



# Factors Associated with Poor Sleep Quality in Postpartum Women: A Crosssectional Study

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Sleep Sci

## Abstract

**Objective** This study aimed to analyze the factors associated with poor sleep quality in women in the postpartum period who were assisted in a municipality in central Brazil.

**Material and Methods** This is a cross-sectional study ( $n = 400$ ) conducted virtually from 2020 to 2021. Sociodemographic and clinical characteristics, self-perceived sleep, and the Pittsburgh Sleep Quality Index (PSQI) were assessed.

**Results** It was identified that 82% of postpartum women were between 18 and 35-years-old and had an average monthly household income of R\$2,339.27  $\pm$  1,812.95. It was also found that 33.50% (95% CI: 28.7–38.0) had sleep disorders (PSQI >10); 70.25% (95%CI 65.8–74.8) had poor sleep quality (PSQI >5); 57.4% (95% CI: 52.0–63.1) had inadequate sleep on weekdays/workdays; and 64.1% (95% CI 59.3–69.2) had unsuitable sleep on weekends/days off. It was found that the factors associated with sleep disturbance were: age between <18 years and >35 years ( $p = 0.048$ ); difficulty to think clearly ( $p = 0.043$ ); frequent sadness ( $p = 0.046$ ); poor sleep quality; low income ( $p = 0.030$ ); difficulty to think clearly ( $p = 0.013$ ); and loss of interest in things ( $p = 0.030$ ). As for sleep on weekdays, the associated factors were: marital status without a partner ( $p = 0.008$ ); and being a victim of physical violence ( $p = 0.003$ ). Finally, for sleep on weekends/off: nonwhite skin-color ( $p = 0.039$ ); and having postpartum depression ( $p = 0.029$ ).

**Conclusion** The findings of the present study call attention to the impacts of changes in women's bodies, behavior, and interpersonal relationships caused by the arrival of a newborn. We also highlight the need for a multidisciplinary and comprehensive medical approach in this period.

## Keywords

- ▶ postpartum
- ▶ sleep quality
- ▶ women's health

## Introduction

Postpartum, or puerperium, is the pregnancy-puerperal cycle period in which the anatomical, physiological, and mental changes that occur during pregnancy significantly

return to the situation prior to pregnancy. However, these changes may not always be at the desired level and this situation can cause problems in the puerperium<sup>1</sup> and profoundly affect patients' quality of life.<sup>2</sup>

received  
December 26, 2022  
accepted  
October 3, 2023

DOI <https://doi.org/10.1055/s-0044-1782174>.  
ISSN 1984-0659.

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Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

Among the main problems encountered in the puerperium, the most common are fatigue, breast problems, conditions related to the urinary or gastrointestinal systems, and mental disorders such as mood fluctuations and depression.<sup>3,4</sup> Moreover, these physiological and behavioral issues are associated with changes to the sleep-wake cycle (less exposure to natural light and oscillations in bedtime and wake-up time) and decreased estrogen and progesterone levels, which can interfere with sleep induction and, consequently, decrease sleep duration and quality.<sup>5</sup>

Sleep is a basic human need that postpartum women have difficulty obtaining in adequate quality and quantity. They are significantly more likely to experience sleep disturbances than pregnant women or women in general, with most reporting exhaustion during the first 3-months after labor.<sup>6,7</sup>

Inadequate sleep in the postpartum period has been linked to poor daytime functioning and reduced neurobehavioral performance, family dysfunction, depressive symptoms, poor infant sleep, low weight gain, and infant restlessness.<sup>8-12</sup> In addition to scientific evidence showing that poor quality sleep is directly related to postpartum depression, it increases the chances of relapse later in life.<sup>5,13</sup>

As a result of these studies, it is evident that the common problem is in the sleep-rest area. Thus, knowledge of sleep quality is considered an important clinical device for identifying health problems, including sleep disorders, especially in the puerperal-pregnancy period.

Intervention studies to improve sleep and reduce fatigue in postpartum women have been tested with varying degrees of effectiveness, mainly in the middle-income populations of several countries;<sup>14,17</sup> however, Brazilian works that assess sleep in this period are scarce.

The few studies performed in Brazil have investigated mental health<sup>18</sup> in isolation from changes in sleep patterns, an underreported problem in postpartum women.<sup>19</sup> Except for a literature review performed by our research group<sup>20</sup> with findings that motivated us to investigate the factors associated with sleep quality in women in the postpartum period. Considering the above, our hypothesis is that this group has a greater susceptibility to developing poor sleep quality.

