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ORIGINAL ARTICLE

Nutritional Status and Self-Reported Nutrition Education Exposure in Women with Gestational Diabetes Mellitus at Primary Health Clinic

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ABSTRACT

Introduction: Optimal nutritional status is of utmost importance not only for foetal development but also to maintain normoglycemia in women with gestational diabetes mellitus (GDM). This cross-sectional study described the nutritional status of women with GDM and explored whether self-reported nutrition education (NEd) exposure before a GDM diagnosis would be able to promote better nutrition status. **Methods:** GDM women (n= 60; age= 31.6 ± 5.0 years) diagnosed between 13th and 28th week of gestation participated in the study. We assessed nutritional status that included anthropometric and blood pressure assessments, biochemical data, and dietary intake. The respondents self-reported their NEd exposure before a GDM diagnosis was made. **Results:** The pre-pregnancy BMI of the participants was 27.9 ± 6.8 kg/m^2, which was categorised as overweight. Total (4.3 ± 5.6 kg) and rate (0.2 ± 0.3 kg/week) of gestational weight gain were within the recommendations. Glycemic parameters and blood pressure were also within the normal range. Nevertheless, they had high intakes of fat (35.5%) and sugar (14.4%) proportionate to their energy intake. They did not meet the recommended nutrient intakes for fibre, calcium, and iron. Only 28.3% of women had prior NEd exposure. Among them, almost all (94.1%) had recurrent GDM. Those with NEd exposure had lower pre-prandial blood glucose profiles, systolic blood pressure, and proportion of protein intake from energy than those without ($p < 0.05$). **Conclusions:** Suboptimal maternal nutritional status and low exposure to NEd are evident in women with GDM. Those with self-reported NEd exposure had better parameters of nutritional status. The findings recognised the need of having proper nutrition education for women who are at high risk of GDM since at early pregnancy.

KEYWORDS: Gestational diabetes mellitus, nutritional status, dietary intake

INTRODUCTION

An optimal nutritional status before and during pregnancy is of utmost importance as it influences the immediate and long-term health outcomes of the foetus and the mother [1]. Achieving optimal nutritional status is critical for women with gestational diabetes mellitus (GDM) as they not only have to ensure proper foetal development but also to maintain normoglycemia [2]. GDM is defined as any degree of glucose intolerance during pregnancy and is associated with adverse events in both mother and foetus [3].

Reduction in GDM complications has been well-established with appropriate lifestyle interventions [4]. GDM has increased rapidly within the two decades in Malaysia, with a prevalence of almost 12%, higher than any western countries [5]. The increase in prevalence comes as no surprise as being an Asian is one of the risk factors for GDM development, with 37% of the attributable risk contributed by pre-pregnancy weight and low diet quality [6]. Therefore, it is essential to understand the nutritional status and educational needs of women with GDM to derive appropriate evidence-based nutritional recommendations.

Although the benefits of having good nutritional status during pregnancy are well-understood [1], suboptimal dietary intake is frequent in women with GDM. Korean women with GDM reported a higher proportion of total carbohydrate intake from calories but low in necessary nutrients for pregnancy including dietary protein, calcium, iron, thiamine (Vitamin B1), riboflavin (Vitamin B2), niacin (Vitamin B3) and folate (Vitamin B9) [7]. A similar observation was reported among Algerian pregnant women with diabetes mellitus [8]. Their diet lacked iron, calcium, and folate, but had high energy density from fat and carbohydrate. In Malaysia, data on the nutritional status of women with GDM are scanty. The previous study determined the impact of low glycaemic index (GI) intervention to improve dietary intake of women with GDM without detailing the intake data [9]. The central gap lies in understanding their overall nutritional status and dietary intake.

Understanding nutritional status provides an appropriate measure to deliver tailored nutrition education to women with GDM. Nutrition education as part of medical nutrition therapy (MNT) is the primary intervention for up to 90% of women who have been already diagnosed with GDM [10]. Individualised nutrition education improved nutritional status, clinical, and pregnancy outcomes in women with GDM [4, 11, 12]. However, it is not a common practice to provide nutrition education at early pregnancy as the referral for MNT is only made once the GDM diagnosis is confirmed [13]. Nevertheless, in some women, they may have experienced nutrition education before a GDM diagnosis, in particular, those with recurrent GDM in their previous pregnancy [14]. It is unclear whether having nutrition education exposure before GDM diagnosis would promote better nutritional status than those without the exposure. Therefore, this study described the nutritional status of women with GDM and explored whether self-reported nutrition education (NEd) exposure before a GDM diagnosis would further improve their nutritional status.

