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Is restrained eating behaviour associated with pre-pregnancy weight and weight-gain in gestational diabetes?

Tuğba Küçükkasap Cömert[1], Elif Yıldız[1], Funda Akpınar[2], Cantekin İskender[2]

[1]Department of Nutrition and Dietetics, Gülhane Faculty of Health Sciences, University of Health Sciences Turkey, Ankara, Turkey
[2]Department of Obstetrics and Gynecology, Ankara Etlik City Hospital, Ankara, Turkey, Ankara, Turkey

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ABSTRACT

Aims: The aim of this study was to investigate the association between eating behaviors and pre-pregnancy body mass index (BMI) and body weight gain in individuals with gestational diabetes mellitus.

Methods: This cross-sectional study was conducted in 34 pregnant women diagnosed with gestational diabetes mellitus and 50 nondiabetic women above the 28th week of pregnancy. The Dutch Eating Behavior Questionnaire was used to assess eating habits. A quantitative food frequency questionnaire was used to assess food consumption.

Results: Individuals with gestational diabetes had significantly higher levels of restrained eating behavior scores (27.11±5.98 vs 20.32±6.84) compared to nondiabetic women ($p<0.05$). Pre-pregnancy body mass index value was found to be related to restrained eating behavior score in individuals with gestational diabetes ($p<0.05$), and restrained eating score was found to be higher in individuals with gestational diabetes who had body weight gain above the recommendations than in individuals with body weight gain in accordance with the recommendations ($p<0.05$). The energy intake (1965±433.02 kcal/day vs. 1731.04±462.64 kcal/day), carbohydrate (201.19±59.35 g/day vs. 170.56±56.49 g/day) consumption of pregnant women diagnosed with gestational diabetes were higher than those nondiabetic women, whereas vitamin B6 (1.12±0.31 mg/day vs. 1.33±0.46 mg/day), and calcium consumptions (682.88±265.12 mg/day vs. 963.03±391.63 mg/day) were lower ($p<0.05$).

Conclusion: Women with gestational diabetes showed a higher restrained eating behavior score, which may be attributed to pre-pregnancy body mass index and body weight gain above the recommendations. Furthermore, it has been emphasized that this may be associated with an inadequate intake of certain nutrients.

Keywords: Eating behaviour, gestational diabetes, restrained eating

INTRODUCTION

The term gestational diabetes mellitus (GDM) refers to a glucose tolerance disorder that occurs during pregnancy for the first time and factors such as age, genetics, black race, obesity, environment, and lifestyle have been reported to play a role in its etiology.[1] It was reported that the prevalence of GDM in the United States increased from 4.6% to 8.2% from 2006 to 2016,[2] and in a meta-analysis covering the period 2004-2016 in Turkey that the prevalence ranged between 1.9-27.9%, with an average rate of 7.7%.[3]

A number of complications (macrosomia, birth injuries, cesarean section, hydramnios, preeclampsia, metabolic disorders in the newborn) have been shown to be associated with GDM during pregnancy and postnatally for both the mother and the newborn.[4] It was reported that approximately 20-50% of individuals with GDM were diagnosed with diabetes mellitus (DM) within 5-10 years after birth and the risk of type 2 diabetes increased 7.4-fold.[5] It has been emphasized that screening and identification of these individuals are extremely important for improving short- and long-term maternal and fetal outcomes.[6] Medical nutrition therapy is defined as a preliminary therapy for controlling blood sugar levels and preventing ketosis.[7] In general terms, the nutritional requirements of individuals with GDM do not differ from pregnant women without GDM, but it has been suggested that is particularly important to focus specifically on nutritional therapy to ensure and maintain maternal euglycemia, prevent variations in blood glucose levels, and protect maternal and newborn health by ensuring appropriate maternal body weight gain.[8]

It has been pointed out in recent years that individuals with GDM develop unhealthy eating habits as a result of the emotional changes caused by pregnancy, the rules imposed on a comfortable diet, and the stress and anxiety

Corresponding Author: Tuğba Küçükkasap Cömert, tugbaccomert@gmail.com

generated by having to adhere to treatment regimens.[9] In the literature, there are a limited number of studies evaluating eating behaviors in individuals with GDM.[9,10]

In this study, it was aimed to investigate the relationship between eating behaviors and pre-pregnancy body mass index (BMI), body weight gain, and food consumption in individuals with GDM. We tested the hypothesis that eating behavior problems are more common in individuals with GDM than nondiabetic pregnant women and that this is associated with body weight gain and food consumption.

