ORIGINAL RESEARCH

Pregnancy-Related Anxiety and Prenatal Attachment in Pregnant Women with Preeclampsia and/or Gestational Diabetes Mellitus: A Cross-Sectional Study

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ABSTRACT Objective: Health problems experienced during pregnancy may increase anxiety level during pregnancy and affect mother-baby attachment. The present study aimed to compare pregnancy-related anxiety and prenatal attachment levels between low-risk pregnant women and pregnant women with preeclampsia and/or gestational diabetes mellitus (GDM). **Material and Methods:** One hundred fifty women were recruited in this cross-sectional descriptive study (55 preeclampsia and/or GDM, 95 low-risk) pregnant women. Data were collected using descriptive data form, Pregnancy-Related Anxiety Questionnaire-Revised-2 (PRAQ-R2), and Prenatal Attachment Scale (PAS). **Results:** Prenatal attachment scores of the working pregnant women in the low-risk group were higher than those in the non-working pregnant women (p<0.05). Prenatal attachment scores of primiparous women in the preeclampsia/GDM group were higher than multiparous women (p<0.05). No statistically significant differences were found between the groups with regard to PAS, PRAQ-R2 and PRAQ-R2 sub-dimensions scores (p>0.05). **Conclusion:** In line with the study results, it was found that low-risk and working pregnant women had higher prenatal attachment levels. Levels of prenatal attachment were higher in primiparous pregnant women in the high-risk group. As pregnancy-related anxiety levels of high-risk and healthy pregnant women increased, concern about one's own appearance scores increased. Therefore, reducing anxiety levels of pregnant women during pregnancy may be an effective intervention in reducing concerns about their appearance.

Keywords: Pregnancy; attachment; anxiety; high risk pregnancy

Attachment, which is defined as the first and deepest connection between mother and baby, affects the health of both mother and baby in many ways.[1] The studies reveal that a large part of the development of the human brain develops in the prenatal period and the first days of life. The sense of secure and positive attachment that occurs in the early period forms the basis of the healthy development of the fetus.[2,3] The mother-infant relationship that develops in the early period is crucial for the child's future social, emotional, cognitive development and psychological health. The attachment has always been one of the most researched subjects in the literature because it affects the whole life.[2,4-6]

Prenatal attachment is defined as the unique, love-based relation between mother and fetus or as an abstract concept potentially existing between parent and fetus before pregnancy that evolves within an ecological system regarding the cognitive and emotional skills to conceptualize other individuals.[6-8] Prenatal attachment is formed by interacting cognitive, emotional and situational factors between mother and fetus.[9,10] Recently, many studies have revealed prenatal attachment and related factors affecting it.[5,6,8] In these studies, it was stated these factors were feeling the fetal movements and the age of the mother, educational background, race, income level, anxiety, depression, mother's personality structure, stress

perception, attitude towards birth, the relationship between spouses, maternal obesity, risky pregnancies, fetal health status, body image, number of pregnancies, and social support affect prenatal attachment.[5,10-14]

By its very nature, pregnancy causes some health risks for the mother. Just being pregnant can sometimes cause increased anxiety in mothers. A high-risk pregnancy is a vital situation for the woman and her family. Women with high-risk pregnancies may be concerned about their health and fetal health.[11] Additionally, pregnant women may also be concerned about other living children and issues related to their spouse. Complications that can be seen in women with high-risk pregnancies are preterm birth, low birth weight fetus, fetal macrosomia, chromosomal anomalies, oligohydramnios, polyhydramnios, and loss of fetus or mother. Women with high-risk pregnancies must be hospitalized due to one or more of these serious complications. In addition to causing the pregnant woman to worry and fear about her and her baby's health, it can also interrupt other family processes.[9,11,13]

Psychologically negative effects are almost inevitable in pregnant women with high-risk.[9] Hopelessness, vulnerability, distrust, loneliness, and inadequacy related to not having a healthy pregnancy and concerns about birth are some of the problems experienced in high-risk pregnancies. The parenting experiences of women exposed to increased stress and anxiety and high-risk pregnancies may affect attitudes and behaviour towards pregnancy, the fetus, and the mother-fetus relationship.[11,15]

It is stated that pregnant women with high prenatal attachment levels have better health-protective behaviours such as avoiding cigarette/alcohol consumption and going to antenatal controls regularly. Therefore, health professionals must evaluate women's prenatal attachment levels during pregnancy and postpartum. Assessing the effect of anxiety experienced during pregnancy at a level that may adversely affect the pregnancy process on prenatal attachment is vital.

