

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## The prevalence of sleep disorders in pregnancy and some of the associated factors in Hamadan, Iran.

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### ABSTRACT

Sleep disorder is common in pregnancy. Sleep disturbance in pregnant women can cause an increase in adverse pregnancy outcomes, including anxiety, fatigue, depression during pregnancy and after delivery, maternal diabetes, etc. Therefore, due to the importance of the subject, this study was to evaluate the prevalence of sleep disorders in pregnancy and some of the associated factors in Hamadan city, Iran in 2015. This case-control study was carried out on 385 pregnant women (case: sleep disorder, n=176; control: without sleep disorder, n=209) referred to health centers in Hamadan. Cluster sampling was done. The measures used in this study included demographic questionnaire and the Pittsburgh Sleep Quality Index. Data were analyzed using SPSS version 16.0. The results showed that 45.7% of the pregnant women suffered from moderate to severe poor sleep quality. The average of PSQI score was  $6.83 \pm 3.17$ . No significant differences were found in gravidity, age, body mass index(BMI), job, different work shifts, husband's occupation, husband's education, prenatal care and how to get it, wanted or unwanted pregnancy, family income, house status, being satisfied with the sex of the fetus, smoker husband, being satisfied with husband's support, and getting support from her family between the two groups. In another hand, statistically significant differences were found in gestational age, education, BMI ranging, sexual satisfaction, being satisfied with getting support from husband's family, and being satisfied with sleep quality before pregnancy between two groups. Most of pregnant women experienced sleep disorder in pregnancy. Due to factors affecting the sleep quality, measures should be taken to improve quality of sleep in pregnant women.

**Keywords:** Sleep disorder; Associated factors; Pregnancy

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## INTRODUCTION

The phrase “sleep quality” is commonly used in sleep medicine, still we lack an established description for the phrase. “Sleep quality” is sometimes used to refer to a collection of sleep scales including total sleep time, sleep onset latency, degree of fragmentation, total wake time, sleep sufficiency, and sometimes sleep disruptive events such as spontaneous arousals or apnea [1]. Sleep quality is composed of subjective indicators of how sleep experience, like the being satisfied with sleep and feeling after waking up [2].

During sleep, hormones such as norepinephrine, serotonin and growth hormone release, and chemical changes and increasing cellular nutrition occur to make the body ready for the next day's activities. In addition, sleep plays an important role in memory enhancement, restoration, reducing stress and anxiety, concentration, compatibility and enjoyment of daily activities [3-6].

Pregnancy is one of the most important and sensitive period in a woman's life [7-11]. Although pregnancy is a normal phenomenon, this period is associated with major psychological, social and physiological changes, which often cause disturbances in sleep patterns [7, 12]. During pregnancy, women are more likely to develop sleep disorders. The most complaints of women during this period refer to poor sleep quality and reduced sleep duration [13]. During the third trimester of pregnancy, women have reported on average 2.6 hours of awakening during the night, and about 7.5 hours of sleep per night. But some have reported less than 3-4 hours sleeping. About 97.3 percent of pregnant women report awakening at night [14]. Studies have shown that 28-38% of pregnant women experience sleep disorder at least one time point in early gestation [15]. Sleep disorder during the third trimester of pregnancy increases by 75% [16-17].

Hormonal changes during pregnancy alters sleep patterns. During this period, several hormones are released. Some of these production cycles, including growth hormone, prolactin, melatonin, cortisol, thyroid-stimulating hormone, oxytocin and hormones secreted by the placenta, like gonadotropin, progesterone, estriol, dehydroepiandrosterone change in pregnancy and can affect on sleep patterns [18-21]. In addition to hormonal changes, back pain, frequent urination, fetal movements, uterine enlargement, and other factors during pregnancy can have a negative impact on sleep quality [22-23].

Sleep restriction can increase pregnancy-induced hypertension, preterm labor, low birth weight, and depression and anxiety during pregnancy and postpartum period. A study that was conducted in Chicago by Reutrakul et al., showed that sleep disorders are associated with an increased risk of gestational diabetes and adverse pregnancy outcomes [24]. In contrast, the study conducted by Balsarak et al., there was no relationship between lack of sleep and hyperglycemia in pregnancy [25]. Also, a hypothesis suggests that there is an increased risk of cardiovascular dysfunction [26-27].

However, due to the fact that sleep disorders can cause fetal and maternal complications, the present study was to investigate the prevalence of sleep disorders in pregnancy and some of the associated factors in Hamadan city, Iran.

