



# Insomnia During Pregnancy and Related Factors

## Gebelikte Uykusuzluk ve İlişkili Faktörler

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### Abstract

**Objective:** In this study, the aim was to investigate the prevalence of insomnia and related factors in Turkish pregnant women.

**Materials and Methods:** This cross-sectional study was performed out with 467 pregnant women. The Personal Information Form, Insomnia Severity Index, and Epworth Sleepiness Scale (ESS) were used to collect the data.

**Results:** The mean age of the participating pregnant women was 28.9±3.90 years. Of them, 28.5% suffered from insomnia, 30.8% were in the first trimester, 37.5% were in the second trimester, and 31.7% were in the third trimester. The results of the multivariate logistic regression analysis demonstrated that the ESS score, pregnancy trimester, daytime sleep, leg cramp during sleep, and edema were the risk factors affecting insomnia during pregnancy.

**Conclusion:** In the study, it was determined that the daytime sleepiness score was one of the main factors affecting insomnia during pregnancy, that insomnia was more prevalent in the third trimester than it was in the other two trimesters, and that sociodemographic and other obstetric characteristics did not affect insomnia.

**Keywords:** Insomnia, daytime sleepiness, pregnancy, trimester

### Öz

**Amaç:** Bu çalışma, gebelerde uykusuzluk prevalansı ve ilişkili faktörlerin araştırılması amacıyla gerçekleştirildi.

**Gereç ve Yöntem:** Bu kesitsel çalışma 467 gebe ile yapılmıştır. Verilerin toplanmasında Kişisel Bilgi Formu, Uykusuzluk Şiddet İndeksi ve Epworth Uykululuk Ölçeği (ESS) kullanılmıştır.

**Bulgular:** Gebelerin yaş ortalaması 28,9±3,90 yılıdır. Gebelerin %28,5'inin uykusuzluk yaşadığı, bunların da %30,8'inin ilk üç aylık dönemde, %37,5'inin ikinci üç aylık dönemde ve %31,7'sinin üçüncü üç aylık dönemde olduğu belirlendi. Çok değişkenli lojistik regresyon analizi sonuçları, ESS skorunun, gebelik trimesterinin, gündüz uykusunun, uykuda bacak krampları yaşama ve ödemin gebelikte uykusuzluğu etkileyen risk faktörleri olduğunu göstermiştir.

**Sonuç:** Çalışmada, gündüz uykululuk puanının gebelikte uykusuzluğu etkileyen temel faktörlerden biri olduğu, üçüncü trimesterde uykusuzluğun diğer iki trimestere göre daha yaygın olduğu, sosyo-demografik ve diğer obstetrik özelliklerin uykusuzluğu etkilemediği saptandı.

**Anahtar Kelimeler:** Uykusuzluk, gündüz uykululuğu, gebelik, trimester

### Introduction

Insomnia is defined as dissatisfaction with the amount or quality of sleep that occurs at least three times a week for at least 3 months, that is not related to another condition, and that manifests itself with distress or disorder in a person (1). During pregnancy, which is perhaps the most important of these biological milestones, significant changes occur in gonadal steroids, pituitary hormones, and melatonin and cortisol hormones in the female body. These hormonal changes not only directly affect the sleep-wake cycles and sleep structure but also cause physiological changes likely to increase the risk of sleep disorders (2). The prevalence of insomnia in women is lower in the early period of pregnancy but higher in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters (3). The most common causes of insomnia in

the first trimester of pregnancy are nausea/vomiting, frequent urination, back pain, and fetal movements, whereas heartburn, leg cramps/tingling, restless legs syndrome, and shortness of breath are among the causes in the second and third trimesters (2,4,5). In several studies, it has been reported that women who have insomnia problems before pregnancy may have worse conditions during pregnancy and that they wake-up more often after falling asleep, and eye movements are slower during rapid eye movement (REM) sleep (2,3). In addition, sleep problems, such as a decrease in total sleep time, an increase in the number of night awakenings, less deep and REM sleep, more frequent waking in early pregnancy, and snoring, can be seen frequently during pregnancy (3,6). In the literature, insomnia during pregnancy has been reported to increase the risk of hypertension and preeclampsia (6,7), gestational diabetes (6),

