A Comparative Study on Dietary Style and Physical Activity of Women With and Without Gestational Diabetes

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Abstract- Gestational diabetes increases the risks for mother and fetus during pregnancy. As a principle of caring for diabetes, recommending patients to lose weight through more physical activities and a restrictive diet has a long history. The present study was carried out aiming at determining and comparing dietary style and physical activity in women with gestational diabetes and healthy pregnant women. This descriptive-comparative study was carried out simultaneously on 200 pregnant women (with gestational diabetes and healthy). Tools for data collection were questionnaires of dietary style and physical activity during pregnancy. After obtaining research informed consent from samples, sampling was done by multi-stage convenience random sampling. Data was analyzed using SPSS 21. The results of the study revealed that the demographic and obstetric variables were identical. The mean scores for the dietary style of case and control groups were 65.05 and 74.12, $P<0.001$ respectively. The mean scores for physical activity (inactive cases) in the two groups were 5.64 and 4.70, $P<0.223$, the mean scores for light activity in the two groups were 9.07 and 10.75 ($P<0.059$), and the mean scores for moderate activity in the two groups were 4.62 and 5.69, ($P<0.042$) respectively. Lower status of nutrition and physical activity of women with gestational diabetes comparing to non-diabetic pregnant women suggests a need providing sufficient and accurate information on appropriate dietary and physical activities during pregnancy.

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Introduction

Prevalence of gestational diabetes is increasing throughout the world (1). Gestational diabetes is associated with increased risk for mother and fetus during pregnancy and in later stages of life. In the twentieth century we are experiencing industrialization, globalization, increased lifespan, and a change of peoples' lifestyle all over the world. An outcome of such changes is a shift in disease patterns and prevalence of chronic diseases including diabetes (2,3). The incidence of gestational diabetes in Iran is estimated as a total of 4/9% (4). More than 50% of the women with gestational diabetes will develop diabetes type 2 within the next 20 (5,6). More than 80% of the diabetes related deaths occur in middle and low income countries (2).

Health threatening behaviors which stem from inappropriate lifestyles are responsible for 1/3% of deaths in the world. Unhealthy dietary habits and inactivity become an inevitable lifestyle in the cities (2). As a principle of caring for diabetes, recommending patients to lose weight through more physical activities and a restrictive diet has a long history (7). Studies have shown a relationship between slowing down maternal weight gain, adopting a healthy diet, and physical activity with reducing the rate of gestational diabetes (8).

Recent studies have also shown that pre-pregnancy diet plan could possibly relate to the risk of gestational diabetes. The risk of diabetes is especially increased along with a low fiber diet with a high glycemic index

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(9). Studies have shown that the rates of physical activity and dietary behavior are related to pregnancy weight gain and impaired glucose tolerance in pregnant Latin American women (10). On the contrary, it was shown in a clinical trial that aerobics and resistance exercises during the second and third trimesters of pregnancy have no effect on fasting blood sugar (FBS), insulin sensitivity, and birth weight (11).

Gestational diabetes is the most common complication of pregnancy which might function as a facilitator to the future development of diabetes type 2. Having this in mind and due to the contradictory results of the mentioned studies and considering the studies carried out in different communities as well as the growing body of studies on diabetes type 2, the researcher carried out a research aiming at determining and comparing dietary style and physical activity among women with gestational diabetes and healthy pregnant women admitted to teaching hospitals of Shahid Beheshti University of Medical Sciences.

Materials and Methods

This descriptive-comparative study was carried out simultaneously on 100 pregnant women with a definite diagnosis of gestational diabetes (case group) and 100 healthy pregnant women (control group) admitted to midwifery clinics of teaching hospitals of Shahid Beheshti University of Medical Sciences.

Multistage random sampling was used. In the first stage, quota sampling was used and the samples were classified depending on the area of floors of the teaching hospitals of Shahid Beheshti University of Medical Sciences. In the second stage, a number of teaching hospitals were selected randomly each of them being considered as a cluster. In the third stage, judgmental sampling was carried out until the desired sampling unit was reached.

Inclusion criteria were: Iranian nationality, GCT>140 (glucose challenge test), age between 18-35, gestational age between 24-28 weeks based on exact and reliable LMP (last menstrual period) or first trimester ultrasound, single pregnancy, para<4, not having a history of macrosomia (birth weight>4000 g) in previous pregnancies, not having a history of stillbirth in previous pregnancies, not having a history of an abnormal fetus or infant in previous pregnancies, not having a history of diabetes in previous pregnancies, not having a family history of diabetes type 2, not having a history of recurrent abortions more than three times, no history of infertility and diagnosed PCOS (polycystic ovarian syndrome), being non-obese (BMI< 30), Lack of known chronic diseases such as blood pressure, cardiovascular disease, kidney diseases, blood diseases, autoimmune, and thyroid diseases.