METHODS

This cross-sectional study was conducted between March 2022 and November 2022. Ethics committee approval to conduct the present study was obtained from the Clinical Research Ethics Committee (Date: 02.02.2022, Decision No: 2022/20). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The study was conducted on individuals who were >18 years of age, signed an informed consent form, did not have any risky pregnancy status other than GDM, and were >28th week of pregnancy. Pregnant women who were <18 years of age, multiparous, had abnormal laboratory findings, intrauterine growth retardation, and risky pregnancies other than gestational diabetes were excluded from the study.

Sample calculation was calculated via the student-t test with a power of 0.80 at a significance level of 0.05, according to **Table 1** in the study of Lan et al.[11] and it was determined that a minimum of 30 pregnant individuals for each group ((a) with a diagnosis of gestational diabetes pregnant women (b) nondiabetic pregnant women) with a gestational week >28, were required. The study was conducted on a total of 84 pregnant individuals, including 34 subjects who met the inclusion criteria and were diagnosed with GDM and 50 subjects without any risky pregnancy and nondiabetic.

Table 1. Data on the sociodemographic and obstetric characteristics of individuals

Variable	Total (n=84)	With GDM (n=34)	Without GDM (n=50)	p value
Age (years)	28.49±5.06	29.09±4.75	28.40±5.01	0.398
Marriage age (years)	21.81±5.08	21.79±6.71	21.82±3.70	0.980
Number of pregnancy	2.43±1.10	2.41±1.13	2.44±1.09	0.909
Gestatioanl age (week)	30.62±4.79	28.18±4.09	29.34±6.35	0.392
Pre-pregnancy BMI (kg/m²)	24.94±4.23	25.42±4.73	24.61±3.88	0.411
BMI (kg/m²)	28.84±4.46	28.60±4.80	29.04±4.26	0.666

General information, eating behaviors, and food consumption of pregnant women were obtained by the researchers through a questionnaire form by face-to-face interview method. The body weight and height of the subjects were recorded during outpatient clinic visits by the obstetric nurse using a calibrated scale (SECA 711) and a height meter (SECA 220). Pre-pregnancy measurements were obtained from the hospital's electronic registry system. BMI value was calculated for each individual and categorized based on the guidelines of WHO.[12] In addition, body weight gain during pregnancy was evaluated according to the Institute of Medicine recommendations.[13]

Eating behaviors were analyzed by administering the Dutch Eating Behavior Questionnaire (DEBQ), a Turkish validity and reliability study of which was conducted by Bozan et al. (2009). The questionnaire includes 33 items and consists of 3 subgroups assessing emotional eating behaviors (e.g., do you eat sweets when you are unhappy?), external eating behaviors (e.g., if something smells good, do you eat more than you normally eat) and restrained eating behaviors (e.g., do you eat less than you want to eat to avoid getting fat). The items in the questionnaire are rated on a 5-point Likert scale and high scores indicate the presence of eating problems. For the assessment of food consumption, a quantitative Food Frequency Questionnaire (FFQ) was administered by an expert dietitian and analyzed via Nutritional Information System Package Software (Bebispro for Windows, Stuttgart, Germany; Turkish version, 2010) to determine daily energy, micro, and macronutrient consumption.

Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 22.0 for Mac (SPSS Inc., Chicago, IL), and the data distribution was evaluated using the Kolmogorov-Smirnov test (p:0.200>0.05). As confirmed by the kurtosis value (skewness: 0.381, kurtosis: -0.192), the data was found to be normally distributed. Descriptive statistics are presented as the mean and standard deviation. Independent Samples T-test was used to analyze the difference between individuals with GDM and pregnant women without GDM in terms of sociodemographic, obstetric data, eating behavior scores, and food consumption. Multiple regression analysis was used to assess the relationship between pre-pregnancy BMI and eating behaviors (emotional, external, and restraint). The difference between body weight gain in pregnant women with and without GDM was analyzed by chi-square test. Besides, the difference between eating behavior (emotional, extrinsic, and restraint) scores according to body weight gain was determined by a one-way ANOVA test, and the Tukey test was used to find out in which groups there was a difference. The level of significance was set at p<0.05.

RESULTS

The mean age, gestational age, marriage age, number of pregnancies, gestational week, pre-pregnancy, and current BMI (kg/m²) values of the individuals were 28.49±5.06 years, 21.81±5.08 years, 2.43±1.10, 30.62±4.79 weeks, 24.94±4.23 kg/m² and 28.84±4.46 kg/m², respectively. No significant difference was found between age, marriage age, number of pregnancies, gestational week, pre-pregnancy, and current BMI (kg/m²) values in pregnant individuals with and without GDM, and it was shown that they were similar (Table 1).

Among the individuals, 6.0% were underweight, 54.8% were normal, 26.2% were overweight, and 13.1% were obese before pregnancy. Before pregnancy, 8.8% of women with GDM were underweight, 44.1% were normal, 29.4% were overweight, and 17.6% were obese, while 4.0% of without GDM were underweight, 62.0% were normal, 24.0% were overweight, and 10.0% were obese.

The mean restrained, externality, and emotional eating behavior scores of the individuals were 23.07±7.29, 35.61±7.88, and 22.30±8.49, respectively. Individuals with GDM had higher restrained eating behavior scores (27.11±5.98 vs. 20.32±6.84) compared to without GDM (p<0.05), whereas there was no difference in externality and emotional eating score (Table 2).

Table 2. Mean values of individuals' restrictive, extrinsic and emotional eating scores

Variable	Total (n=84)	With GDM (n=34)	Without GDM (n=50)	p value
Restrained eating score	23.07±7.29	27.11±5.98	20.32±6.84	0.000*
Externality eating score	35.61±7.88	35.17±7.62	35.92±8.11	0.670
Emotional eating score	22.30±8.49	23.94±8.36	21.52±8.19	0.332

* p<0.05

It was shown that pre-pregnancy BMI was decisive on restrained eating behavior score (p:0.006) in individuals with GDM and emotional eating score (p:0.042) in without GDM (p<0.05). Restrained eating score was associated with pre-pregnancy BMI in individuals with GDM and emotional eating in individuals without GDM. (Table 3).

A total of 39.3% of the individuals had a body weight gain above the recommendations, 31.0% had a body weight gain below the recommendations and 29.8% had a body weight gain in accordance with the recommendations. It was found that 70.7% of individuals with GDM had a body weight gain above the recommendations, 8.8% had a body weight gain below the recommendations and 20.5% had a body weight gain in accordance with the recommendations, while 18.0% of the without GDM individuals had a body weight gain above the recommendations, 46.0% below the recommendations, and 36.0% in accordance with the recommendations. It was determined that individuals with GDM gained body weight above the recommended weight at a higher frequency (70.7% vs 18.0%) than without GDM (p<0.05).

Restrained, externality, and emotional eating scores according to body weight gain during pregnancy in GDM and without GDM individuals, are presented in Table 4. The restrained eating score was higher in individuals with GDM with body weight gain above the recommended body weight gain than in individuals with body weight gain in accordance with the recommendations (p<0.05). No difference was found between the groups in terms of externality and emotional eating scores (Table 4).

