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Original article

Maternal sleep quality in late pregnancy: The association between preterm birth and sleep quality

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Abstract

Background: A quick look at the existing literature indicates that sleep disturbances during pregnancy could be a risk factor for adverse outcomes. The aim of the study was to assess the prevalence of maternal sleep quality in late pregnancy and the association between preterm births and sleep quality.

Methods: A prospective study was conducted on 300 eligible singleton pregnant women attending the prenatal care clinics, affiliated with Babol University of Medical Sciences. The data were collected through convenience sampling. The self-report Pittsburgh Sleep Quality Index (PSQI) questionnaire was used to measure the pattern and the quality of sleep in pregnant women.

Results: The prevalence of self-reported poor sleep quality was found to be 77% among the pregnant women in Babol, Iran. The chi-square test did not show any statistically significant difference in characteristics between pregnant women with good and poor sleep qualities. Also, the adjusted odds ratio for preterm labor revealed no significant relationships between sleep quality and preterm birth.

Conclusion: The findings demonstrated that there was a high prevalence of poor quality sleep among pregnant women in the third trimester of pregnancy. However, poor sleep quality was not associated with preterm labor, making this problem one of the major problems experienced by pregnant women.

Keywords: Maternal sleep quality, Preterm birth, Third trimester

Introduction

It is generally assumed that preterm birth (PTB) is considered as birth before completing 37 gestational weeks. It is also believed that the incidence of PTB is about 25% and 5% in developing and developed countries, respectively (1). It can supposedly affect about 11% of deliveries worldwide (2). Preterm birth is presumably one of the leading causes of mortality (75% of the perinatal mortalities) (1) and morbidity in infants (neonatal infections, respiratory diseases, and neurodevelopment disorders) (3, 4). This could also be associated with short-term and long-term adverse health outcomes (2), severe cognitive and physical consequences, educational support during the lifespan, and the emotional and financial resources of families (1, 5).

Although some maternal characteristics (e.g. hypertension, high body mass index, smoking, diabetes, maternal age ≥ 35 years)(6), previous preterm deliveries, maternal anemia, periodontal diseases have been proved to be associated with PTB, behavioral factors and lifestyle are of special interest due to their adjustability (7).

Sleep is a physiological need for all humans. Pregnant women, in particular, need adequate sleep to develop their fetuses as well as save energy required for the delivery process (8). Sleep deprivation and snoring are the most common complaints during

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pregnancy, which may be due to physiological, vascular, hormonal and metabolic changes (9-10). About 78% of women reported sleep disturbances during pregnancy compared to other times (11). This figure ranges from 29% to 76% in the other studies (12).

There is a string of research hypothesizing that sleep disorders and sleep deprivations during pregnancy may increase the risk of such adverse pregnancy outcomes as gestational diabetes, preeclampsia, unexpected cesarean delivery, intra uterine growth restriction (8, 12), and recently preterm birth (3).

Inflammation is supposedly regarded as a causal mechanism at the onset of preterm labor. It is thought that the inflammatory mediators may activate the cervical ripening, the onset of contractions and the membrane rupture. With these mechanisms, the inflammation caused by infection or psychological stress may consequently trigger preterm labor. Regarding this hypothesis, sleep disorders are considered as a risk factor for preterm labor (5), yet very few studies on the relationship between maternal sleep and preterm birth have been conducted so far, with many conflicting results (7).

A scoping review study by Warland et al. (2018) aimed to examine the relationship between maternal sleep and the neonatal outcome like preterm birth. They concluded that the topic was vital one and called for further investigations due to limited studies and inconsistent results (13). Thus, the aim of the present study was to assess the maternal sleep quality in late pregnancy and the association between preterm births and sleep quality.

Materials & Methods

To achieve the objectives of this study, 300 eligible singleton pregnant women were recruited from the prenatal care clinics, affiliated with Babol University of Medical Sciences, during the third trimester of pregnancy in 2018. The proposal for the study was approved by Ethics Committee of Babol University of Medical Sciences (Code MUBABOL.REC.1395.251).

To determine the sample size, with type 1 error of 0.05 and the test power of 90%, 300 individuals were considered. The inclusion criteria were: pregnant women in 28-36 weeks of gestation, singleton pregnancy, aged ≥17, no history of infertility, the absence of known chronic diseases (such as diabetes, hypertension, thyroid, cardiovascular disease), any diseases causing anxiety, stress and depression, and no history of smoking, alcohol or substance abuse. All participants were fully explained about the purpose of the study, and then, in the case of willingness, the consent forms were given to them to fill out.