Data was collected by using a checklist to assess the inclusion criteria and blood glucose; a questionnaire to get demographic and obstetric information; and the questionnaires for dietary style and physical activity assessment.

The dietary style and physical activity questionnaire consisted of 20 questions answered by participants according to Likert Scale, the maximum and minimum score of which were 60 (satisfactory diet) and 0 (unsatisfactory diet) respectively. Validity and reliability of the questionnaire were evaluated in the present study.

Physical activity was assessed using Pregnancy Physical Activity Questionnaire. In this questionnaire, physical activity is divided into three categories: physical exercises, household physical activities and leisure time activities based on per hour per week scale. Then the physical activity intensity was calculated using Metabolic Equivalent Test (MET) which is a unit for measuring energy cost of physical activities (the rate of energy consumption for a physical activity during a specific time). In order to measure activity intensity, the MET was multiplied by the time spent during one day or one week. The activity rate was calculated according to activity type by adding up the activity intensity during one day or one week. People with activities having MET values of less than 1.5, 1.5 to less than 3, 3 to 6, and more than 6 were labeled inactive, lightly active, moderately active and very active respectively. The validity of this questionnaire has been estimated and approved by Chasan-Taber *et al.,* (12). Its reliability was approved in a study by Kazemi *et al.,* with a Cronbach's alpha of 0.8513.

Considering the fact that in the present study these questionnaires were used for pregnant women for the first time, reliability and validity of each of them were evaluated. In order to examine validity, two quantitative methods were measured: content validity ratio (CVR) and content validity index (CVI). In this study, average CVR for dietary style was 0.92, and for physical activity, it was 0.85. Besides, S-CVI for dietary style was 0.92, and for physical activity, it was 0.88.

In this study CVR and CVI values in each zone and for every question were acceptable and no questions were eliminated. The reliability of the study was evaluated using test-retest method. Test-retest for dietary style was 0.85, and for physical activity, it was 0.90.

Sampling was performed after obtaining written approval from the ethical committee of Shahid Beheshti University of Medical Sciences. Women with inclusion criteria entered the study after obtaining their written informed consent forms which were attached to the questionnaires. Based on the blood glucose level and diagnostic criteria (GCT>140) for gestational diabetes during weeks 24-28, women were categorized into two groups of the case (those with gestational diabetes) and control (healthy pregnant women). After explaining the purpose and methods of the study to the participants, the questionnaires including demographic and obstetric characteristics forms as well as dietary style and physical activities in pregnancy questionnaires were completed through the interview. The above-mentioned variables of women were studied from their beginning of pregnancy to the week 28 (before the diagnosis of gestational diabetes).

SPSS ver. 21 was used for data analysis. Descriptive statistics was used to provide frequency tables, diagrams, percentage, mean, and standard deviation; inferential statistics including T-test, *Chi*-square test, odds ratio, and Mann-Whitney u tests were used to analyze and find the relationships and differences.

Results

In this study, the comparison of two groups revealed no statistically significant difference between them in terms of possible confounding variables in gestational diabetes including age, Gestational Age in first care (week)**,** BMI pre-pregnancy (kg/m2) (Table 1), para, gravida, gestational age, the number of abortions and socio-economic factors like education, occupation, and accommodation.

Table 1. Comparison of mean score of demographic and obstetric characteristics of women with GDM and non GDM

Variable	GDM (n=100)		Non GDM (n=100)		*P*
	Mean	SD	Mean	SD	
Age (year)	28.68	3.835	27.8	4.569	0.181
Gestational age in first care (week)	5.88	2.679	5.31	2.953	0.154
BMI pre pregnancy (kg/m2)	23.83	2.940	23.90	3.350	0.866

It was also revealed that there were no statistically significant differences between the two groups regarding obstetric variables such as age of first pregnancy, prenatal care, first prenatal care gestational age, while there were statistically significant differences between the two groups regarding joining childbirth classes and pregnancy water exercises (Table 2).

Findings of the study suggest that there is a significant difference between pregnancy dietary styles of the two groups (Table 3). The mean of activity duration of a MET value less than 1.5 and a low intensity activity showed no difference between the two groups while the mean of activity duration with a moderate intensity was significantly higher in the control group comparing to the case group (Table 4).

