JOURNAL OF COMPLEMENTARY MEDICINE RESEARCH

RESEARCH ARTICLE

Nutritional Status, Eating Habits and Foods Intake by Gestational Diabetes Patients in National Hospital of Endocrinology

NGUYEN TRONG HUNG[1], LE THI TUYET NHUNG[2], TRAN THI TRA PHUONG[1], HA THI VAN[1], CHU THI TRANG[3], PHAM THI THU HUONG[1], NGUYEN THI LAM[1], NGHIEM NGUYET THU[1], PHAN HUONG DUONG[4], TRAN NGOC LUONG[4], LE DANH TUYEN[1]

[1] *National Institute of Nutrition, 48B Tang Bat Ho Street, Hanoi, Vietnam, Email: nguyentronghung9602@yahoo.com.*

[2] *Andrology and Fertility Hospital of Hanoi, 431 Tam Trinh Street, Hanoi, Vietnam*

[3]*Vietnam-Germany Friendship Hospital*

[4]*National Hospital of Endocrinology, 215 Ngoc Hoi Street, Hanoi, Vietnam*

ABSTRACT

A cross-sectional study of 60 gestational diabetes mellitus patients who were examined and treated at National Hospital of Endocrinology in 2017 aimed to determine the nutritional status, eating habits and foods intake by these subjects. The results were most gestational diabetes mellitus patients had a body mass index of 18.5 ≤BMI <25 (76.7%); the rate of overweight and obesity was 6.7%, malnutrition was 16.6%. Total dietary energy was 1841.7±92.2kcal and energy level of 29.5±1.5kcal/kg body weight. Dietary protein was 18.7%, dietary lipid was 29%, dietary carbohydrate was 52.3% for total energy. the iron in the diet of gestational diabetes was 14.5±0.9mg/day. The folate intake approximately 400mcg/day, the calcium intake 700mg/day, the vitamin D in the diet was 20IU/day, vitamin B12 about 2.3mcg/day and zinc about 13.5mg/day. The percentage of gestational diabetes mellitus patients who ate ≥ 3 meals per day saw the highest rate of 76.7%; gestational diabetes mellitus patients ate 1 meal with the lowest rate of 3.3%. In terms of the frequency of food consumption, meat was the highest group of food consumption with 100% and seafood fish types were 10%. Rice - the highest consumed food accounted for 100%, then to the bread, dumplings taking up 10%. Oil, peanut group consumed accounted for 86.7% whereas the lowest group was animal's fat with 3.3%. All kinds of vegetable consumed recorded 96.7%. In conclusion, the nutritional diet of women with gestational diabetes with the ratio of 3 thermogenic substances Protein: Lipid: Carbohydrate were 18.7:29:52.3, which was not consistent with the guidelines of the American Diabetes Association 2017 but also quite consistent with the nutritional facts and habits in Vietnam.

KEYWORDS:
Nutritional status, gestational diabetes mellitus (GDM), National Institute of Nutrition, National Hospital of Endocrinology

ARTICLE HISTORY:
Received April 10, 2021
Accepted April 22, 2021
Published May 20, 2021

DOI:
10.5455/jcmr.2021.12.02.17

VOLUME: 12
ISSUE: 2
ISSN: 2146-8397

INTRODUCTION

Diabetes mellitus is a chronic disease characterized by chronic hyperglycaemia along with disturbances of metabolism of carbohydrates, proteins, and lipids due to decreased insulin secretion, decreased ability to function

insulin or both [1]. Gestational diabetes mellitus (GDM) is a special type of diabetes. This is a common metabolic disorder in pregnancy, ranging from 1-28% [2] and is on the rise, especially in the Asia-Pacific region, including Vietnam [3], [4], [5]. The World Health Organization (WHO) definition, GDM is a disorder of glucose tolerance at any level, onset or first detected during pregnancy [6]. Compared with whites, the risk of gestational diabetes increased by 7.6 times in Southeast Asians [7]. In Vietnam, the estimated incidence of the disease is from 5.9 to 39% depending on the method of

screening, screening pregnancy week, diagnostic criteria and population characteristics [3], [8].

