

Original Article

The Relationship between Sleep Quality and Anxiety in Pregnant Women

Berrak Mizrak Sahin, PhD, RN

Associate Professor, Eskisehir Osmangazi University, Faculty of Health Sciences, Nursing Department, Eskisehir, Turkey

Hulya Kok Eren, PhD, RN

Assistant Professor, Eskisehir Osmangazi University, Faculty of Health Sciences, Nursing Department, Eskisehir, Turkey

Correspondence: Berrak Mizrak Sahin, Eskisehir Osmangazi University, Faculty of Health Sciences, Nursing Department, Meselik Campus, 26480 Eskisehir, Turkey. E-mail: bmizrak5@hotmail.com

Abstract

Background: Women who experience anxiety during pregnancy may have various symptoms of insomnia and decreased sleep quality.

Objective: The study aimed to evaluate the relationship between sleep quality and anxiety during pregnancy was analyzed and affecting factors.

Methodology: This was a descriptive study. The study was conducted in the obstetrics clinic of a university hospital in Turkey between the dates of January 2020 and March 2020. 364 pregnant women matching the sample criteria at the time of the study were included in the study. The sample of the study consisted of literate primipara and multipara women who were at and over 12 weeks of pregnancy and the age of 18. The data were collected by Personal Information Form, Pittsburgh Sleep Quality Index and State-Trait Anxiety Inventory.

Results: A negative, weak and statistically significant relationship was found between the state and trait anxiety scores and the PSQI score ($p < .001$). It was determined that as the age increased ($p = .009$), the risk of poor sleep quality increased in the participants who stated that they had sleep problems during pregnancy ($p = < .001$) and in those who had high trait anxiety scale scores ($p = < .001$)

Conclusions: Poor sleep quality is a common problem for pregnant women. Anxiety, increased age, and reporting sleep problems in pregnancy were determined as factors determining sleep quality. These findings support the need for research to be conducted on sleep quality in the perinatal period by healthcare professionals to support pregnant women and infants better. Therefore, we recommend nurses pay more attention to sleep problems especially for pregnant women with anxiety disorders and advanced maternal ages, and to provide sleep consultancy.

Keywords: Sleep quality, anxiety, pregnancy, Turkey.

Introduction

Pregnancy is one of the most important periods in a woman's life. Although it is a natural phenomenon, pregnancy is accompanied by significant physiological, psychological, and social changes (Palagini et al., 2014). Sleep disorders are one of the most common problems experienced in pregnancy (Ko, Lin, & Chen, 2015; Zafarghandi et al., 2012). Sleep disorders usually start from the 12th week of pregnancy and increase in the last trimester (Naghi, Keypour, Ahari, Tavalai, & Khak, 2011; Zafarghandi et al., 2012). As pregnancy progresses, the number and duration of nocturnal awakenings increase and

sleep duration decreases (Polo-Kantola, Aukia, Karlsson, Karlsson, & Paavonen, 2017). Factors such as hormonal changes, restless legs syndrome, frequent urination, fetal growth, respiratory distress, and snoring during pregnancy may affect sleep quality and disorders in pregnancy (Pinar et al., 2014; Ruiz-Robledillo, Canario, Dias, Moya-Albiol, & Figueiredo, 2015). In addition, it has been stated that anxiety and sleep disorders are closely related during pregnancy. Pregnant women may experience anxiety for reasons such as protecting themselves and the health and safety of the fetus, the need to embrace the role of motherhood or to identify with it, fear of

childbirth, and changes occurring in the body (Ko et al., 2015). Accordingly, women who experience anxiety during pregnancy may have various symptoms of insomnia and decreased sleep quality (Polo-Kantola et al., 2017; Wojutari, Alabi, & Matthew, 2018). It has been stated that poor sleep quality and anxiety in pregnant women have labor outcomes such as preterm labor and increased C-section rates as well as negative neonatal outcomes such as low birth-weight infant and intrauterine growth retardation (Palagini et al., 2014).