AIM

Therefore, in this study, we sought to evaluate the prenatal attachment and pregnancy-related anxiety in pregnant women with preeclampsia/gestational diabetes mellitus (GDM).

MATERIAL AND METHODS

DESIGN

This cross-sectional descriptive study was performed in obstetrics polyclinics of an educational research hospital in Muğla Sıtkı Koçman University, Türkiye.

INCLUSION/EXCLUSION CRITERIA

The low-risk pregnant women's inclusion criteria were agreeing to participate in the study, having pregnancy between 20-40th gestational weeks and having no health problem. The high-risk pregnant women's inclusion criteria were being diagnosed with GDM and/or preeclampsia, agreeing to participate in the study, have not hypertension history before and until 20th weeks of pregnancy and having pregnancy between 20-40th gestational weeks. As a preeclampsia diagnosis criterion, urinalysis was checked regarding the presence and amount of proteinuria. The presence of proteinuria ($\geq$300 mg/24-hour) or protein/creatinine ratio $\geq$0.3 (each in mg/dL) or 1+ proteinuria in the measurement made with a urine stick (in cases where other quantitative measurements cannot be made) with blood pressure equal or above 140/90 mmHg established the diagnosis for preeclampsia. For the diagnosis of GDM, it was necessary to have at least one high measurement on the 75-g oral glucose tolerance test (0th hour $\geq$92 mg/dL; 1st hour $\geq$180 mg/dL; 2nd hour $\geq$153 mg/dL). Pregnant women who had known mental disorder and not agreed to participate in the study were excluded in both groups.

RECRUITMENT

Pregnant women who administered to obstetrics polyclinic included in this study and study data were collected between May 20, 2021, and December 30, 2021. Pregnant women's informed consent was obtained. Research data was collected through self-report by each participant.

ETHICAL ASPECT OF THE STUDY

This study was approved by the Muğla Sıtkı Koçman University Health Sciences Ethics Committee (date: April 28, 2021, number: 87). This study had been performed in accordance with the Helsinki Declaration.

PARTICIPANTS

Totally, 203 pregnant women recruited. Between the data we collected, 2 hundred pregnant women were invited, and 163 agreed. Thirteen pregnant did not fill the surveys completely and these surveys were excluded from the study. Finally, 150 (55 GDM and/or preeclampsia/95 healthy pregnant) of them were analyzed.

DATA COLLECTION TOOLS

Descriptive Data Form

The form consists of thirty questions. Nine questions regarding socio-demographic prosperities (age, educational status, marital status, income, etc), and 21 questions regarding pregnant women's obstetric prosperities (parity, gestational week, chronic diseases, smoking status, etc.).

Pregnancy-Related Anxiety Questionnaire-Revised-2

The questionnaire was developed by Van den Bergh.[16] Pregnancy-Related Anxiety Questionnaire-Revised-2 (PRAQ-R2) was revised by Huizink et al.[17] Aksoy Derya et al. conducted Turkish translation study of the PRAQ-R2.[18] PRAQ-R2 consists of ten questions for multiparous and eleven for primiparous pregnant women. The Cronbach's alpha values ranged between 0.81 to 0.94 for the total PRAQ-R2.18 Cronbach's alpha values were found between 0.78 to 0.82 in multiparous women in this study.

Prenatal Attachment Scale

Muller developed this scale in 1990 to assess the attachment level of pregnant women to the fetus.[19] The scale consisted of 21 items, and a four-point Likert type scored between 1-4 (minimum: 21, maximum: 84). As the point obtained from the scale increased, attachment also increased. Yılmaz and Beji carried out the Turkish adaptation study of the Prenatal Attachment Scale (PAS) in 2013.[20] Cronbach's alpha value was found to be 0.84 in the Yılmaz and Beji's study and 0.93 in this study.[20]

DATA ANALYSIS

IBM SPSS Statistics 26.00 program for Windows (SPSS, Inc.,Chicago, IL) was used to analyze the study data. The chi-square, Kruskal-Wallis and Mann-Whitney U tests and descriptive statistics were used in the analysis. The relationships between scale scores were calculated with Spearman correlation coefficient. The post-hoc age adjustment was applied for the age variable. A p<0.05 value was accepted statistically significant.