## Material and Methods

### Participants and Ethics

This is a cross-sectional epidemiological study conducted with postpartum women in two municipalities in the central region of Brazil, specifically in public and private units specialized in maternal and child health. The municipalities involved were one of large size, a state capital, and another of medium size, a reference in health care for 11 regional municipalities.

Data from this survey (questionnaires) were collected virtually from 2020 to 2021 in telephone interviews and completion of a semistructured questionnaire performed on Google Forms with a guarantee of security for volunteers and researchers. This procedure followed the requirements listed in the Guidance Note for Online Research – Research Ethics

Committee (REC) of the UFG/Regional Catalão - *Universidade Federal do Catalão* (UFCAT)<sup>21</sup> “in transition” (REC/UFG/RC), in accordance with the current norms of the Brazilian National Health Council/National Commission on Research Ethics (CNS/CONEP).

The study was approved by the Research Ethics Committee of UFCAT (Protocol 2.402.949/2017, CAAE (*Certificado de Apresentação para Apreciação Ética* – Certificate of Presentation for Ethical Consideration) 79222717.9.0000.5083). All postpartum women who met the inclusion criteria were invited to participate in the study. Then, the informed consent form (ICF) was signed after explanation of the objectives, benefits, and possible risks of the research. For postpartum women under 18 years old, the informed assent form (IAF) was used instead, and the consent of parents or guardians was obtained.

### Eligibility Criteria

Women with a maximum of 90 days from labor, low-risk postpartum period, and age group from 14 to 47 years were recruited. Furthermore, women with medical diagnosis of severe mental disorders and who experienced the loss of a fetus or newborn were excluded from the sample.

### Sample Size Calculation

The sampling was nonprobabilistic, but sample calculation was performed for sample size reference, which was described as follows: it was judged for a population of 10,000; with a statistical power of 80% ( $\beta = 20\%$ ); a significance level of 95% ( $\alpha = 0.05$ ); and a design effect of 1.0. As for the percentage of women’s illness, the research’s base study elected mental illness and an anticipated frequency of 50%, which resulted in a representative sample of 370 postpartum women.

A total of 551 women in the postpartum period were invited to participate in the study, but only 400 answered the instruments, totaling 27.4% of refusals.

### Instruments

Initially, a pilot test was conducted with 12 women in a location close to the municipalities where the present study was conducted. Then, the instruments were adjusted and the data collection team was trained. The initial results did not compose the final sample.

A semi-structured questionnaire was applied, which included sociodemographic characteristics such as age, race, education, marital status, income, and occupation, in addition to personal and obstetric history, current pregnancy history, and aspects related to self-perceived sleep quality.<sup>22</sup>

To assess sleep quality, the Pittsburgh sleep quality index (PSQI)<sup>23</sup> was used, validated and translated into Portuguese.<sup>24</sup> This index is a widely used instrument to measure the subjective quality of sleep during the last month of pregnancy, and has been validated in populations of pregnant women in previous studies,<sup>25,26</sup> including for postpartum women.<sup>27</sup> It is a self-administered questionnaire, composed of 24 questions, with 19 of them being answered

