ORIGINAL ARTICLE

PERCEIVED STRESS AND CHANGES IN LIFESTYLE HABITS IN BRAZILIAN MOTHERS DURING THE COVID-19 PANDEMIC

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Highlight: (1) The COVID-19 pandemic increased perceived stress in Brazilian mothers to high levels. (2) Higher stress was associated with emotional eating and poorer sleep quality. (3) Findings highlight the urgency of actions to improve healthy habits post-pandemic.

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PERCEIVED STRESS AND CHANGES IN LIFESTYLE HABITS IN BRAZILIAN MOTHERS DURING THE COVID-19 PANDEMIC

ABSTRACT

The COVID-19 pandemic caused changes in the population's lifestyle and contributed to increased exposure to stress, especially among mothers. However, there are few studies that have investigated the impact of the pandemic on stress, eating behavior, and lifestyle of this population. The present study aimed to analyze the relationships between perceived stress levels, eating behaviors, and health-related lifestyle of Brazilian mothers during the COVID-19 pandemic. To this end, an online questionnaire was used, consisting of sociodemographic data, the Perceived Stress Scale (PSS-10), the Three-Factor Eating Questionnaire (TFEQ-R21), and changes in lifestyle habits during the COVID-19 pandemic. Participants' perceived stress had a median of 24.0 (IQR: 19.00-29.00), with moderate and high levels in 92.8% (n=167) of participants. Higher levels of stress were positively related to Emotional Eating behaviors (r=0.379; p<0.001) and Loss of Control Eating (r=0.350; p<0.001). Moreover, higher stress levels were also associated with physical inactivity, poorer sleep quality, and increased consumption of alcohol, cookies, and sweets. It is concluded that the high level of stress perceived by Brazilian mothers during the COVID-19 pandemic is associated with dysfunctional aspects of eating behavior and negative changes in maternal lifestyle habits.

Keywords: Psychological stress; Lifestyle; Pandemics; Eating behavior.

INTRODUCTION

The World Health Organization declared a pandemic in March 2020 due to the increase in the number of cases and deaths from the SARS-CoV-2 virus worldwide. At that time, the practice of social distancing was recommended (1). Such measures helped in the prevention and control of the virus, but also resulted in changes in lifestyle and the health of the population (2–4). In this scenario, people were exposed to various pandemic-related stressors, such as loneliness, fear, caregiver overload, financial difficulties, food insecurity, and uncertainty about the future, leading to increased stress, anxiety, and depression, feelings that affect lifestyle behaviors (5,6).

This led to changes in people's routines with health consequences associated with psychological discomfort, sedentary behavior, inadequate sleep, and difficulties in maintaining a healthy lifestyle, including poor dietary choices, increased smoking frequency among

smokers, changes in alcohol consumption, and weight gain in response to inadequate levels of stress, deprivation, and poor sleep quality, and the intake of more caloric foods (2,5,6).

High levels of stress were evidenced among mothers during the pandemic. It is known that women are more prone to developing unbalanced eating patterns and mental health disorders, and mothers, in particular, are subject to greater nutritional and mental health risks during the pandemic, as they are generally the primary caregivers of their children and may suffer from increased domestic responsibilities, remote work, challenges in caring for children, and concerns about their children (3,5).

Few studies have investigated the impact of the pandemic on stress, eating behavior, and lifestyle of women of reproductive age and/or mothers, especially among Brazilian women (3,5). Thus, the present study aims to analyze the relationships between perceived stress levels, dietary behaviors, and health-related lifestyle of Brazilian mothers during the COVID-19 pandemic.

METHODS

Study design and ethical aspects

This is a descriptive study with a quantitative approach, conducted in the last quarter of 2020, with a sample of 180 Brazilian mothers aged between 18 and 44 years. The non-probabilistic sampling method by chain referral (snowball) was used, in which an online questionnaire integrated into the Google Forms platform was applied, disseminated on social media, and in a pediatric clinic through a Quick Response Code (QR Code).