RESULTS

Pregnant women's socio-demographic and obstetric prosperities are compared according to the risk status in Table 1. We found no difference between the groups with regard to the age groups, number of pregnancies, weeks of gestation, educational status, employment status, pregnancy planning status, and chronic disease status before pregnancy (p>0.05). We found a statistically significant difference between GDM and/or preeclampsia and healthy pregnant women regarding age groups (p<0.05).

No statistically significant difference was found between women with high-risk and low-risk pregnancies regarding educational status, employment status, pregnancy planning status, and chronic disease conditions before pregnancy (p>0.05). Working pregnant women's PAS scores were higher than the non-working, in the low-risk group (p<0.05). The women's PAS scores who were primiparous in the risk group were higher than the multiparous women (p<0.05) (Table 2).

We found no statistically significant difference between the groups regarding PAS, PRAQ-R2, and PRAQ-R2 sub-dimensions scores (p>0.05) (Table 3).

We found no significant correlation between PAS and PRAQ-R2 scores of healthy pregnant women and pregnant women with GDM and/or preeclampsia (p>0.05). In pregnant women with GDM and/or preeclampsia, a positive and moderate statistically significant correlation was determined between worries about bearing a handicapped child subscale scores and pregnancy-related anxiety scores (p<0.001). In pregnant women with GDM and/or preeclampsia, a positive and moderate relationship was found between fear of giving birth subscale scores and pregnancy-related anxiety scores, and a weak and positive relationship was found between prenatal attachment scores (p<0.05). As birth fear in-

TABLE 1: Comparison of some socio-demographic and obstetrics variables of pregnant women according to the risk group.

Characteristics n=150	X̄	±SD	PE and/or GDM n=55 (36.7%)		Healthy pregnant women n=95 (63.3%)		Analysis	
			X̄	±SD	X̄	±SD	χ²*, Z**	p value
Age	30.79	4.69	32.20	4.07	29.91	4.83	29.003	0.088
Number of pregnancy	2.37	1.30	2.47	1.51	2.31	1.16	8.326	0.215
Gestational week	31.09	3.96	30.60	4.06	31.37	3.89	2.259	0.256
	n	%	n	%	n	%		
Age group								
22-34 years	112	74.7	34	61.8	78	82.1	**2.744**	**0.006****
35-44 years	38	25.3	21	38.2	17	17.9		
Educational status								
Illiterate	4	2.7	3	5.5	1	1.1		
Elementary	56	37.3	17	30.9	39	41.5	5.201	0.158
High school	40	26.7	13	23.6	27	28.7		
University and higher	49	32.7	22	40.0	27	28.7		
Employment								
Employed	55	63.3	25	45.5	30	31.6	2.888	0.890
Not employed	95	36.7	30	54.4	65	68.4		
Number of pregnancy								
1	45	30.0	20	36.4	25	26.3	1.675	0.196
2 and higher	105	70.0	35	63.6	70	73.7		
Planning status of the pregnancy								
Planned	107	71.3	40	72.7	67	70.5	0.083	0.774
Not planned	33	28.7	15	27.2	28	29.4		
Chronic illness status before pregnancy								
Yes	29	19.3	13	23.6	16	16.8	1.031	0.310
No	121	80.7	42	76.4	79	83.2		

*Chi-square test; **Mann-Whitney U test; PE: Preeclampsia; GDM: Gestational diabetes mellitus; SD: Standard deviation.

creases in pregnant women with GDM and/or preeclampsia, pregnancy-related anxiety and prenatal attachment levels increase.

Positive and moderate correlations were found between pregnancy-related anxiety scores and fear of giving birth, worries about bearing a handicapped child, and concern about one's own appearance scores of healthy pregnant women (p<0.05). As the pregnancy-related anxiety scores of healthy pregnant women increased, birth fear, concerns regarding having a handicapped child, and worries about own appearance increased (p<0.05). A positive and moderate relationship was found between birth fear scores and the concerns about bearing a handicapped child and one's own appearance scores of healthy pregnant women (p<0.05). As the birth fear of healthy pregnant women increased, concerns regarding bearing a handicapped child and their appearance scores increased (Table 4).

