Experimental
&
Clinical Article

The Effect of COVID-19 Lockdown on Oral Glucose Challenge Tests and Body Mass Indexes in Türk Pregnant Women

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ABSTRACT

OBJECTIVE: To investigate the glycemic status of pregnant women by the comparison of 50 g glucose challenge test results and body mass index changes in the pandemic period versus last year's test results.

STUDY DESIGN: In this case-control study two groups were constituted. Group 1 included patients who underwent a glucose challenge test in the year 2019 before the pandemic lockdown (n=604) was assessed as the control group; group 2 (n=505) included patients who underwent the same test in the year 2020 that in the pandemic lockdown period was evaluated as the study group.

RESULTS: Pandemic lockdown affected the gaining weight in every level of educational status who did not exercise, but there was only a statistical difference between university-educated participants. We could not see any negative effect of the pandemic lockdown on glucose challenge test results. But only in the university-educated participants, there was an effect on increased glucose challenge test levels.

CONCLUSION: Our study and the other studies designed like ours show that the pandemic lockdown affects our life worse.

Keywords: Coronavirus, Glucose challenge test, Lockdown, Pregnancy

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Introduction

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was informed as the factor for a series of atypical respiratory diseases in Wuhan, China in December of 2019. The disease of this virus is termed COVID-19 and was officially declared a pandemic by the World Health Organization (WHO) on March 11, 2020. The COVID-19 pandemic is still going on at the time of writing (December 2020) and causing more than 1.7 million deaths all around the world (1). The current pandemic situation has caused some mainly affected countries to set some strict rules, such as self-quarantine, closing shops – restaurants – schools, etc., working from home, and travel restrictions (2). These pandemic precautions may affect our daily lifestyle (2).

Although reproductive health (especially pregnancy) is an important public health topic during pandemics (3), there is a lack of information on how COVID-19 affects pregnancies (3). This may cause emotional stress and anxiety in pregnant women and also insufficient physical activity and changing eating habits depending on stress and anxiety may cause positive energy balance (4). Positive energy balance is associated with a higher risk of diabetes mellitus (DM) and weight gain (5).

In this study; we aim to investigate the glycemic status of pregnant women by the comparison of 50 g glucose challenge test (GCT) results and body mass index (BMI) changes during the pandemic period versus last year's test results.

Material and Method

Ethics committee approval was taken for this case-control study from Etlik Zubeyde Hanim Local Ethics Committee (September 14, 2020; no: 2020/14/14). Informed consent was obtained from patients who participated in this study. All authors and the study protocol have complied with the World

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Medical Association Declaration of Helsinki regarding the ethical conduct of research involving human subjects. All pregnant women who had GCT in outpatient clinics in the year 2019 and 2020, were reviewed in the present study. Our hospital is a tertiary reference center with 15.000 birth per year.

Data: The data of both groups such as demographic information (age, gravidity, and parity), GCT screening gestational week, patient education levels, patient anthropometric parameters (height, weight, and body mass index), and GCT results were obtained from the patients' files or hospital records. Data on the exercise status were collected via telephone survey.

Glucose challenge test was done in two steps. Firstly, the patient drank a 50 g sugary solution. One hour later, the blood sugar level was measured. The test results, which were above 140 mg/dL, were referred to further testing to determine the diagnosis (6). ΔGCT was calculated as, mean GCT (in pre-pandemic period)-mean GCT (in lockdown period).

Low-threshold recommendations for exercise status were targeted at 10,000 steps/day in the present study. Participants were asked about the exercise status of the target limit of 10.000 steps per day with a telephone survey. When not reached on the first attempt, each participant was called on each available phone number a maximum of two times. If a participant did not answer the call after the second call, would exclude from the present study.

Body mass index was calculated as a person's weight in kilograms divided by the square of height in meters. ΔBMI was calculated as mean BMI (in pre-pandemic period)-mean BMI (in lockdown period).

Patient educational stages were evaluated in four groups as; primary school, high school, and university.

The inclusion criterion for this study was singleton pregnancies that had 50 g GCT.

The exclusion criteria for this study were multiple pregnancies, presence of maternal systemic disease, pregnant women younger than 20 and older than 40 years old, and BMI <20 and >29 kg/m^2.

179 participants with BMI <20 or >29 kg/m2 in the control group and 186 participants with BMI <20 or >29 kg/m^2 in the study group were excluded from the study.

