ORIGINAL RESEARCH PAPER

Nutritional Science

COMPARATIVE ANALYSIS OF DIETARY PATTERN AND NUTRIENT CONSUMPTION AMONG WOMEN WITH GESTATIONAL DIABETES MELLITUS (GDM) AND NON-GDM: A CROSS-SECTIONAL STUDY IN RURAL TERTIARY CARE SETTING, VADODARA, GUJARAT

KEY WORDS: Diet, Dietary Pattern, Gestational Diabetes Mellitus, Nutrition

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ABSTRACT

Understanding the dietary behaviours and nutrient intake of Gestational Diabetes Mellitus (GDM) women is crucial for improving the maternal and foetal health outcomes particularly in rural regions. This study aimed to identify the potential differences that could contribute to reducing the incidence of GDM. Around 80 pregnant women (GDM and non GDM) aged 18 to 40 years were enrolled in 2nd trimester from tertiary care hospital using purposive sampling technique. A pre tested questionnaire was used to evaluate dietary intake pattern using 3 days 24-hour dietary recall and food frequency questionnaire. Anthropometric indices were measured and body mass index was calculated. High prevalence of overweight and obese (47%) was found in GDM subjects. A significant negative association was found between intake of fruits and risk of GDM. The cravings for sweet foods including high calorie sweet dairy products were higher in GDM group (30%). A higher percentage of non-GDM women (34%) had a daily intake of pulses and dals compared to GDM women (8%). A positive corelation was found between BMI and fast-food intake in GDM group. GDM women showed higher saturated fat intake and lower protein intake. These findings may provide evidence for making dietary guidelines among pregnant women to prevent GDM.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance resulting in hyperglycaemia of variable severity with onset or first recognition during pregnancy and poses risks for short-term and long-term complications in both mothers and offspring.[1] Age, previous history of GDM, family history of type 2 Diabetes Mellitus, physical activity, and dietary factors are some risk factors for GDM. While its pathophysiology is multifaceted, maternal diet during pregnancy is considered a modifiable risk factor. It plays a central role in the management of GDM, influencing maternal glycaemic control and foetal outcomes. As the prevalence of GDM continues to rise globally, understanding the dietary behaviours, preferences, and nutrient intake of women diagnosed with GDM compared to non-GDM counterparts becomes imperative for effective management and prevention strategies.

METHODOLOGY

A cross-sectional study enrolled 80 pregnant women from an Antenatal Clinic at a Tertiary Care Hospital using purposive sampling. The study included 40 women diagnosed with Gestational Diabetes Mellitus (GDM) via Oral Glucose Tolerance Test (OGTT) and 40 non-GDM women. All participants were in their second trimester and monitored until the study's end. Inclusion criteria were women aged 18-40 years willing to participate, while exclusion criteria included pregestational diabetes, severe infections, or co-morbidities such as preeclampsia or cancer. Ethical approval was granted, and informed consent was obtained. Data were collected using a semi-structured questionnaire, Kuppuswamy's Socioeconomic Status Scale, and standard anthropometric and dietary assessments.[2] Dietary intake was evaluated with a 3-day 24-hour recall and food frequency questionnaire. Statistical analysis included descriptive statistics, chi-square tests for demographic and dietary associations, and Pearson's correlation for glycemic parameters, anthropometrics, and nutrient intake.

RESULTS AND DISCUSSION

Background Information

The study included 80 pregnant women, with 40 diagnosed with GDM and 40 without. The mean age was 29.9 ± 3.18 years for GDM women and 26.9 ± 4.68 years for non-GDM women. GDM was notably more common in women aged 30-40 years (42%), reflecting the risk associated with advanced maternal age.[3] Higher GDM prevalence was observed in families with monthly incomes over 20,000, indicating a socioeconomic influence. The GDM group also had a higher incidence of abortions, at 28%. (Table 1)

Table 1: Demographic Profile of Pregnant Mothers:

Parameters	Non-GDM (N= 40)	GDM (N=40)	Total (N=80)	X2 Value	P value
Age					
18-20	3 (7)	01 (02)	4 (05)	2.45	0.29
20-30	26 (65)	22 (56)	48 (60)		
30-40	11 (28)	17 (42)	28 (35)		
Type of family					
Nuclear	16 (40)	16 (40)	32 (40)	0.76	0.68
Joint	22 (55)	20 (50)	42 (53)		
Extended	02 (5)	04 (10)	06 (7)		
Education					
Primary school	13 (32)	05 (12)	18 (22)	12.03	0.000 5***
Middle & High school	23 (58)	31 (78)	54 (68)		
Graduates	04 (10)	04 (10)	08 (10)		
Family income per month					
>20000	9 (23)	13 (33)	22 (27)	14.08	0.02*
10,000-20,000	20 (50)	18 (45)	38 (47)		
5000-9999	11 (27)	09 (22)	20 (25)		
Age at menarche					
10-12	21 (53)	17 (43)	38 (47)	0.80	0.37
13-15	19 (47)	23 (57)	42 (53)		
Age at marriage					
18-20	05 (13)	03 (8)	08 (10)	1.20	0.75
21-25	23 (57)	27 (67)	50 (62)		
26-30	10 (25)	09 (22)	19 (24)		
>30	02 (5)	01 (3)	03 (4)		
No of Children					
0	19 (48)	15 (38)	34 (42)	1.48	0.53

1-2	21 (52)	22 (54)	43 (54)		
≥ 3	0 (2)	03 (8)	03 (4)		
Abortions/miscarriages					
Yes	36 (90)	29 (72)	65 (81)	4.02	0.04*
No	04 (10)	11 (28)	15 (19)		

Anthropometric Measurements:

About 33% of GDM women were overweight and 14% obese, while over 50% of non-GDM women had a normal BMI. The increasing prevalence of pre-pregnancy overweight/obesity has increased the risk of adverse maternal and neonatal outcomes, including increased rates of GDM.[4] GDM women had higher systolic and diastolic blood pressure, correlating with increased risks of Gestational hypertension and pre-eclampsia.[5]

Table 2: Anthropometric and Biophysical Measurements of GDM and Non GDM Subjects:

Parameters	Non- GDM (Mean ± SD) N= 40	GDM (Mean ± SD) N= 40	Total (Mean ± SD) N=80	't' value
Height (cm)	153.5±0.02	154.2±0.023	154.5±2.7	0.23 NS
Pre-Pregnancy Weight (kg)	54.5±6.09	57.2±6.40	56.5±6.7	2.41***
BMI (Kg/m2)	23.1±2.64	24.4±2.73	23.8±2.8	1.92*
SBP (mmHg)	120±9.4	134.5±11.0	138±17.9	3.80 ***
DBP (mmHg)	82.2±6.3	85.1±9.5	80.7±11.9	3.10 **

BMI: Body Mass Index, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure

Dietary Pattern

Most participants were vegetarians: 55% in the GDM group and 69% in the non-GDM group. Table 3 shows that eating out once a week was more common in the non-GDM group (65%) compared to the GDM group (26%). The GDM group had higher cravings for sweet foods, particularly high-calorie sweet dairy products, with about 30% reporting such cravings. In contrast, 29% of the non-GDM group craved high-fat and high-sugar foods. GDM is linked to impaired glucose metabolism and insulin resistance, which may explain increased sweet food cravings, influenced further by hormonal changes during pregnancy.[6]

Table 3: Comparison of Food Preferences Among GDM and Non GDM Women

Variables	Non-GDM (n=40)	GDM (n=40)	Total (N=80)	X2 Value	P value
	N (%)	N (%)	N (%)		
Food Preferences					
Vegetarian	26(65)	21 (53)	47 (59)	1.28	0.25
Non-Vegetarian	14 (35)	19 (47)	33 (41)		
Eating out Pattern					
2-4 times a week	03 (8)	5 (13)	08 (10)	24.5	0.000 1
Once a week	27(68)	11 (28)	38 (48)		
Once in month	01 (3)	18 (45)	19 (24)		
Rarely	3 (8)	4 (10)	07(9)		
Never	06 (15)	2 (5)	08 (10)		
Food Cravings					
Sweet	7 (18)	12 (30)	19 (24)	6.55	0.16
Savoury	5 (13)	07 (18)	12 (15)		
Sour and Tangy	6 (15)	08 (20)	14 (18)		
HFSS Packed Foods	11 (28)	03 (8)	14 (18)		
None	11 (28)	10 (25)	21 (26)		