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depression (3,6,8), preterm labor (3,6), and unplanned cesarean delivery (7). Other factors affecting insomnia are excessive body mass index (BMI), weight gain, nulliparity, having other children living at home, having to work, and daytime sleepiness (2,8). The review of the literature demonstrates that the number of studies conducted on insomnia, especially during pregnancy is unexpectedly not many (5,8-11). In addition, prenatal routine care guidelines unfortunately do not include any information about the detection and management of insomnia (5). This descriptive, cross-sectional, and community-based study was conducted to investigate the relationship between insomnia in pregnancy, socio-demographic, obstetric characteristics, and sleep-related factors. Based on this information, this study sought answers to the following questions:

1. Do socio-demographic variables have an effect on insomnia?
2. Do obstetric characteristics have an effect on insomnia?
3. Do factors associated with sleep have an effect on insomnia?
4. What are the risk factors for insomnia?

## Materials and Methods

### Design

This descriptive, cross-sectional, and community-based study was carried out between November 17, 2020 and April 28, 2021.

### Sample

This study was conducted in the gynecology and obstetrics outpatient clinics of the private Medipol Nisa Hospital, which is located on the European side of Istanbul, which is the largest city in Turkey, straddles the Bosphorus strait, and lies in both Europe and Asia. The hospital has nine gynecology and obstetrics outpatient clinics and a very high annual birth and pregnancy follow-up rates. The number of pregnant women who were admitted to the obstetrics outpatient clinics of the private hospital between January 2019 and December 2019 was 12,000. The minimum sample size required to conduct the study was calculated as 359 on the Epi info software by assuming the incidence of insomnia during pregnancy as 40% and the type I error ( $\alpha$ ) as 0.05. The power ( $1-\beta$ ) of the test was 0.95 (<https://www.cdc.gov/epiinfo/index.html>, Epiinfo v5.5.2). Considering some attrition during the study, the pattern effect was taken as 1.3, and the sample size was calculated as 467 pregnant women.

The inclusion criteria: Being between the ages of 20 and 40, being primiparous or multiparous, having a singleton pregnancy, and signing the voluntary consent form.

The exclusion criteria: Having a serious complication that may endanger the pregnancy, having a chronic disease (pre-gestational hypertension or hereditary or acquired thrombophilia), having a problem that prevents communication (such as not being able to read and write in Turkish or having impaired hearing, speaking or understanding skills), or having a psychiatric illness and receiving treatment for it (pharmacotherapy, psychotherapy, non-pharmacological methods).

### Data Collection Tools

**Personal Information Form:** The form was prepared by the researchers based on the pertinent literature. In order to test the intelligibility of the form, it was administered to 30 pregnant women who had been admitted to the obstetrics outpatient clinic of the hospital. Based on the feedback from them, the form was revised and finalized. It consisted of 25 questions about women's sleep status, socio-demographic characteristics, medical and obstetric pregnancy history, and current pregnancy.

**Insomnia Severity Index (ISI):** This scale, which was developed to assess the severity of insomnia, consists of five questions (12). A score of 0-7 indicates no clinically significant insomnia, a score of 8-14 indicates sub-threshold insomnia, and a score of 15 shows insomnia. Turkish validity and reliability study of the scale was conducted by Boysan et al. (13). The internal consistency of the scale was found to be 0.79 in the validity and reliability study, and Cronbach's alpha value was found to be 0.93 in this study. Written permission was obtained from the authors who had adapted the scale into Turkish so that we could use it in this study.

**Epworth Sleepiness Scale (ESS):** In this scale, which was developed by Johns (14), women rank their probability of falling asleep from 0 to 3 for 8 different conditions. The total ESS score is obtained by summing the scores of the eight items. Minimum and maximum scores range between 0 and 24. Turkish validity and reliability study of the scale was performed by Izci et al. (15). Cronbach's alpha value was  $\geq 0.86$  in the validity and reliability study, and it was found to be 0.92 in this study. Written permission was obtained from Izci et al. (15) to use the scale in the present study.

