

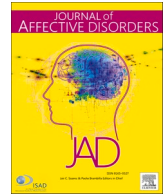


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Research paper



## Postpartum depressive symptoms of Brazilian women during the COVID-19 pandemic measured by the Edinburgh Postnatal Depression Scale

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### ABSTRACT

**Background:** The COVID-19 pandemic gave rise to concerns about its potential impact on the mental health of pregnant and postpartum women as the general postpartum depression rates increased.

**Methods:** Three postpartum questionnaires (Edinburgh Postnatal Depression Scale – EPDS; Anxiety and Depression Scale – HAD; and a demographic questionnaire about isolation and information acquisition) were used to evaluate the mental health of women with and without COVID-19 and determine the factors associated with depressive symptoms (EPDS  $\geq$  12).

**Results:** Data from 184 participants with a mean of 56 postpartum days were analyzed. The rate of symptoms compatible with postpartum depression (PPD) was 38.8%, with a 14.3% positive response to item 10 on the EPDS (suicidal ideation - SI). Listening to the news about COVID-19 averaged 4.45 hours a day. Factors related to PPD were concerns about lack of hospital beds (OR = 2.45), absence of a partner (OR = 2.70), and anxiety symptoms (OR = 10). Factors related to SI were anxiety symptoms (OR = 1.56) and friends as a source of information (OR = 5.60).

**Limitations:** Considering the rapidly changing epidemiological conditions of this pandemic, this study may only be the photograph of an instant.

**Conclusions:** Higher rates of PPD in the Brazilian population are related not only to anxiety but also to an inadequate family environment, kind of information acquisition and concerns about the lack of hospital beds.

### 1. Introduction

Throughout the ongoing battle against COVID-19, only recently has attention been paid to the impairment of mental health, which some have envisioned as the fourth wave (Manjoo, 2020; Duong, 2020), following a second wave of infection by COVID-19 itself and a third wave of chronic diseases neglected for the sake of COVID-19. In March 2020, within the initial stages of the pandemic, the World Health

Organization (WHO) showed its concern vis-à-vis the pandemic situation by addressing it as a challenge to psychological resilience which posed a high risk for the population's mental health, and it predicted that the circumstances of the pandemic might cause or aggravate mental problems (World Health Organization (WHO), 2020).

Soon afterwards, a few authors (Assari and Habibzadeh, 2020; Zhang et al., 2020) began to advocate greater awareness of mental health issues in this pandemic, motivated by examples from recent

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epidemics, during which psychosocial consequences were neglected, and social isolation with its potential for negatively impacting the population's social health disrupted social connectivity, daily routines, and access to goods and services. Despair and psychological stress would increase, not only because of the natural fear of the disease, but also due to fears heightened by fake news and the so-called global disinformation epidemic, better known in academic circles as *infodemic* (Rathore and Farooq, 2020).

Gradually the fears were confirmed. At the turn of the year 2021, an important study was published by the Oxford group (Taquet et al., 2021) reporting that one in every five people infected with COVID-19 in the United States was diagnosed with a psychiatric disorder, primarily an anxiety disorder, along with insomnia, 14 to 90 days after confirmation of the infection (18.1%; relative risk = 2.1).

If this is true for the population in general, it may be equally relevant to the obstetric population. In a recent Italian study, 53% of the pregnant women regarded the pandemic as a stressful, high-impact event, and slightly less than two-thirds (68%) reported higher-than-normal anxiety (Saccone et al., 2020).

The high anxiety levels and isolation within the family incline us to think of a rise in postpartum depression rates. Leaning towards this view as well, are 3 recent editorials (Matvienko-Sikar et al. - Women and Birth, 2020; Thapa et al. - Acta Obst Gynecol Scandinavia, 2020; Viaux et al. - Journal of Gynecology Obstetrics and Human Reproduction), which show concern about a possible wave of postpartum depression (PPD) as a consequence of the pandemic.

However, few are the articles reporting on the pandemic's impact on PPD rates. Two Italian studies (Ostacoli et al., 2020; Zanardo et al., 2020) and a Spanish one (Marino-Narvaez et al., 2021) exhibit data compatible with an increase in PPD rates, while an American study (Silverman et al., 2020) reports a decrease in such rates during the lockdown in New York City.

Thus, questions still remain unanswered about the pandemic's impact on postpartum women's health, especially in the Latin-American scenario. There is a wide variation in postpartum depression (PPD) rates between different world realities, depending on socioeconomic and cultural conditions (Silva, 2013). In Brazil, the rates before the pandemic were already concerning, around 20% (Lobato et al., 2011). It is known that severe depression can lead to suicidal ideation which rates in postpartum varies from 2 to 22% (Halim et al., 2018), with rates in Brazil between 4 and 20.8% (Tabb et al., 2018; Cardillo et al., 2016). Anxiety is one of the factors most associated with perinatal depression. The rates of Anxiety in Brazil vary from 19.8% and 42.9% in pregnancy (Almeida et al., 2012; Silva et al., 2017) and around 20% in the postpartum period (Lamus et al., 2021). More recently, at the beginning of this pandemic, between February and April 2020, rates of up to 49.3% have been described (Silva et al., 2020).

Consequently, in this study, we propose to evaluate the association between the SARS-Cov-2 infection and PPD symptoms, including suicidal ideation, in puerperal women during the COVID-19 pandemic and to determine the related factors, with special attention to anxiety symptoms.

## 2. METHODS

The present study is part of a research project entitled "Exploratory study on COVID-19 in pregnant women" approved by the institutional review board (CAAE: 30270820.3.0000.0068) of the two hospitals belonging to University of Sao Paulo (Hospital das Clínicas, HC, and Hospital Universitário, HU). All participants provided and signed the informed consent before the study entry. The two hospitals are approximately 10 km apart, and HU is a low complexity hospital and HC is a high complexity hospital (tertiary level). However, during the pandemic, the two hospitals worked with the same clientele, as high-risk cases were referred to the HU, since the HC preferentially attended to cases of COVID-19. Therefore, the socioeconomic background between

the two hospitals is quite similar.