Pittsburgh Sleep Quality Index (PSQI) questionnaire, a self-report questionnaire, was applied to measure sleep quality of pregnant women at 28-36 weeks of gestation. It is an international tool to evaluate sleep quality in the last month of pregnancy. It comprises 19 items and seven subscales including: habitual sleep duration, sleep latency, sleep efficiency, sleep subjective quality, sleep disturbances, sleep medication use, and daytime dysfunction. Each item is rated on a 0 (non-difficulty) to 3 (severe difficulty) point scale. The total scores of seven subscales can range from 0 to 21. A total score of more than 5 is associated with the poorer sleep quality (14). The Persian version of the questionnaire was used in this study, with its reliability and validity recently established. The Cronbach's alpha of the questionnaire was reported to be 0.77 (15). The pregnant women were divided into poor sleep (Total score more than 5) and good sleep (Total score equal or less than 5) groups (16)

Giving the current American College of Obstetricians and Gynecologists (ACOG) guidelines, Gestational age was calculated on the date of the last menstrual period (LMP) and was confirmed based on early ultrasound examination around the 15th week of gestation. We categorized deliveries prior to the completion of 37 weeks as preterm birth and deliveries occurring equal or more than 37 weeks as term (17).

The demographic-reproductive variables in the study were: age, educational level, employment status, and sufficient income for expenses. The risk conditions for preterm birth were: activity habit, pre-gestation body mass index, interest in pregnancy, the premature rupture of the membrane, the presentation of fetus, trauma in pregnancy, and the preeclampsia determined by medical documents.

Statistical analysis:

The data were analyzed by Statistical Package for Social Sciences (SPSS) software version 18 to determine the association between the demographic-reproductive characteristics and sleep quality (seven

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subscales) in pregnant women. The p-value of less than 0.05 was considered significant. Multiple logistic regression was used to determine the association between preterm births and sleep quality. The unadjusted and adjusted odds ratios were presented together with their 95% CI. The adjusted ratio was made for independent variables including age, education, occupation, family income, physical activity habit, BMI, interest in pregnancy, the presentation of fetus, the type of deliver, and newborn sex.

Results

Three hundred pregnant women, with the mean age of 25.61±5.13 years (17 to 43 years old), completed the questionnaires. Two hundred and thirty-one (77%) women had sleep disorders (mean of the PSQI total score: 8.67), while sixty-nine of them (23%) did not (mean of the PSQI total score: 3.95). The demographic and reproductive variables of the participants in the two groups are shown in Table 1. Both groups, poor and good sleep groups, were similar with regard to these characteristics (differences were not statistically significant).

Out of 300 study subjects, 2 (0.6%) had not exactly defined gestational age and these excluded; thus 298 participants (251 term birth and 47 preterm birth) were available for analyzing association between sleep quality and preterm birth. In order to better examine the association between sleep quality with preterm birth, the estimated adjusted odds ratio (with 95% CI) for associations between sleep quality with preterm birth and potential covariates were calculated. As shown in Table 2, no significant associations were found between the sleep quality and preterm birth.

Table 1: Characteristics of pregnant women by the sleep quality

Variables	Poor sleep quality (n=231) N (%)	Good sleep quality (n=69) N (%)	*P*-value
Age (years)			0.795
<20	26 (11.3)	7 (10.2)	
20–35	193 (83.5)	57 (82.6)	
>=35 years	12 (5.2)	5 (7.2)	
Educational years			0.091
< 8	34 (14.7)	18 (26.1)	
8-12	121 (52.4)	31 (44.9)	
>12	76 (32.9)	20 (29.0)	
Occupation status			0.833
Housewife	193 (83.5)	57 (82.6)	
Employed	38 (16.5)	12 (17.4)	
Sufficiency of income for expenses			0.699
Yes	172 (74.8)	50 (72.5)	
No	58 (25.2)	19 (27.5)	
Physical activity habit			0.540
Yes	89 (38.9)	24 (34.8)	
No	140 (61.1)	45 (65.2)	
BMI (kg/m^2)			0.603
< 24.9	32 (14.0)	8 (11.6)	
>= 25	196 (86.0)	61 (88.4)	
Interested in pregnancy			0.324
Yes	149 (64.5)	40 (58)	
No	82 (35.5)	29 (42)	
Presentation of fetus			0.712
Cephalic	206 (90.0)	61 (88.4)	
No Cephalic	23 (10.0)	8 (11.6)	
Delivery Type			0.201
Vaginal	123 (53.7)	31 (44.9)	
Cesarean	106 (46.3)	38 (55.1)	
Newborn sex			0.971
Girl	99 (43.2)	30 (43.5)	
Boy	130 (56.8)	39 (56.5)	
Birth Age*			0.425
Term	195 (85.2)	56 (81.2)	
Preterm	34 (14.8)	13 (18.8)	

***** Two missing due to not exactly defined birth age

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Table2: Multi-variable (adjusted) logistic regression: the association of sleep quality with preterm birth and covariates (odds ratio (OR), 95% CI).

