

Original Article

Determining the Relationship Between Sleep Problems and Anxiety Levels of Women with and without Gestational Diabetes

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Abstract

Background: The incidence of type 2 diabetes is increasing. For mother and baby health, pregnant women should be evaluated in terms of diabetes in routine follow-ups. Insomnia and anxiety experienced during pregnancy affect mother and baby health.

Objective: This research was carried out to determine the relationship between sleep problems and anxiety levels of women with and without gestational diabetes.

Methodology: The descriptive-type research was conducted between September 2018 and September 2019 in the Obstetrics and Pediatrics outpatient clinics of a Training and Research Hospital located in southeast Turkey. The research sample consists of 300 pregnant women -150 with gestational diabetes (GDM) and 150 without GDM-who agreed to participate in the study and met the inclusion criteria. Data were collected using the Introductory Information Form prepared by the researchers, the Women's Health Initiative Insomnia Rating Scale (WHIIRS), and the State-Trait Anxiety Inventory (STAI). Shapiro-Wilk test, Mann-Whitney U test, Kruskal-Wallis variance analysis, and Spearman correlation analysis were used to evaluate the data.

Results: In the study, it was found that 60% of women with GDM were 30 years old and older and 34% were illiterate, while 61.3% of women without GDM were 30 years old and older and 34.7% were illiterate. There was a highly significant positive correlation between the WHIIRS and State Anxiety Inventory scores ($p < 0.001$) and a moderate positive correlation was found between WHIIRS and the Trait Anxiety Inventory scores ($p < 0.001$) of women with GDM. There was moderately significant positive correlation was found between WHIIRS and STAI scores of women without GDM ($p < 0.001$).

Conclusions: In this research, it was found that there was a significant relationship between WHIIRS scores and anxiety levels of women with and without GDM, and sleep problems increased with anxiety levels.

Keywords: anxiety, gestational diabetes, pregnancy, sleep

Background

Pregnancy is a natural phenomenon that women can experience in their lifetime. During this period, many changes occur in a woman's life (Sut, Asci & Topac, 2016; Kostanoglu, Manzak & Sahin, 2019). These are physiological, psychological, and social changes (La Marca-Ghaemmaghami & Ehlert, 2015). Changes experienced during this period affect the daily life activities of women (Aneja et al., 2018; Yang, et

al., 2018). An increase in body fat due to uncontrolled nutrition and lack of movement causes gestational diabetes (GDM). GDM is a type of diabetes that occurs as a result of high blood glucose levels in the later weeks of pregnancy in some women with normal pre-pregnancy blood glucose levels (Immanuel & Simmons, 2017; Turker, et al, 2018). The prevalence of GDM varies between 1-14% and increases the risk of Type 2 diabetes (Chen, Mayo, Chatry & Hu, 2016; Turker, et al, 2018). In the third trimester of

pregnancy, an increase in maternal insulin resistance is observed, especially with the anti-insulin effect of placental lactogen (hPL), estrogen, cortisol, prolactin, corticotropin, and progesterone. GDM can negatively affect maternal and infant health (Chen, Mayo, Chatry & Hu, 2016; Immanuel & Simmons, 2017; Turker, et al, 2018).

Sleep is defined as the temporary and periodic loss of the organism's communication with the environment (Sut, Asci & Topac, 2016; Erdogan, & Ozturk, 2018). Sleep, which is a physiological requirement for all humans, has physiological, psychological, and social dimensions (Li at al., 2016; Nacar, 2019). During pregnancy, women experience sleep problems for various reasons. Kostanoglu et al. (2019) found that 51.9% of pregnant women had poor sleep quality (Kostanoğlu, Manzak & Sahin, 2019). In the study conducted by Ozhuner and Celik (2019) sleep disturbance in the third trimester of pregnancy was reported as 97% (Ozhuner & Celik, 2019). During pregnancy, sleep quality is affected by nausea, vomiting, waist and back pain, fetal growth, frequent urination, leg cramps, snoring, and hormonal changes (Mirghaforvand, Mohammad-Alizadeh-Charandabi, Zarei, Effati-Daryani, & Sarand, 2017; Mourady et al., 2017; Kostanoglu, Manzak & Sahin, 2019; Ozhuner & Celik, 2019).