## METHODS

This was a case–control study that was carried out on 385 pregnant women referred to health centers in Hamadan in 2015. The study included case subjects (n= 176) who suffered from sleep disorder. The control subjects (n= 209) were women who did not have sleep disorder. The study population consisted of all pregnant women in Hamadan. The method of collecting data in this study in the given time period was based on cluster sampling among pregnant women referred to health centers in Hamadan. Hamadan City was divided into 4 areas and then from each area, two health centers were selected. Participants of each center who did not have sleep disorder, were selected as a control group and those who had sleep disorder were considered as a case group. The number of samples was determined 385 people by using the formula  $\frac{z^2pq}{d^2}$  (P=0.5, d=0.05). Inclusion criteria were: pregnant women with each gestational age, age ranging from 18-4 years old, singleton pregnancy, no drug addiction, not taking drugs affecting the sleep quality, avoiding the use of antidepressants, not having mental and physical disorders. Exclusion criteria were: any problems during pregnancy (placental abruption, abnormal position of the fetus, umbilical cord prolapse, bleeding, diabetes,

hypertension, preterm labor, etc.), and important mental and emotional changes (such as the death of close relatives or major disputes).

Two questionnaires were used to gather information about participants. Demographic questionnaire and the Pittsburgh Sleep Quality Index. Demographic questionnaire included information about age, education and occupation of the pregnant women, husband's education and occupation, body mass index before pregnancy, gestational age, wanted or unwanted pregnancy, information about the economic situation of the family, being satisfied with sex of the fetus, smoking, being satisfied with the sleep quality before pregnancy, and questions about being satisfied with husband and familial support.

Pittsburgh Sleep Quality Index is a 19-item questionnaire that is used to check sleep quality in the past month. This questionnaire has 7 subscales which include subjective sleep quality (personal perception of sleep), sleep onset latency (representing difficulty in falling asleep), sleep duration (representing nocturnal awakening), sleep efficiency (the real time which a person spends in sleep and not the total time spending in bed), sleep disturbance (representing frequent arm or leg movements), taking sleeping medication, and daytime dysfunction (representing difficulties encountered during the day due to poor sleep quality) [23]. Each subscale represented a score ranging from 0 to 3, where a score of 3 showed the highest level of dysfunction. The total of the individual component scores (range 0 to 21) formed a global sleep quality score. Higher scores indicated poorer sleep quality during the last month. Usually a global score more than 5 was classified as poor sleep quality, and a score of 5 or less were classified as good sleep quality [28]. In this study we considered a PSQI score of <7 as good sleep quality and a PSQI score of 7-21 as moderate to severe poor sleep quality.

The importance of research and its objectives were explained to the participants. They were allowed to leave the study whenever they wanted. Consent was obtained from all participants in research. This study was approved by the Ethical Committee of Hamadan University of Medical Sciences.

Findings were reported as mean ± SD for the quantitative variables and percentages for the qualitative variables. We compared two groups by using the student's *t*-test for the quantitative variables and the *Chi*-square test for qualitative variables. Multivariate logistic regression analysis was taken to investigate their independence predictors. *P*-values less than 0.05 were considered statistically significant. Statistical analysis were done by using SPSS version 16.0.

**RESULTS**

A total of 385 pregnant women participated in the study. We found that 176 people (45.7%) of the participants suffered from moderate to severe poor sleep quality (PSQI score of 7-21). The average of PSQI score was 6.83±3.17. A summary of women characteristics with or without sleep disorder is shown in Table 1 and Table 2. No significant differences were found in gravidity, age, body mass index (BMI), job, different work shifts, husband's occupation, husband's education, prenatal care and how to get it, wanted or unwanted pregnancy, family income, house status, being satisfied with the sex of the fetus, smoker husband, being satisfied with husband's support, and being satisfied with getting support from her family between the two groups. With regard to other characteristics, those who suffered from sleep disorder, had higher gestational age, high education, high BMI ranging, lower sexual satisfaction, lower satisfaction of getting support from husband's family, and lower satisfaction of sleep quality before pregnancy.