The data for the present analysis was prospective collected from puerperal women who delivered in maternities of both hospitals, with post-partum evaluation between June 8 and December 23, 2020. Puerperal women that were already included in the major project who delivery occurred in one of the two hospitals (HC and HU) and fulfilled one of the three criteria were invited to participate in the study: 1) confirmed COVID-19 during pregnancy or at delivery, 2) suspected COVID-19 during pregnancy or at delivery, 3) no suspicion and no COVID-19 during pregnancy or at delivery.

All the participants were submitted to the same procedures by answering three self-reported questionnaires. In view of the isolation conditions imposed by COVID-19 and the high media exposure about the repercussions of the illness, this study started with a questionnaire that sought to understand the routine of patients after the onset of the Pandemic, the individual risks from the actions taken and the level of concern developed from the information shared by the media. Therefore, the questionnaires were passed to the patients in the following sequence: the first covered the participants' demographic data, their degree of social distancing, their fears and concerns about pregnancy and delivery and their reaction to news about the pandemic. The patients rated their concern and feelings of anxiety about such news on a scale of 0 to 10. The other following questionnaires were about mental health (Hospital Anxiety and Depression Scale (HAD) and the Edinburgh Postnatal Depression Scale (EPDS), both in the Portuguese-validated version) (Zigmond & Snaith, 1983; Botega et al., 1995; Cox, 1987; Da Silva, 1998). Anxiety was considered likely if the score on the HAD anxiety module was 12 or higher, and postpartum depression was deemed likely if the overall EPDS score was 12 or higher. A positive response to the EPDS item 10 ("I've been thinking about doing something against myself") was interpreted as suicidal ideation (SI). Cases with incomplete questionnaires were excluded from the analysis. For data analysis, in relation to the social restrictions imposed by the pandemic, we considered retrospectively the official data for the start and end of the lockdown, which was between March 23, and August 23, 2020, in the so-called red phase, that is, with only essential services open.

For analysis, the variables related to demographics, clinical characteristics, social isolation, acquisition of information about COVID, concerns about the news and COVID-19 status were considered. For the COVID-19 status two possibilities were considered: 1) puerperal women who were suspected of having SARS-Cov-2 infection at hospital admission during pregnancy or puerperal women with no symptoms of SARS-Cov-2 infection during pregnancy; 2) diagnosis of SARS-CoV-2 (serology and/or PCR) during pregnancy or at delivery with or without symptoms. All women were followed up during prenatal care and postnatal care with the same clinical protocol.

The questionnaire data were tabulated in Excel for subsequent statistical analysis with the SPSS 20.0 program. Initially, a general descriptive analysis of the variables was performed with the inclusion of the EPDS results. Next, the sample was divided into two groups according to the scores on the EPDS as follows: symptomatic depressive patients (EPDS  $\geq$  12) and patients with no depressive symptoms (EPDS <12). An additional analysis was carried out in the presence of a positive response to the EPDS item 10, i.e., SI. Then, a univariate analysis for potential associations with PPD and SI was made using the chi-square test for categorical variables, along with the Fisher exact test for corrections if necessary. The Mann-Whitney test was performed for quantitative variables without normal distribution. Univariate binary logistic regression analysis was performed to determine odds ratio (OR) with 95% confidence intervals (CI). Multiple regression analysis included independent variables with significant p values ( $p < 0.05$ ) and those with p values < 0.150 from the univariate analysis. The final model was constructed according to the following parameters: 1) no change in OR > 10%; 2) improvement in accuracy, reflected by 95% CIs; 3) total degrees of freedom allowed for each outcome variable. The techniques

used were Stepwise, in which the covariates were tested from lowest to highest p value, and Backward (Wald). The search for the best fit was carried out with the Hosmer and Lemeshow goodness of fit test ( $p > 0.80$ ).

### 3. RESULTS

During the study period 202 puerperal women returned in the outpatient unit for the main study protocol, for the postpartum consultation, and 184 (91%) accepted to participate in the present study. The patients' median age was  $30.84 \pm 6.62$  years; they were mostly white (66.8%) and living with a partner (58.1%). Nearly a third of them were housewives (28.8%) and less than a fifth were salesclerks/storekeepers. Half of the group (50.5%) had finished high school and approximately half of these (21.2%) had a college degree; almost a fifth (18%) had finished only elementary school. The average number of postpartum days at evaluation was  $56.85 \pm 34.03$ . An overwhelming majority (89.4%) was able to isolate themselves at home; the number of days of personal isolation had an average of  $75.79 \pm 89.36$  days with a mean number of  $2.62 \pm 1.41$  people in the same household. Nearly a fourth of

the patients (24.3%) were still observing social isolation when they came to the hospital for evaluation. Considering the COVID-19 status 37.6% of participants were admitted in hospital with COVID-19 symptoms and the total 40% were confirmed cases of COVID-19.

Most of the patients (55.4%) gave birth during lockdown in the city. Between March 23 and August 23 2020, the lockdown's red phase, when all nonessential businesses were closed and social isolation was in force, only 18.5% of the patients were interviewed. At the time of assessment, the mean number of days since the beginning of lockdown in the city of São Paulo was  $205.86 \pm 42.72$  (range: 47-269 days).

The pandemic impacted the patients' lives as follows: 11.8% missed a prenatal visit for fear of coming to the health clinic; 26.8% were involved in family quarrels during the lockdown; 31.5% of the partners stayed home; and 62% worked during the pandemic. The mean number of daily hours a patient was absorbed in the COVID-19 news was  $4.45 \pm 6.36$  hours, with a mean score of  $8.59 \pm 2.06$  for concern about this news and of  $7.92 \pm 2.55$  for feelings of anxiety regarding the news. Additionally, they received a mean score of  $8.99 \pm 2.07$  for their concern about childbirth. The patients obtained information from an average of  $2.56 \pm 1.57$  media sources, and television was the primary source

**Table 1**  
Demographics and clinical characteristics in relation to the presence or absence of postpartum depression – PPD (EPDS  $\geq 12$ ).