During pregnancy, physiological, psychological, and social changes are experienced by women and they need to adapt to these changes. Many women easily adapt to the changes but some women have difficulty adapting to the pregnancy period and may experience mental problems at different levels (Elkin, 2015; Silva, Nogueira, Clapis & Leite, 2017). Many factors such as insufficient social support, marital problems, negative experiences in life, attitude towards pregnancy, and the presence of mental disorders in medical history affect the development of mental disorders in women during pregnancy (La Marca-Ghaemmaghami & Ehlert, 2015; Sat & Sozbir, 2018; Sonmezer, 2018). In addition, lack of nutrition and care and substance abuse during pregnancy affect the level of anxiety. In the third trimester of pregnancy, concerns are experienced regarding the mode of delivery and the health status of the child (Levine et al., 2003; Sonmezer, 2018).

Although pregnancy is a physiological process, these changes during pregnancy affect the

physical and mental health of women negatively (Levine et al., 2003; Sonmezer, 2018). Especially, the nutrition, psychological status, and health of pregnant women diagnosed with GDM during pregnancy are negatively affected and it becomes difficult for them to cope with the problems during pregnancy (Elkin, 2015; Immanuel & Simmons, 2017; Silva, Nogueira, Clapis & Leite, 2017; Sat & Sozbir, 2018). The healthcare team has important roles in reducing or preventing the problems experienced by women during pregnancy (Levine et al., 2003; Sat & Sozbir, 2018). When the literature was reviewed, no study was found that examined the sleep problems and anxiety levels of women with and without GDM in the third trimester of pregnancy. Thus, this research was conducted to determine the relationship between sleep problems and anxiety levels of women with and without GDM.

Methods

Type of the Research: The study was conducted in a descriptive and cross-sectional type to determine the relationship between sleep problems and anxiety levels of women with and without GDM.

Place and Time of the Research: The research was conducted between September 2018 and September 2019 in the Obstetrics and Pediatrics outpatient clinics of a Hospital located in Southeast Turkey.

Population and Sample of the Research: The population of the study consists of all pregnant women, who were diagnosed with GDM according to the criteria of the American Diabetes Association (ADA) and the World Health Organization (WHO), who applied to the obstetrics outpatient clinic of the relevant hospital between September 2018 and September 2019. The sample of the research was determined based on ADA and WHO criteria.

The sample of the group diagnosed with GDM was comprised of 150 pregnant women, who were diagnosed with GDM according to ADA and WHO criteria, accepted to participate in the study, whose physical and cognitive health levels were suitable to answer the forms planned in the study, were at least 18 years old, in the third trimester of pregnancy, did not regularly use sleeping pills, did not have a risky pregnancy, and didn't have a history of psychiatric illness. The sample of the group who weren't diagnosed with GDM was comprised of 150 pregnant women, who were not diagnosed with GDM according to ADA and

WHO criteria, accepted to participate in the study, whose physical and cognitive health levels were suitable to answer the forms planned in the study, were at least 18 years old, in the third trimester of pregnancy, did not regularly use sleeping pills, did not have a risky pregnancy, and didn't have a history of psychiatric illness. In order to ensure numerical equality during the formation of the groups, for each woman diagnosed with GDM included in the study by the researcher, a pregnant woman who was not diagnosed with GDM was included in the study on the same day.

Data Collection Tools: Research data were collected using the Introductory Information Form containing socio-demographic characteristics, the Women's Health Initiative Insomnia Rating Scale (WHIIRS), and the State-Trait Anxiety Inventory (STAI).

Introductory Information Form: In this form, which was created by the researcher in line with the literature, there are introductory characteristics of pregnant women such as age, gender, marital status, education level, employment status, and income level (Sut, Ascı & Topac, 2016; Mirghafarvand, Mohammad-Alizadeh-Charandabi, Zarei, Effati-Daryani, & Sarand, 2017; Mourady et al., 2017; Silva, Nogueira, Clapis & Leite, 2017; Aneja et al., 2018; Erdogan & Ozturk, 2018).

The Women's Health Initiative Insomnia Rating Scale (WHIIRS): The scale was created by Levine et al. (2003) and its validity and reliability study for Turkish was conducted by Timur and Sahin (2009) (Levine, et al., 2003; Timur & Sahin, 2009). While the first 4 questions in the scale determine the onset of insomnia, inability to maintain sleep, and waking up early in the morning, the fifth question is about sleep quality. The answer given to each item is answered according to the experience of the individual, considering the frequency in the last 4 weeks and for each week. It is a Likert-type scale and each item is scored from 0 to 4. In WHIIRS, 0 points in the first 4 questions indicate that there is no problem related to insomnia, while 4 points indicate that there are problems related to insomnia 5 times or more per week. The highest score obtained from the scale shows the greatest degree of insomnia symptoms. The lowest score that can be obtained from the scale is 0, the highest is 20. High scores show the greatest degree of insomnia symptoms. In the study of Timur and Sahin (2009), Cronbach's alpha value of the scale was found to be 0.85 (Timur & Sahin, 2009). In

our study, Cronbach's alpha value of the scale was 0.90.