METHODS

Study Design and Samples

This study employed a cross-sectional design and was conducted at selected health clinics with the highest annual GDM cases in Hulu Langat District, Selangor. Women aged 18 - 45 years old with a confirmed GDM diagnosis between 13th and 28th week of gestation during data collection were recruited to the study. GDM diagnosis was made following a 75-g oral glucose tolerance test (OGTT) using standardised criterion, which was consistent across all health clinics [15]. Women with pre-existing diabetes, pre-eclampsia, and hyperemesis were excluded.

Ethical Consideration

The Research and Ethics Committee of the Ministry of Health approved the study, and respondents provided their written consent before enrolment (Research ID: 20965). All women provided their written consent. Participation in this study was voluntary, and no monetary reimbursement was provided.

Measures

Socio-Demographic

Socio-demographic data such as age, gestational week, occupation, education, and monthly household income were collected. The current and previous health-related pregnancy issues such as recurrent GDM and other health issues were obtained from the medical record.

Self-reported Nutrition Education (NEd) Exposure

Respondents self-reported their exposure to nutrition education (NEd) at any point in time before a GDM diagnosis was made. The exposure included NEd components that they have received during their last pregnancy. The content of NEd was not standardized. For women with recurrent GDM, the exposure to NEd was usually given by a dietitian at the health clinics based on the MNT during their last pregnancy. Meanwhile, the newly diagnosed GDM had the initiative to sought for the NEd themselves through the internet, family members, and other healthcare professionals.

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Nutritional Status Assessments

Nutritional status assessments included data on the components of anthropometry, blood pressure, blood glucose profiles, and dietary intake. The same well-trained study enumerators performed all measurements to ensure consistency and to minimise measurement errors.

Anthropometry and Blood Pressure

Height was measured without shoes using a wall-mounted stadiometer (Model No: 206, SECA, Hamburg, Germany), rounded to 0.1 cm. Current body weight was measured in light clothing without footwear using a digital weighing scale (Model: BWB-800A, Tanita Corporation, Tokyo, Japan) and rounded to 0.1 kg. Pre-pregnancy weight was obtained from the antenatal books of pregnant women. The nurse recorded the patients' self-report pre-pregnancy weight during their initial visit at 4-12 weeks of gestation. Pre-pregnancy body mass index (BMI) was calculated using the formula BMI = weight (kg) /height (m^2) and classified based on the World Health Organization (WHO) classification [16]. Total gestational weight gain (GWG) and rate of weight gain (RWG) during pregnancy were assessed and checked for adherence, according to the 2009 Institute of Medicine (IOM) guidelines [17]. Blood pressure was assessed using the automatic blood pressure device (Omron HEM-907, Healthcare Inc. Bannockburn, country). Three readings were obtained in the seated position by a clinic nurse. The normal range of blood pressure for pregnant women is 110 – 129 mm Hg for systolic and 65 – 79 mmHg for diastolic blood pressure [15].

Biochemical Data

Biochemical data included analyses of fasting plasma glucose (FBG), hemoglobin A1c (HbA1c), and self-monitoring blood glucose profiles. The nurses drew 2 ml of blood into a tube containing sodium fluoride/ potassium oxalate (5mg/4mg) for FBG analysis and into an EDTA tube for HbA1c analysis. Plasma glucose was measured based on the hexokinase method using Cobas Integra (Roche diagnostic, Indianapolis, USA), with a normal range of ≤ 5.3 mmol/L for pregnant women [15]. HbA1c was measured based on the Bio-Rad Variant™ II Haemoglobin A1C Program using ion-exchange HPLC (Bio-Rad Laboratories Marnes-la- Coquette, France). The normal range for HbA1c is <6.5%, following the target for diabetes treatment [15]. All analyses were performed by a certified lab (BP Healthcare, Selangor, Malaysia). Self-monitoring blood glucose (SMBG) profiles is a routine procedure conducted by the health clinics for women diagnosed with GDM as part of the monitoring plan. The SMBG profiles were performed using a finger pricked capillary at four-time points, namely pre-breakfast (pre-prandial), post-breakfast, post-lunch, and post-dinner. These measurements were assessed either at the clinic or self-performed at home. The results were recorded in their antenatal book and verified by the nurses. The recommended value for pre-prandial is ≤ 5.3 mmol/L and should be less than 6.7 mmol/L for post-meal glucose [15].

