



The Frequency of Pregnancy Associated Sleep Disorders Among Pregnant Mothers Who Referred to Rasoul-Akram Hospital for Prenatal Care 2018 - 2019

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Abstract

Background: Sleep, a physiological need, may be disturbed during pregnancy due to the psychological, anatomical, biochemical, hormonal, and emotional adaptations.

Objectives: The present study aimed to investigate the frequency of morningness/eveningness, insomnia, and sleep disorders in pregnant mothers.

Methods: All healthy pregnant women who referred to Rasoul-Akram Hospital in 2018-2019 for prenatal care without severe medical diseases were included in the study by census method. They were asked to fill their demographics, Morningness Eveningness questionnaire (MEQ), Pittsburgh sleep quality index (PSQI), and insomnia severity index (ISI) after signing their informed consent. The data were analyzed using SPSS V.21. Women who gave birth before the third trimester were excluded from analysis.

Results: A total of 347 women completed the study; mean age: 31.46 ± 5.36 years, mean gestational age: 24.68 ± 9.62 weeks. The mean MEQ score was 48.77 ± 5.15 ; 8.1% were moderate evening type, 85.3% intermediate, and 2.6% moderate morning type. Mean ISI score was 16.92 ± 5.51 ; 91.9% had insomnia; 31.1% reported (rather or very) poor sleep quality. The frequency of insomnia (based on ISI scores) and sleep disorders (based on PSQI dimensions) were neither different among the three trimesters of pregnancy, nor between complicated and uncomplicated pregnancies ($P > 0.05$). The MEQ score ($P = 0.008$, OR = 4.275) was positively, and the academic degree was negatively ($P = 0.005$, OR = 0.202) associated with sleep disorder.

Conclusions: The majority of pregnant mothers reported insomnia, and about one-third reported poor sleep quality, indicating the necessity of paying greater attention to the sleep disorders of pregnant women from the early trimester to prevent further complications.

Keywords: Sleep Wake Disorders, Sleep Disorders, Circadian Rhythm, Dyssomnias, Pregnancy, Insomnia

1. Background

Sleep is a physiological need for human beings, and its deprivation/disorders cause several problems for the individual, including personal, familial, occupational, and social problems (1). Sleep can be regulated by several factors, including physical, behavioral, socioeconomic, and psychological factors (2-4). One of the important factors modifying the sleep-wakefulness cycle, the circadian rhythm, is

hormonal regulations (5). Pregnancy, an important part of women's life, causes remarkable changes in different hormones (6), especially those affecting the circadian rhythm, such as estrogen and progesterone, prolactin, oxytocin, and placental hormones, which can cause sleep disturbances for the pregnant woman (7). Furthermore, physiological and anatomical adaptations during pregnancy, such as urinary frequency and sometimes incontinence

and breathing problems, can cause nocturnal discomfort and impair sleep patterns during pregnancy, especially at the final trimester (8, 9). In addition, psychological factors have also been suggested as an important pathophysiology of the pregnancy-associated sleep disorders (10). However, many pregnant women may not report their sleep disorder to their physician and do not seek help, as they don't see it as a problem (11).

A variety of sleep disorders have been reported during pregnancy (12). Insomnia is considered the most frequent sleep disorder during pregnancy, reported as high as 80% (12). Insomnia has been reported in early pregnancy, as early as 10 weeks of gestation (13) with a two-fold increase in its frequency in the third trimester of pregnancy (14, 15). Also, a variety of sleep disturbances have been reported during pregnancy, such as late sleep onset, night awakenings, early morning awakenings, and poor sleep quality (16). Besides, sleep-disordered breathing, including snoring and sleep apnea, observed during pregnancy, can cause adverse pregnancy outcomes (17, 18). Other sleep disturbances have also been associated with adverse maternal and neonatal outcomes; for instance, insomnia during pregnancy is associated with increased duration of delivery stages, adverse neonatal outcomes (19, 20), increased cesarean section rate, and depression disorders during pregnancy (15, 21), and postpartum depression (PPD) (22, 23). Therefore, it is essential to diagnose the sleep disorders of the pregnant mothers and treat these disturbances in order to prevent further complications (24).

One of the important factors associated with sleep disorders in the individuals is the circadian preference toward morningness/eveningness, and eveningness has been associated with pregnancy-associated sleep disorders (25); however, many studies evaluating these disorders have not considered this issue.