The State-Trait Anxiety Inventory (STAI): This inventory, developed by Spielberger et al. (1970), consists of two subscales Trait and State, each consisting of 20 questions. It is a 4 point Likert-type scale, ranging from "Not at all" to "Very Much So". The validity and reliability study of the scale for Turkish was conducted by Oner and Le Compte (1985) (Oner & Compte, 1985). Two types of expressions are used in STAI. Direct expressions express negative feelings, and inverted expressions express positive feelings. The inverted expressions in the State-Trait Anxiety Inventory are items 1, 2, 8, 10, 11, 15, 16, 19, and 20. The inverted statements in the Trait Anxiety Inventory are items 21, 26, 27, 30, 33, 36, and 39. After the total weights of the direct and inverted expressions are found, the total weight score of the reverse expressions is subtracted from the total weight score obtained for the direct expressions. A predetermined and constant value is added to this score. This constant value is 50 for the State-Trait Anxiety Inventory and 35 for the Trait Anxiety Inventory. The resulting value is the anxiety score of the individual. Cronbach's alpha values for the Trait and State Anxiety inventories are 0.83 and 0.94, respectively (Oner & Compte, 1985). In this research, Cronbach's alpha values of the inventories were found as 0.78 and 0.82, respectively.

Data Collection: Pregnant women who were diagnosed with GDM according to ADA and WHO criteria and received insulin therapy were examined and recorded when they came to the outpatient clinic for a routine follow-up. After the examination, those who accepted to participate after being explained the aim and the duration of the research were included in the research. The data were collected in the family planning room in the outpatient clinic so that the pregnant women could answer the questions more comfortably. Questionnaire forms were applied by the researcher using face to face interview method. Later, one pregnant woman who was not diagnosed with GDM was included in the study on the same day, for each woman diagnosed with GDM. Pregnant women who were not diagnosed with GDM were examined and recorded when they came to the outpatient clinic for routine follow-ups. After the examination, after the purpose and duration of the study was explained, the pregnant women who agreed to participate

were included in the research. The data were collected in the family planning room in the outpatient clinic so that the pregnant women could answer the questions more comfortably. Questionnaire forms were applied by the researcher using face to face interview method. It took 10-15 minutes to implement the data collection forms.

Data Analysis: SPSS 23 software was used in the analysis of the research data. Number, percentage, mean, and standard deviation were used to analyze the descriptive data obtained from the study. Mann-Whitney U and Kruskal Wallis tests were used for independent groups by evaluating the conformity to the normal distribution in the analysis of comparative data. The relationship between the scores of the scales was evaluated using Spearman correlation analysis. The statistical significance level was accepted as $p < 0.05$.

Ethical Aspects of the Research: Before starting the study, permission was obtained from the Ethics Committee. In addition, an institutional permit was obtained from the Hospital. The research was conducted in accordance with the Helsinki Declaration Principles. After the information was given about the research, it was emphasized that participation in the research was on a voluntary basis and the data would be kept confidential. In addition, verbal and written consent was obtained from the pregnant women who participated in the study.

Results

In the research, it was found that 60% of women with GDM were 30 years old and older, 92.7%

were housewives, 34.7% had 5 or more pregnancies, and 34% were illiterate. Of the women without GDM, 61.3% were 30 years old and older, 94% were housewives, 30.7% had 5 or more pregnancies, and 34.7% were illiterate (Table 1).

In the study, a statistically significant difference was found between the income status and WHIIRS scores of women with GDM ($p < 0.05$). There was a statistically significant difference between the occupation and income status of women without GDM and their WHIIRS scores ($p < 0.05$). There was no statistically significant difference between the other introductory characteristics of pregnant women and their WHIIRS scores ($p > 0.05$) (Table 2).

The mean WHIIRS and STAI scores of women with GDM were found to be statistically significantly higher than those without gestational diabetes ($p < 0.05$). There was no statistically significant difference between the mean STAI scores of women with and without GDM ($p > 0.05$) (Table 3).

While there was a highly significant positive correlation between the WHIIRS and State Anxiety Inventory scores of women with GDM ($r = 0.664$, $p < 0.001$), there was a moderately significant positive correlation between WHIIRS and the Trait Anxiety Inventory scores ($r = 0.568$, $p < 0.001$). There was a moderately significant positive correlation between WHIIRS and the State-Trait Anxiety Inventory scores of women without GDM ($r = 0.536$, $p < 0.001$; $r = 0.541$, $p < 0.001$) (Table 4).