Sleep disorders during pregnancy were comprehensively presented in previous studies. However, a limited number of studies investigated the impact of psychological symptoms on sleep during pregnancy, and almost all of them were considered as depression only. Besides, as far as we know, none of these studies addressed the possible accompanying effect of anxiety on sleep during pregnancy, although anxiety was intensively presented in other periods. There are a limited number of studies evaluating the relationship between psychological symptoms and sleep during pregnancy in the literature, and these studies generally analyzed the relationship between depression and sleep disorders in pregnancy (Kamysheva, Skouteris, Wertheim, Paxton, & Milgrom, 2010; Okun, Kiewra, Luther, Wisniewski, & Wisner, 2011; Skouteris, Germano, Wertheim, Paxton, & Milgrom, 2008). In our study, the relationship between sleep quality and anxiety during pregnancy was analyzed, and affecting factors were evaluated.

Materials and Methods

Study design

This was a cross-sectional study. The study was conducted in the obstetrics clinic of a university hospital in Turkey between the dates of January 2020 and March 2020. 364 pregnant women matching the sample criteria at the time of the study were included in the study. The sample of the study consisted of literate primiparous and multiparous women who were at and over 12 weeks of pregnancy and the age of 18. Pregnant women with high-risk pregnancy and psychiatric diagnosis and using sleeping pills were excluded from the study.

Data collection tools: The data were collected through 'Personal Information Form', 'Pittsburgh Sleep Quality Index (PSQI)' and 'State-Trait Anxiety Inventory (STAI TX-1 and STAI TX-2)'.

Personal information form

It is a form consisting of 15 questions that determine the socio-demographic characteristics of pregnant women, their knowledge about the stages of pregnancy, and their sleep conditions during pregnancy.

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was evaluated through the Pittsburgh Sleep Quality Index (PSQI). The index consists of seven components, which are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. Individuals score each of the multiple-choice questions from 0 to 3. The total score of the seven components gives the total PSQI score. The total score obtained from this index ranges from 0 to 21, and those scoring above 5 are considered to have poor sleep quality, and those scoring 5 and below are considered to have good sleep quality. The value for Cronbach's Alpha regarding the reliability and validity of the index in Turkey was reported to be 0.80 (Agargun, Kara, & Anlar, 1996).

State-Trait Anxiety Inventory (STAI TX-1 and STAI TX-2)

The Likert-type scale, developed by Spielberg et al., consists of 40 items, 20 of which 1862r efor measuring state anxiety, and 20 of which 1862r efor measuring trait anxiety. The scale is a 4-point Likert type with "not at all", "somewhat", "moderately so", "very much so" options. The total scores obtained from both scales are evaluated separately. There are direct expressions that determine negative and positive emotions, or reverse expressions that determine straight and positive emotions. In scoring, the total score of reverse expressions is subtracted from the total score of the direct expressions. A predetermined and fixed value is added to this number. This value is 50 for state anxiety and 35 for trait anxiety (Spielberger CD, Gorsuch RL, & R, 1970).

Procedure

Data collection tools were applied to mothers who applied to the obstetrics clinic of the hospital where the study was conducted, meet the sample criteria, and volunteer to participate in the study. Written and verbal consent were obtained before the application by informing the participants about the aim of the study. Data collection tools were applied to the participants by the face-to-face interview method by the researchers. Participants who applied to obstetrics clinics and met the

sample criteria were randomly included in the sample.

Statistical analysis

Frequency tables and descriptive statistics were used in the interpretation of findings. The comparison of two independent groups in data showing a non-normal distribution was conducted through “Mann-Whitney U” test (Z-table value); the comparison of three or more independent groups was conducted through “Kruskal-Wallis H” test (χ^2 -table value). Spearman’s correlation coefficient was used in analyzing the relationship between two quantitative variables showing a non-normal distribution. The analysis of variables that were determinants of the PSQI groups was conducted through Binary Logistic Regression: Backward LR model.

Ethical statement

Institutional permissions were obtained from the Non-Interventional Clinical Research Ethics Committee of Eskisehir Osmangazi University (approval number: E.147068-11.12.2019). Written permission and approval were obtained from hospitals and units where this study was conducted. Consent of all the participating mothers was also taken.