Two groups were constituted; group 1 included patients who underwent GCT in the year 2019 before pandemic lockdown (n=588) was assessed as the control group; group 2 included patients who underwent the same test in the year 2020 that was in pandemic lockdown (n=500) was evaluated as a study group. Informed consent was obtained from all patients.

The flowchart of the study population is shown in figure 1.

Statistical Analysis

The patient's demographic and clinical characteristics were summarized with means, standard deviations, and median values to describe the patients. Normality assumptions of

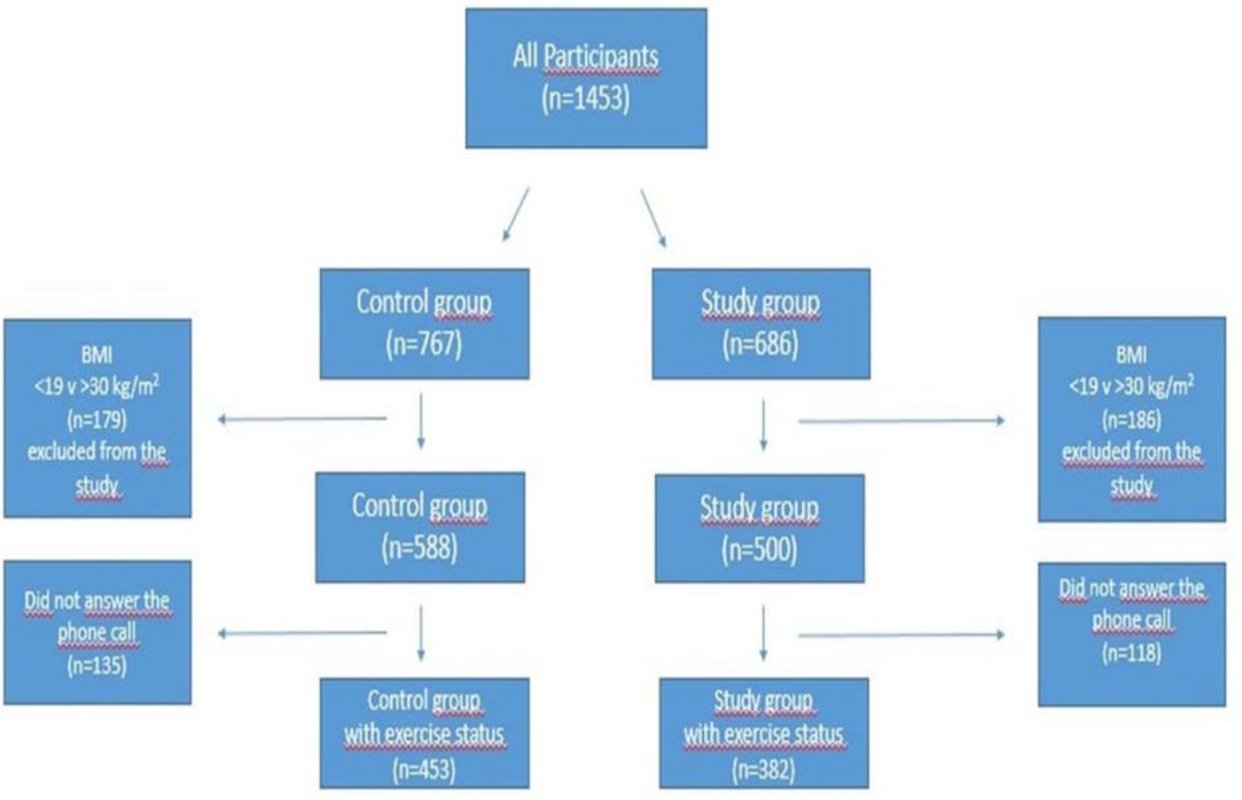

Figure 1: Flow chart of the study

continuous variables were evaluated by the Kolmogorov-Smirnov test. In cases where continuous variables were non-normally distributed, the Mann-Whitney U test was used to compare two groups. The relationships between categorical variables were compared using the Chi-square test. All data were analyzed using SPSS software version 22 for Windows and a *p*-value of <0.05 was considered statistically significant.

Results

A total of 1474 patients were included in the study. 195 participants with BMI <20 or >29 kg/m^2 in the control group and 191 participants with BMI <20 or >29 kg/m^2 in the study group were excluded from the study. The demographic and medical characteristics of all patients are listed in table I. As seen in table I, mean age, gravidity, parity, gestational week, GCT, and BMI results were concluded. The mean value of age, parity, and BMI of group 1 was significantly higher than group 2 (p<0.001; p=0.036; 0.036).