**Table 1** Sociodemographic characterization of postpartum women in the central region of Brazil.

Categorical variables	n = 400		
	n (%)	95%CI	
<i>Age</i>			
<18	10 (2.6)	1.0–4.1	
18–35	318 (82.4)	78.5–86.0	
>35	58 (15)	11.7–18.9	
<i>Race<sup>b</sup></i>			
White	118 (30.5)	25.8–35.1	
Other	269 (69.5)	64.9–74.2	
<i>Education<sup>c</sup></i>			
Complete and incomplete higher education	88 (22.3)	18.3–26.1	
Complete and incomplete high school	224 (56.9)	52.3–61.4	
Complete and incomplete elementary school	82 (20.8)	17.3–25.1	
<i>Marital status</i>			
With partner	258 (69.7)	60.0–69.3	
Without partner	142 (35.5)	30.8–40.0	
<i>Occupation</i>			
Formal employment	113 (28.2)	24.0–32.5	
Informal employment	51 (12.8)	9.5–16.0	
Student	41 (10.3)	7.2–13.3	
Housewife	145 (36.3)	31.8–41.3	
Unemployed	50 (12.5)	9.5–15.8	
<i>Residence<sup>d</sup></i>			
Urban area	363(91.7)	88.9–94.2	
Rural area	33 (8.3)	5.8–11.1	
<i>Homeowner<sup>e</sup></i>			
Yes	243(62.6)	58–67.8	
No	145 (37.4)	32.2–42.0	
<i>Religion<sup>c</sup></i>			
Catholic	157 (39.5)	34.8–44.6	
Protestant	155 (39)	34.5–44.1	
Spiritist	11(2.8)	1.3–4.5	
None	74 (18.6)	14.6–22.7	
<b>Numerical variables</b>	<b>Mean</b>	<b>95%CI</b>	<b>SD</b>
Age (years) <sup>a</sup>	28.31	27.62–29.00	6.72
People living in the house <sup>f</sup>	4.15	4.01–4.29	1.42
Mean household income ( <i>reais</i> ) <sup>g</sup>	2,339.27	2,141.38–2,563.27	1,812.95
Education (years) <sup>h</sup>	12.53	12.05–13.02	3.98
Postpartum time (days) <sup>i</sup>	7.00	9.50–11.77	1–73

**Abbreviations:** CI, confidence interval; SD, standard deviation. **Notes:** <sup>a</sup>Analysis valid for n = 386; <sup>b</sup>Analysis valid for n = 387; <sup>c</sup>Analysis valid for n = 397; <sup>d</sup>Analysis valid for n = 396; <sup>e</sup>Analysis valid for n = 388; <sup>f</sup>Analysis valid for n = 392; <sup>g</sup>Analysis valid for n = 33; <sup>h</sup>Analysis valid for n = 287; <sup>i</sup>Analysis valid for 381, variable expressed as mean and minimum and maximum.

by the interviewed individual and the other 5 directed to their partner. The questions were divided into 7 categories, including: (C1) subjective sleep quality (self-reported); (C2) sleep latency; (C3) sleep duration; (C4) sleep efficiency;

(C5) sleep disturbances; (C6) use of sleeping medication; and (C7) nocturnal dysfunction.<sup>24</sup> At the end of the questionnaire, a score of 0 to 21 is obtained, in which a final score greater than 5 indicates poor quality sleep, and a score

greater than 10 indicates sleep disturbance, as proposed by Fonseca et al.<sup>28</sup>

For the description of mental health conditions, part of the Self-Reporting Questionnaire (SRQ) was used, a self-administered survey instrument developed by the World Health Organization (WHO) with the aim of assessing mental disorders in developing countries. The instrument consists of 20 questions, aimed at assessing non-psychotic disorders, with answers (yes/no), and is able to detect the symptoms of some mental disorders, without specifying the diagnosis of the individuals assessed,<sup>29,30</sup> validated in Brazil by Mari and Williams.<sup>31</sup> In the present investigation, the following questions were used to screen any symptom related to the psychological dimension in women with changes in sleep quality: Do you have frequent headaches? Do you feel nervous, tense, or worried? Do you find it difficult to think clearly? Have you felt sad lately? Do you find it difficult to carry out your daily activities with satisfaction? Have you lost interest in things? Do you feel like you are someone useless, without prestige?

Dependent variables were poor sleep quality (yes; no) based on PSQI score >5, sleep disturbance (yes; no), PSQI score >10, and self-reported sleep quality obtained with the question “How would you classify the general quality of your sleep lately?” (good; poor). For the variables sleep on weekdays/work and sleep on weekends/off days, sleep duration was used (recommended  $\geq 8$  hours; not recommended <8 hours).

Independent variables were sociodemographic information (age, race, education, marital status, occupation, housing, and religion), personal history (practice of physical activity, previous mental illness, and/or victim of physical or psychological violence), and obstetric history (planned pregnancy, number of prenatal visits, pregnancy complications, breastfeeding in the child’s 1<sup>st</sup> of life, and route of delivery).

### Statistical Analysis

All statistical analyses were performed in Data Analysis and the Stata (StataCorp LLC., College Station, TX, US) statistical software, version 14.0. Initially, data normality was tested by the Kolmogorov-Smirnov test. Numerical variables were expressed as mean  $\pm$  standard deviation (SD) and confidence interval (95% CI). Categorical variables were reported in absolute numbers, prevalence, and 95% CI.