**Table 1: Baseline quantitative variables of study population (M±SD)**

| Characteristic           | Sleep disorder group<br>n=176 | Non-sleep disorder group<br>n=209 | t     | P-value |
|--------------------------|-------------------------------|-----------------------------------|-------|---------|
| Gravidity                | 1.30±0.73                     | 1.34±0.67                         | 0.50  | 0.62    |
| Age (Year)               | 26.94±4.65                    | 27.10±5.04                        | 0.21  | 0.84    |
| BMI (Kg/m <sup>2</sup> ) | 25.36±4.30                    | 24.58±3.67                        | -1.81 | 0.07    |
| Trimester                | 2.68±0.47                     | 2.55±0.55                         | -2.36 | 0.02    |
| Gestational Age(Week)    | 30.59±4.96                    | 28.81±6.14                        | -3.08 | 0.002   |

**Table 2: Baseline characteristics and clinical data of study population. n (%).**

| Characteristic              |                       | Sleep disorder group<br>n=176 | Non-sleep disorder<br>group (n=209) | x <sup>2</sup> | df | P-value |
|-----------------------------|-----------------------|-------------------------------|-------------------------------------|----------------|----|---------|
| Age (Year)                  | <20                   | 10(5.7)                       | 12 (5.8)                            | 1.1            | 2  | 0.58    |
|                             | 20-30                 | 133(76.0)                     | 149 (71.6)                          |                |    |         |
|                             | >30                   | 32(18.3)                      | 47 (22.6)                           |                |    |         |
| Educational level           | Uneducated            | 2(1.1)                        | 0(0.0)                              | 11.14          | 4  | 0.02    |
|                             | Elementary            | 3(1.7)                        | 14(6.7)                             |                |    |         |
|                             | Guidance school       | 6(3.4)                        | 9(4.3)                              |                |    |         |
|                             | High school & diploma | 68(38.6)                      | 93(44.7)                            |                |    |         |
|                             | College               | 97(55.1)                      | 92(44.2)                            |                |    |         |
| Job                         | Housewife             | 164(94.8)                     | 192(93.7)                           | 0.22           | 1  | 0.64    |
|                             | employed              | 9(5.2)                        | 13(6.3)                             |                |    |         |
| Shift work                  | Yes                   | 2(22.2)                       | 3(42.9)                             | 0.78           | 1  | 0.38    |
|                             | No                    | 7(77.8)                       | 4(57.1)                             |                |    |         |
| Husband's Job               | Practitioner          | 168(95.5)                     | 197(96.1)                           | 0.1            | 1  | 0.75    |
|                             | Workless              | 8(4.5)                        | 8(3.9)                              |                |    |         |
| Husband's education         | Uneducated            | 1(0.6)                        | 0(0.0)                              | 7.99           | 4  | 0.09    |
|                             | Elementary            | 3(1.7)                        | 13(6.2)                             |                |    |         |
|                             | Guidance school       | 26(14.8)                      | 21(10.0)                            |                |    |         |
|                             | High school & diploma | 85(48.3)                      | 96(45.9)                            |                |    |         |
|                             | College               | 61(34.7)                      | 79(37.8)                            |                |    |         |
| BMI (Kg/m <sup>2</sup> )    | <18.5                 | 9(5.8)                        | 4(2.2)                              | 10.58          | 3  | 0.01    |
|                             | 18.5-24.9             | 69(44.8)                      | 96(52.2)                            |                |    |         |
|                             | 25-29.9               | 49(31.8)                      | 69(37.5)                            |                |    |         |
|                             | ≥30                   | 27(17.5)                      | 15(8.2)                             |                |    |         |
| Prenatal care               | Yes                   | 171(97.2)                     | 206(99.5)                           | 3.43           | 1  | 0.06    |
|                             | No                    | 5(2.8)                        | 1(0.5)                              |                |    |         |
| How to get prenatal care    | Regular               | 166(94.9)                     | 200(96.6)                           | 0.73           | 1  | 0.39    |
|                             | Irregular             | 9(5.1)                        | 7(3.4)                              |                |    |         |
| Pregnancy                   | Wanted                | 138(80.2)                     | 173(84.4)                           | 1.12           | 1  | 0.29    |
|                             | Unwanted              | 34(19.8)                      | 32(15.6)                            |                |    |         |
| Family income (Toman)       | <500000               | 13(7.5)                       | 20(10.0)                            | 2.49           | 2  | 0.29    |
|                             | 500000-1000000        | 83(48.0)                      | 107(53.2)                           |                |    |         |
|                             | >1000000              | 77(44.5)                      | 74(36.8)                            |                |    |         |
| House                       | Personal              | 85(49.1)                      | 115(55.6)                           | 1.56           | 1  | 0.21    |
|                             | Leased                | 88(50.9)                      | 92(44.4)                            |                |    |         |
| Satisfaction of fetus's sex | Yes                   | 159(95.8)                     | 187(95.9)                           | 0.003          | 1  | 0.96    |
|                             | No                    | 7(4.2)                        | 8(4.1)                              |                |    |         |
| Active Smoking              | Yes                   | 0                             | 0                                   | -              | -  | -       |
|                             | No                    | 174(100.0)                    | 205(100.0)                          |                |    |         |
| Passive Smoking             | Yes                   | 44(25.58)                     | 51(24.52)                           | 0.06           | 1  | 0.81    |
|                             | No                    | 128(74.42)                    | 157(75.48)                          |                |    |         |
| Sexual satisfaction         | Satisfied             | 119(68.4)                     | 166(79.8)                           | 6.87           | 2  | 0.03    |
|                             | No idea               | 47(27.0)                      | 34(16.3)                            |                |    |         |
|                             | Unsatisfied           | 8(4.6)                        | 8(3.8)                              |                |    |         |
| Satisfied with              | Satisfied             | 148(84.6)                     | 191(91.8)                           | 5.65           | 2  | 0.06    |

