

## Original Article

## Association between Maternal, Obstetrical Characteristics and Prenatal Distress in Pregnant Women with Gestational Diabetes Mellitus

**Alus Tokat Merlinda, PhD, RN**

Associate Professor Dokuz Eylul University Faculty of Nursing, Obstetric and Gynecologic Nursing Department, Izmir Turkey

**Elmas Ciler, PhD, RN**

Assistant Professor, Tınaztepe University, Faculty of Health Sciences, Midwifery Department, Izmir Turkey

**Elmas Semra, PhD, RN**

Assistant Professor, Avrasya University, Faculty of Health Sciences, Midwifery Department, Turkey

**Correspondence:** Elmas Çiler PhD, RN, Assistant Professor, Tınaztepe University Faculty of Health Sciences, Midwifery Department e-mail: ciler\_yeygel884@hotmail.com

**Place of Study:** Tepecik Education and Research Hospital, Izmir, Turkey

### Abstract

**Background:** To evaluate the prenatal distress of Turkish pregnant women with GDM and to assess the association between prenatal distress and individual and obstetrical characteristics.

**Methods:** Descriptive study conducted in Maternal Hospital İzmir, Turkey. The total of 202 pregnant participated. The mothers who accepted to be part of the study completed Introduction Data Form and Prenatal Distress Questionnaire.

**Results:** GDM mother were in generally moderate distressed. The items most frequently endorsed as causing extreme distress in mothers with gestational diabetes were concerns about the effect of ongoing health problems such as high blood pressure or diabetes on pregnancy (69.3%), premature delivery (64.9%), having an unhealthy baby (65.8%), pain during labor and delivery (65.3%) and feeling tired and having low energy during pregnancy (64.9%). Some factors as previous obstetrical experiences, young age, high BMI, the insulin treatment, not exercising etc. were associated with higher prenatal distress.

**Conclusion:** Awareness of prenatal distress and the factors that can increase this risk in GDM mothers can help health professionals to target specific aspects, provide holistic maternity care including identification, management and relevant support.

**Keywords:** Gestational diabetes, prenatal distress, maternity care.

### Background

Gestational diabetes mellitus (GDM) is defined as diabetes that is first diagnosed in pregnancy. It affects approximately 18% of pregnancies in the world (ADA, 2014). The rise in GDM and type 2 diabetes in parallel with obesity both in the U.S. and worldwide is of particular concern (ADA, 2018). According to the Turkish Diabetes Foundation (2013), the incidence of GDM in Turkey is 3%. However, various studies in Turkey have shown significantly different results

(GDM varies between 1.4-13.5%) (Tarım, 2011). Gestational Diabetes Mellitus is associated with significant maternal, fetal and neonatal problems, including abortion, maternal hypertension, preterm birth risk, macrosomia, and stillbirth. Because of these risk factors, pregnant women experience more stress than pregnant women who had normal pregnancies (Baz, 2016).

Pregnancy is a period of crisis that requires adaptation to changes in women's physical conditions, domestic roles, roles at the

workplace, and, sometimes, in their feelings and attitudes towards maternity. Pregnancy also presents new roles for the woman and her family (Oskay, 2004; Akbas et al., 2008; Calik & Aktas, 2011). However, if there are risk factors related to the mother's and child's health, the stress level experienced by mothers can be increased. Pregnancy-specific distress includes maternal fears and concerns related to the health of the fetus, parent relationships and relationships with others, changes in the body, delivery and baby's health (Yali & Lobel, 1999; Alderdice & Lynn, 2011). Additionally, psychosocial distress during pregnancy can be defined as anxiety and/or depression and classified as mild, moderate or severe (Fuber et al., 2009). Pregnancy distress has been known to cause abnormal fetal heart patterns, low Apgar score, low birth weight, breast feeding problems, fetal deaths, attachment problems, preeclampsia, placental abnormalities, preterm birth, fetal distress, and emergency cesarean (Melender 2002; Mulder et al., 2002; Johnson & Slade 2003; Alder et al., 2007; Akbas et al., 2008; Furber et al., 2009; Calik & Aktas, 2011; Vianna et al., 2011). Factors including individual life experience, such as social support and poverty, cultural factors can also contribute to distress in pregnancy. The stress response varies throughout pregnancy and events early in pregnancy are experienced as more stressful than similar events that occur later in pregnancy (Glynn et al., 2008; Stern et al., 2009). Factors including low education level, low income, and lack of social support can affect mothers' emotional reactions (Yali & Lobel, 1999; Kocabasoglu & Baser 2008). Additionally, negative experiences related to past pregnancies may cause anxiety or emotional distress in women (Côté-Arsenault & Dombeck 2001; Fuber, et al., 2009). Availability of social support and antenatal care are additional factors that can affect mother distress (Demir Sevil et al., 2004). Pregnancy-related complications can increase stress, but there is no research related to distress experienced by mothers with gestational diabetes and the factors that can affect this stress. Gestational diabetes can cause a high-risk pregnancy (Hayase et al., 2014). It is important to be able to identify mothers with GDM who experience stress during pregnancy and to find additional ways of supporting these women to alleviate stress. Therefore, nurses and other health professionals should detect distress early in pregnancy and provide appropriate initiatives (Silveira et al., 2014; Kubo et al., 2017.).

