

Sleep in pregnancy quarters: a longitudinal study

*Sono nos trimestres gestacionais:
um estudo longitudinal*

*El sueño en el trimestres gestacionales:
un estudio longitudinal*

Natália Amorim Ramos Felix^a 
Maria Filomena Ceolim^a 



How to cite this article:

Felix NAR, Ceolim MF. Sleep in pregnancy quarters: a longitudinal study. Rev Gaúcha Enferm. 2023;44:e20210278. doi: <https://doi.org/10.1590/1983-1447.2023.20210278.en>

ABSTRACT

Objective: To identify sleep characteristics and factors associated with sleep issues during pregnancy.

Method: This is a longitudinal, with three follow-up periods at each gestational trimester (called T1, T2 and T3). Fifty (50) pregnant women without comorbidities started the study. The following instruments were used: sociodemographic and clinical characterization, Pittsburgh Sleep Quality Index and Sleep Diary. Data were analyzed using statistical tests (Chi-square, non-parametric tests and regression models).

Results: We identified that 55.3% of the pregnant women reported sleep disorders in T1, 39.5% in T2, and 65.8% in T3; in T3, the risk of reporting sleep problems increased by 67% in comparison with T2.

Conclusion: Considering the high prevalence of poor-quality sleep, especially in the third trimester, prenatal care is understood as a moment of intense learning and an opportunity for nurses to develop actions concerning education, guidance and sleep hygiene.

Keywords: Sleep. Pregnant women. Nursing.

RESUMO

Objetivo: Identificar as características do sono e os fatores associados ao sono de má qualidade ao longo dos trimestres gestacionais.

Método: Estudo longitudinal, quantitativo, com três períodos de acompanhamento, nos trimestres gestacionais (denominados T1, T2 e T3). Estudo longitudinal com 50 gestantes sem comorbidades. Utilizou-se os instrumentos: caracterização sociodemográfica e clínica, Índice de Qualidade do Sono de Pittsburgh e Diário de Sono. Os dados foram analisados por testes estatísticos (Qui-quadrado, testes não paramétricos e modelos de regressão).

Resultados: Identificou-se que 55,3% das gestantes relataram sono de má qualidade em T1, 39,5% em T2 e 65,8% em T3 e que, em T3, houve 67% a mais de risco de relatos de sono de má qualidade do que em T2.

Conclusão: Considerando-se a elevada prevalência de má qualidade do sono, principalmente no terceiro trimestre, compreende-se o pré-natal como um momento de aprendizado e oportunidade para os enfermeiros desenvolverem ações de educação, orientação e higiene do sono.

Palavras-chave: Sono. Gestantes. Enfermagem.

RESUMEN

Objetivo: Identificar las características del sueño y los factores asociados a la mala calidad del sueño a lo largo de los trimestres gestacionales.

Método: Estudio longitudinal, cuantitativo, con tres ondas de seguimiento, en los trimestres gestacionales (denominados T1, T2 y T3). Estudio longitudinal con 50 gestantes sin comorbidades. Se utilizaron los siguientes instrumentos: caracterización sociodemográfica y clínica, índice de calidad del sueño de Pittsburgh y diario del sueño. Los datos se analizaron mediante pruebas estadísticas (Chi cuadrado, pruebas no paramétricas y modelos de regresión).

Resultados: Se identificó que el 55,3% de las gestantes reportaron sueño de mala calidad en T1, 39,5% en T2 y 65,8% en T3 y que, en T3, hubo un 67% más de riesgo relativo de reportar sueño de mala calidad que en T2.

Conclusión: Considerando la alta prevalencia de mala calidad del sueño, la atención prenatal se entiende como un tiempo de aprendizaje y una oportunidad para que las enfermeras desarrollen acciones de educación e higiene del sueño.

Palabras clave: Sueño. Mujeres embarazadas. Enfermería.

^a Universidade Estadual de Campinas (Unicamp), Faculdade de Enfermagem. Campinas, São Paulo, Brasil.