Results

The mean age of pregnant women was 29.12 ± 5.76 and 135 pregnant women (37.1%) were in the 25-29 age group. 151 (41.5%) of the pregnant women were college graduates, 205 (56.3%) of them were housewives, and 198 (54.4%) of them had a moderate socioeconomic status. 43 (11.8%) of the participants also smoked during pregnancy. 183 pregnant women (50.3%) were in the second trimester of pregnancy; 169 (46.4%) of them experienced their first pregnancy. (Table 1) While 71 (19.5%) of the pregnant women had had sleep problems before pregnancy, 218 (59.9%) of them stated that they had sleep problems during pregnancy. While half of the pregnant women (55.8%) described the quality of sleep as good during pregnancy, the most experienced sleep problem by pregnant women was frequent nocturnal awakenings (50.8%) (Table 2). Table 3 shows the comparison of PSQI scores according to some socio-demographic and obstetric characteristics of pregnant women. PSQI scores

of the pregnant women were statistically significant according to the age, gestational week, history of miscarriage, their status of desiring the baby, and their status of going to the pregnancy follow-up regularly. When analyzed by age groups, PSQI scores of pregnant women aged 35 and over were found to be higher than pregnant women in the other age group (under 25 and 25-29 age group) ($\chi^2=14.254$, $p=0.003$). When evaluated according to gestational weeks, PSQI scores of pregnant women who were in the last trimester were higher than those in the second trimester ($\chi^2=17.165$, $p<.001$). PSQI scores of pregnant women who experienced a miscarriage in previous pregnancies ($Z=-1.978$, $p=0.048$), who had unintended pregnancy ($Z=-2.056$; $p=0.040$), and who went to regular pregnancy follow-ups ($Z=-2.065$, $p=0.039$) were found to be higher. PSQI scores of pregnant women according to their sleep characteristics are given in Table 4. PSQI scores of pregnant women who had had sleep problems before pregnancy ($Z=-5.420$, $p<.001$) and who had sleep problems during pregnancy ($Z=-9.940$, $p<.001$) were higher than those who did not have sleep problems before and during pregnancy. PSQI scores of pregnant women whose average sleep duration in pregnancy was less than 8 hours ($\chi^2=80.362$, $p<.001$) and who defined their sleep quality during pregnancy as poor ($\chi^2=131.659$, $p<.001$) were found to be higher.

A negative, weak and statistically significant relationship was found between the state ($r=-.322$, $p<.001$) and trait anxiety ($r=-.380$, $p<.001$) scores and the PSQI score. As a result of the Logistic Regression: Backward LR model performed by including all significant parameters in paired comparisons, variables of age (year), experiencing sleep problems during pregnancy, and trait anxiety inventory scores were used in the optimal model. It was determined that all variables included in the model affected sleep quality. It was determined that as the age increased ($p=.009$), the risk of poor sleep quality increased in the participants who stated that they had sleep problems during pregnancy ($p=<.001$) and in those who had high trait anxiety scale scores ($p=<.001$) (Table 5).

Table 1. Socio-demographic characteristics of the participants

Variable (N=364)	n	%
Age [$\bar{X} \pm S.D. \rightarrow 29,12 \pm 5,76$ (year)]		
<25	75	20.6
25-29	135	37.1
30-34	87	23.9
≥ 35	67	18.4
Education level	41	11.3
Primary school	46	12.6
Middle School	126	34.6
High school	151	41.5
College		
Occupational Status		
Not working	205	56.3
Working	159	43.7
Economic level		
Bad	15	4.1
Middle	198	54.4
Good	151	41.5
Smoking		
Yes	66	18.1
No	298	81.9
Smoking during pregnancy		
Yes	43	11.8
No	321	88.2
Pregnancy [$\bar{X} \pm S.D. \rightarrow 25,22 \pm 8,14$ (week)]		
1st trimester (1-13 weeks)	23	6.3
2nd trimester (14-26 weeks)	183	50.3
3rd trimester (27-41 weeks)	158	43.4
Number of pregnancies		
1	169	46.4
2	113	31.0
3	49	13.5
≥ 4	33	9.1
Miscarriage status		
Yes	80	22.0
No	284	78.0
Status of wanting the baby		
Yes	328	90.1
No	36	9.9
Regular pregnancy monitoring		
Yes	346	95.1
No	18	4.9

Table 2. Distribution of sleep characteristics related to the study

Variable (N=364)	n	%
Sleep problems before pregnancy		
Yes	71	19.5
No	293	80.5
Sleep problems during pregnancy		
Yes	218	59.9
No	146	40.1
Sleep quality during pregnancy		
Very good	50	13.7
Good	203	55.8
Bad	96	26.4
Very bad	15	4.1

Average sleep		
<8 hours	145	39.8
8-9 hours	153	42.1
≥10 hours	66	18.1
Sleep problem during pregnancy *		
Can't sleep at all	27	7.4
Difficulty falling asleep	110	30.2
Waking up often	185	50.8
Difficulty waking up	69	19.0
Waking up with respiratory distress	54	14.8
Daytime sleepiness	105	28.8
Waking up too early	59	16.2
Don't yell while sleeping	11	3.0
Waking up with snoring	26	7.1
Bad dreams	39	10.7

* More than one answer was given to the question.