The questionnaire was developed, including validated tools and questions about sociodemographic characteristics and changes in lifestyle habits (sleep, physical activity, alcohol and cigarette consumption, and screen time), anthropometric data, changes in dietary intake, stress, and eating behavior during the period of social distancing. This study was approved by the Ethics Committee for Research with Human Beings of the Federal University of Lavras (opinion: 4.286.030), and the consent of the participants was recorded through a specific field in the online forms.

Socioeconomic analysis and lifestyle habits

The sociodemographic characteristics were observed according to the Economic Classification Criteria of Brazil, from the Brazilian Association of Research Companies (ABEP) (7). The practice of social distancing was measured according to the participants' self-reported adherence to the recommendations, responding with yes, partially, or no, and the duration in months of these practices. Self-reported weight and height were also used to calculate the Body Mass Index (BMI) and classification following WHO recommendations (8).

The duration of sleep was calculated based on the reported bedtime and wake-up time, referring to the periods before and during the pandemic, and whether there was a change in sleep quality during the social distancing period, thru the responses "improved," "worsened," or "did not change," analyzing the time according to the recommendation for adults of 7-9 hours/night (9).

In addition, data were collected through a self-administered questionnaire regarding alcohol and cigaret consumption, physical activity, work time, and screen time. The latter was assessed thru the question "Time spent per day in front of devices such as cell phones, computers, tablets, and TVs" - indicating whether these practices increased, decreased, remained unchanged, or were not practiced. The screen time evaluated did not distinguish between work and leisure time. The work time was assessed based on the participants' reports according to their daily working hours.

Food intake was analyzed retrospectively, meaning the participants indicated which meals they had during the day, before and during the pandemic, and whether there was a change in the amount consumed according to the options: increased, decreased, did not change/ do not consume. The questions were structured by the researchers based on other previously conducted studies (10,11), consisting of 11 groups of foods considered markers of adequate/unhealthy dietary quality: beans/legumes; cereals; dairy products; fruits; meats; greens and vegetables; hamburgers and/or sausages, ham, mortadella (processed meats); sugary drinks; instant noodles and/or packs of savory "snacks"; filled cookies, chocolates and sweets, and pizza, sandwiches, and fast food. In the end, they answered questions about changes in the quantity of food consumed, the habit of "snacking" between meals, the frequency of consuming food via delivery, and preparing meals at home, indicating whether it increased, decreased, or remained unchanged.

Analysis of stress and eating behavior

Stress was assessed using the Perceived Stress Scale (PSS-10), developed by Cohen, Karmack, and Mermelstein (12), adapted and validated in Portuguese by Luft et al. (13). This questionnaire includes 10 questions that are answered on a Likert scale, from 1-never to 5-very frequently, reporting changes that occurred within the last month. The sum of all items provides a total score from 0 to 40. The stress level can be classified according to the total score as low (0 to 13), moderate (14 to 26), and high (27 to 40) (2,12,13). Eating behavior was measured using the Three-Factor Eating Questionnaire (TFEQ-R21), adapted and validated for Brazilian women by Natacci and Ferreira Júnior, with the structure confirmed in a Brazilian sample by De Medeiros et al (14,15). The TFEQ-R21 consists of 21 items, with items 1-20 structured with 4 response options and item 21 being an 8-point numerical scale, with items 1-20 scored from 1 to 4. The questionnaire assesses behavior in three dimensions: Cognitive Restraint (CR), Eating Disinhibition (ED), and Emotional Eating (EE). These are calculated according to the score of the responses and transformed into scales of 0 to 100 points, where higher scores indicate a more disordered/dysfunctional eating behavior (14,15).