## Subjects and Methods

**Participants:** A descriptive survey design was employed in this study. This research was conducted in the largest Maternity Hospital in Izmir, Turkey, which is the referral hospital for pregnant women with diabetes. A total of 287 GDM mothers were approached, and 202 participated in the study. Fifty-six participants did not participate in the study, 7 had psychiatric disorders and 22 had other exclusion criteria. Inclusion criteria were the following: (1) diagnosed with GDM, (2) aged 18 years and older, (3) in the third trimester of pregnancy and (4) able to speak and read Turkish. Exclusion criteria were the following: (1) multiple pregnancies (2) pregnancy as a result of infertility and (3) other chronic disease.

**Data Collection:** For data collection, the Introduction Data Form and Prenatal Distress Questionnaire were used.

**Introduction data form (Self-Description Form):** The Introduction data form was prepared by the authors according to related literature. A survey contained questions related to the women's personal characteristics and pregnancy-related characteristics. The following personal and pregnancy characteristics were evaluated: age, education level, employment status, type of family living environment, use of cigarettes, number of pregnancies, health problems in previous pregnancies, previous abortion, mode of birth in previous pregnancy, additional health problems in current pregnancy, use of any medication, method of GDM treatment (insulin, Diet, etc.), exercise and diet regimens in current pregnancy, weight gain, and any hospitalization during pregnancy.

**The Revised Prenatal Distress Questionnaire (NUPDQ-17):** NUPDQ-17 aimed to measure prenatal distress (Yali & Lobel, 1999) and was developed from the Prenatal Distress Questionnaire, a 12 item self-report instrument. The Revised Prenatal Distress Questionnaire consists of 17 items that evaluate the distress that mothers experience in terms of physical symptoms, emotional symptoms, relationships, body image, maternity and pregnancy (Lobel, 2008). Mothers were asked to complete all items by stating if they felt bothered, upset or worried related to various aspects of their pregnancy. They rated statements using a 3-point scale ranging from 'not at all' (0) to 'very much' (2). The scores are summed to produce a range from

0 to 34, with higher levels indicating higher prenatal distress. Cronbach's alpha of the Turkish version of the Revised Prenatal Distress Questionnaire was 0.85.

**Procedure:** The pregnant women were approached in high-risk pregnancy outpatient clinics where they went for their routine prenatal visits. The mothers who accepted to participate in the study were asked to complete the Introduction Data Form and Prenatal Distress Questionnaire, which took approximately 15-20 minutes.

**Ethical Considerations:** Permissions were obtained by the institutional review board and the hospital administration. Additionally, participants were informed about the study, and their verbal informed consent was obtained.

**Statistical analysis:** Statistical analyses were performed using the Statistical Program for Social Sciences (SPSS) version 22.0 for Windows (SPSS Inc. Chicago, IL, USA). Descriptive statistics for all variables were calculated. A Kruskal-Wallis, one-way ANOVA and t-test were used to compare the mean values of the Revised Prenatal Distress Questionnaire scale with individual and obstetric characteristics. A two tailed -value  $<.05$  was the criterion for statistical significance. Pearson's correlation coefficient was used to estimate the strength of the linear association between measures. The internal reliability was examined with Cronbach's alpha, and validity was determined by Pearson's correlation test. Cronbach's alpha coefficient ranged between 0-1. The closer Cronbach's alpha coefficient is to 1, the greater the internal consistency of the items on a scale (0-.40 unacceptable; .40-.59 low consistency; .60-.79 acceptable, good consistency; .80-1.00 excellent) (Mishel 1998).

## Results

**Individual characteristics:** The mean age of the participants was 29 (SD 6.59; range:18-45), and more than three quarters of the group (82.6%) had a primary school degree. Only 15.8% of the pregnant women were employed, and most of the participants (79.2%) rated their income level as moderate. 58.4% of the participants lived in nuclear families, and 65.8% reported that they were not smoking cigarettes (Table 1).

**Obstetric characteristics:** Of the women, 72.7% were multi gravida, and the mean gestational age was 32.77 weeks (SD 5.30; range:11-40). In regard to previous pregnancies, 50.7% had vaginal births. In total, 45.6% had at least one miscarriage, 27.3% had GDM in which 87.1% were treated only with diet, 13.4% had hypertension in a previous pregnancy, 22.8% had experienced preterm birth risk. In regard to the current pregnancy, 40.5% reported that their GDM was treated only with diet and exercise, and 44.6% planned a cesarean birth.

The women undergoing a cesarean birth stated the following reasons: previous cesarean birth (63.8%), fear or concerns about birth (25%), doctor's advice (11.1%) and advanced maternal age (11.1%). 41.59% of pregnant women reported that they had experienced preterm birth risk in the current pregnancy. More than three quarters of the participants (91.1%) had not received any verbal education from health professionals related to exercise. However, only 9.9% did not receive any education from health professionals related to diet in GDM. Only 14.9% of pregnant women stated that they were exercising, and all (100%) were walking (Table 1).