DISCUSSION

Health problems experienced during pregnancy may negatively affect pregnant women's mental status and mother-baby attachment. Therefore, prenatal attachment levels and pregnancy-related anxiety scores of pregnant women with GDM and/or preeclampsia and healthy pregnant women were compared in this study. In the current study, prenatal attachment levels of low-risk and working pregnant women were higher than those who did not work (p<0.05). A study conducted by Ossa et al. reported low attachment levels of pregnant women who are housewife and economically dependent.[4] Another study also concluded that non-working pregnant women had weaker prenatal attachment levels.[4,21] It was thought that the higher educational levels and financial independence of working pregnant women might positively affect prenatal attachment levels.

TABLE 2: Comparison of total PAS and PRAQ-2 scores with some socio-demographic and obstetric prosperities of women according to groups.

| | PE and/or GDM n=55 (36.7%) | | Healthy pregnant women n=95 (63.3%) | |
| | PAS | PRAQ-R2 | PAS | PRAQ-R2 |
Characteristics	X̄ (SD)	X̄ (SD)	X̄ (SD)	X̄ (SD)
Educational status				
Illiterate	65.66 (11.84)	26.33 (1.52)	-	-
Elementary	64.64 (11.38)	27.94 (8.71)	58.10 (3.22)	26.71 (6.87)
High school	56.69 (11.32)	25.38 (6.69)	60.88 (11.34)	28.62 (7.96)
University and higher	65.36 (9.73)	27.72 (6.68)	65.76 (8.05)	28.55 (5.81)
t*	5.070	1.012	7.174	4.821
p value	0.167	0.798	0.067	0.185
Employment				
Employed	62.72 (9.58)	26.64 (6.58)	64.96 (8.69)	28.16 (5.86)
Not employed	63.43 (12.28)	27.60 (7.66)	59.01 (12.84)	27.83 (7.67)
Z**	-0.406	-0.475	-2.179	-0.477
p value	0.685	0.635	**0.029**	0.633
Number of pregnancy				
1	67.40 (11.39)	28.25 (6.16)	62.48 (9.01)	29.96 (6.43)
Two and higher	60.65 (10.21)	26.54 (7.66)	60.34 (12.87)	27.21 (7.25)
Z	-2.163	-1.194	-0.651	-1.816
p value	**0.031**	0.233	0.515	0.069
Planning status of the pregnancy				
Planned	63.80 (10.35)	26.77 (6.83)	61.59 (10.79)	27.86 (7.13)
Not planned	61.26 (12.93)	28.20 (10.35)	59.32 (14.43)	28.10 (7.20)
Z	-0.775	-0.777	-0.451	-0.245
p value	0.438	0.437	0.652	0.806
Chronic illness status before pregnancy				
Yes	67.38 (11.15)	28.07 (6.34)	62.56 (12.55)	30.12 (6.04)
No	61.78 (10.80)	26.88 (7.42)	60.57 (11.89)	27.49 (7.27)
Z	-1.675	-0.547	-0.695	-1.574
p value	0.094	0.585	0.487	0.115

*Kruskal-Wallis test; **Mann-Whitney U test; PAS: Prenatal Attachment Scale; PRAQ-R2: Pregnancy-Related Anxiety Questionnaire-Revised-2; PE: Preeclampsia; GDM: Gestational diabetes mellitus; SD: Standard deviation.