### Data Collection

The Personal Information Form was used to find out whether the pregnant women met the research criteria. Those who met the criteria were included in the study. The ISI and ESS were administered to pregnant women who met the inclusion criteria to assess their insomnia status. The study data were collected from the participants with the data collection tools by the researcher, using the face-to-face interview method. It took an average of 20 minutes to fill out the data collection tool.

### Statistical Analysis

The statistical analysis of the data was performed on SPSS 24.0 software. In the analysis of the data, descriptive statistical methods (frequency, percentage, arithmetic mean, standard deviation) were used. The Kolmogorov-Smirnov test was used to find out whether the data were distributed normally. Pearson's chi-square test, Fisher's Exact test, and Mann-Whitney U test were used for the intergroup comparisons. The logistic multivariate regression test (backward Wald method) was employed for further (advanced) analysis. Statistical significance was accepted as  $p < 0.05$  at the 95% confidence interval.

### Ethical Approval

The study was approved by Istanbul Medipol University Researches Ethics Committee (reference number: 10840098-772.02-E.61615, date: 17.11.2020) before the data were

collected. All procedures were carried out in accordance with the 1964 Helsinki Declaration. Before the study was conducted, written permission was obtained from the chief physician of the private Medipol Nisa Hospital where the study was planned to be conducted. Then, the data collection process was initiated, the participants were informed about the study, and their written consent was obtained.

## Results

### 1. Demographic Characteristics of Pregnant Women

Four hundred sixty-seven healthy pregnant women participated in the study. Of these women, 28.5% had insomnia, 4.5% had moderate insomnia, and 71.5% did not have insomnia. The socio-demographic and obstetric characteristics of pregnant women with and without insomnia are given in Table 1. While there was no statistically significant difference between the groups with and without insomnia in terms of their socio-demographic characteristics, a difference was found between the two groups in terms of variables, such as BMI during pregnancy, coffee use, and smoking status. While there was no statistically significant difference between the ISI groups in terms of the variables such as the number of pregnancies and whether the pregnancy was planned, there was a difference between the ISI groups in terms of the variables such as trimester and baby's sex (Table 1).

### 2. Sleep Characteristics of the Participants

In the present study, of the participants, 98.5% had not experienced insomnia before pregnancy, 98.1% did not experience restless legs syndrome, 80% did not snore during sleep, 78.2% had no edema, 82% did not have a pre-pregnancy - or pregnancy- induced chronic disease, and 49.5% slept during the day. The duration of daytime sleep was 15 minutes or less in 54% of those who slept during the daytime. Given the sleep-related characteristics of the participants, a statistically significant difference was determined between the ISI groups in terms of the variables, such as pre-pregnancy insomnia, daytime sleepiness, daytime sleep duration, and the variables, such as having the restless legs syndrome, snoring during sleep, edema, and having cramps at night. There was also a statistically significant difference between the two ISI groups in terms of their ESS scores (Table 2).

### 3. Risk Factors Affecting Insomnia

All the variables that were significant according to the multivariate analysis were found to be significant predictors in the univariate analysis. The model that we created through the multivariate analysis allowed us to determine that 85% of the cases were classified correctly. Accordingly, the increase in the ESS score obtained by the pregnant women increased their insomnia 1,175 times. The pregnant women in the first trimester had 0.294 times less insomnia than the pregnant women in the third trimester, and the pregnant women in the second trimester had 0.390 times less insomnia than the pregnant women in the third trimester. Of the pregnant women, those who slept during the day had insomnia 2,223

times more than those who did not sleep during the day, those who had cramps in their legs during night sleep had insomnia 2,811 times more than those who had no cramps, and those with edema had insomnia 2,344 times more than those who did not have edema (Table 3).