**Prenatal Distress in Pregnant Women with Gestational Diabetes Mellitus:** We determined prenatal distress score as  $20.76 \pm 8.57$  and the Cronbach's  $\alpha$  0.627. The most common factors that caused extreme distress in mothers with gestational diabetes were concerns about the effect of ongoing health problems, such as high blood pressure or diabetes, on pregnancy (69.3%); physical symptoms of pregnancy, such as vomiting, swollen feet, or backaches (67.3%); premature delivery (64.9%); having an unhealthy baby (65.8%); pain during labor and delivery (65.3%); feeling tired and having low energy during pregnancy (64.9%) and concern about what will happen during labor and delivery (61.4%).

Most mothers were not distressed about working at a job after birth (82.7%), working or caring for family during pregnancy (74.8%) and whether the baby might be affected by alcohol, cigarettes or drugs that they had taken (66.3%) (Table 2).

**Table 1. Introduction and Obstetric Data of the Sample (n=202)**

<b>Introduction Characteristics</b>		
	<b>M (min-max)*</b>	<b>SD**</b>
<b>Age</b>	29.00 (18-45)	6.59
	<b>Number (N)</b>	<b>%</b>
<b>Education level</b>		
Primary school	167	82.6
High School	26	12.9
University	9	4.5
<b>Income Level</b>		
Good	6	3.0
Moderate	160	79.2
Bad	36	17.8
<b>Employment status</b>		
Employed	32	15.8
Not employed	170	84.2
<b>Type of family whom she is living</b>		
Extended family	84	41.6
Nuclear family	118	58.4
<b>Smoking cigarettes</b>		
Yes	69	34.2
No	133	65.8
<b>Body Mass Index (BMI)</b>		
Low	2	1.0
Normal	19	9.4
High	91	45.0
Obese	90	44.6
<b>Obstetric characteristics</b>		
Gravida		
Primigravida (current pregnancy)	55	29.7
Multigravida	147	72.7
<b>Mode of last birth<sup>‡</sup></b>		
Vaginal	72	50.7
Cesarean	70	50.3
<b>Had any miscarriage?<sup>‡</sup></b>		
Yes	67	45.6
No	80	54.4
<b>Gestational diabetes mellitus diagnosis for first time in current pregnancy</b>		
Yes	157	77.7
No	45	27.3
<b>The treatment of gestational diabetes mellitus in previous pregnancy<sup>‡</sup></b>		
Diet	176	87.1

Insulin and diet	26	12.9
<b>Hypertension in previous pregnancy</b>		
Yes	27	13.4
No	175	86.6
<b>Preterm birth/preterm birth risk in previous pregnancy<sup>‡</sup></b>		
Yes	46	22.8
No	156	77.2
<b>The treatment of gestational diabetes mellitus in current pregnancy</b>		
Diet and exercise	82	40.5
Insulin and diet	120	59.5
<b>Any preterm birth risk in current pregnancy</b>		
Yes	84	41.59
No	118	58.41
<b>Education from health professionals related to exercise in gestational diabetes mellitus</b>		
Yes	18	8.9
No	184	91.1
<b>Application of any exercise during pregnancy</b>		
Yes	30	14.9
No	172	85.1
<b>Type of exercise performed</b>		
Walking	30	100
<b>Any education from health professionals related to diet in gestational diabetes mellitus</b>		
Yes	182	90.1
No	20	9.9

\* *M*: mean; \*\**SD*: standard deviation

<sup>‡</sup> *Multiparous mother*

**Table 2. Prenatal Distress in Pregnant Women with Gestational Diabetes Mellitus (n=202)**

	Item-total		Percentage			Mean scores		
	correlation r†	p	Not at all (0) %	Some what (1) %	Very much (2) %	Mean (SD)	Min.	Max.
(1) ...about taking care of a newborn baby?	0.841	0.000	20.3	27.7	52.0	2.31 (0.79)	0	2
(2) ...about the effect of ongoing health problems such as high blood pressure or diabetes on your pregnancy?	0.649	0.000	8.9	21.8	69.3	2.60 (0.64)	0	2
(3) ...about feeling tired and having low energy during your pregnancy?	0.695	0.000	5.0	30.2	64.9	2.59 (0.58)	0	2
(4) ...about pain during labor and delivery?	0.695	0.000	12.9	21.8	65.3	2.52 (0.71)	0	2
(5) ...about paying for your medical care during pregnancy?	0.807	0.000	17.8	28.7	53.5	2.35 (0.76)	0	2
(6) ...about changes in your weight and body shape during pregnancy?	0.786	0.000	19.8	22.3	57.9	2.38 (0.79)	0	2
(7) ...about whether the baby might come too early?	0.629	0.000	16.8	18.3	64.9	2.48 (0.76)	0	2
(8) ...about physical symptoms of pregnancy such as vomiting, swollen feet or backaches?	0.611	0.000	11.4	21.3	67.3	2.55(0.69)	0	2
(9) ...about the quality of your medical care during pregnancy?	0.899	0.000	28.2	26.2	45.5	2.17(0.84)	0	2
(10) ...about changes in your	0.568	0.000	46.0	23.3	30.7	1.84 (0.86)	0	2

