BMC Pediatrics

RESEARCH

Open Access

Comparison of postpartum depression, anxiety, sleep quality and neonatal outcomes in mothers with pregestational and gestational diabetes

Ozlem Kemer Aycan[1*] and Sevde Cubukcu Aksu[2]

Abstract

Background This study was conducted to compare postpartum depression, anxiety, sleep quality, and neonatal outcomes in mothers with pregestational and gestational diabetes mellitus.

Methods Designed as a descriptive, comparative, and prospective study, the sample consisted of 80 mothers (40 with pregestational diabetes mellitus (PGDM) and 40 with gestational diabetes mellitus (GDM)), who were monitored by the Pediatric Outpatient Clinic of Balıkesir University Training and Research Hospital in Türkiye. The data were collected using the "Descriptive Information Form," "Pittsburgh Sleep Quality Index (PSQI)," "Beck Anxiety Inventory (BAI)," and "Edinburgh Postnatal Depression Scale (EPDS)."

Results In terms of neonatal outcomes, the rate of newborn intervention was 40.0%, exclusive breastfeeding 22.5%, and combined breastfeeding and formula feeding 52.5% in the GDM group. These rates were 37.5%, 25.0%, and 60.0%, respectively, in the PGDM group. The most common neonatal complications among infants of PGDM mothers were hypoglycemia (42.5%), hyperbilirubinemia (37.5%), and large for gestational age (LGA) (27.5%), while in the GDM group, hypoglycemia (42.5%), respiratory distress syndrome (RDS) (27.5%), and hyperbilirubinemia (22.5%) were most frequently observed. In our study, mothers in the PGDM group had significantly higher scores on both the Edinburgh Postnatal Depression Scale and the Beck Anxiety Inventory compared to those in the GDM group.

Conclusion These results suggest that healthcare professionals should address not only diabetes treatment and monitoring, nutrition, weight management, and exercise during the prenatal and postpartum periods but also monitor emotional issues such as sleep disturbances, anxiety, and depression in mothers with pregestational and gestational diabetes to improve maternal and neonatal health outcomes.

Keywords Postpartum period, Pregestational diabetes, Gestational diabetes, Depression, Anxiety, Sleep quality

*Correspondence:
Ozlem Kemer Aycan
ozlem.aycan@balikesir.edu.tr
[1]Faculty of Medicine Department of Pediatrics, Balikesir University, Balıkesir, Turkey
[2]Faculty of Health Sciences, Department of Obstetrics and Gynecology Nursing, Balıkesir University, Balıkesir, Turkey

Background

Hyperglycemia that first appears during the second or third trimester of pregnancy and persists throughout pregnancy is referred to as 'gestational diabetes' or 'gestational diabetes mellitus' (GDM). If it occurs in a woman with type 1 or type 2 diabetes, it is referred to as "diabetes in pregnancy," "diabetes manifesting during pregnancy," "pregestational diabetes," or "pregestational diabetes mellitus" (PGDM). In the literature, both GDM and PGDM have been reported to increase perinatal morbidity and mortality compared to pregnancies uncomplicated by diabetes. Considering the current increase in maternal age, sedentary lifestyle, obesity, and type 2 DM, it is possible that some patients with hyperglycemia during pregnancy may actually have undiagnosed PGDM [1–6].

According to the 2021 IDF Diabetes Atlas, 16.7% of live births worldwide are linked to hyperglycemia in pregnancy, with 80.3% being GDM and 10.6% being PGDM. In Europe, the prevalence of GDM ranges from 8.9% in Northern Europe to 31.5% in Eastern Europe. In Turkey, GDM prevalence is reported between 1.9% and 27.9%, averaging 7.7% [6–8]. According to the American Diabetes Association, PGDM affects 1% to 2% of pregnancies in the United States, and its prevalence continues to increase [6]. The prevalence of GDM in our country has been reported to range between 1.9% and 27.9%, with an average prevalence of 7.7% (Turkish Ministry of Health Turkey Diabetes Program, 2023). Maternal age, body mass index, previous gestational diabetes in prior pregnancies, and family history of diabetes are the primary risk factors for GDM development. Even in low-risk groups (age < 25, body mass index < 25 kg/m^2, no family history of diabetes), the disease rate is 4.5%, which is higher than rates reported in some European countries [9–11].

Maternal diabetes is known to be associated with an increased risk of pregnancy complications and adverse maternal and neonatal outcomes [11–13]. Despite a large body of evidence linking PGDM to more adverse pregnancy outcomes than GDM due to pre-pregnancy hyperglycemia and prolonged exposure to intrauterine hyperglycemia, conflicting results have also been reported [14–17]. In the short term, diabetes is associated with macrosomia, large for gestational age (LGA) infants, respiratory distress syndrome (RDS), neonatal hypoglycemia, admission to the neonatal intensive care unit (NICU), intrauterine growth restriction, congenital anomalies, preterm birth, preeclampsia, cesarean delivery, and preterm birth, while in the long term, the risk of metabolic diseases increases for both mothers and infants [18, 19]. Specifically, women with GDM have approximately a 7-fold increased risk of developing T2DM and approximately a 4-fold increased risk of developing cardiovascular and coronary artery disease after pregnancy, while pre-existing diabetes predisposes women to diabetes-related complications such as retinopathy and nephropathy or may accelerate the progression of these complications if already present [20].