Characteristics	Categories	N	Postpartum Depression (n=178)		P	OR (95% CI)
			No (n=109) N (%), Median (IQR)	Yes (n=69) N (%), Median (IQR)		
Age		184	31 (25-36)	30 (25-37)	.895 <sup>#</sup>	-
Color/Ethnicity	White	123	72 (69.2)	45 (37.8)	.465	1.27 (0.66-2.44)
	nonwhite	57	31 (56.4)	24 (43.6)		
Schooling	illiterate / incomplete elementary school	12	8 (66.7)	4 (33.3)	.434	-
	complete elementary school	38	21 (61.8)	13 (38.2)	.763	1.25 (0.31-4.95)
	complete high school	89	49 (55.7)	39 (44.3)	.474	1.6 (0.45-5.68)
	bachelor's degree	27	19 (73.1)	7 (26.9)	.686	0.74 (0.17-3.24)
Occupation	housewife	46	31 (70.5)	13 (29.5)	.845	-
	tradeswoman	29	17 (63)	10 (37)	.513	1.4 (0.51-3.87)
	general services assistant	27	15 (57.7)	11 (42.3)	.279	1.75 (0.63-4.81)
	student	15	9 (60)	6 (40)	.456	1.6 (0.47-5.38)
	technician or higher level professional	30	18 (62.1)	11 (37.9)	.456	1.46 (0.54-3.93)
Relationship status	with partner	107	72 (69.2)	32 (30.8)	.006 <sup>**</sup>	2.4 (1.27-4.43)
	without partner	75	37 (51.4)	35 (48.6)		
Number of people at home		173	2 (2-3)	3 (2-3)	.979 <sup>#</sup>	-
Partner's situation	out at work	114	71 (64.0)	40 (36.0)	.642	1.2 (0.6-2.4)
	at home	58	33 (58.9)	23 (41.1)		
Hospitalization before delivery	No	95	59 (64.8)	32 (35.2)	.392	1.4 (0.7-2.5)
	Yes	84	47 (57.3)	35 (42.7)		
Hospital admission as COVID-19	No	104	76 (68.5)	35 (31.5)	.017 <sup>*</sup>	2.3 (1.2-4.2)
	Yes	67	33 (49.3)	34 (50.7)		
Diagnosis of COVID-19	Negative	107	64 (64.6)	35 (35.4)	.268	1.4 (0.75-2.71)
	Positive	77	37 (56.1)	29 (43.9)		
Concerns about delivery		179	10 (8-10)	10 (10-10)	.011 <sup>#,**</sup>	-
Delivery during lockdown	No	17	46 (58.2)	33 (41.8)	.561	0.8 (0.4-1.5)
	Yes	144	63 (63.6)	36 (36.4)		
Something went wrong during delivery	No	131	68 (61.8)	42 (38.2)	.974	
	Yes	42	38 (60.3)	25 (39.7)		
Postpartum Days		184	46 (37-61)	49 (38-61)	.950 <sup>#</sup>	-
Anxiety (HAD > 12)	No	106	86 (83.5)	17 (16.5)	<.001 <sup>***</sup>	12.3 (5.9-25.4)
	Yes	73	21 (29.2)	51 (70.8)		
Missed an appointment for fear of going to the hospital	No	157	96 (63.2)	56 (36.8)	.258	1.9 (0.8-4.7)
	Yes	21	10 (47.6)	11 (52.4)		
Quarrels at home	No	131	86 (67.7)	41 (32.3)	.004 <sup>**</sup>	2.8 (1.4-5.6)
	Yes	48	20 (42.6)	27 (57.4)		

Analysis by the chi-square test and correction by Fisher's exact test when necessary unless indicated

<sup>#</sup> Mann-Whitney test. IQR: interquartile range.

\* <.05,

\*\* <.01,

\*\*\* <.0001

(80.4%), with the Internet in general coming in second (59.8%), and the newspaper in third (33.2%), followed by news sites (28.3%), family members (18.5%), friends (15.2%), and WhatsApp (14.1%).

The pandemic topics the patients were most worried about were the number of deaths (88%), the lack of hospital beds (58.2%), aspects of the economy (22.3%), and political aspects (13.6%). There were a few reports of concerns about the seriousness of the disease and the pandemic’s potential to harm pregnant women and their babies.

When asked about how they isolated themselves, many patients reported partial isolation. They reported an average of  $4.17 \pm 1.95$  external activities during the pandemic: 63% of them stated they went out, when doing so somehow broke the rules of social isolation; 54.9% disclosed they went to the supermarket, while 19% went to visit relatives, 10.3% to shop elsewhere and 6% went to the shopping mall; and 7.1% declared they went out for walks, 4.9% to visit friends, 2.2% to go to parties, and 1.6% to go on a trip.

As many as 46.9% were hospitalized before childbirth, and 37.1% thought something went wrong during hospital admission or during delivery.

Symptoms of postpartum depression (EPDS  $\geq 12$ ) were experienced by 38.8% (69/178) and anxiety symptoms (HAD-A  $\geq 12$ ) by 40.8% (73/179), whereas the number of affirmative answers to item 10 on the EPDS, corresponding to the presence of SI, was 14.3% (26/182).

Table 1 presents the results of the demographics and clinical characteristics in relation to the presence or absence of PPD. The symptoms of postpartum depression displayed by 38.8% of the patients were not associated with the diagnosis of SARS-Cov-2 infection. However, the risk of PPD increased by 2.3 in the presence of hospital admission for SARS-Cov-2 infection (50.7% vs 31.5%, OR=2.3 (1.2-4.20)). Concerns about delivery was also associated with PPD (p=0.02). The presence of anxiety symptoms as measured by HAD-A was also associated with PPD in 70.8% of the patients with anxiety symptoms against 16.5% of asymptomatic patients (OR=12.3). In addition, relationship status without partner (48.6% vs. 30.8%, OR=2.4(1.27-4.43)) and a quarrel with a family member at home raised the PPD risk (57.4% vs. 32.3%, OR=2.8 (1.4-5.6)).

The characteristics of social isolation and the acquisition of information about COVID19 in relation to the presence of PPD are presented

**Table 2**

Characteristics of social isolation and the acquisition of information about COVID19 in relation to the presence or absence of postpartum depression – PPD (EPDS  $\geq 12$ ).