Table 1: Introductory Information of the Pregnant Women

Features	With Gestational Diabetes n(%)	Without Gestational Diabetes n(%)
Age		
≤29	60(40.0)	58(38.7)
≥30	90(60.0)	92(61.3)
Education Status		
Illiterate	51(34.0)	52(34.7)
Literate	30(20.0)	26(17.3)
Primary education	32(21.3)	41(27.3)
High school and above	37(24.7)	31(20.7)
Occupation		
Housewife	139(92.7)	141(94.0)
Public servant	11(7.3)	9(6.0)
Income Level		

Income is less than expenses	25(16.7)	24(16.0)
Income is equivalent to expenses	125(83.3)	126(84.0)
Number of Pregnancies		
1-2	57(38.0)	51(34.0)
3-4	41(27.3)	53(35.3)
5 or more	52(34.7)	46(30.7)
Age (years) (X±SD)	31.92±6.11	32.40±6.35

Table 2: Comparison of the Descriptive Characteristics of Women with and without Gestational Diabetes According to Their Mean WHIIRS Scores

Features	With Gestational Diabetes	Test Value	Without Gestational Diabetes	Test Value
	WHIIRS X±SD		WHIIRS X±SD	
Age				
≤29	13.61±4.02	$z^*=-.188$	12.62±4.32	$z^*=-.378$
≥30	13.78±3.26	$p=0.851$	13.11±3.19	$p=0.705$
Education Status				
Illiterate	13.80±3.24	$\chi^2_{**}=1.530$	13.32±2.70	$\chi^2_{**}=4.808$
Literate	14.23±2.47	$p=0.675$	13.11±3.27	$p=0.186$
Primary education	12.84±4.36		11.65±4.54	
High school and above	13.94±3.99		13.77±3.83	
Occupation				
Housewife	13.74±3.58	$z^*=-.435$	12.77±3.68	$z^*=-1.973$
Public servant	13.33±3.60	$p=0.664$	15.33±2.44	$p=0.049$
Income Level				
Income is less than expenses	12.40±2.87	$z^*=-2.595$	10.79±3.90	$z^*=-3.043$
Income is equivalent to expenses	13.98±3.65	$p=0.009$	13.33±3.49	$p=0.002$
Number of Pregnancies				
1-2	13.70±4.02	$\chi^2_{**}=0.537$	13.03±4.30	$\chi^2_{**}=1.203$
3-4	13.92±3.42	$p=0.764$	12.54±3.61	$p=0.548$
5 or more	13.57±3.21		13.23±2.92	

Note. *Value z of the Mann Whitney U test, ** Value chi-square of the Kruskal Wallis

Table 3: Comparison of the Mean WHIIRS and STAI Scores of Women with and without Gestational Diabetes

Scales	With Gestational Diabetes	Without Gestational Diabetes	z*	p
	X±SD	X±SD		
WHIIRS	13.72±3.57	12.92±3.66	-1.974	0.048
State Anxiety Inventory Scores	53.15±2.96	51.85±3.59	-3.210	0.001
Trait Anxiety Inventory Scores	49.70±2.97	50.40±4.05	-1.807	0.071

Table 4: The Relationship Between the Sleep Characteristics and Anxiety Levels of Women with and without Gestational Diabetes

	With Gestational Diabetes	Without Gestational Diabetes
	WHIIRS r; p	WHIIRS r; p
State Anxiety Inventory Scores	0.664; <0.001	0.536; <0.001
Trait Anxiety Inventory Scores	0.568; <0.001	0.541; <0.001

Discussion

Although pregnancy is a natural phenomenon, it can cause physiological and psychological changes that affect the daily living activities of many women. Along with hormonal changes in pregnancy, in the last trimester, sleep interruptions increase due to reasons such as stomach disorders, increased baby movements, frequent urination, pelvic pain, and lower-back pain, and sleep quality deteriorates (Kay-Stacey & Attarian, 2017; Plancoulaine et al., 2017; Yeral, 2018). In addition, with the approach of delivery, birth anxiety and stress also affect sleep quality (Plancoulaine et al., 2017; Yeral, 2018; Osman Bakr, El-Gawad, Abd El-Fattah & Fawzy Elsayed, 2020). The increase in the level of anxiety that occurs with a decrease in sleep quality during pregnancy causes the development of various complications (La Marca-Ghaemmaghami & Ehlert, 2015; Yang et al., 2018; Immanuel & Simmons, 2017; Silva, Nogueira, Clapis & Leite, 2017; Osnes et al., 2020). Thus, the possibility of metabolic complications such as GDM increases (Chirakalwasan & Reutrakul, 2020; Facco, 2017). In this research, the relationship between the sleep problems (onset of insomnia, inability to sustain sleep, waking up early in the morning, and sleep quality) and anxiety levels of women with and without gestational diabetes was investigated.