The presence of both fetal and maternal adverse effects of PGDM and GDM increases the mother's anxiety about her baby, while the combination of increased insulin resistance and hyperglycemia may increase the likelihood of anxiety and depression in these women [21]. The presence of depression also increases anxiety levels in pregnant women, and anxiety and depression can trigger each other in a bidirectional manner. Considering the susceptibility of pregnant women with gestational diabetes to anxiety and depression, it is possible to say that they are at risk after childbirth [22]. It has been noted that pre-pregnancy diabetes and GDM are also associated with the onset of postpartum depression. Women with GDM or hyperglycemia have been found to have higher depression scores in the first and third months postpartum [23, 24]. Liu et al. identified gestational diabetes, depression during pregnancy, giving birth to a male child, a history of depression in a previous pregnancy, and the use of epidural anesthesia during childbirth as risk factors for postpartum depression [25].

Healthy lifestyle behaviors in women with PGDM and GDM positively affect maternal and fetal health [26–28]. Health professionals play an important role in promoting and maintaining healthy lifestyle behaviors in pregnant women. Healthcare professionals should promote healthy lifestyle behaviors such as diabetes treatment and monitoring, nutrition, weight control, and exercise during both the prenatal and postpartum periods to improve maternal and neonatal health in mothers with pregestational and gestational diabetes. They should also monitor emotional problems such as sleep, anxiety, and depression. Although studies have been conducted on depression and sleep quality in pregnant women with gestational diabetes, data on anxiety, depression, and sleep problems in the postpartum period among PGDM and GDM mothers are quite limited.

This study aims to comparatively evaluate postpartum depression, anxiety, and sleep disturbances in mothers diagnosed with pregestational and gestational diabetes—an area underrepresented in existing literature. By focusing on the early postpartum phase and addressing multiple psychosocial parameters simultaneously, this research provides a unique and integrative perspective.

Methods

Type, Location, and time of study

This descriptive, comparative, and prospective study was conducted to compare postpartum depression, anxiety, sleep quality, and neonatal outcomes in mothers with pregestational and gestational diabetes. The study was conducted between January 1, 2025, and March 31, 2025, at the Pediatric Health and Diseases Outpatient Clinic of Balıkesir University Health Application and Research Hospital.

Population and sample

The population consists of mothers with pregestational and gestational diabetes who are followed up by the Department of Pediatrics at Balıkesir University Health Application and Research Hospital in Türkiye. The research sample was determined using G*Power-3, based on the results of previous studies 1.9.2 with a margin of error of 5%, an effect size of 0.25 (moderate), and a power of 90%, resulting in a minimum sample size of 40 women with PGDM and 40 women with GDM, totaling 80 participants. Women who agreed to participate in the study and met the inclusion criteria (diagnosed with GDM or PGDM, contactable, aged 18 or older, and without a diagnosis or treatment for psychiatric disorders) were included in the study sample using a non-probability random sampling method. Participants were excluded from the study if they met any of the following criteria: (1) A pre-existing psychiatric diagnosis (e.g., major depressive disorder, anxiety disorders), (2) Multiple pregnancy (e.g., twins or more), (3) Presence of severe obstetric complications (e.g., preeclampsia, preterm birth < 34 weeks, or intrauterine growth restriction), (4) Current use of psychotropic medication, or inability to complete the questionnaires due to cognitive or language barriers.

Data acquisition

Research data were collected using the "Informative Information Form," "Pittsburgh Sleep Quality Index (PSQI)," "Beck Anxiety Scale (BAS)," and "Edinburgh Postnatal Depression Scale (EPDS)." The data were collected from mothers who presented to the relevant outpatient clinic during the postpartum period for follow-up and met the inclusion criteria. After informing them about the study objectives and data collection tools and obtaining their informed consent, the data were collected using face-to-face interviews with the use of the demographic information form and scales, taking an average of 15–20 min.

Data were collected between the 4th and 6th postpartum weeks. The validity of psychosocial assessment tools such as the EPDS and BAI has been established for this period. Additionally, data were collected within the same season (late winter to early spring) to minimize seasonal effects, which are further discussed in the Discussion section.

The information form; contains questions about sociodemographic, obstetric, diabetes, and neonatal characteristics of mothers with PGDM and GDM. This form contains 27 questions that researchers developed by reviewing the literature [1, 10].

Pittsburgh Sleep Quality Index (PSQI); Developed by Buysse et al. [29], its validity and reliability in Turkish were established by Ağargün et al. [30]. It consists of 7 subcomponents (subjective sleep quality, sleep latency (delay), sleep duration, habitual sleep efficiency, sleep disturbance, sleep medication use, and daytime dysfunction) and a total score ranging from 0 to 21. A high total score on the scale (PSQI score > 5) indicates poor sleep quality and the presence of sleep disorders [29]– [30]. The Cronbach's alpha value of the scale was found to be 0.80. In our study, Cronbach's Alpha coefficient was determined as 0.80.

Beck Anxiety Inventory (BAI); Developed by Beck et al. in 1988 to determine the frequency of anxiety symptoms, its validity and reliability in Turkish were established by Ulusoy et al. [31]. The scale is a four-point Likert scale ranging from 0 to 63 points and consists of a total of 21 items. A higher total score on the scale indicates greater severity of anxiety experienced by the individual [31]– [32]. The Cronbach's alpha value of the scale was found to be 0.93. In our study, Cronbach's alpha coefficient was found to be 0.81.