Characteristics	Categories	N	Postpartum Depression (n=178)		P	OR (95% CI)
			No (n=109) N (%), Median (IQR)	Yes (n=69) N (%), Median (IQR)		
Lockdown interview	No	150	88 (60.3)	58 (39.7)	.717	0.8 (0.4-1.8)
	Yes	34	21 (65.6)	11 (34.4)		
Isolation at some point in time	No	17	8 (47.1)	9 (52.9)	.392	0.6 (0.2-1.6)
	Yes	144	85 (61.2)	54 (38.8)		
Total isolation until the interview	No	131	71 (55.5)	57 (44.5)	.044*	0.4 (0.2-0.9)
	Yes	42	30 (75)	10 (25)		
Days after lockdown		184	211 (190-246)	206 (183-227)	.506#	
Isolation days		161	40 (15-150)	15 (10-60)	.020#**	
Number of external activities		184	4 (3-5)	4(3-5)	.692#	
Went out of the home for appropriate reasons	No	6	3 (50)	3 (50)	.678	0.6 (0.1-3.2)
	Yes	178	106 (61.6)	66 (38.4)		
Went out of the home for inappropriate reasons	No	68	38 (56.7)	29 (43.3)	.422	0.7 (0.4-1.4)
	Yes	116	71 (64)	40 (36)		
Information through TV	No	36	16 (47.1)	18 (52.9)	.091	0.5 (0.2-1.0)
	Yes	148	93 (64.6)	51 (35.4)		
Information through the Internet	No	74	44 (62)	27 (38)	.994	1.1 (0.6-2.0)
	Yes	110	65 (60.7)	42 (39.3)		
Information through news sites	No	132	79 (62.2)	48 (37.8)	.804	1.2 (0.6-2.2)
	Yes	52	30 (58.8)	21 (41.2)		
Information through YouTube	No	170	102 (61.4)	64 (38.6)	1.000	1.1 (0.3-3.7)
	Yes	14	7 (58.3)	5 (41.7)		
Information through WhatsApp	No	158	94 (61.8)	58 (38.2)	.854	1.2 (0.5-2.8)
	Yes	26	15 (57.7)	11 (42.3)		
Information through newspapers	No	123	73 (60.3)	48 (39.7)	.844	0.9 (0.5-1.7)
	Yes	61	36 (63.2)	21 (36.8)		
Information through friends	No	156	91 (60.7)	59 (39.3)	.811	0.9 (0.4-2.0)
	Yes	28	18 (64.3)	10 (35.7)		
Information through family members	No	150	85 (58.6)	60 (41.4)	.192	0.5 (0.2-1.2)
	Yes	34	24 (72.7)	9 (27.3)		
Daily hours of information		142	1.8 (1-3)	2 (1-8)	.196#	-
Number of information media		182	2 (1-4)	2 (1-3)	.474#	-
Anxiety about the news		179	8 (6-10)	10 (8-10)	.003#***	-
Concerns about the news		179	9 (8-10)	10 (8-10)	.018#**	-
Concerns about the number of deaths	No	22	15 (68.2)	7 (31.8)	.631	1.4 (0.5-3.7)
	Yes	162	94 (60.3)	62 (39.7)		
Concerns about lack of beds	No	77	51 (68.9)	23 (31.1)	.106	1.8 (0.9-3.3)
	Yes	107	58 (55.8)	46 (44.2)		
Concerns about politics	No	159	92 (59.7)	62 (40.3)	.417	0.6 (0.2-1.7)
	Yes	25	17 (70.8)	7 (29.2)		
Concerns about aspects of the economy	No	143	83 (59.7)	56 (40.3)	.547	0,7 (0.4-1.6)
	Yes	41	26 (66.7)	13 (33.3)		

Analysis by the chi-square test and correction by Fisher’s exact test when necessary unless indicated

# Mann-Whitney test. IQR: interquartile range.

\* <.05,

\*\* <.01,

\*\*\*<.0001

in Table 2. The women with PPD had on average fewer days of isolation (median of 15 vs. 40 days,  $p=0.02$ ). In fact, those who remained in isolation until the time for evaluation had a lower rate of depressive symptoms (25% vs. 44.5%,  $OR=0.40$  (0.2-0.9)). Furthermore, there was an association between being concerned about the news (median of 10 vs. 9,  $p=0.018$ ) and anxiety sourced by the news (median of 10 vs. 8,  $p=0.003$ ) with PPD. No association was observed between the way the information reached the women and PPD, or between concerns about politics, economics, number of deaths and lack of beds with PPD.

There was 14.3% of patients with SI detected by an affirmative answer to item 10 on the EPDS, revealing a more serious and urgent depressive state. To better understand the factors related to such an event, we performed a few additional statistical analyses.

Table 3 shows the results of demographic and clinical characteristics in relation to the presence of suicidal ideation. There was an increased risk for SI in the following variable: the partner's staying at home rather than being out at work (22.8% vs. 9.6%;  $OR = 2.8$  (1.2-6.7)), family quarrels at home (31.9% vs. 7.6%;  $OR = 5.7$  (2.3-13.8)), and anxiety symptoms (31.9% vs. 1.9%;  $OR=24.4$  (5.5-107.7)). Even though isolation was not related to suicidal ideation, the fact of leaving the home

only for appropriate reasons (only events related to prenatal care, such as exams and medical visits) lowered the risk for such a serious depressive event (13.1% vs. 50%;  $OR=0.2$  (0.03-0.8), Table 4). Information sourced from friends increased the risk for suicidal ideation (28.6% vs. 11.7%;  $OR = 3.0$  (1.2-7.9) Table 4) in line with this, there was an association between higher scores in concerns about the news ( $9.3 \times 8.5$ ;  $p = 0.041$ ) and in anxiety caused by the news ( $9.0 \times 8.0$ ;  $p = 0.006$ ) with suicidal ideation. In addition, there was a significant association between the number of daily hours devoted to the search for information (4.5 h vs. 2.0 h;  $p = 0.003$ ) with suicidal ideation (Table 4).