HFSS: High Fat, Salt, Sugar

Mean Nutrient Intake

The mean nutrient intake of GDM and non-GDM compared with the recommended dietary allowance (RDA) by ICMR 2024 is depicted in Table 4. The mean energy intake was 12% below the RDA for GDM women and 26% below for non-GDM women, with GDM women consuming more total calories. Similar study showed that total energy intake was higher in women with GDM than in women without the condition.[7] Both groups met carbohydrate needs but had high saturated fat intake in GDM. High intake of saturated fats (>10% of TE) observed in GDM at the expense of decreased carbohydrate intake is associated with an increased risk of GDM.[8] Protein intake was significantly low (38% deficit in GDM and 40% in non-GDM), and major minerals (calcium, iron, zinc) and fiber were also below RDA.

Table 4: Mean Nutrient Intake Among GDM and Non GDMWomen.

Nutrients	*RDA	non- GDM (n=40)		GDM (n=40)	
		Mean intake	% Excess/ Deficit	Mean intake	% Excess/ Deficit
Energy (kcal)	2010	1476	-26	1750	-12
Protein (g)	68	52	-20	40	-38
Total Fats (g)	78 g	67	-14	87	+11
Carbohydrates (g)	250	264	+14	256	+6
Dietary Fibre(g)	25	17	-32	16	-36
Iron (mg)	27	11	-59	12	-55
Calcium (mg)	1000	659	-34	518	-48
Zinc (mg)	14.5	6.5	-29	7	-23
Folate (µg)	346	153	-55	160	-53

*RDA for pregnant women, ICMR 2024

Food Frequency Pattern

The dietary habits of pregnant women, as revealed by the food frequency analysis, indicated that cereals were a daily staple for over half of both the GDM and non-GDM groups. However, the consumption of millets, particularly jowar and bajra, was more prevalent among women with GDM. Notably, a higher percentage of non-GDM women, (34%), had a daily intake of pulses and dals compared to only 8% of GDM women. Both groups showed consistent levels of vegetable consumption. However, less than 50% of the women were consuming fruits more frequently in a week in GDM group. In terms of non-vegetarian foods, a majority of women consumed eggs, fish, and chicken regularly. A positive corelation was found between BMI and Fast-food intake in GDM group (R^2= 0.754). (Figure 1)

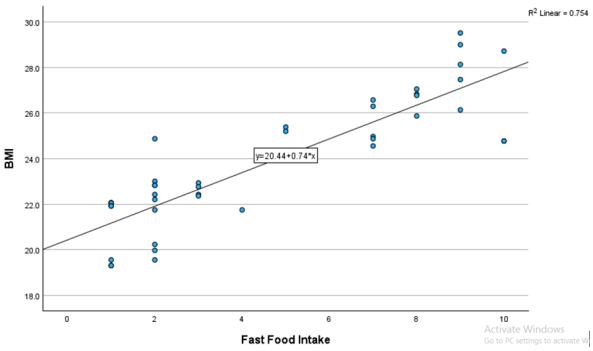

Figure 1: Correlation of BMI with Fast Food Intake in GDM

Limitation Of The Study

The study could not consider confounding variables like levels of physical activity and genetic predispositions, which could impact the relationships noted between demographic features, dietary habits, and GDM status.

CONCLUSION

The present study underscores the significance of dietary factors in the development and management of GDM. It is important to promote healthy dietary patterns, including monitoring fruit intake, managing sweet cravings, and encouraging the consumption of nutrient-rich foods such as

pulses and dals, to mitigate the risk of GDM and associated complications during pregnancy. Additionally, understanding these dietary behaviours can aid in developing personalized strategies for managing and preventing GDM, ultimately enhancing maternal and fetal health.

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