Edinburgh Postnatal Depression Scale (EPDS);The validity and reliability study of the scale developed by Cox et al. [33] to assess depression in women during the postpartum period. The Turkish validity and reliability study of the EPDS was conducted by Engindeniz et al. [34]. The EPDS is a self-report scale consisting of 10 items with a 0–30-point Likert scale, which assesses the individual's psychological state over the past seven days. The cutoff point for the EPDS is 12/13, with higher total scores indicating greater severity of depression [33]– [34]. The Cronbach's alpha value of the scale was found to be 0.78. In our study, Cronbach's Alpha coefficient was determined to be 0.84.

Ethical considerations

Ethical approval for the study was received from Balıkesir University Health Sciences Non-Interventional Research Ethics Committee with the number 03.12.2024-E.452,846. The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants included in the study. For participants under the age of 16, informed consent was obtained from their parents or legal guardians, in accordance with national regulations. Confidentiality and security of patient information were ensured in line with hospital data security protocols. The study commenced following formal written approval obtained from the Office of the Chief Physician, ensuring institutional authorization prior to data collection.

Statistical analysis method

The data obtained from the research were evaluated using the Statistical Package for the Social Sciences 21 (SPSS 25.0) software package and descriptive analyses (number, percentage, mean, standard deviation, minimum, maximum), Student's t-test and one-way ANOVA for comparing quantitative data that conform to a normal distribution, the Mann-Whitney U test for comparing data that do not conform to a normal distribution, and correlation to identify relationships between scales. In the study, a significance level of $p < 0.05$ was accepted.

Results

The average age of PGDM mothers participating in the study was 31.72 ± 5.17, with 77% having a high school education or higher, 57.5% unemployed, 22.5% smoking, 25% having a chronic illness, and experiencing the most common complications during pregnancy, including threatened miscarriage (40%), hypothyroidism (20%), urinary tract infection (18%), and iron deficiency anemia (18%) during their pregnancies. When examining the characteristics of GDM mothers, the average age was 32.55 ± 4.87, 82.7% had a high school diploma or higher, 42.5% were unemployed, 15.0% smoked, 17.5% had a chronic illness, and during their pregnancies, they experienced the most common complications of low birth weight (32.5%), urinary tract infection (25%), and hypertension (22%), unlike mothers with GDM.

67.5% of PGDM mothers reported concerns about themselves and their babies, only 22.5% attended prenatal classes, 42.5% were primiparous, 95% delivered by cesarean section, and 75% used insulin, while 52.5% of mothers with GDM reported concerns about themselves and their babies, only 7.5% attended prenatal classes, 65.0% were multiparous, and similarly 95% delivered via cesarean section, and 75% used insulin. When examining neonatal outcomes: the average birth weights of infants (PGDM = 4.18 ± 0.49, GDM = 3.37 ± 0.39), infant lengths (PGDM = 50.6 ± 1.29, GDM = 50.1 ± 1.36), and head circumferences (PGDM = 35.5 ± 1.17, GDM = 34.76 ± 0.98), Apgar scores of 7–10 at 1 min (PGDM = 60%, GDM = 52%), and the rates of admission to neonatal intensive care (PGDM = 37.5%, GDM = 40%) were found to be similar. In contrast, the rate of neonatal intervention in GDM mothers was 40.0%, the rate of exclusive breastfeeding was 22.5%, and the rate of mixed feeding with breast milk and formula was 52.5%, while in PGDM mothers, these rates were 37.5%, 25.0%, and 60.0%, respectively. The three most common problems in infants of PGDM mothers were hypoglycemia (42.5%), hyperbilirubinemia (37.5%), and LGA (27.5%), while in GDM mothers, the most common problems were hypoglycemia (42.5%), RDS (27.5%), and hyperbilirubinemia (22.5%). Between the two groups, there were significant differences in concerns about their own/their baby's health (t: 3.176, p: 0.015), the baby's birth weight (t: 3.106, p: 0.000), and the baby's one-minute Apgar score (t:2.176, p: 0.005), the need for newborn intervention (t:2.192, p:0.037), and infant feeding (t:2.120, p:0.034). (Table 1).

In our study, it was determined that mothers in the PGDM group who attended postnatal check-ups scored significantly higher on both the Edinburgh Postnatal Depression Scale and the Beck Anxiety Scale compared to the GDM group (p < 0.05, Table 2). Additionally, it was found that 22.5% of mothers with PGDM exhibited mild anxiety symptoms, 35.0% moderate symptoms, and 42.5% severe symptoms, while these rates were 30.0%, 37.5%, and 42.5%, respectively, in mothers with GDM. Furthermore, the incidence of postpartum depression was 57.5% in mothers with PGDM and 25.0% in mothers with GDM.

Additionally, the mean scores for the PSQI Scale Total Score (8.78 ± 2.14), sleep duration (2.10 ± 1.02), sleep disturbance (2.83 ± 0.32), and daytime dysfunction (2.14 ± 0.72) were significantly higher than those in the GDM group ($p < 0.05$, Table 2). Additionally, 62.8% of mothers in the PGDM group and 57.1% of mothers in the GDM group were found to have poor sleep quality.