■ INTRODUCTION

Hormonal and physical changes during pregnancy can cause significant changes in sleep patterns and quality. Moreover, the increase in abdominal size during pregnancy and the need for changes in body position to sleep are factors related to sleep disorders. Improving sleep quality and minimizing related problems is essential during a healthy gestational period⁽¹⁾.

Good sleep is considered fundamental in growth, development and learning of human beings, being characterized as a basic physiological need, indispensable for good physical and psychological health⁽²⁾. It also constitutes a period of relaxation that allows healthy waking hours, and is fundamental for a good quality of life^(2,3).

Pregnancy can be a time of sleep changes, even for women who have never previously reported complaints or problems. Many women report feeling extremely tired during pregnancy, especially during the first and third trimesters, and report more distress during pregnancy than at any other time in their lives. In addition, pregnant women are more likely than women in general to have sleep problems⁽⁴⁾. Up to 97% of pregnant women report sleep disorders, particularly during the third trimester of pregnancy⁽⁵⁾. Consequently, sleep disorders during pregnancy is a frequent problem that affects women's health⁽⁴⁾.

Evidence suggests that during pregnancy there is an increase in sleep duration in the first trimester and a decrease in the second and third trimester, and that reduced sleep duration and/or sleep disorders during pregnancy are associated with adverse maternal and neonatal outcomes⁽⁶⁾. At the end of pregnancy, short-term sleep and sleep disorders are associated with higher occurrence of hypertension, pre-eclampsia, gestational diabetes and postpartum depression. They are also related to preterm and longer labors⁽⁵⁾.

Considering the observations of health professionals regarding prenatal consultations, there is the perception that pregnant women complain of intense sleepiness in the first trimester, and they do not have an explanation for this fact. Another important aspect refers to pregnant women in the last trimester, who report discomfort when sleeping and insomnia attributed to pregnancy changes⁽⁵⁾. From these observations, it is relevant to obtain a longitudinal analysis of the characteristics and quality of sleep in each gestational trimester and to identify factors associated with them. According to the searches carried out by the authors in national and international databases, few longitudinal studies addressed sleep changes in healthy pregnant women, without gestational risk factors.

Nurses who work in primary health care assumes great responsibility in this regard, as they directly participates in health promotion activities for pregnant women. They also assume an important role in prenatal consultations, analyzing physical, emotional, socioeconomic, and educational needs of pregnant women, providing pregnant woman further clarifications and guidance on sleep quality during this period⁽⁷⁾.

Given the above, the following question arises: What are the characteristics of sleep during pregnancy? From this point of view, the objective here was to identify sleep characteristics and factors associated with poor sleep during gestational trimesters.

■ METHODS

This is a longitudinal study with a quantitative approach carried out from February 2018 to June 2019, during prenatal consultations of usual risk, in a public health center in a city of the Southeastern region of Brazil.

Data collection took place in a primary care unit that provides care through the Brazilian Unified Health System, with an average of 40 pregnant clients per month. The sample size was calculated considering the comparison between the three gestational periods and the quality of sleep scores. Sample size calculation took into consideration ANOVA models of repeated measures. In this calculation, a significance level of 5% was assumed, a test power of 80% and an effect size of 0.61, which can be considered as medium effect size. The calculation resulted in a minimum sample size of 28 pregnant women.

The sample consisted of 50 pregnant women. The inclusion criteria were aged 18 years or over without clinical and/or obstetric comorbidities and exclusion criteria included any disease or complication during prenatal care (requiring referral to a high-risk prenatal service), pregnancy loss or change of address.

Data collection was carried out by the main researcher at three stages: first trimester, between 1 to 13 gestational weeks (T1); second trimester from 14 to 27 weeks (T2), and third gestational trimester from 28 weeks (T3), with a minimum period of 8 weeks (2 months) between the application of questionnaires. The questionnaires were applied in person by the primary researcher at the end of the prenatal consultation of women included in the study.

The instruments used and applied in the three trimesters were:

- Sociodemographic and clinical/obstetric questionnaire built for this study, containing questions about age, education, marital status, paid job, anthropometric data (weight and

height) and gestational data, such as number of children, previous abortions, pregnancy planning, age pregnancy, presence of comorbidities, physical activity, main gestational symptoms (pain, nausea and/or others), perception of support and type of delivery.