relationships with other people because of having a baby?									
(11) ...about whether you might have an unhealthy baby?	0.692	0.000	13.4	20.8	65.8	2.52 (0.72)	0	2	
(12) ...about what will happen during labor and delivery?	0.720	0.000	16.3	22.3	61.4	2.45 (0.75)	0	2	
(13) ...about working or caring for your family during your pregnancy?	0.047	0.508	74.8	16.3	8.9	1.34 (0.63)	0	2	
(14) ...about paying for the baby's clothes, food or medical care?	0.548	0.000	21.8	50.0	28.2	2.16 (0.87)	0	2	
(15) ...about working at a job after the baby comes?	0.220	0.002	82.7	8.9	8.4	1.61 (0.89)	0	2	
(16) ...about getting day care, babysitters or other help to watch the baby after it comes?	0.870	0.000	31.2	21.3	47.5	1.41 (0.49)	0	2	
(17) ...about whether the baby might be affected by alcohol, cigarettes, or drugs that you have taken?	0.608	0.004	66.3	5,9	27.7	1.61 (0.89)	0	2	
Total score						20.76 (8.57)	5	34	

\* $p < 0.05$  †Pearson's correlation coefficient.

**Table 3. The comparison of Revised Prenatal Distress Questionnaire (NUPDQ) scores with introduction and obstetric characteristics of sample (n = 202)**

Introduction characteristics	N	NUPDQ mean scores		Statistical Tests p-value
		Mean	SD	
<b>Age group</b>				
20–29 years	106	24.41	7.18	$\chi^{2kw}=41.801^{\dagger}$ p= 0.000
30–39 years	82	17.18	8.52	
40-45 years	14	14.07	5.23	
<b>Education level</b>				
Primary school	167	21.39	8.05	F=6.018 <sup>‡</sup> p= 0.001
High School	26	17.88	9.58	
University	9	11.11	3.25	
<b>Income Level</b>				
Good	6	17.33	9.04	$\chi^{2kw}=0.902^{\dagger}$ p= 0.637
Moderate	160	20.80	8.74	
Bad	36	21.16	7.79	
<b>Employment status</b>				
Employed	32	21.15	10.63	t=0.283 <sup>‡</sup> p= 0.778
Not employed	170	20.68	8.15	
<b>Type of family</b>				
Extended family	84	24.59	7.10	t = -5.779 <sup>‡</sup> p= 0.000
Nuclear family	118	18.03	8.50	
<b>Smoking cigarettes</b>				
Yes	69	27.52	5.85	t = 9.797 <sup>‡</sup> p= 0.000
No	133	17.25	7.61	
<b>Body Mass Index (BMI)</b>				
Low	2	13.00	7.07	$\chi^{2kw}=7.416^{\dagger}$ p= 0.060
Normal	19	16.05	6.63	
High	91	21.78	8.23	
Obese	90	20.90	8.98	
<b>Obstetric characteristics</b>				
	N	NUPDQ mean scores		Statistical Tests
		Mean	Mean	
<b>Gravida</b>				
Primigravida (current pregnancy)	55	20.21	8.88	t=-0.551 <sup>‡</sup> p= 0.582
Multigravida	147	20.96	8.47	
<b>Mode of last birth<sup>‡</sup></b>				
Vaginal	72	18.76	8.310	t=-3.708 <sup>‡</sup> p= 0.000
Cesarean	70	23.80	7.86	
<b>Had any miscarriage?<sup>‡</sup></b>				
Yes	67	21.52	8.30	t=1.390 <sup>‡</sup> p= 0.167
No	80	19.60	8.38	



<b>Gestational diabetes mellitus diagnosis for first time in current pregnancy</b>				
Yes	157	19.74	8.71	t=-3.223 <sup>†</sup>
No	45	24.31	7.06	p= 0.001
<b>The treatment in gestational diabetes mellitus in previous pregnancy<sup>‡</sup></b>				
Diet	176	20.37	8.56	t=-1.679 <sup>†</sup>
Insulin and diet	26	23.38	8.28	p= 0.095
<b>Hypertension in previous pregnancy?<sup>‡</sup></b>				
Yes	27	21.37	8.43	t=0.395 <sup>†</sup>
No	175	20.66	8.61	p= 0.693
<b>Preterm birth/preterm birth risk in previous pregnancy?<sup>‡</sup></b>				
Yes	46	22.95	8.54	t= 1.990 <sup>†</sup>
No	156	20.11	8.49	p= 0.048
<b>The treatment of gestational diabetes mellitus in current pregnancy</b>				
Diet and exercise	82	16.50	8.01	t= 6.397 <sup>†</sup>
Insulin, diet and Exercise	120	23.67	7.54	p= 0.000
<b>Any preterm birth risk in current pregnancy</b>				
Yes	84	25.46	7.46	t=7.408 <sup>†</sup>
No	118	17.41	7.71	p= 0.000
<b>Any education from health professionals related to exercise in gestational diabetes mellitus</b>				
Yes	18	17.77	8.73	t = -1.553 <sup>†</sup>
No	184	21.05	8.52	p= 0.122
<b>Application of any exercise during pregnancy?</b>				
Yes	30	16.06	8.66	t= -3.333 <sup>†</sup>
No	172	21.58	8.31	p= 0.001
<b>Any education from health professionals related to diet in gestational diabetes mellitus</b>				
Yes	182	20.90	8.65	t = 0.721 <sup>†</sup>
No	20	19.45	7.87	p= 0.472