The energy and nutrient intakes of pregnant women with GDM and without GDM pregnants are shown in Table 5. The energy intake (1965±433.02 kcal/day vs. 1731.04±462.64 kcal/day), carbohydrate (CHO)

Table 3. Multiple linear regression analysis of the effect of pre-pregnancy BKI on restrained, externality, emotional eating score

Variable	Birth status	Beta	t	p	95% confidence interval	
Restrained eating score	GDM Without GDM	0.480 0.055	2.999 0.371	0.006* 0.712	0.023 -0.026	0.121 0.038
Externality eating score	GDM Without GDM	-0.216 -0.305	-1.229 -1.730	0.229 0.090	-0.067 -0.059	0.017 0.004
Emotional eating score	GDM Without GDM	0.077 0.342	0.487 2.088	0.630 0.042*	-0.026 0.001	0.043 0.060

*p<0.05

Table 4. Restrained, externality and emotional eating scores in individuals with GDM and without GDM according to body weight gain status during pregnancy

Variable		Under recommended (n=24)	Recommended (n=27)	Above recommended (n=33)	p
Restrained eating score	GDM Without GDM	27.66±3.78 21.08±7.21	21.85±2.54[a] 20.38±6.59	28.58±6.14[b] 18.22±6.70	0.027* 0.576
Externality eating score	GDM Without GDM	29.00±6.55 37.65±8.58	36.00±7.52 33.22±7.81	35.70±7.70 36.88±6.71	0.349 0.208
Emotional eating score	GDM Without GDM	19.00±5.56 19.30±7.88	28.28±11.37 20.00±7.07	24.70±7.47 24.66±10.47	0.273 0.240

a,b: It shows that the difference between the groups is significant.

(201.19±59.35 g/day vs. 170.56±56.49 g/day), B1 (0.85±0.33 mg/day vs. 0.70±0.17 mg/day) and B2 (1.47±0.55 mg/day vs. 1.24±0.41 mg/day) vitamin consumption of individuals with GDM were higher than without GDM, whereas vitamin B6 (1.12±0.31 mg/day vs. 1.33±0.46 mg/day), and calcium consumptions (682.88±265.12 mg/day vs. 963.03±391.63 mg/day) were lower (p<0.05). The consumption of other nutrients was similar between the groups (Table 5).

Table 5. Daily energy and nutrients intake of individuals

Variable	With GDM (n=34)	Without GDM (n=50)	p
Energy (kcal/day)	1965±433.02	1731.04±462.64	0.022*
CHO (g/day)	201.19±59.35	170.56±56.49	0.019*
CHO (%)	43.25±9.97	38.91±9.28	0.045*
Protein (g/day)	67.±53±20.32	71.51±15.49	0.313
Protein (%)	14.76±2.51	15.80±3.20	0.099
Fat (g/day)	93.95±24.71	86.12±27.10	0.183
Fat (%)	45.08±7.56	43.05±6.58	0.208
Fibre (g/day)	19.53±8.58	19.10±5.78	0.803
Vitamin A (mcg/day)	1294.95±877.14	1223.91±976.19	0.729
Vitamin E (mg/day)	25.75±13.15	25.97±7.73	0.923
Vitamin B1 (mg/day)	0.85±0.33	0.70±0.17	0.021*
Vitamin B2 (mg/day)	1.47±0.55	1.24±0.41	0.042*
Vitamin B6 (mg/day)	1.12±0.31	1.33±0.46	0.023*
Vitamin B12 (µg/day)	1.24±0.39	1.71±0.70	0.001*
Folate (mcg/day)	277.56±100.88	279.34±83.38	0.932
Calcium (mg/day)	682.88±265.12	963.03±391.63	0.021*
Iron (mg/day)	11.26±4.46	9.93±2.50	0.084
Zinc (mg/day)	9.92±3.52	9.26±2.69	0.339
Vitamin C (mg/day)	117.40±80.30	120.60±73.24	0.851

*p<0.05

DISCUSSION

During pregnancy, eating behaviors may be affected by hormonal and emotional changes.[14] In particular, women diagnosed with GDM may develop anxiety about consuming foods without restriction. As a result of stopping eating certain foods that they previously enjoyed and changing their eating habits, they become insufficient in their food consumption and make wrong food choices.[15]

In our study, the Turkish version of DEBQ was used and restraint, external, and emotional eating behaviors were measured. There was no difference in external and emotional eating behavior scores between individuals with and without GDM, but restrained eating behavior showed a difference between the groups. The restrained eating behavior score was found to be higher than in without GDM individuals, and it was shown that restrained eating behavior was associated with pre-pregnancy BMI and resulted in excessive body weight gain during pregnancy.