Educational stage parameters were concluded as 438 were primary school educated (40.2%), 513 were high school educated (47.2%) and 137 were university-educated (12.6%). When the education levels of the participants were compared by years, the p-value was found to be significant at <0.001. In group 1, 189 were primary school educated (32.2%), 356 were high school educated (60.5%), 43 were university-educated (7.3%), and in group 2, there were 249 (49.8%), 157 (31.4%), and 94 (18.8%) participants, respectively. Group 2 had a higher rate of patients with primary school and university education.

1088 participants had a telephone survey for exercise status. 135 participants in group 1 and 118 participants in group 2 did not answer the call after the second call and so, they were excluded from the present study. In group 1, 246 (54.3%) participants took 10.000 steps per a day; while 229 (59.7%) participants did in group 2 respectively. 207 (45.7%) participants in group 1 and 153 (40.1%) participants in group 2 did not take 10.000 steps per day. There was no significant difference in exercise status between groups (p=0.101). But we added education variables to both groups, and the exercise status significantly increased at higher education levels (p=0.001).

In table II, the changes in ΔBMI and ΔGCT after a 3-month lockdown according to education level characteristics and exercise status were shown.

Discussion

In our world, the incidence of obesity and DM is increasing rapidly day by day, and this is due to unhealthy nutrition

Table I: *Demographic parameters of the groups*

Parameters	Group 1 (n=588)	Group 2 (n=500)	*p* (<0.05)
Age (years ± SD)	29.27 ± 4.13	28.07 ± 4.73	<0.001
Gravidity (mean ± SD)	2.43 ± 1.33	2.28 ± 1.22	0.064
Parity (mean ± SD)	1.06 ± 0.92	0.94 ± 0.90	0.036
GW (mean ± SD)	25.46 ± 1.27	25.64 ± 1.50	0.340
BMI (kg/m^2 ± SD)	25.54 ± 2.36	25.23 ± 2.53	0.036
GCT (g/dL ± SD)	123.64 ± 33.41	120.20 ± 31.29	0.810

GW: Gestational week, BMI: Body mass index, GCT: Glucose challenge test, p<0.05

Table II: *Changes in ΔBMI and ΔGCT after 3-month lockdown according to educational and exercise status characteristics*

Parameters		Group 1 n (%)	Group 2 n (%)	ΔBMI (kg/m^2)	*p*	ΔGCT (g/dL)	*p*
Educational status							
Pr. school (n=320)		143 (45)	177 (55)				
Exercise	No (n=153)	73 (48)	80 (52)	+0.74	0.060	-5.83	0.273
	Yes (n=167)	70 (42)	97 (58)	-1.43	<0.001	-6.73	0.200
High school (n=395)		274 (69)	121 (31)				
Exercise	No (n=174)	124 (71)	50 (29)	+0.77	0.054	-6.36	0.232
	Yes (n=221)	150 (68)	71 (32)	-1.33	<0.001	-2.73	0.568
University (n=120)		36 (30)	84 (70)				
Exercise	No (n=33)	10 (30)	23 (70)	+2.90	0.001	+3.21	0.783
	Yes (n=87)	26 (30)	61 (70)	-0.70	0.189	+8.69	0.262

BMI: Body mass index, GCT: Glucose challenge test, p<0.05

and fewer exercises in daily life (7). To our knowledge, this study is the first research article designed to investigate the effect of quarantine mode on GCT results and BMI in Turkish pregnant women during the COVID-19 pandemic. When we look through our results, there are no statistical differences in the results of GCT and BMI changes in the three-month lockdown period.

Lockdown is a term, nowadays used as self-quarantine, and is typically based on "stay-at-home" or "shelter-in-place" strict rules set up by the national government, for imposing social distancing and hence limiting or completely restricting the movement of the population (8). This situation caused a greater risk of a sedentary lifestyle and so reduction of movements on one side; but on the other side, an increased possibility to eat always every repast at home, the impossibility to consume processed food or prepared meals by restaurants/cafeterias, and the availability of more time to cook by yourselves. Besides these situations, emotional stress and anxiety caused by the pandemic period make positive energy balance on metabolism (4,5). All these factors with a prolonged lockdown period were associated with glucose intolerance and weight gain (9).