2. Objectives

Accordingly and with respect to the significance of sleep disorders during pregnancy, the present study aimed to investigate the frequency of insomnia and sleep disorders in pregnant women, in addition to the assessment of morningness/eveningness.

3. Methods

3.1. Study Design

All pregnant women who referred to Rasoul-Akram Hospital from 20th July 2018 to 1st August 2019 for prenatal care were considered as the study population. The study protocol was approved by the Ethics Committee of

Iran University of Medical Sciences (code: IR.IUMS.REC 1396.3213). The sample size was calculated at 368 pregnant mothers considering the frequency of sleep disorder as 40%, type I error at 5%, and study power of 80%; the researcher selected the eligible participants based on the following criteria and included them into the study by census method: women who referred to the study place during the study period for prenatal care and did not have severe medical conditions, such as depression disorders, restless leg syndrome, sleep disorders, hypertension, or overt diabetes before pregnancy, cardiac or hepatorenal diseases, and autoimmune disorders. First, the researcher explained the study protocol and objectives to the eligible participants and then asked the study participants to read and sign the written informed consent.

The participants were asked to fill four questionnaires; the demographic and obstetric characteristics of the participants were asked in the first section of the first questionnaire, which included age, educational level, economic status, occupational status, weight, height, and body mass index (BMI), as well as number of pregnancies, deliveries, live births, the current gestational age, and medications used during pregnancy. The questionnaires included:

1) Morningness Eveningness questionnaire (MEQ); this questionnaire evaluates sleep patterns and sleep hours through 19 questions with different scores, designed by Horne and Ostberg (26). The total score ranges from 16 to 86; a higher score shows more morningness and lower scores show more eveningness in the participant: 86 - 70 definite morning type, 59 - 69 moderate morning type, 42 - 58 intermediate, 31 - 41 moderate evening type, and 16 - 30 definite evening type. The validity of the Persian version of this questionnaire (used in the present study) has been approved previously by Rajabi (27).

2) Pittsburgh sleep quality index (PSQI): this questionnaire was developed in 1989 by Buysse et al. (28), which includes 9 themes and 19 items, scored based on a 4-point Likert scale (0 to 3). It evaluates 7 subscales, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. The subscales are scored differently, resulting in a total score of 0 to 21; designers reported a Cronbach's alpha efficient of 0.83 for the English version (28). In addition, its use has been confirmed for the assessment of sleep disorders during pregnancy (29). Also, the reliability and validity of its Persian version (used in the present study) have been previously approved (30).

3) Insomnia severity index (ISI) evaluates insomnia and its consequences of daily life through 7 questions, each scored based on a 5-point Likert scale (0 indicating no problem to 4, severe problem). A total score > 8 is considered as

insomnia.

Women who gave birth before the 28th gestational week were excluded from analysis.

3.2. Statistical Analysis

Results of the categorical variables were described by frequency (percentage) and compared between subgroups using the chi-square test or Fisher's exact test, based on the number of samples in each category. For numeric variables, first, the normal distribution of the data was tested using the one-sample Kolmogorov-Smirnov test, and according to the results of this test, the results of numeric variables were described using mean \pm standard deviation (SD), minimum, and maximum. The association of variables were evaluated by uni- and multivariate logistic regression analysis using enter approach and odds ratio (OR). For the statistical analysis, the statistical software IBM SPSS Statistics for Windows version 21.0 (IBM Corp. 2012. Armonk, NY: IBM Corp) was used. P values of < 0.05 were considered statistically significant.

4. Results

The mean \pm SD of participants' age was 31.46 ± 5.36 (min: 18 and max: 49) years with a mean gestational age of 24.68 ± 9.62 weeks (min: 4 and max: 40). The complete demographic and obstetric characteristics of the participants are shown in [Table 1](#).

The mean \pm SD of total MEQ scores of the participants was 48.77 ± 5.15 (min: 32, max: 63); 8.1% of the participants were moderate evening type ($n = 28$), 85.3% were intermediate type ($n = 296$), and 2.6% were moderate morning type ($n = 9$); 4% ($n = 14$) did not respond. The mean \pm SD of total ISI scores of the participants was 16.92 ± 5.51 (min: 7, max: 25); 5.8% of the participants did not have insomnia ($n = 20$) and 91.9% had insomnia ($n = 319$); 2.3% ($n = 8$) did not respond.