For logistic regression, the odds ratio (OR) effect measure was applied, thus dependent variables underwent bivariate and multiple analysis. In the bivariate analysis, dichotomized independent variables with  $p \leq 0.10$  for the multiple model were selected. As for the multiple model, the forced entry method of variables was applied, and those that behaved as confounding or collinear were controlled. Finally, a  $p < 0.05$  was considered statistically significant.

### Results

Among the interviewees ( $n=400$ ), the mean age was  $28 \pm 6.72$  years (95% CI: 27.68–28.96), with a minimum of

14 years and a maximum of 47 years. The mean schooling was  $12 \pm 3.98$  years of education (95% CI: 12.06–12.99). Most lived with a partner (64.5%, 95% CI: 59.5–69.2) and had a monthly income of  $R\$2,339.27 \pm 1,812.957$  (95% CI: 2,141.38–2,563.27). Moreover, 269 participants (69.5%, 95% CI: 64.9–74.2) self-declared as nonwhite. The mothers who had a partner during the puerperal period comprise 258 women (69.7%, 95% CI: 60.0–69.3%). The median postpartum time was 7 days (min: 1, and max: 73).

The data obtained through the PSQI total score showed that 281 women had poor sleep quality (PSQI >5, 70.25%, 95% CI: 65.8–74.8). Moreover, 134 postpartum women were found to have sleep disturbance (PSQI >10, 33.50%, 95% CI: 28.7–38.0).

Independent variables that showed associations for sleep disturbance in postpartum women were age under 18 and over 35 years ( $p=0.048$ ), difficulty to think clearly ( $p=0.043$ ), and frequent sadness ( $p=0.046$ ). **Table 2** shows the other variables.

Regarding sleep variables, measured through the volunteers’ self-perception, the following percentages were obtained: 39.6% ( $n=151$ ; 95% CI: 34.9–44.6) reported poor/very poor sleep; 57.4% ( $n=190$ ; 95% CI: 52.0–63.1) had inadequate sleep on weekdays/workdays; and 64.1% ( $n=214$ ; 95% CI: 59.3–69.2) had inadequate sleep on weekends/off days.

**Table 3** presents the bivariate logistic regression analyzes for variables dependent on self-perceived poor sleep quality of postpartum women, such as sleep quality, sleep on weekdays/workdays, and sleep on weekends/off days.

Based on the bivariate analysis, the significant variables were selected for the multiple analysis.

**Table 4** shows the multiple analysis of dependent variables and associations. There were three dependent variables, shown in **Table 3**, that remained associated after multiple analysis for sleep quality: income ( $p=0.030$ ), difficulty to think clearly ( $p=0.013$ ), and loss of interest in things ( $p=0.030$ ). As for sleep on weekdays, the variables were: marital status without a partner ( $p=0.008$ ) and being a victim of physical violence ( $p=0.003$ ). And, finally, for sleep on weekends: nonwhite skin-color ( $p=0.039$ ) and having postpartum depression ( $p=0.029$ ).

### Discussion

In this study, we found that 39.6% of postpartum women considered their sleep as poor or very poor. On the other hand, when the same sample was submitted to another form of assessment (PSQI > 5), it was found that 70.2% of them had an impaired sleep quality.

In agreement with this research, a study conducted on 116 women in the postpartum period pointed out that 49.1% of them presented poor sleep quality (PSQI > 5).<sup>27</sup> Another assessment conducted in late pregnancy also found a high percentage (67.8%, PSQI > 5).<sup>32</sup> The findings of this study reinforce the hypothesis that postpartum women have high vulnerability for poor sleep quality. There is a consensus in the puerperal-pregnancy period that changes in sleep

**Table 2** Bivariate and multiple logistic regression of independent variables associated with sleep disturbance (classification by score  $\geq 10$  by the PSQI) in postpartum women from the central region of Brazil.