## Discussion

In this study, we investigated the effects of socio-demographic and obstetric characteristics and sleep-related factors on insomnia during pregnancy. Our search, in which insomnia in women was investigated in all the trimesters of pregnancy, demonstrated a gap in the literature (5,8-11,16). The data obtained from the study indicated that 28.5% of the participants had insomnia (the scores they obtained from the overall ISI ranged between 8 and 28) and 36.8% suffered daytime sleepiness. Of these, 24% had mild insomnia, and 4.5% had moderate insomnia. This made us think that the study would contribute to the relevant national and international literature on the prevalence of insomnia and daytime sleepiness during pregnancy. A study conducted with 370 singleton gravidas indicated that 73.5% of the women had insomnia and that 22.2% had daytime sleepiness (8). The prevalence of insomnia was 51.2% in the study by Kızılırmak et al. (17), 3.4% in the study by Kalmbach et al. (18), and 33.3% in the study by Okun et al. (19). These differences between the results are thought to stem from the differences between the definitions of insomnia, and the methodologies and measurement tools used in studies. Our study results are within the range that is determined in the aforementioned studies.

In the literature, it is stated that insomnia increases significantly during pregnancy (17,19). Pregnant women experience problems, such as leg cramps, hormonal changes, and pressure exerted on the diaphragm by the growing fetus, which thus disrupt sleep patterns and sleep quality as the pregnancy progresses (4,20). In a study conducted with 436 pregnant women, Wang et al. (21) determined a relationship between excessive daytime sleepiness and insomnia. They also determined that 19.7% of these women had excessive daytime sleepiness and that the pregnant women who suffered from insomnia obtained higher scores from the ESS. Our study results are consistent with those in the literature, and it is assumed that daytime sleep compensates both the disturbed night sleep and inadequate sleep time. Mindell et al. (4) emphasized that taking a nap during the day should be considered as a strategy used by pregnant women to cope with insomnia. In the chi-square analysis conducted in this study, although a statistically significant difference was determined between ISI groups in terms of the variables such as coffee use, smoking, and BMI during pregnancy (respectively  $p=0.001$ ,  $p=0.011$ ,  $p=0.000$ , Table 1) and the sex of the baby ( $p=0.001$ , Table 1), these variables were removed from the model because the multivariate logistic regression analysis revealed that they did not contribute to the model established (Table 3). In the present study, independent risk factors affecting insomnia during pregnancy were the ESS score indicating daytime sleepiness, pregnancy trimester, daytime sleep, cramping in the

legs during sleep, and edema. These variables predicted 85% of the cases. Increased daytime sleepiness increased the pregnant women's insomnia by 1,175 times. The pregnant women in the first and second trimesters experienced insomnia less than the pregnant women in the last trimester. Of the pregnant women, those who slept during the day, suffered from cramps in their legs during night sleep or had edema also experienced more insomnia. In the study conducted with 517 pregnant women by Al-Jahdali et al. (22), as daytime sleepiness increased, so did insomnia. Ebert et al. (23) reported that daytime sleep had very

little effect on night sleep parameters and that sleep continuity and sleep quality were moderately impaired in those who took a long nap (90 minutes). Although daytime sleepiness is thought to have a compensatory effect, the view that daytime sleepiness may diminish sleep difficulties or that it is a useful measure for coping with insomnia is unclear. The findings of this study are similar to those in other studies. In the study conducted with 486 pregnant women by Kızılırmak et al. (17), the risk of insomnia in the third trimester was determined to be 2.03 times higher than in other trimesters. Salari et al. (24)