<sup>†</sup>Kruskal-Wallis Analysis

<sup>‡</sup>Multiparous mother <sup>†</sup>t-test

<sup>‡</sup>One way ANOVA

**Individual characteristics associated with maternal prenatal distress in mothers with gestational diabetes:** There was a statistically significant difference between the mean scores of the Prenatal Distress questionnaire and maternal age ( $\chi^{2kw}=41.801$ ,  $p=.000$ ). Nevertheless, Turkey's post hoc analysis showed that older mothers had lower distress. Additionally, education level was statistically significant ( $F=6.018$ ,  $p=.001$ ). According to Bonferroni post-hoc test, primary education level was associated with higher distress. The study found that income level and employment of the mother did not significantly affect mothers' distress ( $\chi^{2kw}=0.902$ ,  $p=.637$ ;  $t=0.283$ ,  $p=.778$ ). Living with extended

family was determined as a factor that increased pregnancy distress ( $t=-5.779$ ,  $p=.000$ ). Pregnant women that smoked cigarettes noted higher distress ( $t=9.797$ ,  $p=.000$ ) as well. A statistically significant difference was found between pregnant prenatal distress and BMI ( $\chi^{2kw}=7.416$ ,  $p=.060$ ). According to Turkey's post hoc analysis, obese and pregnant women with high BMI had higher distress scores (Table 3).

**Obstetric characteristics associated with maternal prenatal distress in mothers with gestational diabetes:** The number of pregnancies did not affect pregnant prenatal distress ( $t=-0.551$ ,  $p=.582$ ). However, the mean scores of the

Prenatal Distress questionnaire were higher in multigravida women with previous cesarean section ( $t=-3.708$ ,  $p=.000$ ). Having a miscarriage in a previous pregnancy was not a statistically significant factor for prenatal distress ( $t=1.390$ ,  $p=.167$ ). However, having GDM in previous pregnancies was associated with increased prenatal distress ( $t=-3.223$ ,  $p=.001$ ). The difference in the Prenatal Distress scores in relation to treatment method of GDM in previous pregnancy was not statistically significant ( $t=-1.679$ ,  $p=.095$ ). Hypertension in previous pregnancies was also not significant ( $t=0.395$ ,  $p=0.693$ ). However, previous experience of a preterm birth risk was associated with higher prenatal distress ( $t=1.990$ ,  $p=.048$ ). In regard to the current pregnancy, using insulin in GDM treatment was associated with higher prenatal distress ( $t=-1.679$ ,  $p=.095$ ). Experiencing preterm birth risks in the current pregnancy was also a significant factor in prenatal distress ( $t=7.408$ ,  $p=.000$ ). Education from health professionals related to diet ( $t=0.721$ ,  $p=.472$ ) and exercise ( $t=-1.553$ ,  $p=.122$ ) in GDM were not statistically significant factors that affected prenatal distress. However, application of any exercise during pregnancy was an important factor that decreased prenatal distress ( $t=-3.333$ ,  $p=.001$ ) (Table 3).

## Discussion

Gestational diabetes is a high-risk pregnancy condition that can negatively affect the mother and fetus and also requires lifestyle changes. Research has evaluated the distress in healthy and high risk pregnancies, but no study has investigated the distress experienced by mothers with gestational diabetes and the factors that can affect this stress. The cross-sectional study by Woods et al. (2010) found that most pregnant women reported low-moderate antenatal stress. In another observational cross-sectional study that measured the pregnancy-related stress among low risk mothers, prenatal distress was reported as moderate (Lynn et al., 2010). Gennaro et al. (2008) examined the difference in stress levels between healthy mothers and mothers with preterm birth risks across the duration of pregnancy (4 measurement; 28, 32, 35 and 37 pregnancy week), and they determined that mothers with preterm birth risks had higher pregnancy-related stress, but this difference was higher at 28 weeks. In a Turkish study conducted by Yuksel et al. (2013), the 522 healthy pregnant women were evaluated during their prenatal visits, and the participants was moderately

distressed. Yali and Lobel (1999) found that pregnant women who were in a high risk pregnancy group were moderately to extremely distressed. In the current study we found the prenatal distress level 20.76 (8.57), and we determined that the pregnant women with GDM were mostly stressed about ongoing health problems, having an unhealthy baby, risk of premature delivery, feeling tired and having low energy during pregnancy, physical symptoms of pregnancy pain during labor and delivery and concern about what will happen during labor and delivery. Related to these results, we can state that health professionals should enhance support of GDM pregnant women in regard to the factors that increase their pregnancy distress. Providing necessary knowledge and giving emotional support is important in enhancing their ability to cope with fears and stress. In a study conducted by Urech et al. (2010), they found that providing 10-min relaxation techniques (progressive muscle relaxation or guided imagery) was effective in inducing self-reported relaxation in pregnant women.