Dietary Intake Assessments

Dietary intake was assessed using a diet history for the past seven days. The diet history included usual meal patterns, methods of food preparation, and frequency of food consumption. Portion sizes were estimated using standardised household measurements such as a cup, teaspoon, and tablespoon. All foods were converted into grams based on the standard household measurements [18]. Nutrient analysis was carried out using the DietPLUS software, including the analysis of dietary GI and GL [19]. Most cooked foods were available in the database. For mixed foods that were not part of the database, they were broken down into individual ingredients or individual food items. Adequacy of intake was compared with the Malaysian Recommended Nutrient Intakes (RNI) [20].

Data Analyses

Data were analysed using IBM SPSS version 22.0 (Chicago, IL, USA) and a statistical level of $p < 0.05$ was considered significant. Descriptive statistics, including means and standard deviations (SD), were used to report sociodemographic characteristics and nutritional status. The differences in characteristics between those with and without NEd exposure before a GDM diagnosis were compared using Independent T-Test.

RESULTS

Respondents were in their 30s' with a mean gestation week of 22.0 ± 3.4 weeks (Table 1). Majority of the participants were employed (56.7%), attained tertiary

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education level (51.7%) and had a medium level of total monthly household income between RM 3501 and RM 7500 (55.0%). About 26.7% (n = 16) of participants had a history of GDM in their previous pregnancy. A small proportion of the women had other pregnancy-related complications including high blood pressure (6.7%, n = 4), anaemia (3.3%, n = 2) or inappropriate GWG target (5%, n = 3).

Table 1 Nutritional status characteristics of women with GDM (n = 60)

Variables	n	%	Mean ± SD	Normal Values
Social-demographic				
Age (years)			31.6 ± 4.9	
Gestational week			22 ± 3.4	
Occupation				
Employed	34	56.7		
Housewife	26	43.3		
Education				
Primary or below	1	1.7		
Secondary	28	46.7		
Tertiary	31	51.7		
Monthly Household Income				
Low (<RM3500)	19	31.7		
Medium (RM3501 – RM7500)	33	55.0		
High (>RM7501)	8	13.3		
History of GDM				
Yes	16	26.7		
No	44	73.3		
Nutrition education exposure				
Yes	17	28.3		
No	43	71.7		
Anthropometric assessments				
Height (cm)			156.6 ± 6.4	
Weight (kg)			73.3 ± 18.5	
Pre-pregnancy BMI (kg/m^2)			27.9 ± 6.8	
Underweight (< 18.5)	4	6.7		
Normal (18.5 – 24.9)	18	30.0		
Overweight (25.0 – 29.9)	16	26.7		
Obese (≥ 30.0)	22	36.7		
Rate of GWG (kg/week)			0.2 ± 0.3	
Total GWG (kg)			4.4 ± 5.5	
Blood Pressure				
Systolic			117.2 ± 10.4	110 – 129[15]
Diastolic			70.1 ± 9.0	65 – 79[15]
Biochemical Data				
[a]Fasting blood glucose (mmol/L) (n = 57)			4.2 ± 0.8	≤5.3[15]
[a]HbA1c (%) (n = 57)			5.3 ± 0.4	<6.5[15]
SMBG profiles (mmol/L)				
Pre-breakfast			5.1 ± 0.7	≤5.3[15]
Post breakfast			5.9 ± 1.2	≤6.7[15]
Post lunch			5.5 ± 1.0	≤6.7[15]
Post dinner			5.6 ± 1.1	≤6.7[15]

