. Depressão Pós-Parto. Cuidado Pós-Natal. Amamentação. Saúde Pública.

## INTRODUCTION

The World Health Organization (WHO) and the *Food Guide for Brazilian Children under 2 years of age* recommend the early initiation of breastfeeding up to one hour after birth, exclusive breastfeeding (EBF) in the first six months of life, and the introduction of complementary *whole foods* or minimally processed at six months of life, along with the continuation of breastfeeding up to two years of age or older.<sup>1,2</sup> Complementary feeding (CF) is classified as "early" when it started before the child is six months old, "timely" when it began between six and seven months, and "late" when it started up to seven months or more.<sup>3</sup> Several negative outcomes are associated with the early introduction of complementary foods (EICF), such as reduced duration of breastfeeding (BF),<sup>4</sup> higher occurrence of diarrheal and respiratory infections, allergic reactions, lower nutrient absorption,<sup>5</sup> malnutrition, impaired growth and development,<sup>1</sup> hypercholesterolemia,<sup>6</sup> increased body mass index (BMI),<sup>7</sup> overweight and obesity,<sup>8</sup> and increased infant morbidity and mortality.<sup>5</sup> In addition, less healthy eating patterns are associated with EICF.<sup>9</sup>

Nutritional surveys of national representativeness show that EICF often occurs. The II Survey on Prevalence of Breastfeeding in the Brazilian Capitals and the Federal District (2009) found early introduction of water (13.6%), teas (15.3%), and milk other than breast milk (18%), still in the first month of life. Between 2-3 months, 56.8% of the children consumed some kind of thickener.<sup>10</sup> Although studies show improvement in the situation of CF, resulting from public policy strategies,<sup>11,12</sup> several authors report frequent early introduction of food.<sup>13-16</sup>

Maternal mental health is one of the factors that can negatively influence infant feeding. Depression that usually occurs in the first 6 or 12 months after delivery is called "postnatal depression" or "postpartum depression" (PPD). PPD affects between 10% and 15% of women,<sup>17</sup> generating negative consequences for the child's development. Even milder forms of PPD can affect the baby, due to the little mother-child interaction.<sup>18</sup> Although PPD is considered a risk factor for inappropriate feeding practices,<sup>19</sup> there is no consensus in the literature on the association between PPD and breastfeeding.<sup>20,21</sup> Several studies conducted between 4 and 52 weeks after delivery suggest that mothers with depressive symptoms stop breastfeeding their children earlier.<sup>22,23</sup> However, some authors did not find such an association.<sup>24,25</sup>

It's known that EICF and discontinuation of BF are associated.<sup>4,15,26</sup> Although several studies have addressed the association between depression and BF, few publications describe dietary practices established by mothers with depressive symptoms in the postpartum period. Some studies have not observed a higher frequency of EICF among children aged 2-4 months who are children of depressive mothers.<sup>27,28</sup> On the other hand, Hurley et al.<sup>29</sup> found that high energy intake by children aged 0 to 6 months was associated with symptoms of maternal depression.

The objective of the present study is to estimate the association between PPD and IPAC. In addition, it is intended to describe the types of foods introduced early and the frequency with which it happens, related to the population of women with a history of depression during pregnancy.