We found that some personnel characteristics also affected prenatal distress. Our results showed that younger maternal age was associated with higher prenatal distress in GDM mothers. In a study conducted by Yuksel et al. (2013) that evaluated prenatal distress in healthy mothers, there was no statistically significant difference between prenatal distress scores and pregnancy age. The difference that we found may be due to GDM. High risk pregnancies, such as those affected by GDM, occur more often in advanced age. The younger group in this study had significantly higher prenatal distress scores most likely because receiving this diagnosis at a young age may increase prenatal distress. Lynn et al. (2011) evaluated the association between maternal characteristics and pregnancy-related stress, and they also found that lower maternal age (16-20) was associated with higher stress. To better understand the relationship between age and prenatal distress, future studies should be conducted.

The study by Yuksel et al. (2013) reported that healthy pregnant women with lower education had lower prenatal distress. According to the our study, lower education in mothers with GDM was associated with higher prenatal stress. These results can be related to a decreased ability to search for care and conduct self-care in lower educated GDM pregnant.

Additionally, we determined that living with an extended family as a factor that increased prenatal distress in GDM pregnant women. In Turkish culture, there is substantial social support during pregnancy, birth and postpartum period, and this support is increased in high risk pregnancies. Despite this support, living with an extended family affects pregnant women's abilities to make individual decisions; this situation can increase prenatal distress (Taşkın, 2005; Şirin, 2008). Pregnant women that smoked cigarette experienced higher prenatal distress compared to non-smokers. Most health professionals allow limited cigarette smoking in women who are vigorous smokers because not smoking can negatively affect their stress. However, GDM is a disease that is characterized by limited blood circulation, and smoking cigarettes can also increase this risk. This factor maybe why smokers experience higher prenatal distress (Taşkın, 2005; Şirin, 2008). According to our findings Body Mass Index (BMI) was not a statistically significant factor in prenatal distress in women with GDM. However, women with high BMI and obesity had higher prenatal distress scores. High BMI can increase insulin resistance, and because control of GDM is more difficult in this group, prenatal distress that they perceive can be substantially affected (Gilbert, 2002; Youngkin & Davis, 2004; Taşkın, 2005; Şirin 2008). It is important to note that employment and income status did not affect prenatal distress. Yuksel et al. (2013) had similar findings.

In regard to obstetric characteristics, we did not find a significant relationship between the number of pregnancies and prenatal distress scores. The prenatal distress score was similarly high in primigravidas and multigravidas. However, other studies have reported that prenatal distress levels or anxiety was higher in primigravidas compared with multigravidas (Akbas et al., 2008; Lynn, 2011; Yuksel, 2013). The difference in findings may be related to GDM. Due to this diagnosis, pregnant women may have concerns related to their babies' lives, and this concern can increase their stress independently by the number of pregnancies. These findings support the concept that the health professionals working at primary health centers should evaluate and support multigravidas and primigravidas with high risk pregnancies for prenatal distress.

Those who reported experiencing GDM in previous pregnancies also exhibited greater levels

of prenatal distress. We also determined that experiencing preterm birth risk/preterm birth in a previous pregnancy was also associated with elevated prenatal distress. Previous cesarean was found to increase prenatal distress compared to previous vaginal delivery. Fertl et al. (2009) and Geller et al. (2004) reviewed findings of various studies, and they indicated that previous obstetric problems affect stress-related disorders during current pregnancies. Furber et al. (2009) conducted that those with a history of problems during previous pregnancy and deliveries had higher stress. Lynn et al. (2011) reported that experiencing previous obstetric problems caused greater levels of pregnancy-related stress in low risk pregnancies. We believe that the relationship between prenatal distress and previous experiences in GDM mothers indicate a need to develop support programs, especially for high risk mothers with previous negative obstetric experiences. We did not determined miscarriage in previous pregnancies and the treatment method of GDM (insulin or only diet and exercise) in previous pregnancies as factors that affect prenatal distress (Hui et al., 2014). In regard to current pregnancy data, pregnant women that received insulin treatment had higher distress compared to the diet and exercise treatment group. Performing daily injections can be a significant burden for pregnant women and can increase their distress. According to this finding, we can say that health professionals should give educational and emotional support to GDM pregnant; peer support could also be effective in this area.