Sleep disturbance	Unadjusted OR	95% CI	p-value	Adjusted OR	95% CI	p-value
<i>Age</i>						
$\geq 18 \leq 35$	1	–	–	1	–	–
$< 18 > 35$	1.664	(0.96–1.50)	0.062	1.77	(1.00–3.14)	<b>0.048</b>
<i>Skin color</i>						
White	1	–	–	–	–	–
Others	0.887	(0.82–1.12)	0.609	–	–	–
<i>Education</i>						
$\geq 10$	1	–	–	–	–	–
$< 10$	0.613	(0.71–1.03)	0.146	–	–	–
<i>Income*</i>						
$> 1,900$	1	–	–	–	–	–
$\leq 1,900$	0.701	(0.70–1.11)	0.255	–	–	–
<i>Marital status</i>						
With partner	1	–	–	–	–	–
Without partner	0.792	(0.80–1.06)	0.299	–	–	–
<i>Physical activity</i>						
Yes	1	–	–	–	–	–
No	0.646	(0.64–1.10)	0.182	–	–	–
<i>Difficulty to think clearly**</i>						
No	1	–	–	1	–	–
Yes	1.732	(1.02–1.45)	0.017	1.684	(1.01– 2.79)	<b>0.043</b>
<i>Frequent sadness</i>						
No	1	–	–	1	–	–
Yes	1.682	(1.02–1.41)	0.018	1.568	(1.00–2.44)	<b>0.046</b>
<i>Numbers of prenatal care visits</i>						
$\geq 6$	1	–	–	–	–	–
$< 6$	0.465	(0.68–0.96)	0.058	0.484	(0.21–1.10)	0.084

**Abbreviations:** CI, confidence interval; OR, odds ratio. **Notes:** \*Income expressed in Brazilian currency (reais, R\$), and each R\$1.00 equals about US \$5.5; \*\*Frequent sadness variable was controlled for having behaved as a confounding variable.

quality and recovery sleep are frequent and result from the physiological changes of pregnancy from physical discomfort and increased endogenous progesterone. It is known that progesterone and estrogen are responsible for activating the neurotransmitters capable of maintaining sleep and some phases of female life.<sup>13</sup> However, in the postpartum period, there is still no conclusive evidence about this mechanism and effects on sleep.

Data from the present study also indicate that women have inadequate self-perception of their sleep. Similar data described how postpartum women, even with poor sleep duration ( $< 7$  hours/per night), denied having insomnia.<sup>33</sup> Our hypothesis is that this contradiction found in the results obtained by the self-assessment and by the validated questionnaire may occur due to sleep deprivation itself, which is related to reduced cognitive performance.<sup>34</sup>

During the last trimester of pregnancy and postpartum, several changes in sleep pattern can occur and this is due to changes in the sleep-wake cycle, cortical excitation, reduced latency, and increased rapid eye movement sleep duration, which can lead to sleep disorders such as insomnia, sleep interruption, and poor sleep quality.<sup>35</sup> In the sample studied, 33.5% of the volunteers had sleep disorders (PSQI  $> 10$ ). The high prevalence of poor sleep quality and sleep disorders in this sample can also be justified by the intensified challenges during the COVID-19 pandemic, such as social isolation, reduced support network, and fear of the illness.<sup>36,37</sup> Additionally, although all postpartum women are vulnerable to changes in sleep quality, it was found that the chances of sleep disorders were 1.77 times greater at the age extremes (under 18 years old and over 35-years-old). This can be explained by the high prevalence of high-risk pregnancies

**Table 3** Bivariate analysis of variables dependent on self-perception of poor sleep quality of postpartum women in the central region of Brazil.