TABLE 3: Comparison of women's PAS, PRAQ-R2, and PRAQ-R2 sub-dimension scores according to groups.

| | | | PE and/or GDM n=55 (36.7%) | | Healthy pregnant women n=95 (63.3%) | | | |
Characteristics (n=150)	X̄±SD		X̄±SD		X̄±SD		Z*	p value
PAS	61.72	11.54	63.10	11.04	60.91	11.96	-0.925	0.355
PRAQ-R2	27.65	7.11	27.16	7.14	27.93	7.12	-0.674	0.500
PRAQ-R2 sub-dimensions								
Fear of giving birth	12.03	3.78	11.78	3.99	12.17	3.67	-0.738	0.460
Worries about bearing a handicapped child	9.23	3.77	9.14	3.99	9.28	3.66	-0.416	0.678
Concern about one's own appearance	6.38	2.63	6.23	2.93	6.47	2.46	-1.082	0.279

*Mann-Whitney U test; PAS: Prenatal Attachment Scale; PRAQ-R2: Pregnancy-Related Anxiety Questionnaire-Revised-2; PE: Preeclampsia; GDM: Gestational diabetes mellitus; SD: Standard deviation.

Prenatal attachment levels of primiparous women were higher than those of multiparous women, in the high-risk group (p<0.05). In another study conducted to determine the relationship between the prenatal attachment, anxiety, stress levels, and marital adjustment of low-risk pregnant women

TABLE 4: Correlation between PAS, PRAQ-R2 and PRAQ-R2 subscale scores of women.

	PE and/or GDM n=55 (36.7%)								Healthy pregnant women n=95 (63.3%)							
	PRAQ-R2		Fear of giving birth		Worries about bearing a handicapped child		Concern about one's own appearance		PRAQ-R2		Fear of giving birth		Worries about bearing a handicapped child		Concern about one's own appearance	
	r value	p value	r value	p value	r value	p value	r value	p value	r value	p value	r value	p value	r value	p value	r value	p value
PAS	0.072	0.600	0.339*	0.011	-0.111	0.421	-0.102	0.461	0.008	0.940	0.022	0.831	0.081	0.439	-0.010	0.927
PRAQ-R2			0.586**	<0.001	0.666**	<0.001	0.529**	<0.001			0.764**	<0.001	0.637**	<0.001	0.693**	<0.001
Fear of giving birth					0.054	0.694	-0.015	0.913					0.181	0.079	0.352**	<0.001
Worries about bearing a handicapped child							0.231	0.090							0.271**	0.008

Spearman correlation test *Correlation is significant at the 0.05 level; **Correlation is significant at the 0.01 level; PAS: Prenatal Attachment Scale; PRAQ-R2: Pregnancy-Related Anxiety Questionnaire-Revised-2; PE: Preeclampsia; GDM: Gestational diabetes mellitus.

during the third trimester, prenatal attachment levels were higher in primiparous women.[15] In some research, no relationship was determined between the pregnancy number and prenatal attachment levels of pregnant women.[4,21] In line with these results, it can be said that multiparous women are in the risk group regarding low prenatal attachment levels. Therefore, it is crucial to examine the factors affecting the prenatal attachment of multiparous pregnant women with GDM and/or preeclampsia and plan appropriate interventions.

Our study results showed no significant difference between high-risk and low-risk groups regarding prenatal attachment levels and pregnancy-related anxiety scores. There are studies with similar findings in the literature with this result.[1,11,15,22] According to the results obtained from a systematic review examining prenatal anxiety and maternal bonding, it was concluded that there was no relationship between anxiety and maternal attachment.[1] A different study examined prenatal attachment and pregnant women's anxiety levels with high-risk pregnancies and hospitalized and non-hospitalized pregnant women and no difference was found between the groups.[11] Another study reported that stress and depression were negatively correlated with prenatal attachment levels of pregnant women.[15] In line with these results, it can be concluded that the anxiety experienced by women with high-risk pregnancies does not affect their prenatal attachment levels directly. However, it should be considered that long-term exposure to high anxiety may cause adverse effects on both mother and fetus.

In this study, we observed that as the pregnancy-related anxiety of women with high-risk pregnancies increased, concerns about bearing a disabled baby scores also increased. However, in Duman et al.'s study, pregnant women's concern about having a handicapped child levels were compared in mild and severe preeclampsia groups and no significant difference was found.[23] In Duman et al.'s study, preeclampsia was grouped as mild or severe, and all sample consisted high-risk group.[23] For this reason, there may not be a statistically significant difference between mild and severe preeclampsia groups. In line with these results, women with high-risk pregnancies are concerned about having a handicapped child, as they worry their baby's health may also be affected by the health problems they experience.