The first of gestational diabetes mellitus diagnostic criteria recommended by John Oimullivan and Claire Mahan in 1964. They set up diagnostic criteria based on the incidence of related diseases. Those who meet this diagnostic criterion are at increased risk of complications for the newborn and are particularly at increased risk of diabetes mellitus in the future with a 28-year follow-up period [9]. In 2010-2011, The International Association of the Diabetes and Pregnancy Study Group (IADPSG) and American Diabetes Association (ADA) agreed to standard of diagnosis of gestational diabetes [10], [11]. If gestational diabetes is not diagnosed and treated, there is a high risk of obstetrical and pediatric complications such as pre-eclampsia, abortion, stillbirth, neonatal pregnancy, perinatal death, and fetal enlargement, increase the risk of difficult delivery and cesarean delivery [12], [13], [14] ... Infants of mothers with gestational diabetes are at risk of hypoglycemia, hypocalcemia, jaundice, when older children will be at risk of obesity, diabetes typ 2 [15], [16]. About 30-50% of women with gestational diabetes will get gestational diabetes at the next pregnancy [17]. Approximately 20-50% of mothers with gestational diabetes will became diabetes mellitus in 5-10 years after birth [18], the risk of type 2 diabetes increases 7.4 times [17]. As recommended by the American Diabetes Association, women at high risk of gestational diabetes should be screened for screening for gestational diabetes at the first pregnancy check-up. [19].

Many studies on gestational diabetes have been conducted, so the knowledge about the disease and its control is increasingly effective. The research results in Vietnam and the world show that the incidence of disease is on the rise day by day. A study conducted in the Department of Endocrinology at Bach Mai Hospital (2012) showed that the rate of pregnant women with gestational diabetes accounted for 39% [3]. Moreover, the research results also pointed out some risk factors for gestational diabetes: family history, history of disease, nutritional status before pregnancy, weight gain and regimen. Nutrition of pregnant women during pregnancy [20], [21], [22], [23], [24].

Recently studies have demonstrated the effectiveness of dietary modifications for the treatment of gestational diabetes: good blood sugar control and reduction of obstetric complications [3], [25], [26], [27]. The National Hospital of Endocrinology is a terminal hospital for the treatment of endocrine diseases and metabolic disorders and is in charge of the National Diabetes Prevention Program. Therefore, we conducted the project: "Nutritional status, eating habits and food intake of gestational diabetes patients in National Hospital of Endocrinology". The aims of this study have evaluated diet of pregnant women with gestational diabetes as well as describe some characteristics: family history, history of disease, nutritional status before pregnancy, weight gain during pregnancy to the situation Diabetes pregnancy. And at the same time, it also helps to provide more information in nutrition counseling for pregnant women with gestational diabetes.

MATERIALS AND METHODS

Study Subjects

A cross-sectional study was designed to collecting 60 pregnant women who came for examination and treatment at the Department of Reproductive Endocrinology at National Hospital of Endocrinology in 2018.

This study used the cut-off points for the diagnosis of gestational diabetes mellitus based on the American Diabetes Association criteria 2011 [28].

Women have testing undertaken at 24–28 weeks of gestation who found not to have diabetes mellitus before. The test should be done in the morning after an overnight fast of between 8 and 14 h and after at least 3 days of unrestricted diet (≥ 150 g carbohydrate per day) and unlimited physical activity. The subject should remain seated and should not smoke throughout the test. At least one of the venous plasma concentrations must be met or exceeded for a positive diagnosis (Table 1).

Table 1: Diagnosis of GDM with a 75-g oral glucose load

	mg/dl	mmol/l
Fasting	92	5.1
1 h	180	10.0
2 h	153	8.5

Exclusion: Patients with diabetes before pregnancy, patients with diseases affecting carbohydrate metabolism (Basedow, hypothyroidism, cushing, adrenal myeloma, liver failure, kidney failure ...), patients are using drugs affecting carbohydrate metabolism (corticosteroids, salbutamol, sympathomimetics blockers, thiazide diuretics ...) or are suffering from acute diseases.

Sampling size and sampling method

Used a sample size formula describing the characteristics of a patient with gestational diabetes

$$n = \frac{t^2.\delta^2.N}{e^2.N + t^2.\delta^2}$$

In which: n: number of patients, t: normalized percentile (t = 2, probability 0.954). 6: standard deviation = 187.5 (standard deviation taken from a previous study [29]). e: permissible error = 50Kcal (error in the question to write the serving size is 35-50Kcal). N: 1000 (is the number of patients hospitalized with gestational diabetes in 1 year). Number of patients: n =

54 patients, with 10% prophylaxis, the sample size needed to collect was 60 patients.

The study sample was selected based on the convenient sampling method. All patients who stayed in hospital during the time of conducting the study and met the selection criteria above were selected for the study until there were enough sample sizes.

Variable research

The height of students was measured in centimeters (cm) by the Microtoise stature meter with the precision of 0.1 cm, while weight was measured in kilograms (kg) using a Tanita digital scale. Body mass index (BMI) was then calculated, and overweight and obesity were classified based on the gender- and age-specific BMI and World Health Organization (WHO 2000): BMI= Weight (kg)/Height^2 (m) (Table 2). [30].