Table 3. Frequency and comparison of mean score of dietary style in women with GDM and non-GDM

Gestational diabetes dietary style	GDM (n=100)		Non GDM (n=100)		Independent T-test result
	frequency	Percentage	Frequency	Percentage	
Average (34-66)	55	55	22	22	
Normal (67-100)	45	45	78	78	
Sum	100	100	100	100	*P*<0.001
Mean	65.05		74.12		
Standard deviation	9.68		9.90		

Table 4. Comparison of mean of physical activity duration depending on its intensity in women with GDM and non-GDM

Gestational diabetes activity intensity (MET)	GDM (n=100)	Non GDM (n=100)	Independent T-test result
	M(SD)	M(SD)	
Inactive/leisure time activity (<1.5)	5.64(2.712)	4.70(3.747)	*P*=0.223
Light activity=household activity (1.5-<3)	9.07(5.524)	10.75(6.886)	*P*=0.059
Moderate activity=exercise (3-6)	4.62(7.520)	5.69(4.469)	*P*=0.042

Table 2. Frequency and distribution of demographic characteristics and obstetric in women with GDM and non-GDM

Variable		GDM (n=100)		Non GDM (n=100)		*P*
		N	%	N	%	
Education	Illiterate	1	1	1	1	0.773
	Primary school	3	3	3	3	
	Middle school	25	25	14	14	
	High school	40	40	58	58	
	University	31	31	24	24	
Occupation	Householder	86	86	92	92	0.175
	Employed	14	14	8	8	
Accommodation	Personal	38	38	39	39	0.884
	Rental	62	62	61	61	
Gravida	1	43	43	50	50	0.411
	2	38	38	32	32	
	3	16	16	15	15	
	4	3	3	3	3	
Gestational age(week)	24-27	12	12	9	9	0.584
	28-31	25	25	24	24	
	32-35	34	34	37	37	
	36-40	29	29	30	30	
Parturition	0	57	57	62	62	0.563
	1	34	34	28	28	
	2	9	9	10	10	
Abortion	Yes	26	26	23	23	0.622
	No	74	74	77	77	
Prenatal care	Yes	27	27	30	30	0.638
	No	73	73	70	70	
Perinatal preparation Classes	Yes	13	13	26	26	0.020
	No	87	87	74	74	
Aquagymnastic	Yes	3	3	11	11	0.027
	No	97	97	89	89	

Discussion

Findings of the study suggest that there is a significant difference between pregnancy dietary styles of the two groups. Akondan *et al*., (2011) found that western dietary pattern increases the risk of gestational diabetes (14). Zhang *et al*., (2006) found that a consistent high fiber and fruit rich diet before pregnancy has a significant relationship with reducing the risk of gestational diabetes. Daily absorption of 10 grams of fiber reduces gestational diabetes by 26% while a high glycemic index diet has a positive relationship with the risk of gestational diabetes (9). Jahanpak *et al*., (2013) found that women with gestational diabetes do not have a satisfactory nutritional and physical activity level, in other words, nutritional status of most pregnant women (68.7%) was relatively normal (15). In the same vein, in our study dietary style of most women (55%) was average. Owing to the fact that results of other studies are in the same line as well, we regard this as a proof of the necessity of paying attention to women's pregnancy dietary style and taking related educational and counseling measures.

The mean of activity duration of a MET value less than 1.5 and a low intensity activity showed no difference between the two groups while the mean of activity duration with a moderate intensity was significantly higher in the control group comparing to the case group. Researchers found that doing recreational moderate and intense physical activities measured in MET leads to a 27% reduction of the risk of increased glucose during pregnancy (16). The beneficial biologic effects of physical activities on blood glucose metabolism and sensitivity to insulin in non-pregnant women is well known. Doing physical activities reduces blood glucose density, increases sensitivity to insulin, improves the cardiovascular system, and decreases body fat. There is evidence that these effects occur with

regards to sensitivity to insulin during pregnancy. Besides, physical activity leads to cell sensitivity to insulin, fat mass and lipid density modification, reduction of pre-inflammatory cytokines and C-reactive protein (CPR) in peripheral blood circulation which can repair the process of endothelial dysfunction (17). In a meta-analysis study, Tobias *et al.*, (2011), concluded that performing consistent physical activities before or at the first stages of pregnancy could potentially prevent gestational diabetes (18).

On the other hand, Oostdam *et al.*, (2009) carried out a clinical trial including an exercise plan for obese and overweight pregnant women at risk of gestational diabetes during their second and third trimesters and found out that implementing exercise intervention during this stage of pregnancy has no effect on fasting blood sugar, sensitivity to insulin and birth weight. In this study physical activity data collection was conducted based on self-report by participants (11). It seems that mother's concerns regarding pregnancy exercises are caused by lack of knowledge about safe pregnancy exercises and how to do these exercises. Misinformation affects their behavior which makes them choose a sedentary lifestyle during pregnancy (19). Due to the fact that most pregnant women think they are not allowed to do any physical activities or because they do not have enough information about the duration and of physical activities.

The findings of the study showed that members of the control group had a better dietary style. Besides, no significant difference was observed between the mean of activity duration with a MET value less than 1.5 and low intensity for the two groups. But the mean of moderate intensity activity was significantly higher in in the control group comparing to that of the case group.

The results of our study suggest that health care personnel particularly midwife can provide enough information on physical activities during pre-pregnancy and prenatal visits. It is possible to prevent gestational diabetes by appropriate counseling and making pregnant women aware of having an appropriate and healthy lifestyle during pregnancy and any intervention that might improve it.

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