– The Pittsburgh Sleep Quality Index (PSQI-BR): an instrument validated in Brazil that assesses quality of habitual sleep in the last thirty days, consisting of 19 self-reported questions grouped into seven components (subjective sleep quality, latency, duration, efficiency, disorders, use of sleeping medications and daytime dysfunction). The score of responses to each component ranges from zero to three and are added together to produce an overall score, which ranges from zero to 21 points – the higher the score, the worse the quality of sleep. A score higher than five indicates sleep difficulty⁽⁸⁾. This index was applied in each gestational trimester, during prenatal consultation.

– Sleep diary: used for daily sleep characterization – pregnant women wrote down the time they went to sleep at night, how long it took them to fall asleep, time to wake up in the morning, how many night awakenings occurred and how many naps during the day. They also took the instrument to their home, after being instructed to fill it in for 15 days, in the morning immediately after waking up, beginning on the Saturday following the consultation.

Data were entered into an Excel® spreadsheet and analyzed using statistical software SAS® version 9.4 and SPSS® version 24. The following statistical tests were used: Chi-square or Fisher's exact test to analyze associations between qualitative variables; Friedman's non-parametric test (followed by Dunn-Bonferroni *post-hoc* test) or linear regression model via Generalized Estimating Equations (GEE) to compare periods with quantitative variables; Generalized Estimating Equations

(GHG) regression model to identify factors present in T1 that influenced quality of sleep over trimesters. The level of significance adopted was 5%, but when data were analyzed separately, two by two at each time, Bonferroni correction was applied to significance level, which resulted in 1.67%.

The study was approved by the Research Ethics Committee of the authors' institution. The pregnant women were informed about objectives of the study and signed the Informed Consent Form (ICF), according to the ethical standards that currently regulate research with human beings in Brazil and worldwide. The study was approved with a Ethical Appreciation Certificate number 80673717.0.0000.5404, on 11/29/2018.

■ RESULTS

Fifty (50) pregnant women participated in this study, 12 of which were excluded according to pre-established criteria, totaling 38. The average age was 29 years old (minimum 18 years old, and maximum 40 years old), 86.8% of them had a partner, 55.2% did not have a paid activity, 44.7% did not have children, 55.2% reported that the pregnancy was not planned, 60.5% felt very supported by the child's father, 28.9% reported little support, and 10.5% did not feel supported at all. Regarding pain report in T3, 60.5% felt pain every day. We also identified that 60.5% of them had normal delivery.

Regarding sleep quality, according to PSQI-BR scores, we identified that 55.3% of pregnant women ($n = 21$) reported sleep difficulties in T1, 39.5% ($n = 15$) in T2, and 65.8% ($n = 25$) in T3.

It was observed that, in T3, the risk of presenting sleep disorders increased by 67%, compared to T2 (Table 1).

Table 1 – Relative risk of presenting sleep complaints according to the Pittsburgh Sleep Quality Index (PSQI-BR) over gestational trimesters, according to the Generalized Estimating Equations (GEE) model. Sumaré, São Paulo, Brazil, 2019

Gestational trimesters	Risks Ratio	95% CI LI – LS	p-value*
Second vs. first trimester	0.71	0.50 – 1.01	0.059
Third vs. first trimester	1.19	0.89 -1.60	0.249
Third vs. second trimester	1.67	1.08 – 2.56	0.019

Source: Survey data, 2019.

Notes: * Poisson regression model via GEE.

** Relative risk of presenting the result "sleep disorder" was estimated according to the PSQI score.

Table 2 refers to the comparison of variables in the Sleep Diary and PSQI-BR (total score and components) during the gestational period. There was an increase in night awakenings during pregnancy. We found no significant difference between the periods regarding sleep duration, the number of naps and latency to start sleeping. Analysis of multiple comparisons with the GEE model showed a significant difference in the number of night awakenings in T3, compared to T1 and T2.