In this study, as the fear of giving birth increases in high-risk pregnant women, pregnancy-related anxiety and prenatal attachment levels also increase. In a meta-synthesis study, that included 24 articles conducted to assess the content and the

moderators of pregnant women's fear of childbirth, women reported mostly general concerns about the well-being of the fetus.[24] Another study conducted to determine the psychosocial predictors of the fear of childbirth in low-risk pregnant women reported no relationship between the fear of childbirth and anxiety.[25] The positive relationship between fear of giving birth and anxiety levels may be an expected situation. However, in line with the different results, it can be interpreted as the anxiety level of high-risk pregnancies may be affected more than low-risk pregnant women in terms of childbirth fear. Interestingly, it was concluded that as the fear of giving birth increased, the prenatal attachment levels of women also increased. This may be due to the fact that women with high levels of attachment to their babies are more worried about the baby's health during labor. No other studies were encountered in the literature that assessed the same variables.

Experiencing bodily changes during pregnancy may cause anxiety about the loss of pre-pregnancy appearance for some pregnant women.[26] We found no difference between the worries regarding appearance of high-risk and low-risk pregnant women. However, as the pregnancy-related anxiety levels of pregnant women in both group increased, it was observed that the worries regarding appearance and having a handicapped child scores increased. Another study with hospitalized high-risk pregnant women reported that low-risk pregnant women had a higher concern regarding own appearance.[27] Different results between studies are thought to be affected by other variables. The inclusion of high-risk pregnant women, both hospitalized and outpatient may have affected our study results.

In the current study, as the pregnancy-related anxiety of pregnant women who were low-risk group increased, birth fear, concerns about bearing a disabled baby and own appearance scores increased. These findings are similar to the results in the high-risk group. Accordingly, regardless of the risk situation in pregnancy, it can be said that the increase in anxiety levels negatively affects the birth fear, concerns regarding bearing a disabled baby, and own appearance.

LIMITATIONS/STRENGTHS

We recognize some limitations and strengths of this study. One of the limitations of this study is that a statistically significant difference was found between women with high risk and low-risk pregnancy regarding age groups. Therefore, statistical age adjustment was performed and the same result was verified. Therefore, further studies should consider conducting the study in homogenous age groups. This study was single-centered and employed a moderate size sample. Further studies are recommended to be conducted with a larger sample size. The results obtained from this study are valid for the population included in this study. We didn't classify preeclampsia diagnosis as mild or severe, and this factor can be considered in further studies. According to our knowledge, the strength of the study is that this is the first study that compared pregnancy-related anxiety and prenatal attachment levels between low-risk and high-risk pregnant women.

CONCLUSION

According to our study results, prenatal attachment of working pregnant women who did not have a risky pregnancy was higher than those who did not work, and the prenatal attachment of high-risk primiparous pregnant women was higher. The pregnancy-related anxiety levels of high-risk and low-risk pregnant women increased, and the scores of concerns about one's own appearance and bearing a disabled baby increased. Accordingly, reducing pregnant women's pregnancy-related anxiety levels may be an effective intervention in reducing worries about one's own appearance and bearing a disabled baby.

In this study, multiparous women's prenatal attachment levels were low. For this reason, it can be recommended to plan studies to determine the factors affecting the prenatal attachment of multiparous pregnant women, especially with high-risk pregnancies.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: İlknur Yeşilçınar, Mehmet Ferdi Kıncı; **Design:** *İlknur Yeşilçınar, Mehmet Ferdi Kıncı, Hikmet Can Ünver;* **Control/Supervision:** *Mehmet Ferdi Kıncı, Ahmet Akın Sivaslıoğlu;* **Data Collection and/or Processing:** *Mehmet Ferdi Kıncı, Hikmet Can Ünver;* **Analysis and/or Interpretation:** *İlknur Yeşilçınar, Ahmet Akın Sivaslıoğlu;* **Literature Review:** *İlknur Yeşilçınar, Mehmet Ferdi Kıncı, Hikmet Can Ünver, Ahmet Akın Sivaslıoğlu;* **Writing the Article:** *İlknur Yeşilçınar, Mehmet Ferdi Kıncı, Hikmet Can Ünver;* **Critical Review:** *Ahmet Akın Sivaslıoğlu;* M*aterials: Mehmet Ferdi Kıncı.*

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