Variable	Sleep quality <sup>1</sup>			Sleep on weekday/work <sup>2</sup>			Sleep on weekends/day-off <sup>3</sup>		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
<i>Age</i>									
≥18 ≤35	1	–	–	1	–	–	1	–	–
<18 >35	1.073	(0.61–1.85)	0.888	0.862	(0.48–1.53)	0.616	0.561	(0.31–1.00)	0.051
<i>Race</i>									
White	1	–	–	1	–	–	1	–	–
Other	0.928	(0.59–1.45)	0.745	1.130	(0.69–1.83)	0.619	1.643	(1.01–2.67)	<b>0.045</b>
<i>Marital status</i>									
With partner	1	–	–	1	–	–	1	–	–
Without partner	1.003	(0.65–1.54)	0.986	1.571	(0.99–2.49)	0.055	1.203	(0.75–1.92)	0.441
<i>Income*</i>									
>1,900	1	–	–	1	–	–	1	–	–
≤19,00	0.643	(0.40–1.01)	0.059	0.9339	(0.58–1.51)	0.797	0.961	(0.58–1.56)	0.875
<i>Health problem</i>									
No	1	–	–	1	–	–	1	–	–
Yes	1.781	(1.02–3.10)	<b>0.041</b>	1.136	(0.62–2.07)	0.762	1.137	(0.62–2.08)	0.761
<i>Physical violence</i>									
No	1	–	–	1	–	–	1	–	–
Yes	1.547	(0.80–2.96)	0.188	0.322	(0.15–0.66)	<b>0.002</b>	1.327	(0.62–2.08)	0.582
<i>Psychological violence</i>									
No	–	–	–	1	–	–	1	–	–
Yes	2.023	(1.19–3.42)	<b>0.010</b>	0.609	(0.34–1.06)	0.083	0.740	(0.41–1.31)	0.302
<i>Postpartum depression</i>									
No	1	–	–	1	–	–	1	–	–
Yes	3.001	(1.11–7.70)	<b>0.022</b>	1.383	(0.49–3.83)	0.620	0.317	(0.11–0.89)	<b>0.023</b>
<i>Frequent headaches</i>									
No	1	–	–	1	–	–	1	–	–
Yes	1.775	(1.11–2.82)	<b>0.016</b>	1.238	(0.75–2.03)	0.451	0.957	(0.57–1.59)	0.897
<i>Nervous or tens feelings</i>									
No	1	–	–	1	–	–	1	–	–
Yes	1.608	(1.03–2.50)	<b>0.036</b>	0.701	(0.43–1.12)	0.156	0.684	(0.42–1.11)	0.147
<i>Find it difficult to think clearly</i>									
No	1	–	–	1	–	–	1	–	–
Yes	2.500	(1.58–3.94)	<b>&lt;0.001</b>	1.110	(0.68–1.79)	0.714	0.969	(0.58–1.59)	0.899
<i>Find it difficult to carry out daily activities with satisfaction</i>									
No	1	–	–	1	–	–	1	–	–
Yes	2.054	(1.35–2.25)	<b>0.001</b>	0.987	(0.62–1.55)	1.000	0.815	(0.51–1.29)	0.409



**Table 3** (Continued)

Variable	Sleep quality <sup>1</sup>			Sleep on weekday/work <sup>2</sup>			Sleep on weekends/day-off <sup>3</sup>		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
<i>Has lost interest in things</i>									
No	1	–	–	1	–	–	1	–	–
Yes	2.872	(1.69–4.88)	<0.001	0.805	(0.46–1.40)	0.477	0.687	(0.38–1.21)	0.235
<i>Useless or worthless thoughts</i>									
No	1	–	–	1	–	–	1	–	–
Yes	2.337	(1.22–4.45)	0.012	1.118	(0.54–2.28)	0.857	0.637	(0.31–1.29)	0.264
<i>Religion</i>									
Yes	1	–	–	1	–	–	1	–	–
No	0.698	(0.40–1.19)	0.231	0.607	(0.35–1.04)	0.074	0.668	(0.38–1.16)	0.192
<i>Breastfeed at the first time</i>									
Yes	1	–	–	1	–	–	1	–	–
No	1.214	(0.75–1.96)	0.429	1.602	(0.93–2.74)	0.085	0.891	(0.52–1.51)	0.683
<i>Pregnancy complications</i>									
No	1	–	–	1	–	–	1	–	–
Yes	1.393	(0.89–2.17)	0.169	0.781	(0.48–1.26)	0.327	0.659	(0.40–1.07)	0.092

**Abbreviations:** CI, confidence interval; OR, odds ratio. **Note:** \*Income expressed in Brazilian currency (*reais*, R\$), and each R\$1.00 equals about US \$5.5; <sup>1</sup>Valid analysis for n = 381; <sup>2</sup>Valid analysis for n = 331; <sup>3</sup>Valid analysis for n = 334.

**Table 4** Multiple analysis of dependent variables such as sleep quality, sleep on weekdays/work, and sleep on weekends/leave off of postpartum women in the central region of Brazil.