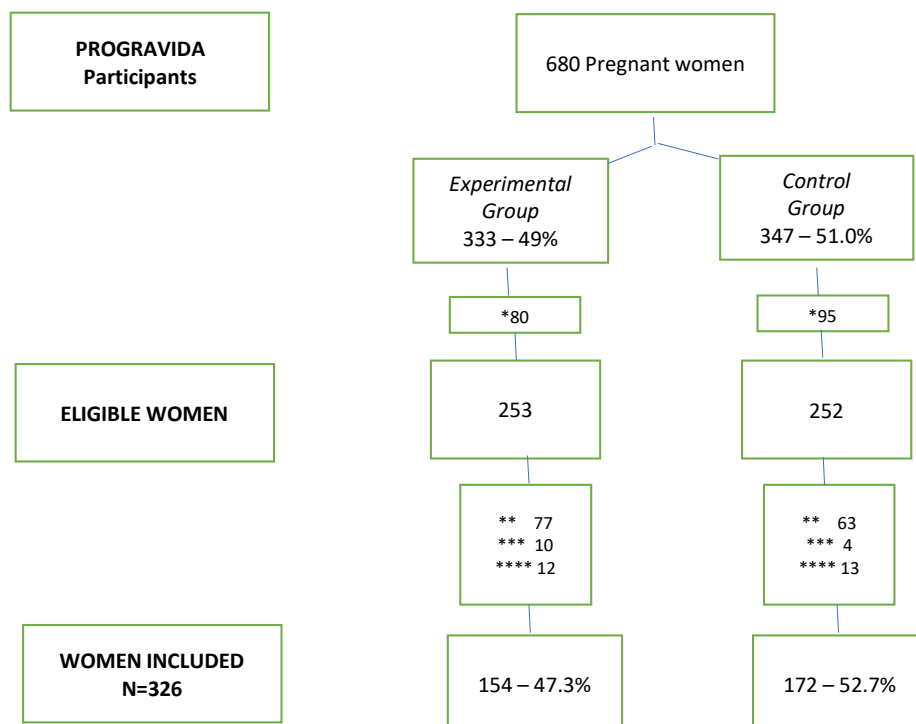
## METHODS

This is a cross-sectional analysis of data from 326 puerperal women who had participated in the PROGRAVIDA study. Data were collected between 6 and 9 months after delivery, from 08/01/2013 to 08/31/2014.

PROGRAVIDA was a community trial that evaluated the effectiveness of a Depression Management Program (DMP) in pregnant women with depressive symptoms, being carried out in partnership with the Associação Saúde da Família (Family Health Association), which has 12 UBS (Basic Health Units) that have already implemented the ESF (Family Health Strategy) in the area of the Health Coordination of the Northern Region of São Paulo. In total, 680 pregnant women participated in the PROGRAVIDA, which constituted two groups: the experimental (n=333), in which the PMD was implemented, and the control (n=347), which received routine prenatal treatment.

The main outcome of the PROGRAVIDA community study was to analyze the presence and intensity of symptoms of depression in women after childbirth in the two different groups. The inclusion criteria were: pregnant women aged 18 years or older who started prenatal care up to 24 weeks of gestation, had depressive symptoms, and were attended to during prenatal care by ESF teams. Pregnant women who presented suicidal plans (according to the evaluation of the study), those who underwent specialized treatment for any mental disorder, and pregnant women unable to respond to the assessment of the research protocol (for example, for not speaking Portuguese) were excluded. Between 6 and 9 months after delivery, the eligible puerperal women from both groups of the program, who were located by phone contact and agreed to participate in this study, received a home visit from the field researcher trained to sign the Informed Consent Form (ICF), conduct the interview and apply questionnaires, used as assessment instruments. Additional information on the PROGRAVIDA study is available in the article written by Scazufca et al.<sup>30</sup> From the original study with 680 pregnant women, 505 puerperal women were eligible. After other exclusions, women ineligible for having children > 9 months and losses (women not located and refusals), 326 women were included in this study. The flowchart with the women participating in this study is presented in Figure 1

Figure 1. Participants flowchart.



Exclusions:

\* number of women ineligible for having children > 9 months; Losses: \*\*number of women not located, \*\* \*refusals, and \*\*\* \*the number of women excluded for loss of Postpartum Depression information and infant feeding.

## Instruments

### **Main outcome: Early introduction of complementary foods (EICF)**

The evaluation of the EICF was made through a structured questionnaire, prepared by the authors, on food consumption and BF. The questionnaire contained questions about the introduction of the following foods: vegetables, fruits, meats, rice and beans, other kinds of milk (cow's milk and/or any powdered milk), juice (natural/industrialized), water, teas, pasta (any kind), and cookies and/or crackers. To evaluate the period of introduction of food, a direct question was asked to the child's mother: "How many months was the child when food X was introduced?".