Table 3. Comparison of PSQI scores of pregnant women according to some socio-demographic and obstetric characteristics

Variable (N=364)	n	Pittsburgh sleep quality index		Statistical analysis
		$\bar{X} \pm S.D.$	Median [IQR]	
Age				
<25 ¹	75	6.12±3.80	5.0 [5.0]	$\chi^2=14.254$ p=0.003 [1.2-4]
25-29 ²	135	6.19±3.45	6.0 [4.0]	
30-34 ³	87	7.53±3.86	7.0 [7.0]	
≥35 ⁴	67	7.94±3.67	8.0 [5.0]	
Education level				
Primary school	41	7.34±4.29	6.0 [7.0]	$\chi^2=7.748$ p=0.052
Middle School	46	6.65±4.00	6.0 [5.5]	
High school	126	7.41±3.64	7.0 [5.0]	
College	151	6.18±3.47	6.0 [5.0]	
Occupational Status				
Not working	205	6.84±3.46	6.0 [5.5]	Z=-0.554
Working	159	6.74±4.05	6.0 [5.0]	p=0.580
Economic level				
Bad	15	8.07±4.10	7.0 [8.0]	$\chi^2=1.381$ p=0.501
Middle	198	6.73±3.43	6.0 [5.0]	
Good	151	6.76±4.04	6.0 [5.0]	
Smoking				
Yes	66	7.55±4.07	7.0 [7.3]	Z=-1.677 p=0.094
No	298	6.63±3.63	6.0 [5.0]	
Smoking during pregnancy				
Yes	43	8.07±3.91	7.0 [7.0]	Z=-2.292 p=0.022
No	321	6.63±3.67	6.0 [5.0]	
Pregnancy				
1st trimester	23	7.09±3.67	7.0 [7.0]	$\chi^2=17.165$ p<.001 [2-3]
2nd trimester	183	6.03±3.71	6.0 [5.0]	
3rd trimester	158	7.94±3.58	8.0 [5.3]	
Number of pregnancies				
1	169	6.22±3.38	6.0 [4.0]	$\chi^2=6.433$ p=0.092
2	113	7.18±3.77	7.0 [6.0]	
3	49	7.22±4.04	6.0 [6.0]	
≥4	33	7.82±4.41	7.0 [7.5]	
Miscarriage status				
Yes	80	7.53±3.90	7.0 [6.0]	Z=-1.978 p=0.048
No	284	6.59±3.65	6.0 [5.0]	

Status of wanting the baby				
Yes	328	6.66±3.68	6.0 [5.0]	Z=-2.056
No	36	8.06±3.93	8.0 [6.0]	p=0.040
Regular pregnancy monitoring				
Yes	346	6.88±3.73	6.0 [6.0]	Z=-2.065
No	18	5.11±3.18	4.5 [3.3]	p=0.039

Table 4. Comparison of PSQI scores according to sleep characteristics

Variable (N=364)	n	Pittsburgh sleep quality index		Statistical analysis
		$\bar{X} \pm S.D.$	Medyan [IQR]	
Sleep problems before pregnancy				
Yes	71	9.03±3.77	10.0 [6.0]	Z=-5.420
No	293	6.26±3.51	6.0 [4.0]	p<.001
Sleep problems during pregnancy				
Yes	218	8.32±3.52	8.0 [5.0]	Z=-9.940
No	146	4.52±2.74	4.0 [3.3]	p<.001
Sleep quality during pregnancy				
Very good ¹	50	3.54±2.29	3.0 [3.0]	$\chi^2=131.659$ p<.001 [1-2 3.4]
Good ²	203	5.86±2.90	6.0 [3.0]	
Bad ³	96	9.53±2.98	10.0 [4.8]	
Very bad ⁴	15	12.80±4.39	14.0 [4.0]	
Average sleep				
<8 hours	145	9.06±3.89	9.0 [6.0]	$\chi^2=80.362$ p<.001 [1-2.3]
8-9 hours	153	5.46±2.88	5.0 [4.5]	
≥10 hours	66	4.94±2.31	5.0 [3.0]	