Results from the multivariate analysis (Tables 5 e 6) showed that the predictive factors for PPD ( $EPDS \geq 12$ ) were the presence of anxiety symptoms (seen here as  $HAD > 8$ ;  $aOR = 10.08$  (4.30-23.67)), concerns about lack of hospital beds ( $aOR = 2.45$  (1.02-5.90)) and relationship status without partner ( $aOR = 2.70$  (1.15-6.30)), with Odds Ratio adjusted for several conditions (hospital admission as COVID-19, concerns about delivery, missed appointments for fear of going to the hospital and isolation days). Similarly, the predictive factors for SI were acquisition of information through friends ( $aOR = 5.60$  (1.04-30.1)) and anxiety symptoms ( $HAD > 8$ ;  $aOR = 1.56$  (1.26-1.92)), controlled by the

**Table 3**  
Demographics and clinical characteristics in relation to the presence of suicidal ideation (PSI) based on question 10 of the EPDS.

Variables	Categories	N	Presence of Suicidal Ideation (n=182)		P	OR (95% CI)
			No (n=156) N (%), Median (IQR)	Yes (n=26) N (%), Median (IQR)		
Age		184	31 (26-36)	29 (21-39)	.629 <sup>#</sup>	-
Color/Ethnicity	White	123	106 (86.9)	16 (13.1)	.407	1.44 (0.61-3.41)
	Nonwhite	57	46 (82.1)	10 (17.9)		
Schooling	illiterate / incomplete elementary school	12	12 (100)	0	.062	-
	complete elementary school	38	34 (94.4)	2 (5.6)		
	complete high school	89	71 (79.8)	18 (20.2)		-
	bachelor's degree	27	25 (92.6)	2 (7.4)		
Occupation	Housewife	46	37 (82.2)	8 (17.8)	.257 <sup>#</sup>	-
	tradeswoman	29	24 (82.8)	5 (17.2)		0.96 (0.28-3.30)
	general services assistant	27	25 (96.2)	1 (3.8)		0.18 (0.02-1.57)
	Student	15	12 (80)	3 (20)		1.12 (0.26-5.07)
	technician or higher-level professional	30	28 (93.3)	2 (6.7)		0.33 (0.06-1.68)
Relationship status	with partner	107	95 (88.8)	12 (11.2)	.136	1.88 (0.81-4.34)
	without partner	75	59 (80.8)	14 (19.2)		
Number of people at home		173	2 (2-3)	2 (2-3)	.638 <sup>#</sup>	-
Partner's situation	out at work	114	103 (90.4)	11 (9.6)	.036 <sup>*</sup>	2.8 (1.2-6.7)
	at home	58	44 (77.2)	13 (22.8)		
Hospitalization before delivery	No	95	81 (86.2)	13 (13.8)	1.000	
	Yes	84	71 (85.5)	12 (14.5)		1.1 (0.5-2.5)
Hospital admission as COVID-19	No	104	99 (86.8)	15 (13.2)	.731	1.3 (0.5-3.0)
	Yes	67	57 (83.8)	11 (16.2)		
Diagnosis of COVID-19	Negative	107	88 (86.3)	14 (13.7)	.461	1.4 (0.9-3.2)
	Positive	77	55 (82.1)	12 (17.9)		
Concerns about delivery		179	10 (8.5-10)	10 (9-10)	.618 <sup>#</sup>	-
Delivery during lockdown	No	17	70 (86.4)	11 (13.6)	.976	1.1 (0.5-2.6)
	Yes	144	86 (85.1)	15 (14.9)		
Something went wrong during delivery	No	131	94 (84.7)	17 (15.3)	.714	0.8 (0.3-1.9)
	Yes	42	58 (87.9)	8 (12.1)		
Postpartum Days		184	46 (38-61)	49 (34-51)	.609 <sup>#</sup>	-
Anxiety (HAD > 12)	No	106	104 (98.1)	2 (1.9)	<.001 <sup>***</sup>	24.4 (5.5-107.7)
	Yes	73	49 (68.1)	23 (31.9)		
Missed an appointment for fear of going to the hospital	No	157	135 (86.5)	21 (13.5)	1.000	1.1 (0.3-4.0)
	Yes	21	18 (85.7)	3 (14.3)		
Quarrels at home	No	131	121 (92.4)	10 (7.6)	<.0001 <sup>***</sup>	5.7 (2.3-13.8)
	Yes	48	32 (68.1)	15 (31.9)		

Analysis by the chi-square test and correction by Fisher's exact test when necessary unless indicated

<sup>#</sup> Mann-Whitney test. IQR: interquartile range.

\* <.05,

\*\* <.01,

\*\*\* <.0001

**Table 4**

Characteristics of social isolation and the acquisition of information about COVID19 in relation to the presence of suicidal ideation (PSI) based on question 10 of the EPDS.