The PGDM group showed a positive advanced relationship between the mothers' PSQI Scale Total Score and EPDS ($r = 0.797$, $p < 0.05$) and BAS ($r = 0.714$, $p < 0.05$) scores, there was a negative moderate correlation between sleep duration and EPDS ($r = -0.587$, $p < 0.05$) and BAS ($r = -0.410$, $p < 0.05$) scores, there was a positive moderate correlation between sleep disorder and EPDS ($r = 0.614$, $p < 0.05$) and BAS ($r = 0.601$, $p < 0.05$) scores, and there was a strong positive correlation between daytime dysfunction and EPDS ($r = 0.754$, $p < 0.05$) and BAS ($r = 0.889$, $p < 0.05$) scores. In the GDM group of mothers, a strong positive relationship was found between the PSQI Scale Total Score and EPDS ($r = 0.765$, $p < 0.05$) and BAS ($r = 0.712$, $p < 0.05$) scores, a weak negative correlation was found between sleep duration and EPDS ($r = -0.207$, $p < 0.05$) and BAS ($r = -0.310$, $p < 0.05$) scores, there is a moderate positive correlation between sleep disorder and EPDS ($r = 0.514$, $p < 0.05$) and BAS ($r = 0.612$, $p < 0.05$) scores, and a moderate positive correlation between daytime dysfunction and EPDS ($r = 0.534$, $p < 0.05$) and BAS ($r = 0.489$, $p < 0.05$) scores was found (Table 3).

Discussion

Our findings demonstrate that mothers with pregestational diabetes (PGDM) are at greater risk of experiencing postpartum depression, anxiety, and sleep disturbances compared to those with gestational diabetes

Table 1 Comparison of pregnancy and neonatal outcomes in mothers with pregestational diabetes mellitus and gestational diabetes mellitus

Characteristics	**PGDM Group**		**GDM Group**		**t**	***p***
	n	**%**	***n***	**%**		
Age	X ± SD: 31.72 ± 5.17 Min-Max: 22–40 Range: 18		X ± SD: 32.55 ± 4.87 Min-Max: 24–45 Range: 21		−1.652***	0.071
Concerns About Own or Baby's Health						
Yes	27	67.5	21	52.5	3.176 *	0.015
No	13	32.5	19	47.5		
Going to Pregnant School						
Yes	9	22.5	3	7.5	2.192*	0.063
No	31	77.5	37	92.5		
Birth Type						
Vaginal Birth	2	5.0	2	5.0	1.106 *	0.074
Cesarean Birth	38	95.0	38	95.0		
Number of Births						
Primiparous	17	42.5	14	35.0	1.192*	0.163
Multiparous	23	57.5	26	65.0		
Treatment						
Diet	40	100.0	40	100.0	0.106**	0.084
Exercise	8	20.0	10	25.0		
Insulin	30	75.0	30	75.0		
Oral antidiabetics	-	-	-	-		
Baby's Birth Weight	X ± SD = 4.18 ± 0.49 Min-Max: 2.40–4.41 Range: 2.01		X ± SD = 3.37 ± 0.39 Min-Max: 2.60–4.30 Range: 1.70		3.106***	0.000
Baby's Height	X ± SD = 50.6 ± 1.29 Min-Max: 48–54 Range: 6		X ± SD = 50.1 ± 1.36 Min-Max: 46–52 Range: 6		1.071***	0.244
Baby's Head Circumference	X ± SD = 35.5 ± 1.17 Min-Max: 33–38 Range: 5		X ± SD = 34.76 ± 0.98 Min-Max: 33–36 Range: 3.5		0.204***	0.162
One-minute Apgar Score						
0–3 Point	-	-	-	-	2.176 **	0.005
4–6 Point	16	40.0	19	47.5		
7–10 Point	24	60.0	21	52.5		
Newborn Intervention Status						
Yes	17	42.5	20	50.0	2.192*	0.037
No	23	57.5	20	50.0		
Neonatal Intensive Care Referral Status						
Yes	15	37.5	16	40.0	0.254*	0.148
No	25	62.5	24	60.0		
Baby's Nutritional Status						
Only Breast Milk	10	25.0	9	22.5	2.120**	0.034
Breast Milk + Formula	24	60.0	21	52.5		
Only Formula	6	15.0	10	25.0		
Neonatal Outcomes						

Table 1 (continued)

Characteristics	PGDM Group		GDM Group		t	p
	n	%	*n*	%		
Hyperbilirubinemia	15	37.5	9	22.5		
Hypoglycemia	17	42.5	17	42.5		
LGA	11	27.5	8	20.0		
Abnormalities	6	15.0	8	20.0		
Difficulty Breathing	4	10.0	8	20.0		
Heart Problem	5	12.5	4	10.0		
RDS	10	25.0	11	27.5		
Meconium Aspiration	5	12.5	4	10.0		
Preterm Action	4	10.0	2	5.0		
Brachial Plexus	5	12.0	5	12.0		

PGDM: Pre-gestational diabetes mellitus, GDM: Gestational diabetes mellitus, PSQI: Pittsburgh Sleep Quality Index

** Chi-square test*

*** One-way ANOVA test*

**** Mann-Whitney U test, X Mean, SD: Standard deviation*

Table 2 Comparison of mean scores on the PSQI sleep quality scale and its subscales, Beck anxiety scale, and Edinburgh postnatal depression scale among mothers with pregestational diabetes mellitus and gestational diabetes mellitus