[a]Three other GDM women refused additional blood withdrawal for fasting blood glucose and hbA1c

The mean pre-pregnancy weight was 73.3 ± 18.5 kg, with a mean height of 156.6 ± 6.4 cm. The mean pre-pregnancy BMI was 27.9 ± 6.8 kg/m^2 and classified in the overweight category. A detailed observation of the pre-pregnancy BMI category showed that the majority of the subjects were either obese (36.7%) or overweight (26.7%). The rest of the respondents were within the normal BMI (30%) and underweight (6.7%) category. Regarding GWG, the mean rate was 0.2 ± 0.3 kg/week, with a mean total GWG of 4.3 ± 5.5 kg from the pre-pregnancy weight. Blood glucose parameters and blood pressure were within the normal range (Table 1).

The RNI of energy for the second trimester was between 1890 and 1940 kcal/day (20). The mean energy intake exceeded the RNI [20], with half of the respondents (50%) exceeded the recommended intake (Table 2). Only 1.7% of the respondents achieved the RNI [20]. Similar results were also reflected in protein intake, where only 1.7% achieved the RNI with the majority (83.3%) have exceeded the recommended intake. The respondents consumed adequate dietary carbohydrates but slightly higher fat intake. The proportion of sugar intake from total energy was more than the recommended level of 10%, with 71.7% of them having excessive sugar intake. Nevertheless, the majority of them did not achieve the RNI for dietary calcium and iron intake (Table 2).

Table 2 Food nutrition-related history of women with GDM (n = 60)

Energy and Nutrients	Mean ± SD	RNI Cut-off [20]	Proportion achieved RNI [20] (%)	Proportion exceeded RNI [20] (%)
Energy (kcal/day)	2163 ± 820	1890 - 1940	1.7	50
Energy density (kcal/kg)	30.8 ± 13.3	NA	NA	NA
Carbohydrates (g/day)	248.8 ± 94.3	NA	NA	NA
% total energy	46.3 ± 8.3	50 - 65	31.7	0
Protein (g/day)	91.9 ± 35.7	60	1.7	83.3
% total energy	18.23 ± 5.1	NA	NA	NA
Protein density (g/kg)	1.3 ± 0.6	NA	NA	NA
Fat (g/day)	85.3 ± 44.5	60 - 71	15.0	50
% total energy	35.5 ± 6.5	25 - 30	16.7	76.7
Fibre (g)	17.6 ± 6.2	20 - 30	36.3	3.3
g/1000 kcal	8.5 ± 2.4	NA	NA	NA
Calcium (mg)	808.0 ± 356.7	1000	8.3	16.7
Iron (mg)	17.3 ± 18.2	29	3.3	8.3
Sugars (g)	78.4 ± 41.6	NA	NA	NA
% total energy	14.4 ± 6.1	≤10%	28.3	71.7
Dietary glycaemic index	60.5 ± 9.2	NA	NA	NA
Dietary glycaemic load	150.8 ± 60.7	NA	NA	NA

RNI: Recommended Nutrient Intakes
NA: not available

This study showed that only 28.3% of participants had the NEd exposure before a GDM

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diagnosis. Among them, almost all (94.1%) had recurrent GDM (Table 3). Women with the NEd exposure before a GDM diagnosis had significantly lower pre-prandial blood glucose profiles, systolic blood pressure, and the proportion of protein intake from energy than those without the NEd exposure (Table 3).

Table 3 Nutritional status between GDM women with and without prior nutrition education