Table 2: BMI classification [6]

BMI (kg/m^2)	Classification
< 18,5	Chronic Energy Disease
18,5 – 24,9	Healthy Weight
25 – 29,9	Overweight (Pre-obesity)
≥ 30	Obesity

- Diet of pregnant women (Protein, Lipid, Carbohydrate)
- Eating habits of pregnant women (Eat on time, number of meals a day)
- Frequency of food consumption (group of meat, fish, rice, cooking oil, fat, green vegetables)

Methods of information collection

Interviewed subjects from the date of admission using questionnaires combined with oral record. Subjects to record the 24 hours dietary recall were asked. Diets are calculated nutritional values according to a table developed by the National Institute of Nutrition based on data on nutritional ingredients of foods in Vietnam [9]. The frequency of consuming certain foods in the past month of study subjects is recorded. The frequency is classified according to the landmarks: Never, 1-3 times/month, 1-2 times/week, > 2-4 times/week, ≥ 2 times/day, 1 time/day.

Collect measurements of weight and height of subjects by asking pregnant women directly on interview date.

Statistical Analyses

The database was established using EpiData software (EpiData Association, Odense, Denmark, http://www.epidata.dk/). Reseach was carried out using Stata 12.0.

Ethical consideration

This study was approved by The Ethics Review Board. All procedures and experiments performed in studies involving human participants were in accordance with approved guidelines and regulations, and written informed consent was obtained from each participant.

RESULT

Table 1. General characteristics of the study object

General characteristics	Statistical value (n=60, %)
Age, years	
< 25	6.7%
25- 35	63.3%
≥ 35	30%
Education	
Uneducated and Primary school	3.3%
Junior school	0 %
High school	20%
College and above	76.7%
Gestational age at admission, weeks	31.1 ± 0.7
Parity	
1	33.3%
2	23.3%
≥3	43.4%
Personal history	

Diabetes	0%
Glucose tolerance disorder	6.7%
Gestational diabetes in the previous pregnancy	3.3%
Family history of diabetes **Yes, %**	33.3%
Pre-pregnancy BMI	
< 23, %	83.3%
≥ 23, %	16.7%
Plasma glucose (mmol/l)	
Fasting ≥ 5.1	5.1±0.13 56.7%
1 hour (mmol/l) ≥ 10.0	10.9±0.33 73.3%
2 hour (mmol/l) ≥ 8.5	9.0±0.26 76.7%
HbA1C	5.4±0.08

Table 1 shows hat, approximately 63.3% of study participants are between 25-35 years old with the majority of education being college and above levels, accounting for 76.7%. The average gestational age was about 31 weeks (31.1 ± 0.7) since it was in the second and early trimester of pregnancy. Number of pregnancies ≥ 3 times was 43.4%. History of gestational diabetes in previous pregnancy was 3.3%, history of glucose tolerance disorder was 6.7%. In this study, 33.3% family history of having siblings having diabetes. The nutritional status of patients with gestational diabetes pre-pregnancy with BMI> 23 was 16.7%. After glucose tolerance test, the ratio of fasting, after 1 hour of testing and after 2 hours were 56.7%, 73.3% and 76.7% respectively. The HbA1C result in these patients was 5.4 approximately.

Table 2: Nutritional status and gain weight according to the nutritional status pre-pregnancy of study participants

Nutritional status pre-pregnancy BMI, kg/m²	**Statistical value (n=60,%)**	**Weight gain at pregnancy (kg/week)**	**Recommendations to gain weight according to IOM 2009 (kg/week) [31]**
Malnutrition **BMI < 18.5**	16.6%	0.46±0.8	0.45-0.59
Normal 18.5 ≤ BMI ≤ 24.9	76.7%	0.66± 0.05	0.36-0.45
Overweight 25.0 ≤ BMI ≤ 29.9	6.7%	0.93±0.29	0.23-0.32
Obesity BMI > 3.0	0%	0	0

Nutritional status of study subjects was shown in table 2. The history of pre-pregnancy weight of gestational diabetes indicated the result. In particular, the majority (76.7%) of patients with gestational diabetes had normal nutritional status, 16.6% study subjects had impaired malnutrition and 6.7% with overweight. The patients who gestational diabetes normal status gained weight of 0.66±0.05kg/week and 0.93±0.29kg/week in overweight pre-pregnancy, higher than patients with gestational diabetes who were pre-pregnancy malnutrition (0.46±0.8kg/week) and recommendations to gain weight according to IOM 2009.

Table 3: Eating habits of study participants

	Percentage (%)
Frequency of meal consumption	
Three times a day	100
Frequency of snack consumption	
≥3	76.7
2	20.0
1	3.3
End of time of last meal	
< 19h	0
19h -21h	56.7
>21h	46.3
Hobby of eating sugary foods	63.3

Table 3 showed the regularity of the meal and snack consumption of the subjects. Investigation on nutritional habits indicated that 100% of study participants consumed 3 meals a day, more than 95% of all subjects consumed 2 or 3 snacks a day. The last meal usually ended late between 19:00 and 21:00 (56.7%) and after 21 hours (46.3%). The majority of patients with gestational diabetes (63.3%) like to eat sugary foods (cakes, candies, soft drinks ...).