There was a statistically significant difference between prenatal distress scores and preterm birth risk in current pregnancy. Literature indicates that obstetric problems increase prenatal distress, and many studies have indicated that preterm birth risk increases prenatal distress (Mulder et al., 2002; Gennaro et al., 2008; Yuksel 2013). GDM can also increase mothers' stress related to negative pregnancy outcomes. According to the literature, both psychological and physiological stresses have been related to preterm delivery (Petragila et al., 2001; Gennaro et al., 2008). Health professionals have an important role in supporting these pregnant women and can create initiatives to reduce distress to prevent psychological and physiological stress in GDM pregnant women.

We did not found statistically significant difference between pregnant women that received

and did not receive education from health professionals in regard to diet and exercise and their prenatal distress scores. Although there were no statistically significant differences, we found that prenatal distress levels were high even if education on diet and exercise was provided. This finding may be related to the method used to provide the education. In Turkey, often patient education is given too much information in a very short time. This factor can cause difficulties with patient understanding and acceptance. However, mothers with GDM that reported that they perform exercise had statistically significant lower prenatal distress. Having done this study, we learned the importance of health professionals providing suitable education and encouragement on maternal distress during pregnancy.

### Conclusion

Gestational diabetes is a high risk pregnancy disorder that can increase prenatal distress in mothers. Health professionals should provide preventive care including the identification, management and support of prenatal distress in GDM pregnant women. With this results we showed that negative obstetric experiences, including insulin treatment and GDM in previous pregnancies, were factors that increased prenatal distress in this group. Understanding the factors that increase prenatal distress in pregnant women can assist healthcare professionals to provide appropriate support for women to achieve a healthy pregnancy. Systematic evaluation of prenatal stress of GDM pregnant women will help to identify risks on time and to plan initiatives for decreasing the stress and improving the health of pregnant women.

**Conflict of interest:** The authors declare that no potential conflicts of interest exist with respect to the research, authorship, or publication of this manuscript.

### References

- ADA (American Diabetic Association). (2014). Standards of medical care in diabetes. *Diab Care.*, 37(1),14-80.
- ADA. (American Diabetic Association). (2018). Standards of medical care in diabetes. 3. Management of Diabetes in Pregnancy: Standards of Medical Care in Diabetes. *Diabetes Care* 2018 Jan; 41(Supplement 1), 137-143.
- Akbas E, Virit O, Kalenderoglu A, Savas H.A, & Sertbaş G. (2008). The relationship of sociodemographic variables with anxiety and depression levels in pregnancy. *Archives of Neuropsychiatry*, 45,85–91.
- Alder J, Fink N, Bitzer J, Hosli I, & Holzgreve W. (2007). Depression and anxiety during pregnancy: a risk factor for obstetric fetal and neonatal outcome? A critical review of literature. *J Matern Fetal Neonatal Med*, 20(3),189-209.
- Alderdice F, & Lynn F. (2011). Factor structure of Prenatal Distress Questionnaire. *Midwifery*, 27(4),553-559.
- Baz B, Riveline J.P, & Gautie J.F. (2016). Gestational diabetes mellitus: definition, aetiological and clinical aspects. *Eur J Endocrinol*, 174,43–45.
- Calik K, & Aktas S. (2011). Depression in pregnancy: frequency, risk factors and treatment. *Current Approaches in Psychiatry*, 3(1),142-162. Epub 2014/06/21. <https://doi.org/10.1016/j.diabet.2014.05.002> PMID: 24948416.
- Fertl K.I, Bergner A, Beyer R, Klapp B.F, & Rauchfuss M. (2009). Levels and effect of different forms of anxiety during pregnancy after a prior miscarriage. *Eur J Gynec Reprod Biol.*, 142(1),23-29.
- Furber C.M, Garrod D, Maloney E, Lovell K, & McGowan L. (2009). A qualitative study of mild to moderate psychological distress during pregnancy. *Int J Nurs Stud.*, 46(5),669–677.
- Geller P.A, Kerns D, & Killer C.M. (2004). Anxiety following miscarriage and the subsequent pregnancy: a review of literature and future directions. *J Psychosom Res.*, 56(1),35-45.
- Gennaro S, Shults J, & Garry D.J. (2008). Stress and preterm labor and birth in black women. *J Obstet, Gyneco Neonatal Nurs.*, 37(5),538–545.
- Gilbert S.E, & Harmon J.S. (2002). Gestational diabetes and nursing care. In: Flood L. (eds.). *High Risk Pregnancies*. Istanbul, Turkey: Palme Publishing, 253-275.
- Glynn L.M, Schetter C.D, Hobel Calvin J, & Sandman C.A. (2008). Pattern of perceived stress and anxiety in pregnancy predicts preterm birth. *Health Psychol.*, 27(1),43-51.
- Hayase M, & Shimada M, Seki H. (2014). Sleep quality and stress in women with pregnancy-induced hypertension and gestational diabetes mellitus. *Women and birth: journal of the Australian College of Midwives*, 27(3),190–195. <https://doi.org/10.1016/j.wombi.2014.04.002> PMID: 24881523.
- Hui A.L, Sevenhuysen G, Harvey D, & Salamon E. (2014). Stress and anxiety in women with gestational diabetes during dietary management. *Diabetes Educ.*, 40(5),668-677. doi: 10.1177/0145721714535991.
- Kavlak O, Atan Unsan S, Sirin A, Sen E, Guneri S.E, & Dag H.Y. (2013). Pregnant Turkish women with low income: their anxiety, health-promoting lifestyles, and related factors. *Int J Nurs Pract.*, 19(5),507–515.