Scales	PGDM Group	GDM Group	t	p
	X ± SD	X ± SD		
Edinburgh Postnatal Depression Scale	11.82 ± 4.21	8.75 ± 4.49	3.283	0.000
Beck Anxiety Scale	24.07 ± 9.40	21.12 ± 8.02	2.842	0.000
PSQI Scale and Subscales				
PSQI Scale Total Score	8.78 ± 2.14	7.68 ± 3.14	2.311	0.021
Subjective Sleep Quality	2.55 ± 1.73	1.25 ± 0.73	1.164	0.183
Sleep Latency	2.16 ± 1.88	1.16 ± 0.78	1.738	0.062
Sleep Duration	2.1 ± 1.02	1.81 ± 1.15	1.255	0.001
Habitual Sleep Activity	2.36 ± 2.10	1.26 ± 1.20	1.188	0.258
Sleep Disorder	2.83 ± 0.32	1.63 ± 0.72	2.241	0.041
Use of Sleeping Medication	0.16 ± 0.21	0.26 ± 0.41	1.337	0.385
Daytime Dysfunction	2.14 ± 0.72	1.58 ± 0.95	2.370	0.005

PGDM Pre-gestational diabetes mellitus, GDM Gestational diabetes mellitus, PSQI Pittsburgh Sleep Quality Index, t Student's t-test, X: Mean,SD Standard deviation

(GDM). This aligns with prior literature suggesting that chronic metabolic conditions may have enduring psychological consequences beyond the perinatal period. However, our study adds to the existing body of knowledge by focusing specifically on the early postpartum phase (weeks 4–6), during which the psychological burden may peak. While previous research often examined these variables separately or during pregnancy, our integrated approach provides a more comprehensive understanding of the mental health challenges faced by diabetic mothers. These results highlight the importance of early psychological screening and support, particularly for women with PGDM, who may require tailored interventions that address both metabolic and psychosocial needs during the postpartum period. Studies have shown the high rate of cesarean delivery in mothers with GDM, the risk of postnatal hypoglycemia and prematurity in newborns, the high need for neonatal intervention and intensive care, thereby prolonging the infant's separation from the mother, and delayed lactogenesis II in mothers with gestational diabetes, which affects the timing of breastfeeding initiation and exclusive breastfeeding rates. Indeed, in our study, the rates of neonatal intervention were significantly high in both the PGDM and GDM groups, and the rates of exclusive breastfeeding were significantly low. Haile, Billionnet et al., Işık, and Doğan also supported our findings in their similar studies [28, 35–37]. Mothers in the GDM group had higher rates of neonatal intervention and admission to the neonatal unit compared to the PGDM group. However, Al-Nemri, Abu-Heija, and Yamamoto found higher neonatal admission rates in babies of PGDM mothers [2, 16, 38]. The birth weights of infants born to PGDM mothers were significantly higher, and this finding is also reflected in our neonatal outcomes in terms of LGA rates (PGDM: 27.5%, GDM: 20%). Yamamoto et al. also reported higher LGA rates in pregestational diabetes (35.0%) compared to GDM (15.9%) [38]. In our neonatal outcomes, hypoglycemia rates were equal, while hyperbilirubinemia, cardiac problems, meconium aspiration, LGA, and preterm labor rates were higher in PGDM mothers compared to GDM mothers. Yamamoto found equal hypoglycemia rates in both groups [38]. The RDS incidence rates in Barakat's study support our findings, while Abu-Heija's study reported a higher RDS incidence rate in newborns of PGDM mothers [2, 39]. In Billionnet et al.'s study, the risks of adverse maternal and neonatal outcomes were lower in the GDM group. Specifically, in the GDM group, macrosomia (15.7%) and RDS (3.6%) were observed, while in the PGDM group, macrosomia (43.7%), RDS (11.4%), and cardiac malformations (3.8%) were more prevalent [36]. These results indicate that neonatal risk

Table 3 Relationship between the PSQI sleep quality scale and its subscales, Beck anxiety scale, and Edinburgh postnatal depression scale scores in mothers with pregestational diabetes mellitus and gestational diabetes mellitus

PSQI Scale and Subscales			EPDS	BAS
PGDM Group	PSQI Scale Total Score	r	0.797	0.714
		p	0.005*	0.004*
	Subjective Sleep Quality	r	−0.295	0.206
		p	0.185	0.742
	Sleep Latency	r	−0.510	0.145
		p	0.210	0.256
	Sleep Duration	r	−0.587	−0.410
		p	0.041*	0.034*
	Habitual Sleep Activity	r	−0.179	0.194
		p	0.320	0.410
	Sleep Disorder	r	0.614	0.601
		p	0.001*	0.002*
	Use of Sleeping Medications	r	0.101	0.158
		p	0.401	0.065
	Daytime Dysfunction	r	0.754	0.889
		p	0.014*	0.035*
GDM Group	PSQI Scale Total Score	r	0.765	0.712
		p	0.001*	0.001*
	Subjective Sleep Quality	r	0.090	0.275
		p	0.114	0.212
	Sleep Latency	r	−0.210	0.245
		p	0.310	0.156
	Sleep Duration	r	−0.207	−0.310
		p	0.021*	0.044*
	Habitual Sleep Activity	r	0.120	0.110
		p	0.614	0.412
	Sleep Disorder	r	0.514	0.612
		p	0.000*	0.000*
	Use of Sleep Medications	r	0.121	0.258
		p	0.561	0.075
	Daytime Dysfunction	r	0.534	0.489
		p	0.044*	0.045*