We also observed that they had bad sleep quality, according to the PSQI-BR classification, in three gestational trimesters. The Dunn-Bonferroni post-hoc test showed significant difference in the PSQI-BR score between T2 and T3. There was a significant difference in scores for Sleep Quality, Sleep Duration and Daytime Dysfunction between trimesters,

according to Friedmann’s analysis. However, the Dunn-Bonferroni *post-hoc* test only maintained the difference between T1 and T3 regarding sleep quality (Table 2).

Table 3 shows associations between sleep disorders, identified by PSQI-BR, and the variables “paid activity” and “type of delivery,” in each gestational trimester. Significant association was found between sleep problems in T2 and the cesarean delivery, and between sleep disorders and not having remunerated activity, in T3.

Table 4 shows factors, present in T1, that could be associated with the relative risk of presenting sleep problems, according to the PSQI-BR score, throughout gestational trimesters, according to the GEE model. None of the studied factors was independently associated with the risk of reporting sleep complaints over trimesters.

Table 2 – Comparison of variables in the Sleep Diary and the total score and components of the Pittsburgh Sleep Quality Index (PSQI-BR) between gestational trimesters. Sumaré, São Paulo, Brazil, 2019

Variable	Trimester	Average (SD)	Median	Minimum	Maximum	p-value
Sleep duration (hours)	1st	9.2 (1.2)	9.3	5.7	12.0	0.1307*
	2nd	9.0 (1.3)	8.8	4.7	11.2	
	3rd	8.8 (1.3)	8.5	4.7	12.5	
Sleep latency (minutes)	1st	19.7 (24.0)	12.9	0.0	102.9	0.1792**
	2nd	15.9 (21.3)	9.5	0.0	94.3	
	3rd	16.6 (21.6)	7.5	0.0	94.3	
Awakenings during sleep (number)	1st	1.5 (0.9)	1.6	0.0	3.9	0.013*
	2nd	1.7 (1.0)	1.7	0.0	4.4	
	3rd	2.1 (1.4)	2.1	0.0	5.2	
Naps (number)	1st	0.4 (0.4)	0.4	0.0	1.1	0.4405**
	2nd	0.3 (0.4)	0.2	0.0	1.8	
	3rd	0.4 (0.4)	0.3	0.0	1.8	

Table 2 – Cont.

Variable	Trimester	Average (SD)	Median	Minimum	Maximum	p-value
PSQI-BR (total score)	1st	6.3 (2.9)	6.0	3.0	16.0	0.0018**
	2nd	7.0 (3.0)	4.5	2.0	14.0	
	3rd	7.2 (3.4)	6.0	3.0	13.0	
Component 1: Sleep Quality	1st	0.9 (0.6)	1.0	0.0	3.0	0.004**
	2nd	1.0 (0.6)	1.0	0.0	2.0	
	3rd	1.5 (0.8)	1.0	0.0	3.0	
Component 2: Sleep latency	1st	1.4 (0.9)	1.0	0.0	3.0	0.0825**
	2nd	0.9 (1.0)	1.0	0.0	3.0	
	3rd	1.1 (1.0)	1.0	0.0	3.0	
Component 3: Sleep Duration	1st	0.5 (0.7)	0.0	0.0	3.0	0.0279**
	2nd	0.3 (0.5)	0.0	0.0	1.0	
	3rd	0.6 (1.0)	0.0	0.0	3.0	
Component 4: Sleep efficiency	1st	0.4 (0.7)	0.0	0.0	3.0	0.0743**
	2nd	0.2 (0.6)	0.0	0.0	3.0	
	3rd	0.4 (0.7)	0.0	0.0	3.0	
Component 5: Sleep Disorders	1st	1.2 (0.5)	1.0	0.0	3.0	0,0907**
	2nd	1.2 (0.4)	1.0	1.0	2.0	
	3rd	1,4 (0,6)	1.0	1.0	3.0	
Component 7: Daytime Dysfunction	1st	1.9 (1.0)	2.0	0.0	3.0	0.0110**
	2nd	1.5 (0.9)	2.0	0.0	3.0	
	3rd	2.0 (1.1)	2.0	0.0	3.0	

Source: Survey data, 2019.

Notes: * p-value obtained using the GHG model.