- Kocabasoglu N, & Baser Z.S. (2008). Psychiatric diseases triggered by pregnancy and childbirth. Istanbul University Cerrahpaşa Faculty of Medicine Continuing Medical Education Activities, Symposium Series, 62,349-354.
- Kubo A, Ferrara A, Brown S.D, Ehrlich S.F, Tsai A, Quesenberry C.P, Crites Y, & Hedderson M.M. (2017). *Perceived psychosocial stress and gestational weight gain among women with gestational diabetes*. Public Library of Science, 12(3). e0174290. <https://doi.org/10.1371/journal.pone.0174290>.
- Lobel M. (2008). The Revised Pregnancy Distress Questionnaire (NUPDQ). *State University of New York, Stony Brook, NY*.
- Lynn F.A, Alderdice F.A, Crealey G.E, McElney J.C. (2011). Associations between maternal characteristics and pregnancy-related stress among low-risk mothers: an observational cross-sectional study. *Int J Nurs Stud.*, 48(5),620-627.
- Melender H.L. (2002). Experiences of fears associated with pregnancy and childbirth: a study of 329 pregnant women. *Birth*, 29(2),101-111.
- Mishel M.H. (1998). Methodological studies: instrument development. In: Brink P.J, & Wood M.J, (eds.). *Advanced Design in Nursing Research*. 2nd edn, Thousand Oaks, CA: Sage Publications; 1998:235–282.
- Mulder E.J, Robles de Medina P.G, Huizink A.C, Van den Bergh B.R, Buitelaar J.K, & Visser G.H.(2002). *Prenatal maternal stress: effects on pregnancy and the (unborn) child*. *Early Hum Dev.*, 70(1-2),3-14.
- Oskay U. (2004). Adverse effects of recommended bed rest in high-risk pregnancies. *İ.Ü. Florence Nightingale HYO Journal of Nursing*, 53,115-125.
- Petrigila F, Hatch M.C, Lapinski R, Stomali M, Reis F.M, Cobellis L. (2001). Lack of effect of psychosocial stress on maternal corticotropin-releasing factor and chatecolamines levels at 28 week gestation. *J Soc Gynec Investig.*, 8(2),83-88.
- Sevil D.U, Saruhan A, Ertem G, & Kavlak O. (2004). Examination of women's prenatal and postnatal anxiety and depression levels and the factors affecting them. *Journal of Dokuz Eylul University Faculty of Medicine*, 18,67–76.
- Silveira M.L, Whitcomb B.W, Pekow P, Braun B, Markenson G, & Dole N. (2014). Perceived psychosocial stress and glucose intolerance among pregnant Hispanic women. *Diabetes & metabolism*. 40 (6),466–475.
- Sirin A, & Kavlak O. (2008). *Women's Health*. Istanbul, Turkey: Bedray Publishing, 549-553.
- Tarim E. (2009). (Gestational diabetes study group survey evaluation report. *National Perinatology Congress*, Istanbul.
- Taskin L. (2005). *Obstetrics and Gynecology Nursing: VI. Print*, Ankara, Turkey: Sistem Maatbacılık, 224-231.
- TDHS. Turkey Demographic and Health Survey 2013. Hacettepe University Institute of Population Studies, Ankara, Turkey. [http://www.hips.hacettepe.edu.tr/TDHS\\_2013\\_main.report.pdf](http://www.hips.hacettepe.edu.tr/TDHS_2013_main.report.pdf); 2014. Accessed May 15, 2017.*
- Urech C, Fink N.S, Hoesli I, Wilhelm F.H, Bitzer J, & Alder J. (2010). Effects of relaxation on psychobiological wellbeing during pregnancy: a randomized controlled trial. *Psychoneuro endocrinology*, 35(9),1348-1355.
- Woods S.M, Melville J.L, Guo Fan M.Y, & Gavin A. (2010). Psychosocial stress during pregnancy. *Am J Obstet Gynecol.*, 202(61),1-7.
- Yali M.A, & Lobel M. (1999). Coping and distress in pregnancy: an investigation of medically high risk women. *J. Psychosom Obstet Gynec*, 20(1),39–52.
- Youngkin E.Y, & Davis M.S. (2003). *Women's Health a Primary Care Clinical Guide*. Third Edition, New Jersey: Pearson Prentice Hall.
- Yuksel F, Akin S, & Durna Z. (2011). Adaptation of Prenatal Distress Scale into Turkish and factor analysis. *Journal of Education and Research in Nursing*. 8.43–51.