r Spearman's correlation coefficient,*p< 0,05

ratios are more prevalent in newborns born to PGDM mothers compared to those born to GDM mothers. This difference is particularly concerning given that optimal glucose control was achieved during prenatal follow-ups in PGDM mothers. Additionally, while the importance of pre-pregnancy health and optimal glucose control during pregnancy is acknowledged, this finding underscores the importance of not underestimating the significance of preventing GDM. In our study, the mean EPDS score for mothers in the PGDM group was 11.82 ± 4.21, while it was 8.75 ± 4.49 for mothers in the GDM group. Similar studies have also found that the risk of postpartum depression is significantly higher in mothers with GDM compared to healthy groups; however, no studies comparing GDM with the pregestational group have been identified [36, 38, 40]. Azami et al. [41] conducted a meta-analysis examining the relationship between gestational diabetes and postpartum depression, finding that GDM significantly increased the risk of postpartum depression (95% CI: 1.22–2.07, $p = 0.001$). The high prevalence of depression in pregnant women with GDM can be explained by the high rates of cesarean delivery and multiparity, which are risk factors for depression, in addition to high blood sugar levels. Indeed, in our study, the rates of cesarean delivery and multiparity were high in both groups of mothers. Billionnet et al. found that the risk of depression development was higher in GDM patients receiving insulin compared to those not using insulin [36]. In our study as well, insulin use was similarly high in both groups. In our study, the mean anxiety score was 24.07 ± 9.40 in the PGDM group and 21.12 ± 8.02 in the GDM group. Additionally, 42.5% of PGDM mothers and 42.5% of GDM mothers exhibited severe anxiety symptoms. Postpartum anxiety may be associated with a decrease in maternal self-confidence and may lead to long-term adverse outcomes such as delayed mental development in children. In studies conducted by Doğan and Bayri Bingöl and Demirgöz Bal with mothers with GDM during the postpartum period, anxiety levels were found to be high [8, 35]. Indeed, 67.5% of mothers with PGDM and 52.5% of mothers with GDM expressed concerns about their own and their babies' health, and it is believed that this finding also influences the rates of anxiety and depression among mothers.

In our study, the PSQI total score was 8.78 ± 2.14 in the PGDM group and 7.68 ± 3.14 in the GDM group. This indicates that sleep quality is more impaired in PGDM mothers during the postpartum period. Similarly, the literature reports that pregestational diabetes is more strongly associated with sleep disorders due to long-term metabolic disorders, increased insulin resistance, and systemic inflammation [42,43]. In addition, the chronic nature of diabetes in PGDM patients, longer disease duration, and the accompanying psychosocial burden can negatively affect sleep structure [43].

On the other hand, the acute onset and generally transient nature of GDM may result in less impairment of sleep quality in this group of mothers. The findings obtained demonstrate the importance of postpartum-specific sleep regulation and supportive interventions, particularly in mothers diagnosed with PGDM.

In terms of neonatal outcomes, a review of the literature revealed more adverse outcomes in PGDM compared to GDM. Complications such as preterm birth, congenital anomalies, preeclampsia, neonatal hypoglycemia, and admission to the neonatal intensive care unit (NICU) were more common in the PGDM group. In our study, similar findings were observed, with a higher risk of complications in the PGDM group, except for postnatal hypoglycemia and brachial plexus injury. These results have been associated with better hyperglycemia control or milder hyperglycemia in the GDM group [44].

Conclusion

Our study results are important in that they demonstrate a strong relationship between pre-pregnancy health and pregnancy and neonatal outcomes. This study indicates that PGDM poses a greater risk for pregnancy and neonatal complications than GDM and also increases mothers' rates of depression and anxiety in the postpartum period, reduces sleep quality and quality of life, and decreases breastfeeding rates. Therefore, maintaining optimal glucose control during the pre-pregnancy period is crucial, along with evaluating mothers' emotional state and sleep quality during postpartum newborn follow-ups and implementing appropriate counseling, education, and treatment methods. Additionally, intervention strategies should be developed to prevent the high rates of adverse outcomes observed in women with GDM and to prevent the development of GDM.

Limitations

This study has several limitations. First, it was conducted in a single center, limiting the generalizability of the findings. Second, the sample size was relatively small. Third, data collection relied on self-reported questionnaires, which may introduce reporting bias. Lastly, the study did not assess other potential factors influencing postpartum mental health, such as social support or marital satisfaction.

Data Availability

The identified datasets used and analyzed during the current study are available from the corresponding author upon reasonable request. Restrictions on the availability of raw clinical data apply due to patient confidentiality and institutional policies; access requires approval from the ethics committee of Balıkesir University Faculty of Health Sciences.

Abbreviations

GDM	gestational diabetes mellitus
PGDM	pregestational diabetes mellitus
PSQI	Pittsburgh Sleep Quality Index
BAI	Beck Anxiety Inventory
EPDS	Edinburgh Postnatal Depression Scale
IDF	International Diabetes Federation
RDS	respiratory distress syndrome
NICU	neonatal intensive care unit
LGA	large for gestational age

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12887-025-06257-5.

Supplementary material 1.

Supplementary material 2.

Supplementary material 3.

Authors' contributions

Authors' Contributions: Concept and Design: OKA, SCAData Collection: OKAAnalysis and Interpretation of Data: SCA Manuscript Writing: OKA, SCACritical Revision of Manuscript: OKA, SCA All authors read and approved the final manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability

The de-identified datasets used and analyzed during the current study are available from the corresponding author upon reasonable request. Restrictions on availability of raw clinical data apply due to patient confidentiality and institutional policies; access requires approval from the ethics committee of Balıkesir University Faculty of Health Sciences.

Declarations

Ethics approval and consent to participate

Ethical approval for the study was received from Balıkesir University Health Sciences Non-Interventional Research Ethics Committee with the number 03.12.2024-E.452846. Written informed consent was obtained from all participants, and for participants under the age of 16, consent was obtained from their parents or legal guardians.