For the classification of "Early introduction of complementary foods", the following criterion was adopted: "EICF" positive if there was introduction of at least one type of food before four months of age; and "EICF" negative if the introduction occurred after this period. Although the World Health Organization (WHO) does not recommend the introduction of any food or beverage before the age of six months,<sup>2</sup> the practice of introducing complementary foods in Brazil often occurred before the age of six months<sup>10,16</sup> at the time of data collection of the present study, which justifies the established cutoff point (4 months). The same cutoff point was used by other authors.<sup>13</sup>

### **Main exposure: Postpartum Depression (PPD)**

PPD was assessed using the *Patient Health Questionnaire-9 (PHQ-9)*, which is an instrument validated for depression screening, according to the DSM-IV criteria for assessing the presence of a depressive mood disorder. The PHQ-9 was evaluated in Brazil with an excellent ability to discriminate between cases and non-cases of depression<sup>31</sup> and is one of the most used screening instruments for PPD in the world.<sup>32</sup> The PHQ-9 investigates the presence and intensity of nine items related to the period of the two weeks prior to the interview. The scores range from 0 ("never") to 3 ("almost every day"), and the total score can range from 0 to 27. Scores of 10 or more are considered cases of major depression, while scores of 5 to 9 represent cases of mild depression, according to the original validation of the instrument.<sup>33</sup> In the present study, the following categorization was adopted: women without depression (PHQ-9 score < 10) and women with moderate to severe depression (score > 9).

The covariates of interest corresponded to socioeconomic and demographic characteristics: self-reported ethnicity (white vs non-white), education (up to 8 years of study; 9 to 12 years of study and more than 12 years of study), monthly family income (0 to 1,054 reais; 1,055 to 1,800 reais and above 1,801 reais), maternal work situation (working vs unemployed) and marital status (single/without partner vs married/with partner or stable union); maternal: age (up to 19 years; 20 to 34 years and above 35 years), number of children (primiparous vs multiparous) and type of delivery (normal vs cesarean) and child: age (6 months; 7 months and 8 months or older), birth weight (<2,500g vs >2,500g), use of pacifiers (used/uses vs never used) and breastfeeding (no vs yes).

## Statistical Analysis

All variables were categorized. The prevalence of the outcome (EICF) with a 95% confidence interval (CI) was estimated. The Chi-square test was used to compare groups (control and intervention) regarding the EICF, aiming to evaluate the possible impact of the intervention tested in the PROGRAVIDA study. The prevalence ratio (PR) with 95% CI was used to evaluate the association between PPD and EICF, controlling for

covariates. The chi-square test for trends was used to evaluate whether there is a linear trend in the ordered categories. The adjusted and unadjusted PR, with 95% CI, was estimated by Poisson regression with robust variance. The chi-square trend test was used to assess whether there was a linear trend when the categories were ordered.

The effects of PPD on EICF were examined, taking into account possible confounding factors, using hierarchical modeling with three levels of adjustment to control the distal (socioeconomic) and proximal (child characteristics) factors associated with EICF. Model 1 was adjusted for randomization in the community trial PROGRAVIDA and for sociodemographic and socioeconomic characteristics; model 2 was adjusted for model 1 and for perinatal characteristics; and model 3 was adjusted for model 2 and child characteristics.

Variables with a p-value <0.20 in the bivariate analysis were selected for the multivariate analysis. These variables were maintained in the model even though they lost statistical significance after the inclusion of the lower blocks. To consider that the association between a factor and the outcome was statistically significant, a significance level of 5% was adopted. The statistical analysis was performed using the STATA 14 software.

## Ethical Aspects

This study was approved by the Comitê de Ética em Pesquisa da Universidade de São Paulo (Research Ethics Committee of the University of São Paulo) (CAAE 63030116.0.0000065). All participating women were informed about the objectives of the study. Those who consented to participate signed the written Informed Consent Form (ICF) at the time of the postpartum evaluation and were assured of the confidentiality of the data provided and the possibility of interrupting their participation in the study at any time if they wished.

## RESULTS

Regarding randomization in the PROGRAVIDA study, in the present study, no significant differences were found between the eligible mothers who participated and those who did not participate (due to losses), except for the education variable, observing, in the group submitted to the intervention, that the participating mothers had higher education compared to non-participating women (data not tabulated).

Regarding maternal characteristics, most were married or had a partner (82.7%) and were between 20 and 34 years old (78.2%). Almost 70% of mothers studied until high school, and 80% were unemployed. Regarding the characteristics of the children, about 70% were six months old, most were still in BF (63.8%) at the date of the interview, and more than half used pacifiers (61.3%). The prevalence of the EICF was 75.8% (95% CI 0.71:0.80). We found that 19% of women presented moderate/severe depression (Table 1)..