Based on PSQI scores, 10.1% of participants evaluated their sleep quality as very good ($n = 35$), 57.6% rather good ($n = 200$), 23.6% rather poor ($n = 82$), and 7.5% very poor ($n = 26$); the mean and frequency of PSQI scores are shown in [Table 2](#).

The frequency of insomnia (based on ISI scores) and sleep disorders (based on PSQI dimensions) compared among the three pregnancy trimesters indicated that none of the sleep parameters were significantly different among women in different trimesters ($P > 0.05$; Appendix 1 in Supplementary File). Also, comparing the frequency of insomnia (based on ISI scores) and sleep disorders (based on PSQI dimensions) between women with and without pregnancy problems showed no significant difference between these two groups ($P > 0.05$; Appendix 2 in Supplementary File).

The association of demographic characteristics with sleep disorder were evaluated by univariate regression, which showed that mean MEQ score was significantly associated ($P = 0.001$, OR = 5.536), but not with age, moderate economic status, poor economic status, occupational status, number of pregnancies, deliveries, abortions, live births, 2nd and 3rd trimester pregnancy, pregnancy disorders, and BMI ($P > 0.05$; [Table 3](#)). Thus, only the MEQ score entered multivariate regression analysis, the results of which showed a significant association ($P = 0.008$, OR = 4.275). Also, considering the participants' educational level, guidance school ($P = 0.043$, OR = 0.168) and academic education ($P = 0.007$, OR = 0.216) predicted the sleep disorders in univariate regression analysis, but only academic education remained significant in multivariate regression ($P = 0.005$, OR = 0.202) and guidance school education lost its significance ($P = 0.147$, OR = 0.257). The complete results of uni- and multivariate regression analysis are shown in [Table 3](#).

5. Discussion

The present study on 347 pregnant mothers showed a high frequency of insomnia (91.9%) and sleep disorders, which was not different based on the trimester and pregnancy complications. These results are in line with the results of previous studies, considering the high frequency of insomnia and sleep disorders during pregnancy, although the frequency rates differ among studies. Kizilirmak et al. (21) evaluated 486 pregnant women who consulted with the gynecology polyclinics and assessed the frequency of insomnia using Women's Health Initiative Insomnia Rating scale (WHIIRS); this research reported insomnia in 51.2% of the pregnant women and an increase in WHIIRS scores by pregnancy trimester and BMI. The frequency of insomnia in our study was significantly higher than that reported by Kizilirmak et al. (21) that could be due to the different assessment tools used. Fernandez-Alonso et al. (31) used ISI for evaluation of insomnia in pregnant women in the late third trimester of pregnancy and reported insomnia in 73.5% of women. The assessment tool used in their study was similar to that of the present study; however, the study population differed, as they only considered women in late pregnancy, while we evaluated all pregnant women with different gestational ages.

The frequency of insomnia was 12.2%, 38.6%, and 49.2% in the first, second, and third trimester of our study population, respectively. One of the notable issues of these results is the presence of insomnia in early pregnancy (the first trimester). In the study by Okun et al. (32), evaluation of 143 pregnant women at 12 weeks gestation using the Insomnia Symptom questionnaire (ISQ) identified insomnia

Table 1. The Demographic and Obstetric Characteristics of Study Population^a

Variable	Category	Total	Minimum-Maximum	Values
Age, y		342	18.00 - 49.00	31.46 ± 5.36
Number of pregnancies		347	0 - 6.00	1.81 ± 1.04
Number of deliveries		347	0 - 4.00	0.61 ± 0.77
Number of abortions		347	0 - 4.00	0.41 ± 0.70
Number of live births		347	0 - 5.00	0.54 ± 0.70
Gestational age, wk		339	4.00 - 40.00	24.68 ± 9.62
Weight, kg		329	39.00 - 144.00	72.72 ± 13.44
Height, m		332	147.00 - 179.00	162.64 ± 5.73
Body mass index, kg/m ²		319	16.16 - 58.42	27.47 ± 4.88
Educational level	Primary school	347		15 (4.3)
	Secondary school			32 (9.2)
	High school diploma			97 (28)
	Academic degree			203 (58.5)
Economic status	Poor	346		51 (14.7)
	Moderate			233 (67.1)
	Wealthy			62 (17.9)
Occupational status	Housewife	347		255 (73.5)
	Employee			92 (26.5)
Using medications	Yes	347		187 (53.9)
	No			160 (46.1)