Data analysis

The normality of the data was verified using the Kolmogorov-Smirnov test. The numerical variables are presented in median and IQR - interquartile range (1st and 3rd quartile), and categorical variables are presented in terms of frequency and percentage. Correlation analyses were conducted using the Spearman Coefficient, and associations were tested using Fisher's Exact Test, as well as post-hoc analysis to confirm the dependency/significance relationship of the associations via adjusted residual values. All data were analyzed using IBM® SPSS Statistics® version 21 software, adopting a significance level of 5%.

RESULTS

This research is part of a cross-sectional study aimed at evaluating maternal and child eating behavior during the COVID-19 pandemic. In the present sample, 180 mothers with an average age of 35.0 (IQR: 33.0-38.0) years were included. The majority (86.8%) resided in the southeastern part of the country and belonged to class B. According to the estimated BMI, the majority (59.4%, n=107) of the mothers were eutrophic and the minority 3.3% (n=6) were underweight, with an average value of 24.02 kg/m² (IQR: 21.7-26.9). Regarding social distancing, the majority reported practicing it partially (52.2%) or completely (42.2%), and only 5.6% said they do not adhere to it, with an average duration of 7 (IQR: 6.0-7.0) months. The perception of stress showed a score above the average value, considering its range from 0 to 40. The medians of the subscales of eating behavior CR, ED, and EE suggest higher scores for restriction and emotional eating, and a lower score for loss of control, according to the total variation from 0 to 100 (TABLE 1).

Table 1. Characterization, isolation profile, and nutritional status of mothers during the COVID-19 pandemic.

Variables	Median (Interquartile Range) % (n)
Age (years)	35,0 (IIQ: 33,0-38,0)
Regions	
Midwest	3,7 (5)
Northeast	4,4 (6)
North	0,7 (1)
Southeast	86,8 (118)
South	4,4 (6)
Social isolation (Months)	7,0 (IIQ: 6,0-7,0)
Complete	42,2 (76)
Partial	52,2 (94)
Not isolation	5,6 (10)
Socioeconomic situation	38,0 (IIQ: 33,0-44,0)
Class A	22,8 (41)
Class B1	31,1 (56)
Class B2	33,9 (61)
Class C1	8,9 (16)
Class C2	3,3 (06)
Anthropometric Data	
BMI (kg/m²)	24,02 (IIQ: 21,7-26,9)
Underweight	3,3 (06)
Eutrophy	59,4 (107)
Overweight	26,1 (47)
Obesity	11,1 (20)

The perception of stress showed a median of 24.0 (IQR: 19.00-29.00), indicating a score above the average value, considering its range from 0 to 40. The subscales of eating behavior, CR, ED, and EE presented medians of 50.0 (IQR: 27.78-61.11), 37.0 (IQR: 22.22-51.85), and 47.2 (IQR: 16.67-66.67), respectively. Suggesting higher scores for restriction and emotional eating, and reduced disinhibition, according to the total variation from 0 to 100, and the presented medians. Perceived stress correlated positively, in a moderate manner, with the parameters of EE ($r=0.379$; $p<0.001$) and ED ($r=0.350$; $p<0.001$) eating behaviors, indicating that the higher the level of stress, the greater the observed emotional eating and loss of control

behaviors. The other continuous variables analyzed did not show significant correlations with stress (TABLE 2).

Table 2. Spearman correlation coefficients (r) between stress and other continuous variables.

Variables	R	p-value
Age (years)	-0,086	0,253
Socioeconomic score	-0,060	0,422
Months of isolation	0,136	0,187
BMI	0,034	0,649
Hours of sleep	-0,119	0,110
Number of meals/day	-0,098	0,199
TFEQ-ED	0,350	<0,001***
TFEQ-CR	-0,144	0,126
TFEQ-EE	0,379	<0,001***

Note:***p<0,001. Three-Factor Eating Questionnaire (TFEQ-R21) domains: Cognitive Restraint (CR), Eating Disinhibition (ED), and Emotional Eating (EE).