**Table 1.** Factors associated with EICF<sup>a</sup> and their crude prevalence ratios. Sample from the PROGRAVIDA community trial (n =326). São Paulo, Brazil. 2014.

Explanatory variables	Total	Early introduction at 4m	PR **	95%***	p-value ****
		N (%)			
<i>PPD - Postpartum Depression</i>					
No PPD/Mild PPD	264	201 (76.1%)			0.76
Moderate /severe PPD	62	46 (74.2%)	0.97	0.83 – 1.14	
<i>Ethnicity</i>					
White	151	121 (80.1%)			0.09
Non-white	175	126 (72.0%)	0.90	0.79 – 1.02	
<i>Marital status</i>					
Single/unmarried	56	41 (73.2%)			0.65
Married/partnered	268	204 (76.1%)	1.04	0.87 – 1.23	
<i>Maternal work situation</i>					
Not employed	259	202 (78.0%)			0.07
Working	65	43 (66.1%)	0.84	0.70 – 1.01	
<i>Education</i>					
Up to 8 years of schooling	59	45 (76.3%)			
From 9 to 12 years of schooling	217	162 (74.6%)	0.98	0.83 – 1.15	*0.767
More than 12 years of schooling	48	38 (79.2%)	1.03	0.84 – 1.27	
<i>Family income (in reais)</i>					
Up to 1,054	111	79 (71.2%)			
1,055 – 1,800	111	80 (72.1%)	1.00	0.85 – 1.19	*0.023
> 1,800	104	88 (84.6%)	1,18	1.03 – 1.37	
<i>Mother's age</i>					
Up to 19 years	44	35 (79.5%)			
20-34 years old	255	191 (74.9%)	0.94	0.79 – 1.10	*0.755
35 years old or more	27	21 (77.8%)	0.98	0.76 – 1.26	
<i>Number of children</i>					
Primiparous	120	87 (72.5%)			0.27
Multiparous	206	160 (77.7%)	1.08	0.94 – 1.23	
<i>Type of birth</i>					
Normal	190	145 (76.3%)			0.79
Cesarean section	136	102 (75.0%)	0.98	0.87 – 1.11	
<i>Child's age</i>					
6 months	233	178 (76.4%)			
7 months	46	34 (73.9%)	0.96	0.79 – 1.16	*0.714
8 months or more	47	35 (74.5%)	0.97	0.81 – 1.17	
<i>Weight of the child at birth</i>					
<2,500g	43	28 (65.1%)			0.13
>2,500g	277	215 (77.6%)	1.19	0.95 – 1.50	
<i>Use of a pacifier</i>					
No	126	84 (66.7%)			0.00
Yes	200	163 (81.5%)	1.22	1.06 – 1.40	
<i>BF at 6 months</i>					
No	118	107 (90.7%)			0.00
Yes	208	140 (67.3%)	0.74	0.66 – 0.83	

\* EICF: early introduction of complementary foods; \*\* PR: Prevalence ratio; \*\*\* CI95%: 95% of confidence interval; \*\*\*\* p-value for trend

In the bivariate analysis, the following explanatory variables were associated with the early introduction of food: family income, use of pacifiers, and BF at six months. The prevalence of EICF before four months was 18% higher in the comparison between children from families in the highest and lowest income tertile ( $p= 0.02$ ). Children who used pacifiers showed a 22% increase in the prevalence of EICF when compared to those who did not use it (PR: 1.22; 95% CI 1.06 – 1.40). The prevalence of early introduction of CF among children who were being breastfed at six months was 26% lower when compared to children who were not being breastfed anymore (PR: 0.74; 95% CI 0.66 – 0.83). The other explanatory variables, including PPD, were not significantly associated with the outcome (Table 1). No significant difference was found in the association between randomization and EICF (data not tabulated).

In the multivariate analysis, the estimate of the association between PPD and EICF did not change significantly after adjustments for confounding variables (PR:0.96; 95% CI 0.81:1.12). There was a lower prevalence of EICF among women who were still breastfeeding the child at six months, those who worked outside the home, and those with lower family income (Table 2).

**Table 2.** Multivariate analysis between PPD \* and EICF \*\*, according to a hierarchical model. São Paulo, Brazil.2014.