Variables	OR	95%CI	p-value
<b>Sleep quality</b>			
Income ≤1,900	0.583	(0.35–0.94)	0.030
Do you feel nervous or tense?	1.233	(0.71–2.12)	0.451
Do you find it difficult to think clearly?	2.067	(1.16–3.66)	0.013
Do you find it difficult to carry out your daily activities with satisfaction?	1.427	(0.85–2.38)	0.173
Have you lost interest in things?	2.089	(1.07–4.07)	0.030
Postpartum depression (Yes)	2.251	(0.68–7.43)	0.183
<b>Sleep on weekdays/work</b>			
No partner	1.975	(1.19–3.26)	0.008
No religion	0.610	(0.33–1.10)	0.101
Did not breastfeeding in the first time?	1.620	(0.92–2.83)	0.091
Suffered physical violence	0.249	(0.09–0.62)	0.003
Suffered psychological violence	1.123	(0.53–2.34)	0.757
<b>Sleep on weekends/days off</b>			
Age (<18 >35 years)	0.579	(0.31–1.05)	0.073
Color (other)	5.484	(1.09–2.74)	0.039
Postpartum depression	0.296	(0.11–0.89)	0.029

**Abbreviations:** CI, confidence interval; OR, odds ratio.

and, consequently, complications in childbirth,<sup>38</sup> greater social vulnerability, lack of partner support (mainly observed in very young women),<sup>39</sup> and teenage pregnancy.<sup>13</sup>

Among the sociodemographic factors analyzed in this study, nonwhite skin-color was associated with inadequate sleep on the weekends. Johnson et al.<sup>40</sup> found that racial/ethnic minority groups, particularly black people, were less likely than white people to report sleep complaints despite having worse overall sleep based on objective measures. However, the current literature presents more studies focused on sleep duration, emphasizing the need to investigate other dimensions of sleep health, which may be even more directly linked to race in terms of biological mechanisms.<sup>40</sup>

Regarding psychological variables, most were shown to be predictors of risk for sleep quality, such as having experienced psychological violence, postpartum depression, recurrent headaches, feeling nervous or tense, difficulty to think clearly, difficulty performing daily activities, loss of interest in things, and feeling useless (– **Table 3**). In a recently published study,<sup>41</sup> it was observed that improving sleep led to significant improvements in mental health, depression, anxiety, and stress. In this regard, strategies to improve the quality of sleep in puerperium women are important, since they can have a beneficial impact on psychological health.

Regarding purchasing power, family income lower than R \$1,900.00 was associated with better sleep quality when compared with mothers with higher incomes. We believe this may be related to sleep quality assessment being impaired in women exposed to greater socioeconomic vulnerability.

Women without a steady partner showed inadequate sleep (<8 hours) on weekends/off, which possibly reflects the lack of a support network on rest days. Studies have reinforced that the absence of social support is associated with poor sleep quality in the postpartum period.<sup>13,39</sup>

Interestingly, having postpartum depression and having suffered violence proved to be protective factors for the number of hours and quality of sleep. This can be explained by the fact that individuals in these circumstances often use sleeping pills and/or other medications whose side effects cause excessive sleepiness.<sup>42,43</sup> For future studies, we suggest that these associations be adjusted for medication use, which are known to act as potential confounders.

The limitations of this study are its cross-sectional design, which makes it impossible to establish a causal relationship, memory bias, since the questionnaire was self-generated, sample size, and type of nonprobabilistic sampling, which limits the generalization of results. One can also cite the difficulty of performing the PSQI in its entirety, as it is not always possible to apply to women and their companions. It is worth mentioning that assessment of isolated sleep impairments in postpartum women was little publicized in the works cited in researched databases. Therefore, it is necessary to better investigate this topic.

However, this work innovates by exploring sleep assessment globally and fractionally, demonstrating a broad analysis of the investigated object, through five dependent variables and associated independent variables, including

self-perceived sleep quality. It also innovates because it is an unprecedented work performed only with postpartum women in Brazil, which is a sample of people overloaded with newborn care.

## Conclusion

Factors associated with poor sleep quality in postpartum women were age extremes (<18 years and >35 years), absence of a partner, income, impaired thinking, lack of interest, frequent sadness, having suffered physical violence, lack of breastfeeding in the 1<sup>st</sup> hour of life, and history of prior depression.

In the postpartum period, several changes in sleep pattern, such as hormonal and/or behavioral changes, can cause alterations in the sleep-wake cycle, which results in inadequate sleep, as found in this study. Interventions focused on improvements to postpartum sleep quality are effective in the prevention and early diagnosis of illnesses associated with impaired quality of life of these women, especially as related to mental disorders.

### Funding Source

The author(s) received no financial support for the research.

### Conflict of Interests

The authors have no conflict of interests to declare.

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