Variables	Categories	N	Presence of Suicidal Ideation (n=182)		p	OR (95% CI)
			No (n=156) N (%), Median (range)	Yes (n=26) N (%), Median (range)		
Lockdown interview	No	150	126 (85.1)	22 (14.9)	.846	0.8 (0.2-2.4)
	Yes	34	30 (88.2)	4 (11.8)		
Isolation at some point in time	No	17	13 (76.5)	4 (23.5)	.394	0.5 (0.1-1.6)
	Yes	144	124 (87.3)	18 (12.7)		
Total isolation until the interview	No	131	111 (85.4)	19 (14.6)	.896	0.8 (0.3-2.3)
	Yes	42	36 (87.8)	5 (12.2)		
Days after lockdown		184	211 (183-240)	204 (183-212)	.358 <sup>#</sup>	-
Isolation days		161	30 (14-120)	30 (15-120)	.806 <sup>#</sup>	-
Number of external activities		184	4 (3-5)	4 (3-5)	.856 <sup>#</sup>	-
Went out of the home for appropriate reasons	No	6	3 (50)	3 (50)	.039 <sup>*</sup>	0.2 (0.03-0.8)
	Yes	178	153 (86.9)	23 (13.1)		
Went out of the home for inappropriate reasons	No	68	55 (82.1)	12 (17.9)	.397	0.6 (0.3-1.5)
	Yes	116	101 (87.8)	14 (12.2)		
Information through TV	No	36	31 (86.1)	5 (13.9)	1.000	1.0 (0.4-3.0)
	Yes	148	125 (85.6)	21 (14.4)		
Information through the Internet	No	74	64 (88.9)	8 (11.1)	.439	1.6 (0.6-3.8)
	Yes	110	92 (83.6)	18 (16.4)		
Information through news sites	No	132	115 (88.5)	15 (11.5)	.150	2.1 (0.9-4.8)
	Yes	52	41 (78.8)	11 (21.2)		
Information through YouTube	No	170	145 (86.3)	23 (13.7)	.427	1.7 (0.4-6.6)
	Yes	14	11 (78.6)	3 (21.4)		
Information through WhatsApp	No	158	136 (87.2)	20 (12.8)	.221	2.0 (0.7-5.7)
	Yes	26	20 (76.9)	6 (23.1)		
Information through newspapers	No	123	107 (7)	16 (13.0)	.628	1.4 (0.6-3.2)
	Yes	61	49 (83.1)	10 (16.9)		
Information through friends	No	156	136 (88.3)	18 (11.7)	.035 <sup>*</sup>	3.0 (1.2-7.9)
	Yes	28	20 (71.4)	8 (28.6)		
Information through family members	No	150	128 (86.5)	20 (13.5)	.587	1.4 (0.5-3.7)
	Yes	34	28 (82.4)	6 (17.6)		
Daily hours of information		142	2 (1-3)	4.5 (2-12)	.003 <sup>#***</sup>	-
Number of information media		182	2 (1-3)	3 (2-4)	.226 <sup>#</sup>	-
Anxiety about the news		179	8 (6-10)	10 (9-10)	.006 <sup>#**</sup>	-
Concerns about the news		179	10 (8-10)	10 (9-10)	.041 <sup>#**</sup>	-
Concerns about the number of deaths	No	22	19 (86.4)	3 (13.6)	1.000	1.1 (0.3-3.9)
	Yes	162	137 (85.6)	23 (14.4)		
Concerns about the lack of beds	No	77	66 (86.8)	10 (13.2)	.878	1.2 (0.5-2.7)
	Yes	107	90 (84.9)	16 (15.1)		
Concerns about politics	No	159	134 (85.4)	23 (14.6)	1.000	0.8 (0.2-2.9)
	Yes	25	22 (88)	3 (12.0)		
Concerns about aspects of the economy	No	143	120 (85.1)	21 (14.9)	.856	0.8 (0.3-2.3)
	Yes	41	36 (87.8)	5 (12.2)		

Analysis by the chi-square test and correction by Fisher’s exact test when necessary unless indicated

<sup>#</sup> Mann-Whitney test. IQR: interquartile range.

<sup>\*</sup> <.05,

<sup>\*\*</sup> <.01,

<sup>\*\*\*</sup><.0001

**Table 5**

Multivariate analysis for postpartum depression - PPD (EPDS ≥ 12). Stepwise analysis.

Variable	non-adjusted OR (95%CI)	adjusted OR* (95%CI)	p
Anxiety symptoms (HAD > 8)	12.3 (5.9-25.4)	10.08 (4.29-23.68)	<.001
Concerns about lack of beds	1.8 (0.9-3.3)	2.45 (1.02-5.90)	.046
Relationship status (without partner)	2.4 (1.27-4.43)	2.69 (1.15-6.29)	.022

<sup>\*</sup> Multivariate analysis controlled by the following: situation at hospital admission (symptoms of COVID-19 or not), concerns about delivery, missed appointments for fear of going to the hospital, isolation days. Adequacy of the model by the Hosmer and Lemeshow test (p= 0.974).

**Table 6**

Multivariate analysis for presence of suicidal ideation (SI), Backward (Wald).

	non-adjusted OR (95%CI)	adjusted OR* (95%CI)	p
Information through friends	3.0 (1.2-7.9)	5.60 (1.04-30.1)	.044
Anxiety symptoms (HAD-A > 8)	1.52 (1.31 - 1.77)	1.56 (1.26-1.92)	<.001

<sup>\*</sup> Multivariate analysis controlled by Partner at home. Adequacy of the model by the Hosmer and Lemeshow test (p= 0.885).

variable partner at home, without going out to work.

**4. DISCUSSION**

First of all, we want to highlight that the demographic profile of our sample is very similar to that found at the Hospital das Clínicas in recent years. The present sample had only a slightly older mean age, as well as a

lower proportion of white women. Something that fits the demographic change in Brazil in recent years, with a tendency for the age of pregnant women to increase, for postponing the maternity plan after achieving greater professional stability, and also because there is a decrease in teenage pregnancy rates, due to improved conditions socio-economic aspects of the country in the last two decades. The number of people who self-report themselves as black or mixed race has increased in recent years, not only due to greater miscegenation but also to a feeling of greater ethnic identification.

The findings of the present study, conducted during a COVID19 pandemic period, showed a high rate of postpartum depression symptoms, anxiety symptoms and suicidal ideation. In addition, the chances of postpartum depression were increased by 10-, 2.5- and 2.7-fold in the presence of anxiety symptoms, concerns about lack of bed, and relationship status without partner, respectively. Moreover, COVID-19 information obtained through friends and anxiety symptoms increased the chances of suicidal ideation by 5.6- and 1.6-fold, respectively. Therefore demographics, clinical and acquisition of information characteristics influenced the rates of PPD and SI.

#### 4.1. Prevalence of Postpartum Depression

The 38.8% rate of depression-compatible symptoms seemed high to us when compared with the usual Brazilian rates. A systematic review by Silva (2013), suggested that variations in the prevalence of postpartum depression were associated with the country's human development index (HDI), the tool which was used, the study design, and the sample size. Thus, prevalence would be higher in countries with lower HDI and in studies with smaller sample size, with self-evaluation tools rather than a clinical interview, and with a cross-sectional design instead of a longitudinal design. Therefore, comparisons were made with the rates found in Brazilian studies whose participants were of similar socioeconomic and cultural status.