Predictors	Preterm (n=47) N (%)	Term (n=251) N (%)	Unadjusted OR (95% CI)	*p*-value	Adjusted* OR (95% CI)	*p*-value
Sleep Quality						
Good	13 (18.8)	56 (81.2)	1.00		1.00	
Poor	34 (14.8)	195 (85.2)	1.33 (0.65-2.69)	0.425	083 (0.39-1.72)	0.619
Age (years)						
<20	3 (9.1)	30 (90.9)	1.00		1.00	
20–35	40 (16.1)	208 (83.9)	3.39 (0.65-17.65)	0.146	3.44 (0.63-18.66)	0.152
>=35 years	4 (23.5)	13 (76.5)	1.61 (0.49-5.24)	0.425	1.51 (0.44-5.19)	0.508
Educational years						
< 8	12 (23.1)	40 (76.9)	1.00		1.00	
8-12	20 (13.3)	130 (86.7)	0.61 (0.26-1.44)	0.265	0.67 (0.25-1.79)	0.435
>12	15 (15.6)	81 (84.4)	1.20 (0.58-2.48)	0.616	1.22 (0.52-2.86)	0.646
Occupation status						
Housewife	40 (16.1)	208 (83.9)	1.00		1.00	
Employed	7 (14.3)	42 (85.7)	0.87 (0.36-2.07)	0.755	0.78 (0.28-2.16)	0.644
Sufficiency of income for expenses						
Yes	34 (15.5)	186 (84.5)	1.00		1.00	
No	13 (16.9)	64 (83.1)	0.90 (0.44-1.81)	0.768	1.10 (0.51-2.38)	0.794
Physical activity habit						
Yes	18 (15.9)	95 (84.1)	1.00		1.00	
No	29 (15.7)	156 (84.3)	1.01 (0.53-1.93)	0.954	0.94 (0.48-1.84)	0.866
BMI (kg/m^2)						
< 24.9	7 (17.5)	33 (82.5)	1.00		1.00	
>= 25	40 (15.6)	217 (84.4)	0.90 (0.44-1.81)	0.768	0.86 (0.36-2.22)	0.819
Interested in pregnancy						
Yes	27 (14.3)	162 (85.7)	1.00		1.00	
No	20 (18.3)	89 (81.7)	1.34 (0.71-2.54)	0.35	1.62 (0.76-3.45)	0.218
Presentation of fetus						
Cephalic	40 (15.5)	227 (85.0)	1.00		1.00	
No Cephalic	7 (22.6)	24 (77.4)	0.60 (0.24-1.49)	0.272	2.07 (0.72-5.95)	0.174
Delivery Type						
Vaginal	26 (16.9)	128 (83.1)	1.00		1.00	
Cesarean	21 (14.6)	123 (85.4)	1.19 (0.63-2.22)	0.586	0.62 (0.30-1.29)	0.208
Newborn sex						
Girl	19 (14.7)	110 (85.3)	1.00		1.00	
Boy	28 (16.6)	141 (83.4)	0.87 (0.46-1.63)	0.666	1.46 (0.68-3.11)	0.325

*Potential confounders used in each characteristic were other characteristics

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Discussion

In this prospective study, we assessed the relationship between maternal sleep quality during their third trimester of pregnancy and the preterm birth. The descriptive data showed that the mean total score of PSQI in participants was 7.6 ± 3.0, and the prevalence of poor sleep quality in the pregnant women during the third trimester was 77%. According to the findings of other studies, 69.4% of Malaysian women (18), 78% of women in Alexandria (11) and over 79% of women in Michigan (3) had disturbed sleep during pregnancy, which are all consistent with the results of the present study. The results of a meta-analysis study also indicated that the mean PSQI score in pregnancy was 6.07, and that 45.7% of pregnant women reported poor sleep quality (12).

In this study, the demographic and reproductive variables were not significantly different between the two groups (the poor and good sleep quality groups). These findings are in line with the results of other studies (1, 5, 7). In other words, the findings show that poor sleep quality is independent of the effects of demographic and fertility variables, it is most likely dependent on the physiological, vascular, hormonal and metabolic pregnancy changes (9-10).

Regarding the main question of the present study as to whether there is a significant relationship between the sleep quality in the third trimester of pregnancy and preterm birth, the results showed that the incidence of preterm birth did not significantly differ between the poor and good sleep quality groups. The results of this study are in line with the findings of studies by Loy et al and Dolatian et al (1, 2). In some studies, such as those conducted by Okun et al., Felder et al., and Katerina Micheli et al., it was reported that sleep deprivation, poor sleep quality, and insomnia were all associated with a significantly increased risk of preterm birth (3, 4, 19). Warland et al., who conducted a scoping review study, concluded that there was still limited and conflicting information on this topic (13).

An important point with regard to all these studies is that not all of them have used a common tool to assess sleep quality. Some studies that strove to link maternal sleep with preterm birth were actually about sleep apnea and snoring (3, 4, 19). Blair et al. also reported that the impact of race on the relationship between poor sleep quality and inflammation can predict preterm birth. They concluded that poor sleep quality in African American women was associated with preterm birth, while it was not so for European American women (5).

In another meta-analysis study by Sedov et al., it was found that the cut-off point of PSQI (>5) might not have been suitable for pregnant women. Although it may reflect sleep status, there is an urgent need for the determination of a cut-off point, which could undoubtedly be used for further investigation and treatment of pregnant women (12).

Conclusion

This prospective study on the relationship between maternal sleep quality in pregnancy and preterm birth demonstrated that poor quality sleep was common in pregnant women in the third trimester. However, data analysis showed no association between sleep quality and preterm birth, making this problem one of the major problems experienced by pregnant women.

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Conflicts of Interest

The authors have no conflicts of interest to declare.

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