Restrained eating behavior refers to the tendency of chronically limiting food intake to lose weight or prevent weight gain.[16] Researchers have demonstrated that this type of moderate eating, though adaptive in today's obesogenic environment, is paradoxically associated with extreme dietary restriction, increased impulsivity, and increased reactivity to food.[17] In the literature, there is no study evaluating restrained eating behavior in individuals with GDM, and the number of studies evaluating restrained eating behavior in individuals without GDM is limited.[18-21]

The findings of a prospective study in which eating behaviors and body weight gain were assessed in 463 healthy pregnant women in Italy indicated that excessive body weight gain was a sign of unhealthy eating habits and a tendency to diet.[18] In the Irish study, restrained eating behaviors before pregnancy and body weight gains at the 15th week of pregnancy were prospectively analyzed in 799 pregnant individuals, and restrained eating behavior was found to be associated with higher weight gain.[19] In a study in which restrained eating behavior and body weight gain were evaluated with a three-factor eating behavior test in individuals who had quit smoking before pregnancy and in early pregnancy, it was shown that the restraint tendency was associated with increased body weight gain.[20] Eating behaviors were analyzed via the Revised Restraint Scale in 62 Caucasian pregnant individuals who were about to give birth to their first or second baby, and body weight gain above or below the recommended level during pregnancy was found in those who showed restrained eating behavior.[21] In a sample of 204 infant-mother, maternal restrained eating behaviors and pre-pregnancy BMI were assessed using maternal self-report measures and was determined that maternal restrained eating behavior waslinked with an increased risk of overweight in early infancy.[22]

It is well-known that appropriate body weight gain during pregnancy is crucial for maternal and newborn health.[23] In the present study, body weight gain above recommendations was found to be higher in individuals with GDM than without GDM, and it was demonstrated that restrained eating behavior scores were higher in individuals with GDM who had body weight gain above recommendations during pregnancy. In our study, restrained eating behavior was also associated with increased body weight gain in individuals with GDM.

In a prospective study in which 156 pregnant women were followed up and their body weight gains were evaluated, 56% of the individuals were above the recommendations, 27% were in accordance with the recommendations and 16% were below the recommendations,[24] while in another study in Greece in which 977 pregnant individuals were

evaluated, it was found that 45% of the individuals gained body weight above the recommendations, 32% gained body weight in accordance with the recommendations and 23% gained body weight below the recommendations.[25] In the Polish study, in which 42 pregnant individuals with GDM and 28 pregnant individuals without a diagnosis of GDM who were in the 24-28th gestational week of pregnancy were evaluated, no difference was found between the groups in terms of body weight gain.[26]

Moreover, in this study, pre-pregnancy BMI was shown to be a determinant of restrained eating behavior scores in individuals with GDM. Likewise, in the Pregnancy, Infection, and Nutrition study, on 2006 pregnant women with a gestational week <20, it was found that anxiety and restrained eating behaviors were more common in individuals with a high pre-pregnancy BMI.[27] In a study evaluating 795 pregnant individuals in the 2003-2012 National Health and Nutrition Examination Survey, it was shown that diet quality decreased as pre-pregnancy BMI increased.[28] In a Chinese study in which 106 individuals with GDM were evaluated, high pre-pregnancy BMI was associated with excess body weight gain during pregnancy.[29]

We found no relationship between eating behaviors and nutrient consumption of individuals in our study; however, energy, CHO, vitamin B1, and B2 intakes were higher among individuals with GDM, and vitamin B6 and Ca intakes were lower among without GDM. The higher energy intake among individuals with GDM may associated with higher over-recommended body weight gain than among individuals without GDM. In particular, CHO consumption was found to be high, whereas consumption of animal-derived nutrients, B6 and Ca, which are important during pregnancy, was low.