Table 4: Nutrient intakes status of the subjects

Nutrients	**Value**
Energy, kcal	1841.7±92.2
Energy level, kcal/kg body weight	29.5± 1.5
Carbohydrate, g % total energy	243.4± 16.5 52.3 ± 2.0
Protein, g % total energy	84.3± 3.9 18.7±0.67
Lipid, g % total energy	59.1± 4.2 29.0±1.6
Saturated fattty acide –SFA, g % total energy	15.7± 1.2 7.7±0.4
Monounsaturated fatty acide –MUFA, g % total energy	17.7±1.6 8.5±0.6
Cholesterol, mg % total energy	299.2± 41.6 0.15±0.02
Iron, mg	14.5 ± 0.9
Folic acid, µg	403.5 ± 54.4
Calcium, mg	707.2 ± 44.4
Vitamin D, IU	21.3 ± 5.8
Vitamin B12, µg	2.3 ±0 .19
Zinc, mg	13.5 ± 0.75

Analysis of actual diets of study subjects was showed in Table 4. Total dietary energy was 1841.7±92.2kcal and energy level of 29.5±1.5kcal/kg body weight. The carbohydrate intake (243.4±16.5g/day) constituted 52.3±2.0% of total dietary energy. The protein intake of the respondents was 84.3±3.9g/day (equivalent to 18.7±0.67% total dietary energy). Amount of lipid intake was 59.1±4.2g/day, constituted 29.0±1.6% of the total dietary energy. In which, the SFA fat constituted 7.5% and the MUFA fat constituted 8.5% of the total dietary energy. The cholesterol intake 299.2± 41.6mg/day.

Analysis of the ration of some vitamins and minerals showed that the iron in the diet of gestational diabetes was 14.5±0.9mg/day. Amount intake of folate, calcium, vitamin D, vitamin B12 and zinc were 403.5µg/day, 707mg/day, 21.3IU/day, 2.3µg/day and 13.5mg/day respectively.

Table 5: Foods frequency of consumption of the subjects

Food Item	Number of times consumed					
	Daily	3-5 per week	1-2 per week	1-2 per month	Sometime	No
Carbohydrate group						
Rice	100%	-	-	-	-	-
Potato, sweet potato	6.7%	16.7%	46.7%	30%	-	-
Noodles	-	23.3%	43.3%	33.3%	-	-
Bread, dumplings	10%	33.3%	46.7%	10%	-	-
Cakes, ice-cream, …	23.3%	20%	46.7%	10%	-	-
Protein group						
Meats	100%	-	-	-	-	-
Seafoods	10%	43.3%	43.3%	3.3%	-	-
Beans	-	30%	70.0%	-	-	-
Eggs	10%	46.7%	40%	3.3%	-	-
Lipid group						
Vegetable oils	86.7%	10%	3.3%	-	-	-
Animal fat	3.3%	3.3%	13,3%	-	80%	-
Peannut/ Sesame	6.7%	3.3%	60%	30%	-	-
Nuts	6.7%	-	-	-	93.3%	-
Vitamin and Mineral group						
Green vegetables	96.7%	3.3%	-	-	-	-
Ripe fruits	96.7%	3.3%	-	-	-	-
Milk and Drink group						
Milks	86.7%	6.7%	6.7%	-	-	-
Diabetic milk	10%	-	-	-	90.0%	-
Soft drinks	3.3%	3.3%	90%	3.3%	-	-
Beer, wine	-	-	-	-	3.3%	93.3%

As for high carbohydrate foods, the frequency of rice consumption was daily, all kinds of potatoes, noodles, cakes consumed with a frequency of once or twice per week were 46.7%. Among those, for high protein foods, the daily consumption of meats (of poultry and livestock) was 100%, seafood and aquatic products about 3 to 5 times a week, 43.3%, and legumes once or twice per week was 70%, eggs with frequency of 3-5 times per week was 46.7%. With high lipid foods, the daily oil consumption frequency was 86.7%, the use of animal fats was seldom 80%, and the seldom use of fatty nuts (walnuts, cashews ...) was 93.3%. To turn to, foods rich in vitamins and minerals, the daily consumption of ripe green vegetables and fruits was 96.7%. Some types of drinking water are seen. 86.7% of pregnant diabetic women drink milk every day, drink soft drinks once or twice per week is 90% and consume beer/alcohol seldom 3.3%.