** p-value obtained with the Friedman test.

Table 3 – Association between demographic, clinical and gestational data and sleep disorders according to the Pittsburgh Sleep Quality Index (PSQI-BR) in the gestational trimesters. Sumaré, São Paulo, Brazil, 2019

Variable	Pregnant women with sleep disorders according to the Pittsburgh Sleep Quality Index (PSQI-BR)								
	1st trimester			2nd trimester			3rd trimester		
	n	%	p-value	n	%	p-value	n	%	p-value
Marital status									
Without partner	2	40.0	0.6396**	1	20.0	0,6295**	3	60.0	1.000**
With partner	19	57.6		14	42.4		22	66.7	
Paid Activity									
No	13	62.0	0.3601*	8	38.1	0.8468*	17	80.9	0.0285*
Yes	8	47.1		7	41.2		8	47.1	
Feel pain									
No / Sporadically	15	55.6	1,0000*	9	31.0	0.1154**	9	60,0	0.5435*
Every day	6	54.5		6	66.7		16	69.6	
Planned pregnancy									
No	11	52.4	0.6913*	9	42.9	0.6353*	15	71.4	0.4154*
Yes	10	58.8		6	35.3		10	58.8	
Receives support									
No/Little	10	66.7	0.2536*	7	46.7	0.4638*	9	60.0	0.5435*
Very much	11	47.8		8	34.8		16	69.6	
Type of delivery									
Normal	12	52.2	0.6353*	5	21.7	0.0056*	13	56.5	0.1359**
Cesarean section	9	60.0		10	66.7		12	80.0	

Source: Survey data, 2019.

Notes: * p-value obtained with the Chi-square test.

** p-value obtained using Fisher's exact test.

*** Reject null hypothesis when p-value is less than 0.0167.

Table 4 – Relative risk of presenting sleep disorders according to the Pittsburgh Sleep Quality Index (PSQI-BR) over the gestational trimesters, according to the Generalized Estimating Equations (GEE) model. Sumaré, São Paulo, Brazil, 2019

Factors present in the first trimester	Categories	Risks Ratio	95% CI		p-value
			LI	LS	
Age of pregnant women (In years)	-	1.01	0.97	1.05	0.5769
Marital status	Have no partner**	-	-	-	0.3267
	Have a partner	1.44	0.70	2.97	
Paid Activity	No (ref.)**	-	-	-	0.5025
	Yes	0.85	0.54	1.35	
Feel pain	No/sporadically (ref.)**	-	-	-	0.0704
	Every day	1.33	0.98	1.82	
Planned pregnancy	No (ref.)**	-	-	-	0.5691
	Yes	0.87	0.53	1.41	
Support	No (ref.)**	-	-	-	0.5291
	Very much	0.88	0.60	1.30	
Sleep Duration (trimester average)	-	1.01	1.00	1.01	0.1881

Source: Survey data, 2019.

Notes: * Probability of presenting "sleep disorders" was estimated according to the PSQI-BR score.

** Ref: Reference category

■ DISCUSSION

This longitudinal study aimed to assess characteristics and sleep quality over the gestational period of 38 pregnant women who mostly experienced unplanned pregnancies and with a partner. We observed that, in the third trimester sleep quality decreased, according to PSQI-BR, in relation to other periods. The third trimester was the worst in terms of sleep quality, followed by first trimester.

Results show an increased risk of presenting sleep problems in the third trimester, confirming the findings in other research that concluded that pregnancy changes quality and patterns of sleep. This situation is accentuated at the end of pregnancy, as birth approaches⁽⁹⁾. In the first trimester we have characteristics that justify the sleep disorders due to physiological changes in the woman's body⁽¹⁰⁾. Sleep-related

changes can be caused by physiological changes in pregnancy, such as discomfort during sleep, restless legs syndrome, and nightmares, causing pregnant women to complain of sleeping problems, shorter sleep duration, night awakenings, difficulty falling asleep, and decreased sleep efficiency. Pregnant women in the first gestational trimester have higher total sleep time; however, with less deep sleep, and the total time begins to decrease from the second trimester onwards⁽¹¹⁾.