Table 5. Examining the factors affecting sleep quality (PSQI)

Variable	B	S.H.	Wald	Sd	p	OR	95% G.A. (OR)	
							Under	Upper
Age (year)	0.063	0.024	6.904	1	0.009	1.065	1.016	1.116
Pregnant sleep problem *	1.955	0.257	57.957	1	<.001	7.065	4.271	11.688
Trait anxiety	0.066	0.014	20.600	1	<.001	1.068	1.038	1.099
Constant	-	0.953	31.748	1	<.001	0.005		
	5.368							

CCR=81.4% $\chi^2_{(8)}=7.645$, p=0.469

* Reference category for sleeping problems during pregnancy: No

Discussion

Our study confirmed that there is a significant deterioration in sleep quality during pregnancy. It was determined that the sleep quality gets worse especially in the later weeks of pregnancy. After questioning the sleep conditions of pregnant women with a detailed survey, we determined that 60% of them had sleep problems, general sleep quality decreased as pregnancy progressed, and the biggest sleep problem experienced during pregnancy was frequent awakenings. In line with the studies analyzing the sleep quality in pregnant women through PSQI, it was determined that the sleep quality of pregnant women was lower especially in the third trimester (Tsai, Kuo, Lai, &

Lee, 2011; Volkovich, Tikotzky, & Manber, 2016). While it is accepted that sleep quality is frequently impaired during pregnancy and the postpartum period, there is still obscurity regarding why this situation occurs. Especially in the third trimester, poor sleep quality is associated with increased physical discomfort, increased need for urination, back pain, or restless leg syndrome (Cai et al., 2013; Okun, Mancuso, Hobel, Schetter, & Coussons-Read, 2018). Besides, pregnancy-related hormones such as progesterone, estrogen, cortisol, and oxytocin gradually increase during pregnancy, which may affect sleep quality in pregnant women (Field et al., 2007; Mehta, Shafi, & Bhat, 2015). Women

suffering from insufficient sleep period reported an increased prevalence of poor sleep quality during pregnancy; this result is consistent with the results of the study investigating sleep duration and quality in Chinese pregnant women (Xu, Liu, Zhang, Sharma, & Zhao, 2017). However, in this study evaluating sleep duration and sleep quality, sleep quality was evaluated subjectively by the pregnant women themselves (Xu et al., 2017), while an objective measurement tool was used to evaluate sleep quality in our study.

Although hormonal and mechanical factors are associated with sleep disorders in pregnancy, little is known about contributing or related factors (Field et al., 2007). In this study, it was determined that sleep quality is negatively affected in women with high anxiety levels. Previous epidemiological studies presented that there is a relationship between sleep and anxiety in non-pregnant populations (Gregory et al., 2005; Taylor, Lichstein, Durrence, Reidel, & Bush, 2005). The relationship between sleep and anxiety during pregnancy may be more complex due to psychosocial and biological changes (Yu et al., 2017). The relationship between sleep and anxiety during pregnancy may be more complicated due to psychosocial and biological changes (Yu et al., 2017). While anxiety alone increases sleep problems during pregnancy, it may also increase the impact of other factors that can cause sleep disorder (Field et al., 2007). In our study, we determined that especially women with lifelong anxiety disorder experienced poor sleep quality in the model that we created to evaluate the factors that affect sleep quality the most. It is known that women with lifelong anxiety disorder before pregnancy experience higher psychopathological symptoms in the peripartum period compared to women without lifelong anxiety disorder before pregnancy (Asselmann, Kunas, Wittchen, & Martini, 2020). This finding is compatible with previous evidence regarding that a history of mental illness such as anxiety and depression is associated with an increased risk for anxiety and depressive symptoms and disorders during pregnancy and postpartum period (Asselmann et al., 2020; Biaggi, Conroy, Pawlby, & Pariante, 2016; Schubert et al., 2017). This finding is compatible with previous evidence regarding that a history of mental illness such as anxiety and depression is associated with an increased risk for anxiety and depressive symptoms and disorders during pregnancy and postpartum period (Wen,

Ko, Jou, & Chien, 2018; Yang et al., 2020). Women with advanced maternal age traditionally tend to have heavier domestic responsibilities and care burden (Yang et al., 2020) and to be more affected by physiological and psychological factors, and these factors probably contribute to poor sleep quality. It has been stated that sleep disorders in pregnancy start at the 12th week in line with the literature, and therefore women who were at and over 12 weeks of pregnancy were included in the study. The results obtained from our study may not be generalized to the early stages of pregnancy, as it focused on late pregnancy.