DISCUSSION

Currently there are many studies and standards on gestational diabetes. However, in order to update and properly assess the status of gestational diabetes in Vietnam, like recent epidemiological studies, we apply the criteria for evaluating gestational diabetes according to the American Diabetes Association ADA 2017 [32].

According to many studies as well as published by the American College of Obstetricians and Gynecologists, pregnant mothers under the age of 25 years are considered to be less at risk of gestational diabetes. The higher the age, the greater the risk. Pregnant women between the ages of 25 and 35 are considered to be moderate risk factors and 35 and older are considered high risk factors [33]. This study has shown that about 63.3% of women with gestational diabetes between the ages of 25 and 35 and about 30% of pregnant

women with gestational diabetes are over 35 years old. The study of Jane E. Hirst et al. showed that the average age of pregnant women with gestational diabetes was 31.21 ± 4.16 higher than the non-gestational group. 27.85 ± 4.73 [34]. Research by Ostlund also shows that mother age ≥ 25 risk of gestational diabetes increased 3.37 times compared to the group <25 years old [35]. Regarding the educational level of patients with gestational diabetes, the study showed that the majority of pregnant women with secondary/college/university education accounted for 76.7%. The results of the study are similar to those of La Thi Thanh Tam et al. [36] and the study of Nguyen Khoa Dieu Van et al [3].

The average gestational age of patients with gestational diabetes is about 31 weeks (31.1 ± 0.7) from the 2nd and

early 3rd trimester. According to the American Diabetes Association ADA (2011) and the American College of Obstetricians and Gynecologists (2010) recommends screening for gestational diabetes for women from 24-28 weeks gestation. The number of pregnancies ≥ 3 times was 43.7%. History of gestational diabetes in previous pregnancies was 3.3%, history of glucose tolerance was 6.7%. Family history of parents of siblings with diabetes is 33.3%. Our research results are consistent with the results of other authors [34], [37]. Ostlund also showed that mothers with a history of gestational diabetes increased the risk of gestational diabetes by 5.59 times [35]. A study by Jane E. Hirst et al showed that: the rate of pregnant women with a history of stillbirth in gestational diabetes was 2.97%, in gestational diabetes was 3.8%, the difference is statistically significant [34].

Diagnosis of gestational diabetes when patients have one of the serum glucose values: fasting blood glucose ≥5.1 mmol/l, blood glucose after 1 hour of legal testing ≥ 10.0 mmol/l and blood glucose after 2 hours of solution testing ≥ 8.5 mmol/l. The results of the study indicate that the blood glucose test after the fasting glucose test after 1 hour of legal testing and after 2 hours solution test were 56.7%, 73.3% and 76.7% respectively. The HbA1C index is a measure of the stability of blood sugar in the last 3 months. According to the ADA 2017, the HbA1C is recommended for women with diabetes in early pregnancies with a goal of <6-6.5%. If the mother is at risk of hypoglycemia, it is up to the individual patient to set the target HbA1 <7%. In the 2nd and 3rd pregnancy should optimize HbA1C <6% and should check the HBA1C index monthly. According to the results of the above study, the HbA1C in these patients is about 5.4 ± 0.08, meaning that the target is at the optimal level.

Monitoring pregnant women Gestational diabetes not only monitors blood glucose indicators, it was important to control and monitor the weight of pregnant women. According to IOM 2009 recommendations for weight gain in women Diabetes, the weight gain of pregnant women depends on weight before pregnancy. A pregnant woman before malnutrition in the state of malnutrition, the total weight need to increase from 12.5-18 kg with the rate of weight gain in the 2nd and 3rd pregnancy at about 0.45-0.59kg/week. Pregnant women before pregnancy in normal nutritional status, the total weight needs to increase from 11.3 to15.8 kg with the rate of weight gain in the 2nd and 3rd pregnancy was 0.36-0.45kg/week. When pregnant, overweight and obese nutrition, the total weight need to increase from 5-10 kg with the rate of weight gain in the 2nd and 3rd pregnancy was 0.23-0.32 kg/week. However, our research results show that the rate of weight gain in pregnant women with normal nutritional status and overweight in 2nd and 3rd trimester is much higher than the recommendations. Some previous studies have shown that excessive weight gain during pregnancy also causes the risk of diabetes for mothers and babies [15], [16], [38].

In addition, epidemiological studies on the risk of gestational diabetes also clearly indicate the nutritional status of pre-pregnancy women is one of the risk factors that are easily encountered in pregnant women with diabetes mellitus. Obese people with insulin resistance are susceptible to diabetes. Doherty and et al found that obesity pre-pregnancy was a risk factor for gestational diabetes [39]. Ta Van Binh et al. showed that the prevalence of gestational diabetes between BMI <23 and BMI ≥23 difference was statistically significant [40]. Torloni's study, compared the group with normal BMI, the risk of gestational diabetes decreased in the low-weight group, overweight group, moderate obesity and obesity increased OR = 1.97 (95% CI = 1.77-2.19), OR = 3.01 (95% CI = 2.34-3.87), OR = 5.55 (95% CI = 4.27-7.21) respectively [38].