Karatas S, et al. determined that a prolonged lockdown period increased body weight. After the six months lockdown period, body weight gain was observed even without metabolic disorders in non-diabetic participants (9). In Zimbabwe, Matsungo TM et al. investigated the effect of the pandemic lockdown on nutrition, health, and lifestyle patterns (10). In their study, they indicated that participants' activity levels decreased and perceived weight gain during the lockdown period, this situation caused to increase in the risk of overweight and obesity (10). In the study which was reported by Bhutani S, et al., they aimed to investigate the longitudinal weight gain and related risk behaviors in adults during the peak of the lockdown period (11). Their results indicated that although the peak of the lockdown period took a short time, the effects of this period on daily life could affect longer-term management of weight-related behaviors, putting people at greater risk of pandemic-related weight gain (11).

In our study, we used the 3-month lockdown period data to evaluate GCT and BMI changes in pregnant women. There was no statistical difference in GCT results in the main table. But surprisingly, the BMI values of group 2 were significantly decreased. When we added educational and exercise status variables, ΔGCT and ΔBMI values of the participants with university education who did not exercise were +3.21 mg/dL and +2.90 kg/m^2 respectively during the 3-months lockdown. And, also in the same group, the values of the participants with university education who did exercise, ΔGCT and ΔBMI were +8.69 mg/dL and -0.70 kg/m^2, respectively. These rates were not statistically significant compared to university-educated participants who did exercise or not (p=0.262 and p=0.189). In both primary and high school educated participants who did exercise, ΔGCT was -6.73 g/dL and-2.73 g/dL, respectively but these values were not statistically significant (p=0.200 and p=0.563). Also, in the same groups, ΔBMI was -1.43 kg/m^2 and -1.33 kg/m^2 respectively (p<0.001). Maybe, if we included the six months or more lockdown period data in our study, we would be able to detect statistically significant differences in all groups. This was the handicap of our article. However, in the study by Pellegrini et al., they found that patients with obesity attending their study showed an approximately 1.5 kg self-reported weight gain after the first month of lockdown (12). Self-reported anxiety or depression, lower education level, and not paying attention to the healthiness of food choices were significantly associated with that increase (12). In our study, we did not evaluate the depression or anxiety levels of participants. However, when we compared ΔBMI according to education level, we found that participants with all education levels gained more weight than those who did not exercise. We thought that was it why not, too careful attention to choosing healthy food, and might be associated with a low socioeconomic level not to buy quality-healthy food as mentioned in English medical literature before (12-14).

When we look through our GCT results in this study, there was no statistical difference in the data. However, when we compared ΔGCT according to educational status, we found that participants with lower education levels had lower GCT results than the control group. However, surprisingly, participants with university education had higher GCT results than the control group. In English Medical literature, we found a study designed by Onmez A et al, investigated the effect of the lockdown on weight gain and also glycemic parameters in patients with type-2 DM (15). This study is correlated to our study only on the glycemic parameters because we used GCT to evaluate glycemic parameters. They concluded that in addition to weight gain among type-2 DM patients, statistically insignificant increases were also observed in glycemic parameters during the pandemic period (15).

Our study had several limitations. The retrospective design allowed us to evaluate only associations. On the other hand, our sample size was limited to a 3-months lockdown period.

In conclusion, given the limitation of sample sizes in the groups and the limited lockdown period, we did not find any statistical differences in the ΔBMI and ΔGCT. However, when we evaluated the groups by their educational and exercise status, we found decreased ΔBMI in all educated levels of the participants. As our study and the other studies designed like ours show pandemic lockdown affects our life worse. Nevertheless, due to the lack of sample size, well-designed randomized controlled trials also evaluating dietary habits and other exercise patterns are required.

Declarations
Funding statement: There is no financial disclosure to be made for this study.

Disclosure statement: The authors declare that no conflicts of interest.
All authors and the study protocol have complied with the World Medical Association Declaration of Helsinki regarding the ethical conduct of research involving human subjects.
Consent to participate: Informed consent was obtained from patients who participated in this study.
Availability of data and materials: The data supporting this study is available through the corresponding author upon reasonable request.
Authors' contributions: AA and AKO collected data related to the subject. FBF, YAR, and AA were involved in writing and drafting the manuscript. YAR and AA were involved in the statistical analysis. YAR and FBF made a substantial contribution to the conception and design of the study. YEU participated in the design of the manuscript and the coordination of the study. All authors read and approved the final manuscript. This manuscript has not been published or presented completely or partially elsewhere and it is not under consideration by another journal. Authors have read and understood the journal's policies, and believe that neither the manuscript nor the study violates any of these.
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