|  |             |           |           |      |   |       |
|--|-------------|-----------|-----------|------|---|-------|
| husband's support                              | No idea     | 21(12.0)  | 15(7.2)   |      |   |       |
|  | Unsatisfied | 6(3.4)    | 2(1.0)    |      |   |       |
| Satisfied with getting support from her family | Satisfied   | 160(92.5) | 195(93.8) | 1.29 | 2 | 0.53  |
|  | No idea     | 12(6.9)   | 13(6.2)   |      |   |       |
|  | Unsatisfied | 1(0.6)    | 0         |      |   |       |
| Satisfaction of husband's family support       | Satisfied   | 108(61.7) | 145(69.7) | 7.11 | 2 | 0.03  |
|  | No idea     | 42(24.0)  | 50(24.0)  |      |   |       |
|  | Unsatisfied | 25(14.3)  | 13(6.2)   |      |   |       |
| Satisfaction of sleep quality before pregnancy | Satisfied   | 135(77.6) | 181(87.9) | 9.98 | 2 | 0.007 |
|  | No idea     | 25(14.4)  | 21(10.2)  |      |   |       |
|  | Unsatisfied | 14(8.0)   | 4(1.9)    |      |   |       |

For determining indicators of the appearance of sleep disorder and in a multivariable logistic regression model, advanced education, high gestational age (week), BMI range and being less satisfied with sleep quality before pregnancy were main determinants of sleep disorder (Table 3).

Meanwhile, in a multivariate linear regression analysis, severity of sleep disorder was positively related to high education, high BMI range, being satisfied with sleep quality before pregnancy, and high gestational age (week) (Table 4).

**Table 3: Multivariate linear regression model for determinants of sleep disorder**

|  | Unstandardized Coefficients |            | Standardized Coefficients | t      | Sig.   |
|--|-----------------------------|------------|---------------------------|--------|--------|
|  | B                           | Std. Error | Beta                      |        |        |
| Education  | 0.730                       | 0.213      | 0.182                     | 3.436  | 0.001* |
| Trimester  | -0.659                      | 0.595      | -0.108                    | -1.108 | 0.269  |
| Gestational Age (Week)                                     | 0.124                       | 0.054      | 0.222                     | 2.284  | 0.023* |
| BMI Range  | 0.585                       | 0.222      | 0.140                     | 2.637  | 0.009* |
| Sexual Satisfaction  | 0.242                       | 0.319      | 0.042                     | .759   | 0.448  |
| Being satisfied with getting support from husband's family | 0.465                       | 0.262      | 0.097                     | 1.774  | 0.077  |
| Being satisfied with sleep quality before pregnancy        | 1.460                       | 0.321      | 0.246                     | 4.547  | 0.001* |

\*: P<0.05

**DISCUSSION**

According to our findings, 45.70% of the participants suffered from sleep disorder. Also we found that those who suffered from sleep disorder, had higher gestational age, high education and high BMI ranging. They were less satisfied with marital relationships and getting support from husband's family. Although they were less satisfied with sleep quality before pregnancy.

In a study that was conducted by okun et al. (2013), to determine prevalence of sleep deficiency in early gestation and its associations with stress and depressive symptoms, they concluded that about 28%–38% experienced sleep deficiency for at least one time point in early gestation. Although they found that women experiencing sleep deficiency, had reported more perceived stress than those who didn't have sleep disorders [29]. In another hand, Okun (2014) reported that the average sleep measures from 10-20 weeks gestation had been 5.34±2.7 by using Pittsburgh sleep quality index [15].

Hung et al. in another study to investigate the prevalence of pregnancy-associated sleep disorder (PSQI score  $>5$ ) found that 65.5% of the participants had sleep disorder. The mean PSQI score was  $7.25 \pm 3.43$  [30].