Regarding stress levels, moderate and high levels were observed, reaching 92.8% (n=167) of the participants. Regarding lifestyle parameters, there was an increase in screen time (74.4%; n=134) and work time (46.9%; n=84). The consumption of alcoholic beverages and cigarettes did not indicate significant changes in the frequency of occurrence (TABLE 3). Physical activity showed the greatest tendency for change (62.77%; n=113) with a reduction of 45.6% and an increase of 17.2%, as well as a worsening of sleep quality (51.1%; n=92). The average number of hours of sleep and the number of meals before and during the pandemic did not show significant differences (p=0.204 and p=0.535). The majority adhered to the recommendation for adults to sleep between 7 and 9 hours/day (TABLE 3). Regarding dietary changes, the majority of participants reported an increase in the variables of food quantity, snacking habits, use of delivery services, and cooking practices. The analysis of consumption by food groups showed a predominant report of no change among the participants. Also showing percentages of growth in the consumption of groups of foods considered healthy

(in natura and minimally processed) such as fruits (31.7%; n=57), milk (26.1%; n=47), and vegetables (25.6%; n=46). As well as significant percentages of participants who reported an increase in the consumption of inadequate markers (ultra-processed foods) such as fast food (47.2%; n=85), processed meats (35.0%; n=63), filled cookies and sweets (33.3%; n=60), and sugary beverages (28.9%; n=52), as shown in Table 3.

Table 3. Levels of stress, changes in lifestyle habits, and dietary intake of mothers during the COVID-19 pandemic period**.**

Variables	**% (n=180)**		
Stress level	**Low**	**Moderate**	**High**
	7,2	55,6	37,2
Lifestyle changes:	**Increased**	**Decreased**	**No change/ not practiced**
Screen time	74,4	3,3	22,2
Work time	46,9	28,5	24,6
Alcohol consumption	20,2	11,2	68,5
Cigaret consumption	1,7	0,6	97,7
Physical activity	17,2	45,6	37,2
Sleep time	27,8	35,0	37,2
Amount of food	65,6	11,1	23,3
Habit of snacking	57,2	9,4	33,3
Use/consumption of "Delivery"	61,7	13,9	24,4
Habit of cooking at home	66,7	7,8	25,6
Number of meals/day	21,8	19,5	58,6
Legumes	14,4	07,2	78,3
Cereals	16,7	03,9	79,4
Milk and dairy products	26,1	03,3	70,6
Fruits	31,7	10,6	57,8
Meats	21,1	07,8	71,1
Vegetables/legumes	25,6	10,0	64,4

Processed meats	35,0	08,9	56,1
Sugary drinks	28,9	11,7	59,4
Instant noodles/savory snacks	19,4	10,0	70,6
Stuffed cookies/sweets	33,3	08,3	58,3
Pizza/“fast food”	47,2	07,8	45,0
Change in sleep hours	**<7h**	**7-9h**	**>9h**
Hours of sleep before	12,8	73,3	13,9
Hours of sleep during	14,4	70,6	15,0
Quality of sleep	**Improved**	**Worsened**	**Did not change**
	7,8	51,1	41,1

Analyzing the relationships between stress and lifestyle variables, higher stress levels showed significant associations with the group of mothers who reported a decline in sleep quality (p=0.002) and a decrease in physical activity (p=0.050), as well as increased consumption of alcoholic beverages (p=0.022) and cookies/sweets (p=0.042). On the other hand, lower stress levels were associated with reduced screen time (p=0.027). No significant associations were observed between stress and the other categorical variables studied (TABLE 4).

Table 4. Associations between stress levels and changes in maternal lifestyle during the COVID-19 pandemic period.