^aValues are expressed as No. (%) or mean ± SD.

in 12.6% of the study population, which is similar to the frequency of insomnia in the pregnant women of our study in the first trimester. These results emphasize on the significance of identifying sleep disorders at early pregnancy, as appropriate diagnosis of insomnia in early pregnancy may allow starting supportive care throughout pregnancy, and prevent its further complications (24). Furthermore, the frequency of insomnia in our study has increased by the progress in the trimesters, which is similar to the results of the study by Kizilirmak et al. (21), reporting a higher WHIIRS score by pregnancy progress. Others have also reported a two-fold increase in the frequency of insomnia in the third trimester of pregnancy (14, 15); nevertheless, we did not observe a statistically significant difference in the insomnia frequency among the three trimesters.

Another important aspect of the present study was the high frequency of sleep disorders in pregnant women, evaluated using PSQI. Previous studies have also validated the use of PSQI for assessment of sleep disorders in pregnant women (29). In the study by Qiu et al. (33), assessment of 1,488 pregnant women showed that 37% had poor sleep quality, which confirms the results of the present study,

as in our study 31.1% of participants evaluated their sleep quality as (rather or very) poor. Similarly, Naud et al. (34) assessed the sleep patterns of 260 pregnant women using PSQI and reported 36% of women in the second trimester and 56% in the third trimester, while in our study, the frequency of poor sleepers was 46.9% and 40.8% in the second and third trimester. Also, the results of a meta-analysis of 24 studies evaluating the sleep disturbances of pregnant women showed poor sleep quality in 45.7% of pregnant women, which increased by age and pregnancy progress (35). These results confirm that of the present study in terms of poor sleep in pregnant women, although the frequency rates differ between studies, which may be due to the difference in the inclusion criteria of the study population. As in our study, we only analyzed pregnant women who had an uncomplicated term delivery. In addition, we excluded women with medical diseases, as it has been previously suggested that factors such as smoking and higher blood pressure are associated with insomnia and sleep disorders in pregnant women (31). In another study on 642 women below 16 weeks of gestation, the results showed poor sleep quality in 28.5% of the participants (36), which

Table 2. The Pittsburgh Sleep Quality Index Scores of the Participants

Variable	Category	Mean \pm SD	No. (%)
Subjective sleep quality	Without sleep disorder	2.28 \pm 0.75	35 (10.1)
	Moderate sleep disorder		200 (57.6)
	Severe sleep disorder		82 (23.6)
	Very severe sleep disorder		26 (7.5)
	Not reported		4 (1.2)
Sleep latency	Without sleep disorder	1.84 \pm 0.77	0
	Moderate sleep disorder		126 (36.3)
	Severe sleep disorder		122 (35.2)
	Very severe sleep disorder		75 (21.6)
	Not reported		24 (6.9)
Sleep duration	Without sleep disorder	1.02 \pm 1.04	156 (45)
	Moderate sleep disorder		51 (14.7)
	Severe sleep disorder		110 (31.7)
	Very severe sleep disorder		27 (7.8)
	Not reported		3 (0.9)
Habitual sleep efficiency	Without sleep disorder	2.36 \pm 1.21	70 (20.2)
	Moderate sleep disorder		4 (1.2)
	Severe sleep disorder		1 (0.3)
	Very severe sleep disorder		280 (77.8)
	Not reported		2 (0.6)
Sleep disturbances	Without sleep disorder	2.55 \pm 0.53	0
	Moderate sleep disorder		3 (0.9)
	Severe sleep disorder		72 (20.7)
	Very severe sleep disorder		99 (28.5)
	Not reported		173 (49.9)
Use of sleeping medications	Without sleep disorder	1.12 \pm 0.48	308 (88.8)
	Moderate sleep disorder		16 (4.6)
	Severe sleep disorder		3 (0.9)
	Very severe sleep disorder		6 (1.7)
	Not reported		14 (4)
Daytime dysfunction	Without sleep disorder	1.74 \pm 0.74	0
	Moderate sleep disorder		129 (37.2)
	Severe sleep disorder		113 (32.6)
	Very severe sleep disorder		54 (15.6)
	Not reported		51 (14.7)

is higher than the frequency of poor sleepers in the present study (12.2%).