Conclusions: Poor sleep quality is a common problem for pregnant women. It was determined that sleep quality in pregnant women is lower especially in the third trimester. Besides, anxiety, increased age, and reporting sleep problems in pregnancy were determined as factors determining sleep quality. These findings support the need for research to be conducted on sleep quality in the perinatal period by healthcare professionals to support pregnant women and infants better. Therefore, we recommend nurses pay more attention to sleep problems especially for pregnant women with anxiety disorders and advanced maternal ages, and to provide sleep consultancy. Furthermore, behavioral interventions such as cognitive behavioral therapy, awareness meditation, and relaxation techniques, on which there is evidence about having positive effects on sleep problems and anxiety disorders, can be applied by psychiatric nurses. Research to be conducted should include the determinants of sleep quality such as prenatal anxiety and increased age in the supportive model of sleep-related prenatal care. Future studies can investigate this issue.

References

- Agargun, M., Kara, H., & Anlar, O. (1996). Validity and reliability of the Pittsburgh sleep quality index. *Turkish Journal of Psychiatry, 7*(2):107-115.
- Asselmann, E., Kunas, S., Wittchen, H.-U., & Martini, J. (2020). Changes in psychopathological symptoms during pregnancy and after delivery: A prospective-longitudinal study in women with and without anxiety and depressive disorders prior to pregnancy. *Journal of Affective Disorders, 263*: 480-490.
- Biaggi, A., Conroy, S., Pawlby, S., & Pariante, C. M. (2016). Identifying the women at risk of antenatal anxiety and depression: a systematic review. *Journal of Affective Disorders, 191*: 62-77.