Sleep duration decreased with pregnancy evolution, but not significantly, and the number of night awakenings increased. The latter in the third trimester was significantly different from findings for the other two trimesters. These changes, identified through the sleep diaries, can be associated with woman's difficulty in finding a comfortable position in sleep, back pain, increased urinary frequency and fetal activity. All these symptoms have significant interaction

with each other and tend to increase the incidence and severity of sleep disorders in this situation^(10,12). Regarding nap and latency to start sleep, there was no difference between gestational trimesters.

We found that cesarean delivery was more common in women who had sleep disorders, especially in the second trimester. Although this is a longitudinal study, it is not possible to suggest causal relationships between these two factors, but this finding reinforces the relevance of always investigating the quality of sleep during pregnancy. Some authors also suggest that there is a decrease in the average duration and sleep quality with the progression of pregnancy that may influence the type of delivery^(13,14).

Sleep disorders during this stage can be linked to adverse outcomes, such as premature birth, gestational hypertension and cesarean delivery^(15,16), and may affect the type of delivery, duration of birth, birth weight and Apgar score⁽⁴⁾. Inadequate sleep can also cause adverse fetal outcomes, including restricted intrauterine growth⁽¹⁷⁾.

Regarding components evaluated using PSQI-BR, we found a significant difference only in the sleep quality component between the first and third trimesters, reinforcing that pregnancy physiological changes, psychopathological factors, socioemotional influences, and hormonal changes can interfere with sleep conditions and consequences⁽¹⁸⁾. As of second gestational trimester, complaints related to sleep increase: orthopnea, inguinal pain, cramps, uncomfortable position, urinary urgency, nightmares, and unsatisfactory night rest are the main ones. In the third trimester, there is a worsening of complaints compared to other gestational periods⁽¹⁹⁾.

Sleep problems were more prevalent among pregnant women who did not work (paid job); however, this finding was observed only in the third trimester. This fact may be associated with irregularity of daily routine, provided by the inexistence of formal work schedule and by the non-establishment of a new routine, which contributes to promoting regular sleeping and waking habits. In addition to sleep disorders, irregularity can contribute to daytime sleepiness and naps during the day, in addition to interruptions in the nighttime sleep, resulting in sleep problems. As a possible strategy to improve sleep pattern, some authors propose a daily routine⁽²⁰⁾.

When developing health education actions, nurses aim to improve living and health conditions of the population, but these actions need to be constantly and effectively put into practice, especially during pregnancy to improve living and health conditions and, consequently, promote health in general. Educational actions are fundamental tools to stimulate both self-care and self-esteem of pregnant

women, promoting reflections that lead to changes in attitudes and behaviors.

Although most women report sleeping difficulties during pregnancy, approximately one-third recognize it as a problem. Sleep problems are rarely included in the list of common complaints during prenatal consultations, although representing potential risks. The need for good sleep is essential for gestational health, and health professionals should take this into account⁽¹⁰⁾.

An important aspect to be highlighted is that pregnant women with sleep disorders are more likely to experience depressive symptoms in the postpartum period⁽⁹⁾. Although this aspect has not been addressed in this study, it is understood that it reinforces the relevance of results presented and indicates that intervention and professional guidance on sleep during this period of women's lives is essential.

■ CONCLUSION

The results of this longitudinal study suggest that pregnancy interferes with the sleep of pregnant women, contributing to affect its quality, especially in the third trimester. There was an increase in the number of awakenings as pregnancy progresses. Most pregnant women had sleep disorders in the first and third trimesters, and there was a higher relative risk of having sleep problems in the third trimester compared to the second.

There was a higher prevalence of cesarean delivery among women who reported sleep disorders in the second trimester. Women who did have paid work outside home had higher prevalence of sleep issues in the third trimester.

None of the studied factors was independently associated with risk of reporting sleep disorders throughout pregnancy.

The strengths of this study were the longitudinal design, which gave us the opportunity of following pregnant women throughout the gestational trimesters during their prenatal visits; and the limitations refer to gestational losses that affected the sample size. We also mention the scarcity in literature of longitudinal studies with pregnant women on the topic.

Regarding implications, we understand that it is necessary to establish health promotion guidelines related to the quality of sleep of pregnant women, as a systematic process in health care, as this disorder can influence the women's quality of life. This study ratifies and demonstrate the need for a different look at sleep issues during pregnancy.