Neri et al. in a study that was conducted in 2016, found that 60.76% of pregnant women in third trimester reached a PSQI total score ranging from 7 to 21, suggestive of moderate-severe insomnia(13). They assessed the prevalence of insomnia in pregnancy and factors related to insomnia. Insomnia prevalence in women participating in the study was found 52.2%. They also found that the risk of sleep disorders was 2.03 times higher for those in the third trimester than those in the first and second trimesters, 2.19 times higher for those 20 years old and over than younger ones, and 2.63 times higher for those who were depressed than those who were not [23].

Jahdi et al.(2013), in a study to investigate the prevalence of sleep disorders in the pregnant women in second trimester, reported that the mean score sleep quality was  $7.78 \pm 3.14$  and 87.2 % of the participants had sleep disturbance(PSQI score $\geq 5$ ). They also reported that there were significant relationship between sleep disorder and excessive sleeping and fatigue, urinary frequency, husband smoking and education( $P < 0.05$ ) [31].

Another study by Seyed Ahmadi Nejad et al. that was conducted in third trimester of pregnancy, showed that the average of PSQI score in the third trimester was  $8.27 \pm 2.91$  and 89.88% of the participants had poor sleep quality. They considered poor sleep quality as  $PSQI \geq 5$ . Although, increased maternal age and decreased physical activity was associated with poor sleep quality. Also, higher PSQI score was accompanied with greater number of visits to the doctor's office. The main causes of poor sleep quality were reported as nocturnal awakening due to frequent urination (61.3%) and changing situation in bed (56.0%), hunger (50.6%), and feeling pain (48.8%) [32].

Results of a study revealed that 44.9% of pregnant women in third trimester had poor sleep quality as measured by the PSQI. The average of PSQI score was  $5.65 \pm 2.82$  [33].

In our study, there was no relationship between age and sleep disorder, but in another study increased maternal age was associated with poor sleep quality. In another hand, Sadock reported that as age increases, people experience more sleep disorder [34].

Although we found that higher gestational age, and higher body mass index had been associated with higher PSQI score. Hung et al. also came to this conclusion. He also reported that prenatal depression and sleep quality before pregnancy were one of the best subsets to predict sleep quality in Taiwanese pregnant women. In a study in 2015, overweight pregnant women had more sleep disorder than normal weight women in the second and third trimesters of pregnancy [35].

In this study, there was no statistically significant difference in type of pregnancy (wanted or unwanted) between two groups, but Parsai Rad reported that unwanted pregnancy had been related to depression and sleep disorder.

The level of family income was not statistically different in women with sleep disorder and control group, but in another study social-economical status were reported to affect sleep patterns in pregnant women [36].

All the participants in our study were nonsmokers. They who conducted a polysomnographical analysis on 44 smokers (29 men and 15 women, median age 29.6 years), found that smokers had a number of sleep disorders. Also they concluded that smoking was associated with poor sleep continuity and shorter sleep duration. According to our findings, having a smoker husband was not associated with poor sleep quality. But in another study, pregnant women who exposed to cigarette smoke were likely to have sleep disorders, such as subjective insufficient sleep, difficulty in falling asleep, short sleep duration, and snoring loudly/ breathing problems. Pregnant women who smoke had similar sleep disorders and also experienced excessive daytime sleepiness and early awakening in morning. Zhang also reported that cigarette smoking is independently associated with disturbances in sleep patterns, such as difficulty in falling asleep and a shift toward lighter

stages of sleep. He explained that nicotine in the smoke of cigarette may cause to disturbances in sleep patterns [17].

There was no statistically difference in socioeconomic status (such as job, husband's occupation, husband's education, family income, and house status) between two groups, but the level of pregnant women had educated were in sleep disorder group. Paradoxically Okun found that low socioeconomic status negatively affects sleep in pregnant women [29]. This may be due to different definitions of socioeconomic status in various societies and cultures.

In this regard, another study showed that, a current or former smoker; low levels of education, income, a few drinks in a week or multiple use, a history of cardiovascular disease, diabetes, depression, underweight, or physical restrictions was associated with increased chances of both long and short sleep duration.

We found that in comparison with control group, women experiencing sleep disorder were more dissatisfied with getting support from their husband's family; although there was no statistically significant difference in being satisfied with husband's support and getting support from her own family. Another study showed that lack of social support had been associated with lower sleep quality [19]. They concluded that receiving help from mother-in-law and being satisfied with her condition had affected on sleep patterns in pregnant women. Also women experiencing sleep disorder had lower sexual satisfaction.

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