Variables	With prior NEd (n=17) Mean ± SD	Without prior NEd (n=43) Mean ± SD	p-value
Social-demographic			
History of GDM			
Yes (n, %)	16, 94%	0, 0%	
No (n, %)	1, 6%	43, 100%	
Anthropometric Assessments	28.2 ± 6.6	27.7 ± 7.0	
Pre-pregnancy BMI (kg/m^2)			0.823
Rate of GWG (kg/week)	0.1 ± 0.2	0.2 ± 0.3	0.056
Total gestational weight gain (kg)	2.2 ± 4.2	5.3 ± 5.8	0.054
Blood Pressure			
Systolic	113.0 ± 8.0	118.9 ± 10.8	**0.047**[b]
Diastolic	67.5 ± 7.5	72.1 ± 9.3	0.076
Biochemical Data			
[a]Fasting blood glucose (mmol/L) With prior NEd (n=16); without prior NEd (n=41)	4.3 ± 0.6	4.2 ± 0.8	0.713
[a]HbA1c (%) With prior NEd (n=16); without prior NEd (n=41)	5.3 ± 0.4	5.3 ± 0.3	0.576
SMBG (mmol/L)			
Pre-breakfast	4.8 ± 0.5	5.2 ± 0.7	**0.049**[b]
Post breakfast	5.7 ± 1.3	5.9 ± 1.1	0.510
Post lunch	5.4 ± 1.0	5.5 ± 1.0	0.620
Post dinner	5.4 ± 1.1	5.6 ± 1.0	0.468
Food Nutrition Related Finding			
Energy (kcal/day)	1893.9 ± 765.9	2269.7 ± 824.2	0.110
Energy density (kcal/kg)	28.2 ± 11.7	31.8 ± 13.9	0.347
Carbohydrates (g/day)	218.0 ±104.0	261.0 ± 88.6	0.112
% total energy	45.1 ± 7.4	46.8 ± 8.7	0.475
Protein (g/day)	80.4 ± 20.6	96.5 ± 39.4	**0.043**[b]
% total energy	18.18 ± 4.7	18.26 ± 5.3	0.957
Protein density (g/kg)	1.2 ± 0.4	1.4 ± 0.7	0.223
Fat (g/day)	77.3 ± 34.7	88.4 ± 47.8	0.389
% total energy	36.4 ± 5.2	35.2 ± 7.0	0.536
Fibre (g)	15.1 ± 5.2	18.6 ± 6.3	0.050
g/1000 kcal	8.4 ± 2.4	8.6 ± 2.5	0.851
Calcium (mg)	715.7 ± 335.8	844.5 ± 361.9	0.210
Iron (mg)	12.1 ± 7.0	19.3 ± 20.8	0.169
Sugars (g)	69.8 ± 48.2	81.8 ± 38.8	0.318
% total energy	13.8 ± 6.6	14.6 ± 6.0	0.669
Dietary glycaemic index	60.8 ± 10.1	60.3 ± 8.9	0.866
Dietary glycaemic load	135.0 ± 70.8	157.1 ± 56.0	0.207

[a]Three other GDM women refused additional blood withdrawal for fasting blood glucose and hbA1c
p-value: test between groups, [b]Significant at level $p < 0.05$, NEd: nutrition education,

DISCUSSION

This study described the nutritional status characteristics of women with GDM. Understanding nutritional status characteristics facilitate the proper delivery of MNT for women with GDM [12]. This study observed that more than half of the women with GDM were either overweight or obese at the start of their pregnancies. The findings concur with other studies which reported that 65 – 75% of women with GDM were either overweight or obese before pregnancy [9, 21]. Obese women are at a higher risk of developing pregnancy complications, including GDM [21]. The risk of GDM is increased by 1.3 – 3.8 times in obese women compared to women of optimal BMI [22]. While maternal obesity is an issue in this sample of GDM women, the rate and total GWG were within the recommended range [17]. The optimal GWG is contradicting with the excess energy intake observed in 50% of these women during their second trimester. The excessive energy intake at the second trimester may continue into the third trimester as their appetite improve, which may then lead to excessive GWG. Excessive GWG confers additional risk of large-for-gestational-age babies, macrosomia, gestational hypertension, caesarean section, and low Apgar scores in women with GDM [23].

A controlled-carbohydrate diet is a mainstay of MNT in women with GDM. A study reported that Malaysian women with GDM consumed more than 50% of energy from carbohydrates [9]. Although women in this study had a lower proportion of carbohydrates from energy intake than the previous study, their sugar intake was nearly 15%, which was higher than the 10% cut-off limit [20]. Besides, dietary fats exceeded the recommended intake of 35% [20]. The previous study observed an increased risk of GDM with lower carbohydrate intake at the expense of a high-fat diet [24]. A previous study on dietary health behaviours of healthy Malaysian women reported 56% of energy from carbohydrates, 15% of energy from protein and 26% of energy from fats [25]. Even though the macronutrients intake was in line with the Malaysian RNI for healthy women [20], the study reported low healthy index scores in choices of specific food groups [25].