VARIABLES	EICF		
	Model 1	Model 2	Model 3
Constant in a fixed effects model	0.802 (0.636-1.012)	0.550 (0.229-1.323)	0.673 (0.425-1.068)
Level of depression			
None/mild	1		
Moderate/severe	0.97 (0.83-1.14)	0.97 (0.70-1.34)	0.96 (0.81-1.12)
P	0.76	0.86	0.59
Block 1			
Ethnicity			
White	1	-	-
Non-white	0.89 (0.79 -1.01)	-	-
P	0.06	-	-
Family income (in reais)			
Up to 1,054	1	-	-
1,055 – 1,800	1.01 (0.86 -1.20)	-	-
> 1,800	1.24 (1.07 -1.44)	-	-
P	0.00	-	-
Maternal work situation			
Not employed	1	-	-
Working	0.79 (0.66-0.96)	-	-
P	0.01	-	-
Block 2			
Birth weight			
<2,500g	-	1	-
>2,500g	-	1.22 (0.83-1.82)	-
P	-	0.31	-



**Table 2.** Multivariate analysis between PPD \* and EICF \*\*, according to a hierarchical model. São Paulo, Brazil.2014. (Continues).

VARIABLES	EICF		
	Model 1	Model 2	Model 3
Block 3			
Use of a pacifier			
No	-	-	1
Yes	-	-	1.04 (0.87-1.24)
P	-	-	0.66
Breastfeeding			
Stopped	-	-	1
Still in BF	-	-	0.78 (0.68 – 0.90)
P	-	-	<0.00
Log pseudolikelihood	-311,42056	-304,87048	-302,837
-2 Loglikelihood	622,841 12	609,74096	605,674

<sup>a</sup>PPD: postpartum depression ; <sup>b</sup>EICF: early introduction of complementary foods.

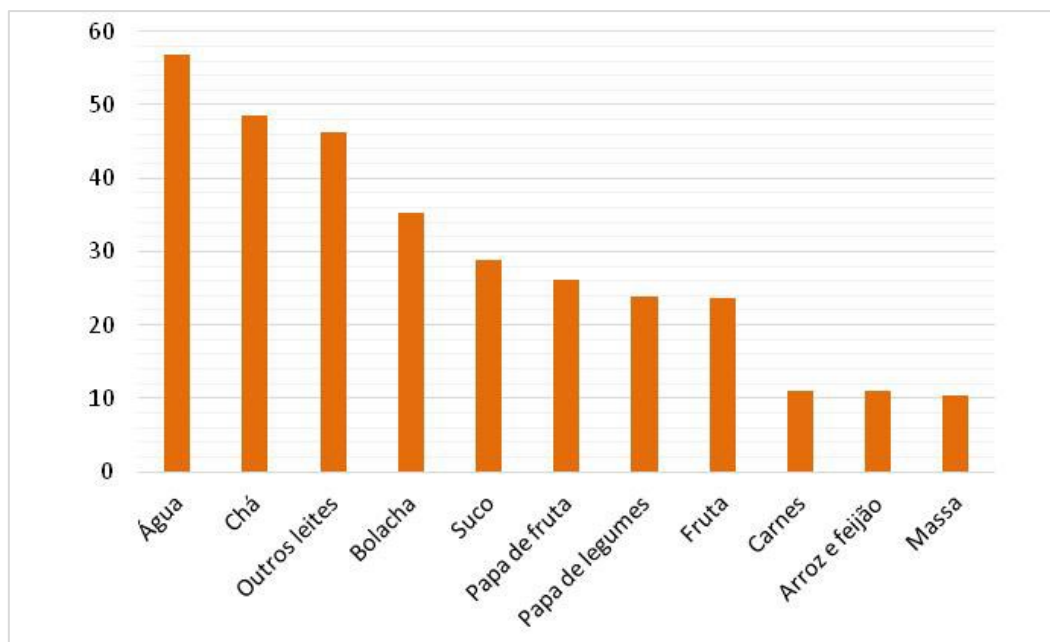
\*Model 1: crude plus socio-demographic and socio-economic characteristics

\*\* Model 2: adjusted by model 1 plus perinatal characteristics

\*\*\* Model 3: adjusted by model 2 plus child factors

Figure 2 shows the types of foods most commonly introduced before four months. It is verified that water (56.7%), teas (48.5%), other kinds of milk (46.3%), and cookies (35.2%) occupy the first positions in the ranking

**Figure 2.** EICF\* Ranking (Frequency order)



(from left to right: water, tea, other kinds of milk, crackers, juice, juice porridge, vegetable porridge, fruit, meat, beans and rice, and pasta.)