Variables % (n)	Stress Levels			X^2 | p-value*
	Low	Moderate	High	
Screen time				10,07 | 0,027
Increased	69,2 (9)	76,0 (76)	73,1 (49)	
Decreased	23,1 (3)	2,0 (2)	1,5 (1)	
Did not change/ does not practice	7,7 (1)	22,0 (22)	25,4 (17)	
Physical activity				9,12 | 0,050
Increased	23,1 (3)	22,0 (22)	9,0 (6)	
Decreased	30,8 (4)	39,0 (39)	58,2 (39)	
Did not change/ not practiced	46,2 (6)	39,0 (39)	32,8 (22)	
Quality of sleep				16,22 | **0,002**
Worsened	30,8 (4)	41,0 (41)	70,1 (47)	
Improved	7,7 (1)	10,0 (10)	4,5 (3)	
Did not change	61,5 (8)	49,0 (49)	25,4 (17)	
Alcoholic beverage				10,66 | **0,022**
Increased	8,3 (1)	13,1 (13)	32,8 (22)	
Decreased	8,3 (1)	14,1 (14)	7,5 (5)	
Did not change/ does not consume	83,3 (10)	72,7 (72)	59,7 (40)	
Consumption of cookies/sweets				9,41 | 0,042
Increased	15,4 (2)	27 (27)	46,3 (31)	
Decreased	7,7 (1)	11,0 (11)	4,5 (3)	
Did not change/ does not consume	76,9 (10)	62,0 (62)	49,3 (33)	

Note: *Fisher's Exact Test.

DISCUSSION

The present study reveals the presence of high levels of stress in Brazilian mothers during the COVID-19 pandemic. In addition to the relationships between these elevated levels, dysfunctional eating behaviors, and negative behavioral changes in lifestyle, indicating that the increase in stress was associated with higher food control loss and emotional eating behaviors, decreased/inactivity physical activity, poorer sleep quality, and higher consumption of alcohol, cookies, and sweets.

In this study, higher scores on the PSS-10 [24.0 (IQR: 19.00-29.00)] were observed compared to the period before the pandemic (17.94±6.41) in Jordanian mothers (16). Similarly,

when compared to a prospective study with Saudi women (19.3±6.3), in which 57.3% (n=129) reported being mothers (2). It is important to highlight the absence of national studies and that the mentioned data were in relation to the period before the pandemic outbreak and in women from other countries.

However, studies conducted during the pandemic period found a positive association between the increase in maternal stress, measured by the Maternal Feeding Stress (MFS)-mealtimes index and the MFS-maternal resentment/difficult child index during this period, mainly related to an increase in the perception of responsibility (M = 4.33, SD = 0.59) and monitoring (M = 4.48, SD = 0.66), compared to the periods before the pandemic (M = 4.09, SD = 0.87 and M = 4.23, SD = 0.73, respectively; $p < 0.05$) (17). Another study, conducted in the United States with the participation of 777 mothers from different locations, reinforces this finding, as the mothers reported consistently moderate levels of perceived stress (18). Moreover, in Brazil, an online study evaluating 103 participants at three different periods of the pandemic during the year 2020 recorded an increase in perceived stress symptoms, rising from 1.9% in March to 28.2% in June 2020. A progressive worsening of mental disorder conditions, such as anxiety and depression, was also described over the first months of the pandemic (19).

Similar PSS-10 scores were observed in the present research compared to a study conducted with Brazilian women (80%; n=1094) and men during the pandemic, which showed a moderate to high stress percentage of 88.0% (11). Just like the research by Shen et al. (2020) (20), conducted in the United States, with a percentage reaching 73.6% (589) of the participants. These findings reinforce the hypothesis that the pandemic had a significant impact on stress perception and that the higher value found in this study (92.8%) reveals a more pronounced proportion among Brazilian mothers.

The perception of maternal mental health has drawn attention, not only due to the greater propensity of women to develop problems related to this dimension and female quality of life, but also because of the potential reflections on the environment and the people around them (children, family members, and close individuals). Thus, the pandemic may have acted as a risk factor for the worsening of maternal stress by intensifying the most common causes, such as fear and insecurity, concerns about health, finances, work, family, safety, and the loss of loved ones (3,5,21,22).