**Table 1. Socio-demographic and obstetric characteristics of pregnant women according to insomnia**

Socio-demographic and obstetric features	ISI ≥8 (n=133)		ISI <8 (n=334)		Total (n=467)		Statistics	
	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	Z	p
Age	29.06±3.84	29 (19-40)	28.83±3.93	29 (20-40)	28.9±3.90	29 (19-40)	-0.468	0.64
Before pregnancy BMI	24.69±3.03	24.22 (16.65-34.60)	24.43±2.99	24.16 (18.37-35.63)	24.5±3.00	24.50 (16.65-35.63)	-1.375	0.169
BMI (in pregnancy)	27.24±3.41	27.34 (17.48-38.06)	25.94±3.10	25.71 (18.73-35.63)	26.31±3.24	26.07 (17.48-38.06)	-4.209	<0.001
Gestation weeks	27.58±10.69	33 (5-40)	18.66±9.47	19 (5-39)	21.20±10.61	21 (5-40)	-8.378	<0.001
	n	%	n	%	n	%	χ <sup>2</sup>	p
<b>Educational status</b>								
Illiterate	2	1.5	5	1.5	7	1.5	4.951	0.175
Primary education	16	12	21	6.3	37	7.9		
High school	99	74.4	274	82	373	79.9		
University	16	12	34	10.2	50	10.7		
<b>Use coffee</b>								
Yes	50	37.6	74	22.2	124	26.6	11.625	0.001
No	83	62.4	260	77.8	343	73.4		
<b>Use cigarette</b>								
Yes	25	18.8	34	10.2	59	12.6	6.4	0.011
No	108	81.2	300	89.8	408	87.4		
<b>Trimester</b>								
1. Trimester	25	18.8	119	35.6	144	30.8	103.454	<0.001
2. Trimester	20	15	155	46.4	175	37.5		
3. Trimester	88	66.2	60	18	148	31.7		
<b>Number of pregnancy</b>								
Primiparous	74	55.6	198	59.3	272	58.2	0.519	0.471
Multiparous	59	44.4	136	40.7	195	41.8		
<b>Baby's gender</b>								
Girl	43	32.3	77	23.1	120	25.7	13.399	0.001
Boy	70	52.6	153	45.8	223	47.8		
Don't know	20	15	104	31.1	124	26.6		
<b>Wanted pregnancy</b>								
Yes	126	94.7	326	97.6	452	96.8	2.517	0.144*
No	7	5.3	8	2.4	15	3.2		

\*Fisher's exact test, χ<sup>2</sup>: Chi-square test, Z: Man-Whitney U testi, p<0.005, ISI: Insomnia Severity Index, Min-max: Minimum-maximum, SD: Standard deviation, BMI: Body mass index

Sleep-related characteristics	ISI≥8 (n=133)		ISI<8 (n=334)		Total (n=467)		Statistics	
	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	Z	p
ESS score	12.45±4.78	13 (1-36)	6.02±5.67	6 (0-33)	7.85±6.15	8 (0-36)	-10.472	<0.001
Daytime sleep	44.96±30.69	60 (0-120)	14.07±21.54	0 (0-90)	22.87±28.16	1 (0-120)	-10.495	<0.001
	n	%	n	%	n	%	χ <sup>2</sup>	p
<b>Before pregnancy insomnia</b>								
Yes	5	3.8	2	0.6	7	1.5	6.436	0.022*
No	128	96.2	332	99.4	460	98.5	-	-
<b>Daytime sleepiness</b>								
Yes	110	82.7	121	36.2	231	49.5	82.207	<0.001
No	23	17.3	213	63.8	236	50.5	-	-
<b>Daytime sleep time</b>								
15 minutes or less	24	18	228	68.3	252	54	116.491	<0.001
16-30 min	41	30.8	69	20.7	110	23.6	-	-
31 min or more	68	51.1	37	11.1	105	22.5	-	-
<b>Restless leg syndrome</b>								
Yes	6	4.5	3	0.9	9	1.9	6.57	0.018*
No	127	95.5	331	99.1	458	98.1	-	-
<b>Snore</b>								
Yes	54	40.6	39	11.7	93	19.9	49.9	<0.001
No	79	59.4	295	88.3	374	80.1	-	-
<b>Edema</b>								
Yes	73	54.9	29	8.7	102	21.8	118.958	<0.001
No	60	45.1	305	91.3	365	78.2	-	-
<b>Cramping in the legs at night</b>								
Yes	73	54.9	23	6.9	96	20.6	134.205	<0.001
No	60	45.1	311	93.1	371	79.4	-	-

\*Fisher's exact test, χ<sup>2</sup>: Chi-square test, Z: Man-Whitney U test, p<0.005, ISI: Insomnia Severity Index, Min-max: Minimum-maximum, SD: Standard deviation, ESS: Epworth Sleepiness Scale