Consent for publication

Written informed consent for publication of the data collected, including any identifiable information or images, was obtained from all participants or their legal guardians.

Competing interests

The authors declare no competing interests.

Received: 1 June 2025 / Accepted: 26 September 2025
Published online: 21 October 2025

References

1. ACOG Practice Bulletin No. Obstet Gynecol. 2018;131(2):e49–64. https://doi.org/10.1097/AOG.0000000000002501. 190: Gestational Diabetes Mellitus.
2. Abu-Heija AT, Al-Bash M, Mathew M. Gestational and pregestational diabetes mellitus in Omani women: comparison of obstetric and perinatal outcomes. Sultan Qaboos Univ Med J. 2015;15(4):e496–500. https://doi.org/10.18295/squmj.2015.15.04.009.
3. American Diabetes Association. 14. Management of diabetes in pregnancy: *Standards of medical care in diabetes-2020*. Diabetes Care. 2020;43(Suppl 1):S183–92. https://doi.org/10.2337/dc20-S014.
4. TEMD Guide for Diagnosis. Treatment and Follow-up of Diabetes Mellitus and Its Complications – 2024. https://file.temd.org.tr/Uploads/publications/guides/documents/diabetesmellitus2024.pdf, Access date 26.04.2025.
5. International Association of Diabetes and Pregnancy Study Groups Consensus Panel, Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, Dyer AR, Leiva Ad, Hod M, Kitzmiler JL, Lowe LP, McIntyre HD, Oats JJ, Omori Y, Schmidt MI. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care. 2010;33(3):676–82. https://doi.org/10.2337/dc09-1848.
6. Practice Bulletin No. Obstet Gynecol. 2017;130(1):244–6. https://doi.org/10.1097/AOG.0000000000002152. 180 Summary: Gestational Diabetes Mellitus.
7. American Diabetes Association (ADA). Classification and diagnosis of diabetes: standards of medical care in diabetes. Diabetes Care. 2018;41(Supplement–1):13–27. Erişim tarihi:15.04.2025. https://care.diabetesjournals.org/content/41/Supplement_1/S13.