\* EICF early introduction of complementary foods

## DISCUSSION

In this cross-sectional analysis including women with depressive symptoms during pregnancy, we found a high prevalence of EICF, but no association between PPD and the time of introduction of complementary feeding. Continuity of breastfeeding until six months of age, the mother working outside the home, and lower family income were associated with a lower prevalence of EICF.

Most of the infants studied (75.8%) started to receive complimentary feeding before four months of life, regardless of maternal depression. The overall prevalence of EICF observed in the study population is higher than that observed in the last national survey, which showed that 59% of children at six months of age had already received some type of food.<sup>16</sup> However, more recent data from smaller studies in different cities show rates similar to those of this study<sup>12,14,34</sup>

When compared with the indicator “breastfeeding children under 6 months”, the proportion of children being breastfed in the study (63.8%) was higher than the national average<sup>35</sup> and according to the OMS target for 2030.<sup>36</sup> BF was significantly associated with EICF. Although the child being breastfed at four months of age was not evaluated, it was found that 90.7% of children who were introduced early to complementary foods were no longer breastfed at six months of life. These results corroborate those of several studies showing an association between shorter breastfeeding time and EICF.<sup>4,26,37</sup>

Breastfeeding offers numerous benefits for the mother-baby binomial, including greater interaction between mother and child,<sup>38</sup> reduced risk of breast cancer,<sup>39</sup> protection against infections and child survival,<sup>40</sup> better performance in intelligence tests among children and adolescents,<sup>41</sup> and reduced risk of overweight or obesity.<sup>41</sup> Specifically for this population of women with a history of depression, BF could decrease the occurrence of the outcome, as well as provide improvement in maternal depressive symptoms.<sup>42-44</sup> In the present study, the prevalence of BF at six months was low, regardless of maternal depression. In fact, the literature on the association between PPD and BF is quite controversial<sup>20,21,45</sup> as some studies find an association<sup>23,46</sup> while others do not.<sup>24,25</sup>

It was also observed that women who worked outside the house adhered better to the recommendation of timely introduction of complementary feeding. This fact contrasts with some studies that found that maternal work hinders the maintenance of BF, favoring EICF.<sup>47,48</sup> For other authors, the fact of working outside is not a barrier to BF when there is a pro-breastfeeding policy in the company, including paid maternity leave, adequate place to milk or breastfeed in the workplace, flexibility of working hours, and access to daycare.<sup>49,50</sup> It is noteworthy that women who work outside possibly have a higher educational level, tending to breastfeed for longer, due to greater access to information about the benefits of breastfeeding for the health and nutrition of children.<sup>51,52</sup>

The positive association between family income and the risk of EICF observed in this study is another controversial topic in the literature. Some authors have found an association between higher income and shorter duration of BF, thus<sup>53-56</sup> favoring EICF, while other studies have shown that lower-income is strongly related to EICF<sup>26,57</sup> and also to a less healthy eating pattern.<sup>58</sup> Faleiros et al.<sup>54</sup> observed a higher rate of BF among women with low and medium purchasing power compared to those with higher socioeconomic status. Kummer et al.<sup>59</sup> found that also from the sixth month, the prevalence of BF is higher among poorer women, a fact perhaps explained by economic difficulties, which prevent complementation with food and other types of milk. Thus, it can be assumed that the higher family income has facilitated the acquisition of other foods, favoring the early introduction of complementary foods.

The relationship between PPD and EICF has been recently investigated. Although few studies have addressed this topic, the findings of our study corroborate some evidence showing that PPD is not associated

with EICF. Some authors report that depressive mothers are more likely to introduce food early when compared to mothers without depression.<sup>27,28,60</sup> However, none of the authors found significant differences after making adjustments for confounding variables. Hurley et al.<sup>29</sup> found higher dietary intake in children whose mothers reported depression, suggesting inadequate dietary practices and high dietary intake in the first six months of age, associated with the presence of maternal mental health symptoms.