Analysis of nutritional habits, we noted in the study of diabetic women divided into several meals a day: 3 meals and 2-3 snacks to distribute glucose consumption and reduce glucose fluctuations serum after eating, better control serum glucose [41], [42].

Conducting an analysis of the diet of pregnant women with diabetes we recorded: The total dietary energy was about 1841.7±92.2kcal/day with an energy level of about 29.5±1.5kcal/kg body weight. The amount of glucose in the daily diet was 243.4±16.5g/day, accounting for more than 50% of the total dietary energy (52.3±2.0%). The amount of protein in the daily diet was 84.3±3.9g/day accounting for more than 18% of the total dietary energy (18.7±0.67%) with protein of 1.36±0.07g/kg body weight/day, 59.1±4.2g/day accounting for about 30% of the total dietary energy (29.0±1.6%). In particular, the amount of SFA fat accounts for more than 7.5% of the total dietary energy, the amount of MUFA fat accounts for more than 8.5% of the total dietary energy and the amount of cholesterol was about 300mg/day. The ratio of three thermogenesis substances in the diet of pregnant women Gestational diabetes in our study was Protein:Lipid:Carbohydrate = 18:30:52. However, according to the recommendations of the American Abstinence Association (2012) and the American Society of Obstetrics and Gynecology (2017), the diet for pregnant women with gestational diabetes needs to control specific carbohydrates: The energy requirement was 30-35kcal/kg/day, of which, 20% protein, 40-45% carbohydrate and 35-40% lipid. The amount of saturated fat was less than 10% of the total fat. We noted that the energy demand of pregnant women with gestational diabetes of 30kcal/kg/day was also consistent with the recommendations of the 2017 ADA but on the ratio of the three triggers, but we found that some of the following issues: First, the nutritional habits of Vietnamese people with the highest lipid rate were approximately 30% lower than the ADA 2017 recommendations for pregnant women with diabetes. Secondly, according to the ADA's guidelines on nutrition for diabetics and the guidelines for nutrition for diabetics in Vietnam, the recommended carbohydrate rate of 50-55% was also suitable. Consistent with nutritional habits in Vietnam. Thirdly, pregnant women often have a condition of dyslipidemia, so the question was whether to follow the

recommendations of the American Abstinence Association (2012) and the American Society of Obstetricians and Gynecologists (2017). For pregnant women with gestational diabetes need to control specific carbohydrates: 20% protein, 40-45% carbohydrate and 35-40% lipid can increase dyslipidemia. Fat quality was also an important nutritional issue that was mentioned in the advice of pregnant women with diabetes. Previous studies showed that one of the risk factors for gestational diabetes was a high-fat diet [43], [44]. Fatty (high in saturated fatty acids, low in unsaturated fatty acids), high in cholesterol [20]. Our study noted that SFA fat accounts for more than 7.5% of total dietary energy, MUFA fat accounts for more than 8.5% of total energy intake and high cholesterol was about 300mg/day. This study found that diabetic pregnant diets with saturated fat content of 8.5% of total dietary energy in accordance with recommendations of the American Abstinence Association (2012) and ADA (2017). Analysis of diet of some vitamins and minerals illustrated that the amount of iron in diet of patients with gestational diabetes was 14.5 ± 0.9mg/day. The amount of folate was 400mcg/day, calcium in the diet was 700mg/day, vitamin D in the diet was 20IU/day, vitamin B12 was 2.3mcg/day and zinc was around 13.5mg/day. Compared to the recommended level of some vitamins and minerals in pregnant women, we found that dietary folate was 70% of the recommended intake, Calcium was 60% of the recommended, zinc was approximately 94% of the recommended. Vitamin D was 10% of the recommended, Vitamin B12 was 7% of the recommended.

However, the majority of gestational diabetes patients (63.3%) prefer to eat sugary foods (cakes, candy, soft drinks ...). Our findings show a preference for sweets in pregnant women with gestational diabetes was similar to that of other studies [21]. However, there have been many studies proving the relationship between high sugar and sweet drinks consumption and the risk of gestational diabetes [23], [45]. Analyzing the frequency of food consumption, we recorded the frequency of cakes consumption once or twice per week was 46.7%. 86.7% of pregnant women with gestational diabetes drink milk every day but are sugary and non-milk for diabetics. Drinking soft drinks once or twice per week was 90% of pregnant women. 96.7% of pregnant women Diabetes eat ripe fruits regularly. According to a study in the US, conducting a comparison between women consuming 1 unit of fresh water/month with women consuming 5 units of soft drinks/or carbonated soft drinks/week showed the risk of gestational diabetes was 22% (95%, CI: 1.01, 1.47) [46]. A study in China found that ripe rations in pregnant women with gestational diabetes were over 500g and higher in pregnant women without gestational diabetes [20]. The source of carbohydrates in the diet was very important, in ripe fruits are high in glucose sucrose, fructose with high glycemic index. Therefore, consuming a lot of ripe fruits with a high glycemic index is also a risk factor for gestational diabetes.