In a Vietnamese study in which the food consumption of 60 individuals with GDM was evaluated with 24-hour food consumption records, the energy consumption of individuals was found to be 1841.7±92.2 kcal/day, dietary CHO was 243.4±16.5 g/day, the dietary protein was 84.3±3.9 g/day and Ca consumption was 700 mg/day.[30] In our findings, meanwhile, energy consumption (1965.0±433.02 kcal/day) was higher and CHO consumption (241.19±59.35 g/day) were similar, whereas dietary protein (67.53±20.32 g/day) and Ca (682.88±265.12 mg/day) consumptions were lower.

A moderate-intensity lifestyle intervention that optimizes consumption of whole grains, vegetables and fruits; reducing the intake of excessively processed food and simple sugars; and the Mediterranean diet intervention are noted to be the most successful options in the dietary treatment of GDM.[31]

CONCLUSION

In our study restrained eating behavior score was found to be higher in individuals with GDM than in nondiabetic pregnant women, and it was revealed that pre-pregnancy BMI was determinant and resulted in body weight gain above the recommendations. Furthermore, it was found that body weight gain was higher than the recommendations in individuals with GDM, more energy and CHO consumption was noted, and vitamin B6 and Ca consumption, both of which are essential during pregnancy, was less.

GDM is a critical condition for which optimal nutrition should be ensured. With planned pregnancies, identifying risky groups early, controlling body weight by assessing eating behaviors, raising awareness of individuals about healthy eating behaviors and the amount of nutrients they need, as well as ensuring their compliance and follow-up will contribute significantly to maternal and newborn health.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission Etlik Zübeyde Hanim Health Practice Clinical Research Ethics Committee (Date: 02.02.2022, Decision No: 2022/20).

Informed Consent: Written consent was obtained from the patient participating in this study.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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REFERENCES

1. Sartayeva A, Danyarova L, Begalina D, Nurgalieva Z, Baikadamova L, Adilova G. Gestational diabetes: Prevalence and rısks for the mother and child (Revıew). *Georgian Med News.* 2022;(328-329):47-52.
2. Lamanna J, Susan B. After gestational diabetes: An overlooked care transition in primary care. *J Nurse Practitioners.* 2020;16:319-323
3. Karaçam Z, Çelik D. The prevalence and risk factors of gestational diabetes mellitus in Turkey: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med.* 2021;34(8):1331-1341.
4. Yessoufou A, Moutairou K. Maternal diabetes in pregnancy: early and long-term outcomes on the offspring and the concept of "metabolic memory". *Exp Diabetes Res.* 2011;2011:218598.
5. You H, Hu J, Liu Y, Luo B, Lei A. Risk of type 2 diabetes mellitus after gestational diabetes mellitus: A systematic review & meta-analysis. *Indian J Med Res.* 2021;154(1):62-77.