As a result of the examination, it was determined that the income status of women with GDM affected the WHIIRS score, while the occupation and income status of women without GDM were effective. However, there was no significant difference between the WHIIRS scores and other introductory characteristics of pregnant women such as age, education level, and the number of pregnancies. Similar to the findings of this research, studies have found that there is no significant relationship between sleep quality and age, education level, or the number of pregnancies (Koybasi & Oskay, 2017; Ozhuner & Celik, 2019). In the literature, contrary to this research,

it was determined that occupation and income status did not affect sleep quality (Li et al., 2016; Koybasi & Oskay, 2017). In this study, mean sleep scores of women with and without GDM who have a medium income-level were higher than those with a lower income level. This may be due to the fact that the number of middle-income participants is five times the number of those with a low income. In addition, those with moderate income may have high levels of sleep problems as they have difficulty in following recommendations on care, follow-ups, and treatment.

During pregnancy, women experience different physiological and psychological changes in each trimester. These changes affect sleep quality. When the literature was examined, it was found that there was a deterioration in sleep quality during pregnancy, especially in the third trimester (Darvish & Zorbakhsh, 2016; Mourady et al., 2017; Koybasi & Oskay, 2017; Kostanoglu, Manzak & Sahin, 2019; Osnes et al., 2020). In a study, it was determined that pregnant women had more sleep problems in the last trimester (Yang et al., 2018). In this study, it was found that there is a moderate relationship between sleep problems and anxiety levels of women in the third trimester of pregnancy without GDM, and a high level of significant relationship in women with GDM. For all pregnant women who participated in this study, it was found that sleep problems increased with anxiety levels. This increase was found to be higher especially in those with GDM. Studies have found that there is a significant relationship between sleep quality and anxiety in pregnant women, similar to the findings of this study and that sleep quality decreases in pregnant women experiencing high levels of anxiety (Mirghaforvand et al., 2017; Mourady et al., 2017; Sedov, Cameron, Madigan & Tomfohr-Madsen, 2018). In addition, studies have shown that sleep problems increase the anxiety levels of individuals by creating tension and negatively

affect daily activities (La Marca-Ghaemmaghami & Ehlert, 2015; Li et al., 2016; Mirghaforvand et al., 2017; Mourady et al., 2017). In their study, Cai et al. (2017) stated that abnormal glucose regulation was observed in women with low sleep quality during pregnancy, and the risk of GDM could be reduced by improving sleep problems (Cai et al., 2017). Zhu et al. (2020) determined that poor sleep quality creates a higher risk for GDM (Zhu, Shi, Park & Reutrakul, 2020). Studies have found that sleep and anxiety are very important for glucose metabolism, and sleep quality can increase pregnancy complications, including GDM (Facco et al., 2017; Wang et al., 2017; Xu et al., 2018; Chirakalwasan & Reutrakul, 2020). Therefore, while anxiety increases sleep problems, sleep problems increase anxiety and cause pregnant women to experience some physical and mental problems. For this reason, it can be stated that it is important to provide individualized care, necessary support, and consultancy services in order to identify and eliminate sleep and anxiety problems of all pregnant women, especially those with GDM.

Limitations of the Research: The research was conducted in the Obstetrics and Pediatrics outpatient clinics of a Hospital in Southeast Turkey. Since the research was conducted in a single center, it can only be generalized to this group. Another limitation of this study is that only women in their third trimester were evaluated. The strength of the study is that it is the first study investigating the relationship between sleep characteristics and anxiety levels of women with and without GDM.

Conclusion: While the income status of women with GDM affected the WHIIRS score, it was determined that occupation and income status were effective in women without GDM. In the study, it was found that there is a significant relationship between sleep quality and anxiety levels in the third trimester of pregnancy, and this relationship is particularly high in women with GDM. For maternal and infant health, sleep and anxiety problems experienced by pregnant women with GDM should be reduced. Pregnant women should be provided with prenatal care and their follow-ups should be done regularly. Health personnel should identify risky groups that may be prone to GDM during pregnancy in the early period. Sleep problems and anxiety levels of women with and without GDM should be evaluated. Pregnant women should be informed

about sleep quality and their concerns, and they should be provided with holistic and individualized care.

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