CONCLUSION

The nutritional diet of women with gestational diabetes with the ratio of 3 thermogenic substances was not consistent with the guidelines of the American Diabetes Association 2017 but also quite consistent with the nutritional facts and habits in Vietnam. The amount of cholesterol in the daily diet was high. The recommended levels of dietary micronutrients such as Calcium, Vitamin D, Zinc, B12, and Folate are about 60%, 10%, 94% and 70% respectively. Diabetic women have good nutritional habits of sharing small meals, but choosing a variety of sugary foods such as sugary milk, confectionery, and ripe fruit leads to the risk of hyperglycemia. The status of weight gain more than recommended in pregnant women with nutritional status before pregnancy BMI>23 overweight, obesity. The features of a history of gestational diabetes, impaired glucose tolerance, history of gestational enlargement, stillbirth, family history of siblings with diabetes are consistent with epidemic studies in Vietnam and internationally.

REFERENCES

1. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2009;32:62-67.
2. Jiwani A. Gestational diabetes mellitus: Results from a survey of country prevalence and practices. J Matern Fetal Neonatal Med. 2012;25:600-610.
3. Nguyen KDV, Thai TTT. Study on prevalence of gestational diabetes according to 2011 ADA standards and risk factors. Journal of Medical Research. 2015;97:5.
4. Ta VB. Management of gestational diabetes mellitus. Practice of diabetes management and treatment. Medical Publishing House. 2003;11-12.
5. Tutino GE, Tam WH, Yang X et al. Review Article: Diabetes and pregnancy: perspectives from Asia. Diabet Med. 2014;31:302-318.
6. WHO. Definition, diagnosis and classification of diabetes mellitus and its complications. Report of WHO consultation. 1999.
7. Dornhorst PC, Nicholls JSD, et al. High prevalence of Gestational Diabetes in woman from ethnic minority groups. Diabetic Medicine. 1992;9:820-825.
8. Tran ST, Jane EH, et al. Early prediction of Gestational Diabetes Mellitus in Vietnam. Diabetes Care. 2013;36:618-624.
9. O'Sullivan JB, Mahan CM. Critical for the oral glucose tolerance test in pregnancy. Diabetes. 1964;13:278-285.
10. Moses, Laurie B. Guideline Issued for Diagnosis and Classification of Hyperglycemia in Pregnancy. Diabetes Care. 2010;33:676-682.
11. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2011;34:62-69.
12. Sayeed MA, et al. Diabetes and hypertension in pregnancy in a rural community of Bangladesh: a population-based study. Diabet Med. 2005;22:1267-1271.
13. Melissa GR, Yvonne WC, Jonathan MS, et al. The Risk of Stillbirth and Infant Death Stratified by Gestational Age in Women with Gestational Diabetes. Am J Obstet Gynecol. 2012;206:1–7.
14. Thomas AB, Anny HX, Kathleen AP. Gestational Diabetes Mellitus: Risks and Management during and after Pregnancy.