Lobato et al. (2011) in a study involving the Brazilian population found a rate of PPD around 20%. Previous study at our clinic the ongoing rate was 15.9% (Faisal-Cury et al., 2004); however, the methodology which was used, the Beck Depression Inventory, was somewhat different. In the present study, our rate has more than doubled the previous rate. A significant increase, most likely related to the pandemic.

#### 4.2. Prevalence of Suicidal Ideation

Based on the positive answers to item 10 on the EPDS, we found a postpartum suicidal ideation rate of 14.3%. We found 4 studies, involving Brazilian population, which reported the same event-related findings during the postpartum period. Two had rates between 4% and 5% (Tabb et al., 2018; Biscegli et al., 2017), and the other two had an incidence rate around 20% (Cardillo et al., 2016; Santos et al., 2017). Another author found the rate of 11.5% in postpartum women in southern Brazil (Tavares et al., 2012). In our own service, there was also a description of 5% of suicidal ideation before the pandemic, but these were data from pregnant and not puerperal women (Benute et al., 2011). Thus, these data seem to indicate an increase in the rate of suicidal ideation in Brazil with the pandemic. In the international literature, a considerable variation in rate numbers can also be found. In a recent systematic review by Halim et al. (2018), specifically evaluating depression related to domestic violence, noted suicidal ideation rates between 2% and 22% during postpartum.

#### 4.3. Postpartum Depression in the Pandemic

Even during this pandemic, there are still few studies of postpartum depression being conducted, and ours appears to be the first among Latin-American countries. Ostacoli et al. (2020) in a study in northern Italy reported a 44.2% rate of depressive symptoms (EPDS  $\geq$  11).

Incidentally, their rate was very similar to ours, a 45.5% rate, considering the same cutoff. Yet, even though they were high rates, no comparisons were made with periods before the pandemic. On the other hand, Zanardo et al. (2020) studied two cohorts of puerperae (N=192) from northeastern Italy, comparing the 2019 data with the 2020 data, and found a considerable increase in the rates of depressive symptoms on the second postpartum day (EPDS  $\geq$  12): 11.9% before the pandemic and 28.5% during the pandemic. Given that these are data obtained on a day close to delivery, they may represent the blues, not an actual puerperal depression. However, Silverman et al. (2020) analyzed 516 puerperal women from New York City, and they detected a drop in the rates of postpartum depression (EPDS  $\geq$  12) during the lockdown that took place between March and June 2020 in relation to the prelockdown period between January and March. The rates fell from 7.2% to 5.7%. An important bias of the study is that winter is severe between January and March, but the weather conditions are much better between March and June, which fact may have interfered in the depressive mood (Melrose, 2015; Parrish, 2018; Øverland et al., 2020). More recently, a research group from Granada, Spain, has challenged the American data. By comparing 82 women who gave birth before the pandemic (September 2019-March 2020) with 75 women who gave birth during the pandemic (April 2020-July 2020), the Spaniards found a 15% increase in the rates of depressive symptoms (EPDS  $>$  10), from 22.4% to 37.3%. However, the authors did not disclose when during postpartum the symptoms were investigated (Mariño-Narvaez et al., 2021).

#### 4.4. Social Isolation

Almost 12% of our patients missed a prenatal visit for self-reported fear of coming to the clinic, which, during the pandemic, may be regarded as a differentiated response. These women scored higher on HAD due to their anxiety and subjective symptoms and actually reported greater anxiety because of the news and engagement in a smaller number of activities outside of the home.

Many of the study participants did not isolate themselves as completely as required by the official restrictive guidelines, likely for financial reasons since most of their partners (62%) had to go out to work at some time during the pandemic. Notwithstanding the recent data revealing that Brazilians were more efficient at social distancing than the Swiss (Puccinelli et al., 2021), with most Brazilians (58%) leaving their homes only for essential activities, in our clinic most of the study patients (63%) went out of their homes at least once for reasons deemed inappropriate by the social isolation standards. For example: they went shopping at the mall, they went to parties, and they visited friends and relatives. On the other hand, the fact that they were isolated at home at some point did not correlate with depressive symptoms, possibly because most did not isolate themselves for long nor completely. Those, however, who did isolate themselves up to the time of the interview had lower depression rates. This, however, may be a cause rather than a consequence.

In the aforementioned study (Puccinelli et al., 2021), a significant association was found between depression and isolation level. However, the authors themselves raised the hypothesis that the socioeconomic factors entailed by the isolation in a country with high unemployment rates and low per capita income may be more relevant than the isolation level itself.

#### 4.5. Family environment

Over a fourth of the patients (26.8%) reported family quarrels. The correlation between increased family quarrels and postpartum depression did not surprise us, given that the relationship between domestic violence and depression is well known (Halim et al., 2018). On the other hand, the partner's absence was also associated with postpartum depression, a fact pointing to the importance of the loss not only of financial support but also of emotional support, for a good marital bond



is a protective factor (Beck, 2001; Akincigil et al., 2010; Malus et al., 2016), perhaps an even more relevant one during the pandemic.

Despite of the non-association of patients' economic concerns with PPD and SI, we cannot disregard the economic situation underline our data. Although the partner's absence at home was associated with PPD, his presence also increased the risk for PPD. What may explain the two seemingly contradictory facts is the family's aggravated financial situation. Being without a partner would entail a lower family income, and having the partner at home could mean a job loss and the attendant worsening of the financial situation. It makes sense. According to the data from IBGE, the Brazilian Institute of Geography and Statistics, the unemployment rates in Brazil reached a historic peak in the third trimester of 2020, involving 14.6% of the population, or rather, 14.1 million people (Instituto Brasileiro de Geografia e Estatística (IBGE), 2021).

#### 4.6. Concerns about the news

The news about the pandemic also interfered in the participants' mental health, as it raised their levels of concern and anxiety. The number of hours spent searching for information was higher among the women with PPD than with the other women (5.6 vs. 3.7 daily hours), and the difference was significant relative to the women with SI (4.5 vs. 2 daily hours). This agrees with the findings of Huang and Zhao (2020) who observed that nearly half of the sample (43.6%) spent over 3 hours per day searching for information about COVID-19 and that such an intense search for news almost doubled the risk for anxiety disorders (OR=1.91).