Another important sleep variable evaluated in our study was morningness/eveningness, and the results showed that the majority of participants (85.3%) were neither types. In the study by Merikanto et al. (25), evaluation of 1653 pregnant women showed the association of eveningness with sleep disorders in pregnancy with troubles of falling asleep, poor sleep quality, and daily tiredness. Also, eveningness in the third trimester of pregnancy has been associated with adverse delivery outcomes (37). Furthermore, the results of regression analysis in the present study showed morningness/eveningness as

an important predictor of sleep disorder. Therefore, it is important to pay attention to the circadian preference toward morningness/eveningness of the pregnant women, when assessing her sleep disorders.

Among all variables studied in the current study, besides morningness/eveningness, which had a positive association with sleep disorder and resulted in about a 5-fold increase in its odds, academic education was the other variable significantly associated with sleep disorder, which decreased its odds, while other variables could not predict sleep disorder.

The present study evaluated different dimensions of sleep disorders in pregnant women at three trimesters,

Table 3. The Results of Univariate and Multivariate Logistic Regression for the Association of Variables with Sleep Disorders

	Univariate Models					Multivariate Model				
	B	P Value	OR	95% CI. for OR		B	P Value	OR	95% CI. for OR	
				Lower	Upper				Lower	Upper
MEQ score	1.711	0.001	5.536	1.977	15.499	1.453	0.008	4.275	1.458	12.534
Age	0.048	0.258	1.050	0.965	1.142	-	-	-	-	-
Educational level										
Guidance school	-1.787	0.043	0.168	0.030	0.948	-1.359	0.147	0.257	0.041	1.613
High school	-1.425	0.060	0.241	0.054	1.062	-1.103	0.162	0.332	0.071	1.555
Academic education	-1.530	0.007	0.216	0.072	0.653	-1.598	0.005	0.202	0.066	0.622
Economic status										
Moderate	-0.460	0.511	0.632	0.160	2.490	-	-	-	-	-
Good	0.321	0.595	1.378	0.423	4.489	-	-	-	-	-
Occupational status	0.770	0.228	2.159	0.617	7.547	-	-	-	-	-
Pregnancy	-0.134	0.531	0.875	0.575	1.330	-	-	-	-	-
Delivery	-0.203	0.454	0.817	0.481	1.387	-	-	-	-	-
Abortion	-0.103	0.745	0.902	0.486	1.674	-	-	-	-	-
Living birth	-0.009	0.978	0.991	0.525	1.870	-	-	-	-	-
Gestational age										
2nd trimester	-0.140	0.865	0.869	0.174	4.354	-	-	-	-	-
3rd trimester	-0.695	0.163	0.499	0.188	1.326	-	-	-	-	-
Drug history	-0.370	0.424	0.690	0.278	1.712	-	-	-	-	-
Pregnancy disorders	0.774	0.104	2.168	0.853	5.508	-	-	-	-	-
BMI	-0.021	0.643	0.979	0.894	1.072	-	-	-	-	-

Abbreviations: BMI, body mass index; CI, confidence interval; MEQ score, Morningness Eveningness questionnaire; OR, odds ratio.

while including a wide range of demographic and obstetric variables. However, it had some limitations. One of the limitations of the present study was nonrandomized inclusion of participants into the study and selection of participants from one center, which increase the effect of confounders on the study results. Furthermore, the small sample size was another limitation of this study.

5.1. Conclusions

In conclusion, the present study showed that the majority of pregnant women were poor sleepers and had insomnia. Considering the presence of sleep disorders in all three trimesters, it is necessary to diagnose the sleep disorders of pregnant women since early pregnancy, in order to treat them appropriately and prevent further effects of sleep disorders on maternal and neonatal outcomes.

Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Footnotes

Authors' Contribution: Study concept and design: AM, SC, and KT. Analysis and interpretation of data: MA, AM, and SB. Drafting of the manuscript: LH and NH. Critical revision of the manuscript for important intellectual content: MM, FK, and ZN. Statistical analysis: LA.

Conflict of Interests: None.

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