The health team must be aware of factors associated with sleep problems, in order to work out alternatives that can be used to alleviate them and inform pregnant women

about the possible sleep changes that may occur. It is also necessary to consider prenatal care as a time of intense learning and an opportunity for nurses to develop education as a dimension of the care process. The attitude of educators should be adopted to guide pregnant women about factors that may interfere with their sleep pattern and propose interventions that, through self-care, favor the quality of sleep during pregnancy.

After detecting the main triggering factors of sleep disorders in pregnancy, we suggest that educational proposals focused on sleep hygiene, addressing the subject in prenatal consultations, seeking to guide sleep routines and regularity, encouraging the practice of physical activities, adequate nutrition, care for the sleeping environment and more comfortable positions for pregnant women, checking difficulties and thus contributing to a better quality of life during this period.

■ REFERENCES

- Peltonen H, Paavonen EJ, Saarenpää-Heikkilä O, Vahlberg T, Paunio T, Polo-Kantola P. Sleep disturbances and depressive and anxiety symptoms during pregnancy: associations with delivery and newborn health. *Arch Gynecol Obstet.* 2022;24(3). doi: <http://doi.org/10.1007/s00404-022-06560-x>.
- Mourady D, Richa S, Karam R, Papazian T, Moussa FH, El Osta N, et al. Associations between quality of life, physical activity, worry, depression and insomnia: a cross-sectional designed study in healthy pregnant women. *PLoS One.* 2017;22(5):e0178181. doi: <http://doi.org/10.1371/journal.pone.0178181>.
- Tang Y, Dai F, Razali NS, Tagore S, Chern BSM, Tan KH. Sleep quality and BMI in pregnancy- a prospective cohort study. *BMC Pregnancy Childbirth.* 2022;22(1):72. doi: <http://doi.org/10.1186/s12884-022-04414-7>.
- Yang Y, Mao J, Ye Z, Li J, Zhao H, Liu Y. Determinants of sleep quality among pregnant women in China: a cross-sectional survey. *Nurs Palliat Care.* 2017;2(3):1-5. doi: <https://doi.org/10.15761/NPC.1000152>.
- Plancoulaine S, Flori S, Bat-Pitault F, Patural H, Lin JS, Franco P. Sleep trajectories among pregnant women and the impact on outcomes: a population-based cohort study. *Matern Child Health J.* 2017;21(5):1139-46. doi: <http://doi.org/10.1007/s10995-016-2212-9>.
- Felder JN, Mirchandaney R, Harrison J, Manber R, Cuneo J, Krystal A, et al. Examining experiences of poor sleep during pregnancy: a qualitative study to inform the development of a prenatal sleep intervention. *Glob Adv Health Med.* 2022;11:1-9. doi: <http://doi.org/10.1177/2164957X221087655>.
- Gomes CBA, Dias RS, Silva WGB, Pacheco MAB, Sousa FGM, Loyola CMD. Prenatal nursing consultation: narratives of pregnant women and nurses. *Texto Contexto Enferm.* 2019;28:e20170544. doi: <http://doi.org/10.1590/1980-265x-tce-2017-0544>.
- Bertolazi AN, Fagundes SC, Hoff LS, Dartora EG, Miozzo ICS, Barba MEF, et al. Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. *Sleep Med.* 2011;12(1):70-5. doi: <http://doi.org/10.1016/j.sleep.2010.04.020>.
- Garbaza C, Hackethal S, Riccardi S, Cajochen C, Cicolin A, D'Agostino A, et al. Polysomnographic features of pregnancy: a systematic review. *Sleep Med Rev.* 2020;50:101249. doi: <https://doi.org/10.1016/j.smrv.2019.101249>.