The news contents that captured the attention of most patients causing them a great deal of concern were the number of deaths (88%) and the lack of hospital beds (58%). What is also worth noting is the association between the concern about the lack of hospital beds and depressive symptoms as evidenced by multivariate analysis (OR=2.5).

The way information reached the patient also interfered. In the cases of PPD, there was a tendency toward protecting oneself when the source of news was a family member or the television. Interference increased with the participation of the social media. In the cases of SI, a threefold increase in risk was found when the information source was the friends (28% vs. 12%; OR=3.0). This is supported by a Chinese study (Li et al., 2020), which reported a significant increase in concerns about health, family, death, and religion, but a decline in concerns about friends and leisure during the pandemic. People start taking better care of their health and seeking social support from their families rather than their friends. Hence, it makes sense that information sourced from friends would be associated with a higher risk of suicidal ideation and that the information provided by family members would protect.

The friends, moreover, might propagate the news in exaggerated and careless fashion, thus heightening the anguish of a population with no access to more reliable sources, such as newspapers (accessible only to 33%) and news sites (accessible only to 28%). It seems to us that there is a relationship between these findings and *Infodemic* (Cinelli et al., 2020; Rathore and Farooq, 2020) with its inappropriate spread through countless social communication media, many of which are not backed up by a professional and ethical conduct. This aspect of fake news is a particularly sensitive issue in Brazil. An international study of the monitoring of accuracy in news about the COVID-19 pandemic (Islam et al., 2020) detected some type of fake news in 82% of the content of diverse online platforms worldwide, and the study put Brazil in sixth place in this type of false propagation. Brazil is the Portuguese-speaking country with the most fake news in the world and it comes in second among the Latin languages.

On the other hand, the facts themselves are a matter of serious concern. A recent report from the Lowy Institute in Australia, upon evaluating 98 countries, ranked Brazil as the country with the worst government management of the pandemic in the world (Lowy Institute, 2021). At the end of February, when we wrote this article, the number of

cases in Brazil had already exceeded 10 million and there were 250 thousand deaths, of which 58 thousand only in the state of São Paulo. In May 2020 the Ministry of Health stopped divulging the official number of deaths, and a consortium of media outlets took on the responsibility to disclose the number of deaths and pertinent data. This explains the participants' concerns about the number of deaths (88%) and the lack of hospital beds (58%), which is understandable, for they would all need a bed at delivery. Therefore, it is not surprising that the preoccupation with the number of hospital beds was associated with SI.

The relatively recent concept of *cyberchondria* (Starcevic & Berle, 2013; Vismara et al., 2020), which refers to a behavior characterized by an excessive online search for medical information and associated with rising anxiety levels, may be of help to us. This condition has certainly been exacerbated during the pandemic, even more so by the spread of ambiguous information. A study conducted in Croatia (Jovic-Begic et al., 2020) revealed that high cyberchondria levels and high levels of preoccupation with COVID-19 were associated with intense avoidance behavior, as was evidenced in our research work by the patients' missing medical visits due to the fear of leaving the home. Such a concept would also explain the reason SI and PPD were associated in our study with a greater number of daily hours spent seeking information.

#### 4.7. Strengths and Limitations

The strengths of the present study are: present novel data from Latin America with contribution to the few studies that investigated PPD; to the best of our knowledge is the first to investigate SI and the effect of the acquisition of information on mental health in puerperal women during pandemic period. The main limitation was not had performed the same investigation before the COVID19 pandemic to compare the rates of PPD and SI. Hence, a comparison of before the pandemic and during the pandemic was made through inferences using the Brazilian studies. Furthermore, there are the rapidly changing epidemiological conditions of this pandemic, with a new incidence curve a few months after the first. Thus, this study is and can only be the photograph of an instant, which may change over time, depending on the conditions of the epidemic.

### 5. CONCLUSION

In conclusion, we may say that in Brazil there was a considerable increase in the prevalence of depressive symptoms compatible with postpartum depression and its more serious expression, suicidal ideation, among the study women. This phenomenon was not related to the diagnosis of COVID-19 but rather with a diagnostic hypothesis of COVID-19 at hospital admission. Postpartum depression was independently associated with the anxiety levels and with concerns about the lack of hospital beds and an absent partner at home. In suicidal ideation, the association with anxiety continued and a correlation emerged with the acquisition of information about the pandemic through friends and the partner's presence at home. A multiple pathological model is discernible, in which the way information reaches the patient, as an avalanche of news with many discordant items, may prompt the patient to engage in a search for reliable information, thus increasing her anxiety. In addition, actual worries about economic aspects, namely rising unemployment and the country's deteriorating economy as a result of the pandemic, lead to growing anxiety and, in turn, to postpartum depression.

The Brazilian conditions for facing the COVID-19 pandemic are unique, and they underlie the series of medical, political, and economic blunders which have been made. Our study results may not be completely generalizable to the public health reality of other countries, but our findings certainly have shed some light and are a serious warning about the potential psycho-emotional impact on more vulnerable populations. In this sense, not only infected people are at risk, but also all those with a previous profile of greater vulnerability. Finally, we

would like to draw attention to the threat infodemic and cyberchondria pose to the mental health of our patients during postpartum and to the need for a progressive tightening of the control over the reliability and the intensity of the news.

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### CRediT authorship contribution statement

**Marco Aurélio Knippel Galletta:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Ana Maria da Silva Sousa Oliveira:** Data curation. **Jéssica Gorrão Lopes Albertini:** Data curation, Resources, Writing – review & editing. **Gláucia Guerra Benute:** Resources, Writing – review & editing. **Stela Verzinhasse Peres:** Formal analysis, Writing – review & editing. **Maria de Lourdes Brizot:** Writing – review & editing, Project administration. **Rossana Pulcineli Vieira Francisco:** Project administration.

### Conflict of interest

The authors disclose that they have no conflicts of interest to declare.

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### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.jad.2021.09.091](https://doi.org/10.1016/j.jad.2021.09.091).

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