Regarding the frequency of early introduction of food, it was found that water, tea, other kinds of milk, and cookies were the most commonly introduced foods. Water was at the top of the *ranking*, with an introduction rate of 56.7%, similar to other studies, which found a prevalence of consumption of 56.1%<sup>14</sup> and 40.6%.<sup>16</sup> The introduction of tea occurred in the diet of 48.5% of the children and was higher than the prevalence of 31.5% found by Schincaglia et al.<sup>16</sup> and 20.2% in Southeastern Brazil. Despite the recommendation of EBF up to six months of age, many children receive other fluids during this period, including water, tea, or juice.<sup>35</sup> According to the ENANI-2019, 13.2% of children in Brazil under six months of age were already being predominantly breastfed, while 19.8% were on mixed breastfeeding and only 45.8% on exclusive breastfeeding.<sup>35</sup> Offering other foods to the breastfed child before six months can lead to reduced breast milk production and weaning too early.<sup>1</sup> The rate of introduction of other kinds of milk was 46.3%, a result similar to that of the Survey on the Prevalence of Breastfeeding II, which verified that 48.8% of the children consumed this beverage.<sup>16</sup> The consumption of cow's milk is associated with the interruption of BF<sup>61</sup>, allergic processes, increased risk of type 1 diabetes, atopic diseases, and infant morbidity<sup>16</sup> and mortality.<sup>62,63</sup>

The rate of introduction of cookies at four months, which is an ultra-processed food not recommended for children under two years of age,<sup>1</sup> was 35%. ENANI-2019 found in children between 6 and 11 months of age that 49.8% of them had already been exposed to sugar and that 66.3% consumed ultra-processed foods.<sup>35</sup>

In addition to the negative effect on the overall nutritional profile of the diet, the consumption of ultra-processed foods among children increases the risk of all forms of malnutrition, from specific nutritional deficiencies<sup>64</sup> to rapid weight gain/overweight/obesity.<sup>41</sup> In addition, ultra-processed foods negatively influence cholesterol levels,<sup>6</sup> compromise the consumption of healthy foods<sup>65</sup> and can determine the child's dietary preferences for these types of products, which can extend into adulthood.<sup>66</sup> All other foods analyzed (juice, fruit porridge, vegetable porridge, fruit, meat, rice and beans, and pasta) were also introduced early, with rates ranging from 29% to 10.4%. These findings corroborate those of other studies, which have shown that many children receive this type of food before their fourth month of life.<sup>14,16, 67,68</sup>

Some limitations of the study should be mentioned. First, although no association was found between PPD and EICF, the cross-sectional design of the study does not allow establishing causal inferences and temporality between depression and EICF. Second, of the 505 eligible women who participated in the community trial (PROGRAVIDA study), only 326 (64.5%) provided complete data for the evaluation of the association between PPD and EICF. However, the losses were not differential, taking into account the randomization of the programmed study, with the exception of the variable "education", which was higher in the women who participated in the study, compared to those who did not participate. Thus, it is unlikely that the intervention in the PROGRAVIDA study had a late effect on EICF. Third, the results of the present study were obtained from a sample of low and middle to low-income women with a history of depression during pregnancy and cannot be generalized to other populations.

Another possible limitation is the information bias since the information refers to retrospective data. Regarding the temporal relationship between PPD and EICF, there is no evaluation of depression in the

interval between pregnancy and the period between 6-9 months. However, it is unlikely that the intensity of depression in this group of women has oscillated downward in this period. The literature also confirms that antenatal depression is a strong predictor of PPD.<sup>69,70</sup> Finally, this assessment of EICF was limited to 11 food groups consumed by the Brazilian population based on national surveys. The exclusion of other foods may have underestimated the rate of EICF.

Among the positive aspects of the present study, it is worth mentioning the novelty of the investigation between PPD and EICF in low and middle to low-income puerperal women who had already presented depressive symptoms during pregnancy.

## CONCLUSIONS

The present study shows the importance of health services in supporting and guiding mothers regarding the proper introduction of complementary foods, regardless of the presence of depressive symptoms and the maintenance of BF, a protective factor of EICF. In the current context of the country, the reduction of high rates of EICF should be focused on social determinants, such as maternal work and family income

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### **Contributors**

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