The results of a Brazilian study conducted with academic workers during the pandemic, of which 72.2% (1,651) were mothers, indicate that this phenomenon may be associated with the unfolding of gender and parenting inequalities, where women began to dedicate more time to family care (of children and the elderly) and household activities compared to fathers and their childless peers, especially those responsible for small children (20,21). Moreover, relationships were identified between stress levels and dysfunctional eating behaviors and lifestyle changes, with positive correlations observed between PSS-10 scores and EE and ED behaviors, as well as significant and positive associations between stress and increased consumption of filled cookies, chocolates, and sweets.

The increase in the consumption of more palatable and sugar-rich foods, which occurs in some cases in an attempt to relax and improve mood, can be explained by hedonic mechanisms related to carbohydrate intake that provoke an increase in serotonin levels, an important neurotransmitter that acts in the central nervous system, promoting the sensation of pleasure and is involved in mood modulation (3,11,23). Shen et al. identified five reasons related to perceived stress that influence food choices and are mediated by emotional eating: mood, convenience, sensory appeal, price, and familiarity, factors that may have contributed to the increase of ultra-processed foods such as filled cookies, chocolates, and sweets (11).

Another observation about the stress level was the increase in alcohol consumption, which may be associated with an attempt to combat stress and the negative emotions resulting from social distancing measures. An example of this is the results of an Australian study conducted during the pandemic with parents and caregivers of children, where elevated stress was among the reasons that led some caregivers to increase their alcohol consumption, in addition to guilt, reward, pleasure, and relaxation (24).

The decrease in physical activity, in studies before the pandemic, was related to the increase in stress, indicating that the practice of physical exercises is associated with lower levels of stress (25,26). An analysis conducted on mothers during the pandemic revealed that moderate-intensity physical activity can reduce the negative impact of stress and other factors related to physical, psychological, and emotional health, emphasizing the importance of physical exercise to alleviate/improve these factors and other negative feelings related to isolation and loneliness (26).

Regarding the association with the worsening sleep observed in mothers, cross-sectional and longitudinal studies, both before and during the pandemic, show that high perceived stress is related to poor, disordered, or short sleep in adults (27, 28). Zhao et al. (2020) point out that these results are an effect of anxiety and that the relationship between perceived stress and anxiety is mediated by self-esteem, aspects that were affected by the pandemic and are evidenced in the maternal population by the prevalence of stress observed in this study (27).

On the other hand, the lower PSS-10 scores were associated with a reduction in maternal screen time. This can be justified by the fact that increased screen time offers greater exposure to stressors, such as increased work and/or study time. Due to social distancing measures, many companies and governments encouraged the practice of telecommuting, which resulted in greater responsibilities, including household activities, childcare, and facilitating home education (11,12).

The limitations of this study include the snowball sampling method, which should be interpreted with caution due to the non-randomness of the data, the reliance on self-reported data, the need for access to remote communication technologies to respond to the questionnaire, which limited the study's population coverage, and the short data collection period, circumstances that suggest future studies should be conducted with more comprehensive and long-term assessment methods and instruments that allow for a more precise analysis of food consumption.

It is also important to mention that the measures adopted to combat the new coronavirus in Brazil lasted almost two years, a sufficient time to develop new health practices or aggravate old habits. This means that the habits acquired during the period of social distancing may persist after its end, resulting in the deterioration of the population's eating behavior and health routine.

With still incipient studies on the consequences and changes in the lifestyle habits of the Brazilian maternal population, the results of this study stand out and should serve to build actions that minimize the possible damages attributed to this period and to promote maternal health and quality of life after the pandemic.

CONCLUSION

The findings of this study suggest that high levels of perceived stress in Brazilian mothers during the COVID-19 pandemic are associated with dysfunctional eating behaviors and negative lifestyle habits. Thus, the need for the development of actions aimed at fostering healthy maternal life practices is emphasized, associated with tools and strategies to improve lifestyle, such as identifying and assisting in the modification of dysfunctional eating behaviors, inactivity or low physical activity, alcohol consumption, and poor sleep quality.

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