8. Bayri Bingol F, Demirgöz Bal M. Factors affecting postpartum maternal anxiety and attachment. J Continuing Med Educ. 2021;30(1):60–8.
9. Turkish Ministry of Health Turkey Diabetes Program, 2023, chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.turkdiab.org/admin/PICS/webfiles/2023_diyabet_tani_ve_tedavi_rehberi.pdf. Erişim tarihi 26.04.2025
10. Moholdt T. Diet, exercise and gestational diabetes mellitus. Nutrients. 2023;15(10):2251. https://doi.org/10.3390/nu15102251.
11. Malaza N, Masete M, Adam S, Dias S, Nyawo T, Pheiffer C. A systematic review to compare adverse pregnancy outcomes in women with pregestational diabetes and gestational diabetes. Int J Environ Res Public Health. 2022;19(17):10846. https://doi.org/10.3390/ijerph191710846.
12. Johns EC, Denison FC, Norman JE, Reynolds RM. Gestational diabetes mellitus: mechanisms, treatment, and complications. Trends Endocrinol Metab. 2018;29(11):743–54. https://doi.org/10.1016/j.tem.2018.09.004.
13. Gualdani E, Di Cianni G, Seghieri M, Francesconi P, Seghieri G. Pregnancy outcomes and maternal characteristics in women with pregestational and gestational diabetes: a retrospective study on 206,917 singleton live births. Acta Diabetol. 2021;58(9):1169–76. https://doi.org/10.1007/s00592-021-01710-0.
14. Al-Nemri AM, Alsohime F, Shaik AH, El-Hissi GA, Al-Agha MI, Al-Abdulkarim NF, et al. Perinatal and neonatal morbidity among infants of diabetic mothers at a university hospital in central Saudi Arabia. Saudi Med J. 2018;39(6):592–7. https://doi.org/10.15537/smj.2018.6.22907.
15. Tinker SC, Gilboa SM, Moore CA, Waller DK, Simeone RM, Kim SY, et al. Specific birth defects in pregnancies of women with diabetes: National birth defects prevention study, 1997–2011. Am J Obstet Gynecol. 2020;222(2):e1761–17611. https://doi.org/10.1016/j.ajog.2019.08.028.
16. Van Zyl H, Levitt NS. Pregnancy outcome in patients with pregestational and gestational diabetes attending Groote Schuur Hospital, Cape Town, South Africa. South Afr Med J = Suid-Afrikaanse Tydskrif Vir Geneeskunde. 2018;108(9):772–6. https://doi.org/10.7196/SAMJ.2018.v108i9.12992.
17. Plows JF, Stanley JL, Baker PN, Reynolds CM, Vickers MH. The pathophysiology of gestational diabetes mellitus. Int J Mol Sci. 2018;19(11):3342. https://doi.org/10.3390/ijms19113342.
18. Ye W, Luo C, Huang J, Li C, Liu Z, Liu F. Gestational diabetes mellitus and adverse pregnancy outcomes: systematic review and meta-analysis. BMJ. 2022;377:e067946. https://doi.org/10.1136/bmj-2021-067946.
19. Schaefer-Graf U, Napoli A, Nolan CJ, Diabetic Pregnancy Study Group. Diabetes in pregnancy: a new decade of challenges ahead. Diabetologia. 2018;61(5):1012–21. https://doi.org/10.1007/s00125-018-4545-y.
20. Güler AE, Güler D, Budak ZÇ, Koparal A, Kıncı B, Şehirli Ö. Evaluation of anxiety levels of pregnant women with gestational diabetes mellitus. Perinat J. 2020;28(2):89–94.
21. Dias JM, Kelty EC, Nicklas JM, Doucette JT, Levkoff SE, Seely EW. Perceived stress and early postpartum depressive symptoms in women with recent GDM: implications for postpartum lifestyle programs. Matern Child Health J. 2025;29(4):465–71. https://doi.org/10.1007/s10995-025-04045-2.
22. Mak JKL, Lee AH, Pham NM, Tang L, Pan XF, Binns CW, Sun X. Gestational diabetes and postnatal depressive symptoms: A prospective cohort study in Western China. Women Birth: J Australian Coll Midwives. 2019;32(3):e427–31. https://doi.org/10.1016/j.wombi.2018.08.171.
23. Liu X, Wang S, Wang G. Prevalence and risk factors of postpartum depression in women: a systematic review and meta-analysis. J Clin Nurs. 2022;31(19–20):2665–77. https://doi.org/10.1111/jocn.16121.
24. Reutrakul S, Anothaisintawee T, Herring SJ, Balserak BI, Marc I, Thakkinstian A. Short sleep duration and hyperglycemia in pregnancy: aggregate and individual patient data meta-analysis. Sleep Med Rev. 2018;40:31–42. https://doi.org/10.1016/j.smrv.2017.09.003.
25. Herring SJ, Nelson DB, Pien GW, Homko C, Goetzl LM, Davey A, et al. Objectively measured sleep duration and hyperglycemia in pregnancy. Sleep Med. 2014;15(1):51–5. https://doi.org/10.1016/j.sleep.2013.07.018.
26. Işık G, Egelioğlu Cetişli N. The effect of gestational diabetes on depression and breastfeeding Self-Efficacy in pregnancy and postpartum period. Clin Experimental Health Sci. 2022;12(2):323–30. https://doi.org/10.33808/clinexphealthsci.770882.
27. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193–213. https://doi.org/10.1016/0165-1781(89)90047.
28. Ağargün MY, Kara H, Anlar Ö. Pittsburgh Uyku kalitesi indeksi'nin geçerliliği ve güvenirliliği. Turk Psikiyatri Derg. 1996;7(2):107–15.
29. Ulusoy M, Şahin NH, Erkmen H. Turkish version of the Beck anxiety inventory: psychometric properties. J Cogn Psychother. 1998;12:163–72.
30. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol. 1988;56(6):893–7. https://doi.org/10.1037//0022-006x.56.6.893.
31. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. Br J Psychiatry. 1987;150:782–6. https://doi.org/10.1192/bjp.150.6.782.
32. Engindeniz AN, Küey L, Kültür S. Validity and reliability study of the Turkish form of the Edinburgh postpartum depression scale. Psychiatry Association; 1997. pp. 51–2.
33. Dogan M, Dissiz M. Comparison of Sleep, quality of Life, anxiety and depression levels with normal and gestational diabetes and postpartum results. Int J Caring Sci. 2024;17(2):1030.
34. Billionnet C, Mitanchez D, Weill A, Nizard J, Alla F, Hartemann A, et al. Gestational diabetes and adverse perinatal outcomes from 716,152 births in France in 2012. Diabetologia. 2017;60(4):636–44. https://doi.org/10.1007/s00125-017-4206-6.
35. Haile ZT, Oza-Frank R, Chertok A, I. R., Passen N. Association between history of gestational diabetes and exclusive breastfeeding at hospital discharge. J Hum Lactation: Official J Int Lactation Consultant Association. 2016;32(3):NP36–43. https://doi.org/10.1177/0890334415618936.
36. Yamamoto JM, Donovan LE, Mohammad K, Wood SL. Severe neonatal hypoglycaemia and intrapartum glycaemic control in pregnancies complicated by type 1, type 2 and gestational diabetes. Diabet Med. 2020;37(1):138–46. https://doi.org/10.1111/dme.14137.
37. Barakat MN, Youssef RM, Al-Lawati JA. Pregnancy outcomes of diabetic women: charting Oman's progress towards the goals of the Saint Vincent declaration. Ann Saudi Med. 2010;30(4):265–70. https://doi.org/10.4103/0256-4947.65253.
38. Zwolińska- Kloc M, Zabel M, Czajkowski K, Ostasz- Ważny J, Kokoszka A. Relations between gestational diabetes and postpartum depressive disorders and symptoms. Arch Psychiatry Psychother. 2017;19(1):43–6. https://doi.org/10.12740/APP/67744.
39. Azami M, Badfar G, Soleymani A, Rahmati S. The association between gestational diabetes and postpartum depression: a systematic review and meta-analysis. Diabetes Res Clin Pract. 2019;149:147–55. https://doi.org/10.1016/j.diabres.2019.01.034.
40. Reutrakul S, Van Cauter E. Sleep influences on obesity, insulin resistance, and risk of type 2 diabetes. Metab Clin Exp. 2018;84:56–66. https://doi.org/10.1016/j.metabol.2018.02.010.
41. Berezowsky A, Ardestani S, Hiersch L, et al. Glycemic control and neonatal outcomes in twin pregnancies with gestational diabetes mellitus. Am J Obstet Gynecol. 2023;229:e6821–13.

Publisher's Note