6. Gupta Y, Kalra B, Baruah MP, Singla R, Kalra S. Updated guidelines on screening for gestational diabetes. *Int J Womens Health.* 2015;19(7):539-550.
7. Rasmussen L, Poulsen CW, Kampmann U, Smedegaard SB, Ovesen PG, Fuglsang J. Diet and healthy lifestyle in the management of gestational diabetes mellitus. *Nutrients.* 2020;12(10):3050.
8. Chu AHY, Godfrey KM. Gestational diabetes mellitus and developmental programming. *Ann Nutr Metab.* 2020;76(3):4-15.
9. Kim HJ, Cho E, Shin G. Experiences of changes in eating habits and eating behaviors of women first diagnosed with gestational diabetes. *Int J Environ Res Public Health.* 2021;18(16):8774.
10. Nguyen H, Le N, Tra TT, et al. Nutritional status, eating habits and foods intake by gestational diabetes patients in National Hospital of Endocrinology. *J Complement Med Res.* 2021;12(2): 143-151.
11. Lan X, Zhang YQ, Dong HL, et al. Excessive gestational weight gain in the first trimester is associated with risk of gestational diabetes mellitus: a prospective study from Southwest China. *Public Health Nutr.* 2020;23(3):394-401.
12. World Health Organization. 2000. Obesity: preventing and managing the global epidemic: report of a WHO consultation. Last reviewed May 5, 2023. Accessed May 5, 2023. https://apps.who.int/iris/handle/10665/42330
13. Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines. Weight gain during pregnancy: reexamining the guidelines. National Academies Press, Washington, 2009
14. Hui AL, Sevenhuysen G, Harvey D, Salamon E. Barriers and coping strategies of women with gestational diabetes to follow dietary advice. *Women Birth.* 2014;27:292–297.
15. Draffin CR, Alderdice FA, McCance DR, et al. Exploring the needs, concerns and knowledge of women diagnosed with gestational diabetes: A qualitative study. *Midwifery.* 2016;40:141–147.
16. Adams RC, Chambers CD, Lawrence NS. Do restrained eaters show increased BMI, food craving and disinhibited eating? A comparison of the restraint scale and the restrained eating scale of the Dutch Eating Behaviour Questionnaire. *R Soc Open Sci.* 2019;6(6):190174.
17. Nederkoorn C, Van Eijs Y, Jansen A. Restrained eaters act on impulse. *Pers Indiv Diff.* 2004;37:1651-1658.
18. Zanardo V, Cavaliere A, Giliberti E, et al. Gestational weight gain and eating-related disorders. *J Obstet Gynaecol.* 2021;41(8):1205-1209.
19. Heery E, Wall PG, Kelleher CC, McAuliffe FM. Effects of dietary restraint and weight gain attitudes on gestational weight gain. *Appetite.* 2016;107:501-510.
20. Slane JD, Levine MD. Association of restraint and disinhibition to gestational weight gain among pregnant former smokers. *Womens Health Issues.* 2015;25(4):390-395.
21. Conway R, Reddy S, Davies J. Dietary restraint and weight gain during pregnancy. *Eur J Clin Nutr.* 1999;53(11):849-853.
22. Rios JM, Miller AL, Lumeng JC, et al. Associations of maternal food addiction, dietary restraint, and pre-pregnancy BMI with infant eating behaviors and risk for overweight. *Appetite.* 2023;184:106516.
23. Johnson, JL, Farr SL, Dietz PM, Sharma AJ, Barfield WD, Robbins CL. Trends in gestational weight gain: The pregnancy risk assessmentmonitoring system, 2000-2009. *Am J Obstet Gynecol.* 2015;212(6):806.
24. Widen EM, Factor-Litvak PR, Gallagher D, et al. The pattern of gestational weight gain is associated with changes in maternal body composition and neonatal size. *Matern Child Health J.* 2015;19:2286–2294.
25. Karachaliou M, Georgiou V, Roumeliotaki T, et al. Association of trimester specific gestational weight gain with fetal growth, off spring obesity, and cardiometabolic traits in early childhood. *Am J Obstet Gynecol.* 2015;212:1–14.
26. Ćwiek D, Lubkowska A, Zimny M, Szymoniak K, Sipak-Szmigiel O. Weight gain during and after pregnancy in women with gestational diabetes mellitus-a preliminary study. *Int J Environ Res Public Health.* 2022;19(19):11959.
27. Laraia BA, Siega-Riz AM, Dole N, London E. Pregravid weight is associated with prior dietary restraint and psychosocial factors during pregnancy. *Obesity (Silver Spring).* 2009;17(3):550-558.
28. Shin D, Lee KW, Song WO. Pre-pregnancy weight status ıs associated with diet quality and nutritional biomarkers during pregnancy. *Nutrients.* 2016;8(3):162.
29. Yang Y, Wei Q, Yu H, et al. Higher pre-pregnancy body mass index is associated with excessive gestational weight gain in normal weight Chinese mothers with gestational diabetes. *J Obstet Gynaecol Res.* 2016;42(5):511-518.
30. Hung NT, Nhung LTT, Phuong TTT. Nutritional status, eating habits and foods ıntake by gestational diabetes patients in national hospital of endocrinology. *J Complement Med Res.* 2021;12(2):143-151.
31. Zugravu C, Petra A, Pietrosel VA, et al. Nutritional interventions and lifestyle changing in gestational diabetes mellitus prevention: A narrative review. *Sustainability.* 2023;15:1069.