Nat Rev Endocrinol. 2012;8:639–649.
15. American Diabetes Association. Gestational Diabetes Mellitus. Diabetes Care. 2003;26:103-105.
16. Mitanchez D. Foetal and neonatal complications in gestational diabetes: perinatal mortality, congenital malformations, macrosomia, shoulder dystocia, birth injuries, neonatal complications. Diabetes Metab. 2010;36:617-627.
17. Bellamy LCJ, Hingorani AD, et al. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta analysis. Lancet. 2009;373:1773-1779.
18. Jovanovic LPD.Gestational diabetes mellitus. JAMA. 2001;286:2516-2518.
19. American Diabetes Association. Medical management of pregnancy complicated by diabetes. Diabetes Mellitus Gestational. 2000.
20. Zhou S, et al. Risk Factors for Gestational Diabetes Mellitus in the Population of Western China. Epidemiology (sunnyvale). 2015;5:2.
21. Dayeon S, et al. Dietary Patterns during Pregnancy Are Associated with Risk of Gestational Diabetes Mellitus. Nutrients 2015;7:9369–9382.
22. Tryggvadottir EA, et al. Association between healthy maternal dietary pattern and risk for gestational diabetes mellitus. Euro J Clin Nutri. 2016;70:237–242.
23. American Diabetes Association. Dietary Risk Factors for Gestational Diabetes Mellitus. Are sugar-sweetened soft drinks culpable or guilty by association? Diabetes Care. 2009;32.
24. Cihanir E, et al.Prevalence of gestational diabetes mellitus and associated risk factors in Turkish woman: the Trabzon GDM Study. Arch Med Sci, 2015;11:724-735.
25. Mukesh MA. Gestational diabetes: simplifying the IADPSG diagnostic algorithm using fasting plasma glucose:Impact of IADPSG on GDM. Diabetes Care. 2010;33:2018-2020.
26. Ofra KL. Screening and Diagnosis of Gestational Diabetes Mellitus:Critical appraisal of the new International Association of Diabetes in Pregnancy Study Group recommendations on a national level. Diabetes care. 2012;35:1894-1896.
27. Caroline AC, Janet E, Hiller. Effect of treatment of Gestational Diabetes Mellitus on Pregnancy Outcomes. The New Eng J Med. 2005;352:2477-2486.
28. Metzger BE, Gabbe SG, Person B, et al. International association of diabetes and pregnancy study groups recommendations on diagnosis and classification of hyperglycemia in pregnancy. Diabetes care. 2010;33:676-682.
29. Shin D, Lee KW, Song WO. Dietary Patterns during Pregnancy Are Associated with Risk of Gestational Diabetes Mellitus. Nutrients. 2015;7:9369-9382.
30. Vietnam Ministry of Health. Guidelines for clinical nutritional treatment. Medical Publishing House. 2015.
31. Moore S, et al. Institute of Medicine 2009 Gestational Weight Gain Guideline Knowledge: Survey of Obstetrics/Gynecology and Family Medicine Residents of the United States. NIH Public Access Author Manuscript. Birth. 2013;40:237–246.
32. American Diabetes Association. Standards of mediacal care in diabetes. Section 13: Management of Diabetes in pregnancy. Diabetes Care. 2017;40:114–119.
33. Wagaarachchi PT, Fernando L, Premachadra P, Fernando DJ. Screening based on risk factors for gestational diabetes in Asian population. J Obstet Gynecol. 2001;21:32-34.
34. Hirst JE, Tran ST, et al. Consequences of gestational diabetes in an urban hospital in Viet Nam: a prospective cohort study. PLoS Med. 2012;9:e1001272.
35. Ostlund I, Hanson U, et al. Maternal and fetal outcomes if gestational impaired glucose tolerance is not treated. Diabetes Care. 2003;26:2107-2111.
36. La TTT. Some epidemiological characteristics in patients with gestational diabetes mellitus at General Hospital, Vinh City, Nghe An Province, Vietnam. Hanoi Medical University. 2015
37. Bottalico JN. Recurrent gestational diabetes: risk factors, diagnosis, management, and implication. Semin Perinatol. 2007;31:176-184.
38. Torloni MR, et al. Prepregnancy BMI and the risk of gestational diabetes: a systematic review of the literature with meta-analysis. Obes Rev. 2009;10:194-203.
39. Doherty DA, et al. Pre-pregnancy body mass index and pregnancy outcomes. Int J Gynaecol Obstet. 2006;95:242-247.
40. Ta VB, Nguyen DV, Pham TL. Evaluate the rate of gestational diabetes and some related factors in pregnant women managing pregnancy at the National Hospital of Obstetrics and Gynecology and Hanoi Obstetrics and Gynecology Hospital, Viet Nam. National Level Research Programs KC 10.05. 2004.
41. Sylvia Escott - Stump (2012). Gestational Diabetes. Nutrition and Diagnosis - Related care. Seven edition. 2012; 552-555.
42. The American College of Obstetricians and Gynecologists. Practice Bulletin No. 180 Summary: Gestational Diabetes Mellitus. Management Guidelines for Obstetrician–Gynecologists. 2017;130:244-246.
43. Saldana TM, Siega-Riz AM, Adair LS. Effect of macronutrient intake on the development of glucose intolerance during pregnancy. Am J Clin Nutr. 2004;79:479-86.
44. Zhang C, Liu S, Solomon CG, Hu FB. Dietary fiber intake, dietary glycemic load, and the risk for gestational diabetes mellitus. Diabetes Care. 2006;29:2223-2230.
45. Mikel DE, Cristina LDB, Miguel AMG, et al. Soft drink consumption and gestational diabetes risk in the SUN project. Clinical Nutrition. 2018;37:638-645.
46. Zhang C and Ning Y. Effect of dietary and lifestyle factors on the risk of gestational diabetes: review of epidemiologic evidence. Am J Clin Nutr. 2011;94:1975–1979.