	Univariate		Multivariate	
	OR (95% CI)	p	OR (95% CI)	p
ESS score	1.232 (1.177-1.290)	<0.001	1.175 (1.106-1.248)	<0.001
<b>Trimester (3. trimester)</b>				
1. trimester	0.143 (0.083-0.246)	<0.001	0.294 (0.130-0.664)	0.003
2. trimester	0.088 (0.050-0.156)	<0.001	0.390 (0.180-0.846)	0.017
<b>Daytime sleep (no)</b>				
Yes	8.419 (5.098-13.904)	<0.001	2.223 (1.199-4.124)	0.011
<b>Cramping in the legs at night (no)</b>				
Yes	16.451 (9.548-28.346)	<0.001	2.811 (1.307-6.042)	0.008
<b>Edama (no)</b>				
Yes	12.796 (7.672-21.343)	<0.001	2.344 (1.126-4.4880)	0.023
Constant				<0.001

CI: Confidence interval, OR: Odds ratio, ESS: Epworth Sleepiness Scale

reported the general prevalence of insomnia in the last trimester of pregnancy as 42.4% in their meta-analysis. Román-Gálvez et al. (5) found the prevalence of insomnia as 44.2% in the first trimester, 46.3% in the second trimester, and 63.7% in the last trimester in their study with 486 pregnant women. These results are similar with those of our study and confirm that the last trimester of pregnancy is the most risky period in terms of insomnia. Caffeine shortens total sleep duration and increases the duration of falling asleep (5). In the present study, the regression analysis revealed that BMI, coffee consumption, and smoking before and during pregnancy were not risk factors for insomnia. The results of the study conducted with 100 pregnant women by Ölmez et al. (20) to determine the factors affecting sleep pattern and sleep quality are consistent with our findings. Guinhouya et al. (25) stated that the incidence of sleep-related disorders increased in overweight. However, although they determined that both obese and overweight women had a lower sleep quality than normal weight women, the effect of BMI decreased when the socio-demographic characteristics were included in the model. Similarly, although a difference was determined between the ISI groups in terms of their BMI values during pregnancy in our study, this data was excluded from the model because its inclusion in the model did not yield any significant result.

Our review of national and international studies demonstrated that smoking habits and higher blood pressure significantly predicted higher insomnia risk (8) and snoring (4,17) and that restless legs syndrome might cause insomnia during pregnancy (24). However, in the present study, these variables did not affect insomnia during pregnancy. In several studies in the literature, snoring and BMI have been determined as factors that decrease sleep quality during pregnancy (18,25). However, in the present study, snoring and BMI had no effect on insomnia during pregnancy. In some other studies, no relationship has been reported between insomnia and socio-demographic variables such as educational status or BMI (13,21,25). This result is similar to our study results.

### Study Limitations

The present study was carried out with pregnant women who were admitted to the obstetrics outpatient clinic of a private hospital in Turkey. Therefore, one of the limitations of the study is that the results obtained from this study apply only to pregnant women admitted to this hospital and cannot be generalized to other pregnant women. The use of polysomnography in the assessment of insomnia provides more reliable and objective data about sleep. However, such a measurement was not used in our study, which is another limitation of the study. The last limitation of the study is its small sample size. Inclusion was based on volunteerism, which caused the study to have a small number of participants.

### Conclusion

Daytime sleepiness is one of the main risk factors for insomnia during pregnancy. We think healthcare workers should assess pregnant women's insomnia complaints during pregnancy,

recommend them to receive preventive and supportive care and provide them with guidance by identifying whether they have such problems.

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We would like to thank the pregnant who agreed to participate in the study.

### Ethics

**Ethics Committee Approval:** The study was approved by İstanbul Medipol University Researches Ethics Committee (reference number: 10840098-772.02-E.61615, date: 17.11.2020) before the data were collected.

**Informed Consent:** Then, the data collection process was initiated, the participants were informed about the study, and their written consent was obtained.

**Peer-review:** Internally peer-reviewed.

### Authorship Contributions

Concept: N.G., Design: A.Ş.K., Data Collection or Processing: N.G., D.K.G., Analysis or Interpretation: N.G., A.Ş.K., Literature Search: N.G., A.Ş.K., D.K.G., Writing: N.G., A.Ş.K., D.K.G.

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