- Sweet L, Arjyal S, Kuller JA, Dotters-Katz S. A review of sleep architecture and sleep changes during pregnancy. *Obstet Gynecol Surv.* 2020;75(4):253-62. doi: <http://doi.org/10.1097/OGX.0000000000000770>.
- Effati-Daryani F, Mirghafourvand M, Mohammad-Alizadeh-Charandabi S, Sahiri-Sarand F, Zarei S. Sleep quality and its relationship with quality of life in Iranian pregnant women. *Int J Nurs Pract.* 2017;23(2):e12518. doi: <https://doi.org/10.1111/ijn.12518>.
- Plancoulaine S, Flori S, Bat-Pitault F, Patural H, Lin JS, Franco P. Sleep trajectories among pregnant women and the impact on outcomes: a population-based cohort study. *Matern Child Health J.* 2017;21(5):1139-46. doi: <http://doi.org/10.1007/s10995-016-2212-9>.
- Moura KL, Gonçalves CSA, Santos DF. Avaliação da qualidade do sono de gestantes em uma Unidade Básica de Saúde de Campina Grande – PB. *Rev Ciênc Méd Biol.* 2022;20(4):594-600. doi: <https://doi.org/10.9771/cmbio.v20i4.45298>.
- Umeno S, Kato C, Nagaura Y, Kondo H, Eto H. Characteristics of sleep/wake problems and delivery outcomes among pregnant Japanese women without gestational complications. *BMC Pregnancy Childbirth.* 2020;20(1):179. doi: <https://doi.org/10.1186/s12884-020-02868-1>.
- Anbesaw T, Abebe H, Kassaw C, Bete T, Molla A. Sleep quality and associated factors among pregnant women attending antenatal care at Jimma Medical Center, Jimma, Southwest Ethiopia, 2020: cross-sectional study. *BMC Psychiatry.* 2021;21(1):469. doi: <http://doi.org/10.1186/s12888-021-03483-w>.
- Yang Z, Zhu Z, Wang C, Zhang F, Zeng H. Association between adverse perinatal outcomes and sleep disturbances during pregnancy: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med.* 2020;35:166-74. doi: <http://doi.org/10.1080/14767058.2020.1711727>.
- Gupta R, Rawat VS. Sleep and sleep disorders in pregnancy. *Handb Clin Neurol.* 2020;172:169-86. doi: <https://doi.org/10.1016/B978-0-444-64240-0.00010-6>.
- Bacaro V, Benz F, Pappacogli A, Bartolo P, Johann AF, Palagini L, et al. Interventions for sleep problems during pregnancy: a systematic review. *Sleep Med Rev.* 2020;50:101234. doi: <https://doi.org/10.1016/j.smrv.2019.101234>.
- Shaun MMA, Nizum MWR, Shuvo MA, Fayeza F, Faruk MO, Alam MF, et al. Association between depressive symptoms and poor sleep quality among pregnant women in Northern Rural Bangladesh: a community-based cross-sectional study. *BMC Psychiatry.* 2022;22(1):201. doi: <http://doi.org/10.1186/s12888-022-03839-w>.
- Alimoradi Z, Abdi F, Gozal D, Pakpour AH. Estimation of sleep problems among pregnant women during COVID-19 pandemic: a systematic review and meta-analysis. *BMJ Open.* 2022;12(4):e056044. doi: <http://doi.org/10.1136/bmjopen-2021-056044>.

■ **Authorship contribution:**

Formal analysis: Natália Amorim Ramos Felix, Maria Filomena Ceolim.

Conceptualization: Natália Amorim Ramos Felix, Maria Filomena Ceolim.

Data curation: Natália Amorim Ramos Felix.

Writing – original draft: Natália Amorim Ramos Felix.

Writing – review and edit: Natália Amorim Ramos Felix, Maria Filomena Ceolim.

Methodology: Natália Amorim Ramos Felix, Maria Filomena Ceolim.

Supervision: Maria Filomena Ceolim.

Validation: Maria Filomena Ceolim.

Visualization: Natália Amorim Ramos Felix, Maria Filomena Ceolim.

The authors declare that there is no conflict of interest.

■ **Corresponding author:**

Natália Amorim Ramos Felix

E-mail: natalia_amorim_ramos@yahoo.com.br

Received: 11.04.2021

Approved: 06.09.2022

Associate editor:

Jéssica Teles Schlemmer

Editor-in-chief:

Maria da Graça Oliveira Crossetti