- Cai, X.-H., Xie, Y.-P., Li, X.-C., Qu, W.-L., Li, T., Wang, H.-X., . . . Wang, L.-X. (2013). The prevalence and associated risk factors of sleep disorder-related symptoms in pregnant women in China. *Sleep and Breathing*, 17(3): 951-956.
- Field, T., Diego, M., Hernandez-Reif, M., Figueiredo, B., Schanberg, S., & Kuhn, C. (2007). Sleep disturbances in depressed pregnant women and their newborns. *Infant Behavior and Development*, 30(1): 127-133.
- Gregory, A. M., Caspi, A., Eley, T. C., Moffitt, T. E., O'Connor, T. G., & Poulton, R. (2005). Prospective longitudinal associations between persistent sleep problems in childhood and anxiety and depression disorders in adulthood. *Journal of abnormal child psychology*, 33(2): 157-163.
- Kamysheva, E., Skouteris, H., Wertheim, E. H., Paxton, S. J., & Milgrom, J. (2010). A prospective investigation of the relationships among sleep quality, physical symptoms, and depressive symptoms during pregnancy. *Journal of Affective Disorders*, 123(1-3): 317-320.
- Ko, Y. L., Lin, P. C., & Chen, S. C. (2015). Stress, sleep quality and unplanned C acesarean section in pregnant women. *International journal of nursing practice*, 21(5): 454-461.
- Mehta, N., Shafi, F., & Bhat, A. (2015). Unique aspects of sleep in women. *Missouri medicine*, 112(6): 430.
- Naghi, I., Keypour, F., Ahari, S., Tavalai, S., & Khak, M. (2011). Sleep disturbance in late pregnancy and type and duration of labour. *Journal of Obstetrics and Gynaecology*, 31(6): 489-491.
- Okun, M. L., Kiewra, K., Luther, J. F., Wisniewski, S. R., & Wisner, K. L. (2011). Sleep disturbances in depressed and nondepressed pregnant women. *Depression and anxiety*, 28(8): 676-685.
- Okun, M. L., Mancuso, R. A., Hobel, C. J., Schetter, C. D., & Coussons-Read, M. (2018). Poor sleep quality increases symptoms of depression and anxiety in postpartum women. *Journal of behavioral medicine*, 41(5): 703-710.
- Palagini, L., Gemignani, A., Banti, S., Manconi, M., Mauri, M., & Riemann, D. (2014). Chronic sleep loss during pregnancy as a determinant of stress: impact on pregnancy outcome. *Sleep medicine*, 15(8): 853-859.
- Pınar, Ş. E., Arslan, Ş., Polat, K., Çiftçi, D., Cesur, B., & Dağlar, G. (2014). A study of the relationship between sleep quality and perceived stress in pregnancies. *Ninth September University School of Nursing Electronic Magazine*, 7(3):171-177.
- Polo-Kantola, P., Aukia, L., Karlsson, H., Karlsson, L., & Paavonen, E. J. (2017). Sleep quality during pregnancy: associations with depressive and anxiety symptoms. *Acta obstetrica et gynecologica Scandinavica*, 96(2): 198-206.
- Ruiz-Robledillo, N., Canário, C., Dias, C., Moya-Albiol, L., & Figueiredo, B. (2015). Sleep during the third trimester of pregnancy: the role of depression and anxiety. *Psychology, health & medicine*, 20(8): 927-932.
- Schubert, K. O., Air, T., Clark, S. R., Grzeskowiak, L. E., Miller, E., Dekker, G. A., . . . Clifton, V. L. (2017). Trajectories of anxiety and health related quality of life during pregnancy. *PloS one*, 12(7): e0181149.
- Skouteris, H., Germano, C., Wertheim, E. H., Paxton, S. J., & Milgrom, J. (2008). Sleep quality and depression during pregnancy: a prospective study. *Journal of sleep research*, 17(2): 217-220.
- Spielberger CD, Gorsuch RL, & R, L. (1970). *Test Manual for the State-Trait Anxiety Inventory (Self Evaluation Questionnaire)*.
- Taylor, D. J., Lichstein, K. L., Durrence, H. H., Reidel, B. W., & Bush, A. J. (2005). Epidemiology of insomnia, depression, and anxiety. *Sleep*, 28(11): 1457-1464.
- Tsai, S.-Y., Kuo, L.-T., Lai, Y.-H., & Lee, C.-N. (2011). Factors associated with sleep quality in pregnant women: a prospective observational study. *Nursing Research*, 60(6): 405-412.
- Volkovich, E., Tikotzky, L., & Manber, R. (2016). Objective and subjective sleep during pregnancy: links with depressive and anxiety symptoms. *Archives of women's mental health*, 19(1): 173-181.
- Wen, S.-Y., Ko, Y.-L., Jou, H.-J., & Chien, L.-Y. (2018). Sleep quality at 3 months postpartum considering maternal age: A comparative study. *Women and Birth*, 31(6): e367-e373.
- Wojujutari, A., Alabi, O., & Matthew, O. (2018). Prenatal Stress and Sleep Quality Influence on Antenatal Women Psychological Capital in Mother/Child Hospital in Akure, Ondo State. *J Sleep Disord Ther*, 7(286) :2167-0277.1000286.
- Xu, X., Liu, D., Zhang, Z., Sharma, M., & Zhao, Y. (2017). Sleep duration and quality in pregnant women: A cross-sectional survey in China. *International journal of environmental research and public health*, 14(7): 817.
- Yang, Y., Li, W., Ma, T.-J., Zhang, L., Hall, B. J., Ungvari, G. S., & Xiang, Y.-T. (2020). Prevalence of poor sleep quality in perinatal and postnatal women: a comprehensive meta-analysis of observational studies. *Frontiers in psychiatry*, 11: 161.
- Yu, Y., Li, M., Pu, L., Wang, S., Wu, J., Ruan, L., . . . Jiang, W. (2017). Sleep was associated with depression and anxiety status during pregnancy: a prospective longitudinal study. *Archives of Women's Mental Health*, 20(5): 695-701.
- Zafarghandi, N., Hadavand, S., Davati, A., Mohseni, S. M., Kimiaimoghadam, F., & Torkestani, F. (2012). The effects of sleep quality and duration in late pregnancy on labor and fetal outcome. *The Journal of Maternal-Fetal & Neonatal Medicine*, 25(5): 535-537.