Although the dietary sugar intake among GDM women with prior self-reported NEd is lower than those without prior NEd, the intake is still more than 10% of the recommended intake. It is quite challenging for them to control the intake of sugary foods and beverages which could be related to their pregnancy condition such as morning sickness and consistent cravings.

However, it is essential to note that the association of sugar, added sugar and sweetened beverages with GDM are somewhat consistent [24, 26, 27, 28]. A high intake of sugary foods and beverages are energy-densed that lead to high energy intake and hence, contributing to excessive GWG. Dietary GI and GL were comparable to another local study in patients with type 2 diabetes [29]. Although there is no specific recommended or requirement for dietary GI and GL for pregnant women, it is recommended to choose foods with low to moderate GI as a study has shown that a lower GI would provide better response to postprandial glycaemic level compared to foods high in GI [30]. We did not assess dietary pattern. Nonetheless, it is believed that the diet was relatively high in dietary GI or GL due to the high intake of white rice, a staple diet of Malaysians [31]. White rice is a high GI food (GI = 72) that produces rapid digestion and absorption rates which lead to the rapid increment in blood glucose level compared to low GI foods [32]. Together with low fibre intake, excessive consumption of rapidly absorbable carbohydrates (high GI) in the form of added sugars may increase the level of fasting blood glucose, and insulin resistance [24].

In this study, the proportion of dietary protein from energy intake was relatively appropriate [20]. However, a majority of these women did not achieve the RNI for dietary calcium and iron, which were also reported in other studies [7, 27, 33]. Adequate iron and calcium are critical for foetal development [34]. In this context, high intake of sugar, which is usually high in GI, may be associated with lower micronutrient adequacy in pregnant women, which was also observed in a previous study [24]. It can be concluded that the nutritional status of pregnant women with GDM may be at risk of nutrient inadequacy and the risk may be reduced by adding low GI intervention in the current NEd as well as emphasize the importance of micronutrient during pregnancy.

As previously mentioned, it is not a common practice to provide nutrition education at early pregnancy until GDM is diagnosed. In this regard, only 28.3% of the women reported that they had nutrition education exposure before a GDM diagnosis. Among them, almost all (94.1%) had a recurrent GDM. GDM recurs in 30 – 69% of the women in their subsequent pregnancies [36]. In the current setting, the exposure to NEd among women with recurrent GDM was usually obtained in their previous pregnancy in which, the dietitian provided appropriate nutrition education based on the MNT at the health clinics. Meanwhile, the newly diagnosed GDM in this study was believed to have the initiative to seek NEd through the internet, family members, and healthcare professionals. About 50% of women would seek additional information on managing GDM after a GDM diagnosis [35].

Also, it is interesting to observe that women with a self-reported NEd exposure before a GDM diagnosis had better pre-prandial blood glucose profiles, systolic blood pressure, and proportion of protein from energy intake than those without the exposure. In this study, women with a history of GDM received adequate support for NEd. It would be intriguing if similar modalities were extended from early pregnancy to women who have a higher risk of GDM, especially those with a history of GDM, to reduce their risk of GDM. Although we observed more than 90% of the women with previous GDM received NEd, the adherence to nutrition is unknown. Thus, continuous nutrition education and counselling are necessary even for women with recurrent GDM to ensure optimal glucose and pregnancy outcomes. Adherence to dietary recommendations is a challenge, suggesting for a long-term nutrition monitoring and evaluation plan [36].

This study exerts both limitations and strengths that are worth some considerations. The nutritional supplements were not taken into consideration in the dietary intake assessment. It is known that most pregnant women were provided with an iron and folic acid supplementation. Hence, an additional consideration is needed in assessing nutrient intakes. This study has only accessed the self-reported NEd before GDM diagnosis without obtaining information on the proper content of the NEd received which warrants further investigation. Besides, the data was not sufficiently powered by the number of respondents who were exposed to NEd before GDM diagnosis, which limit the generalisation of the findings. It is worth noting that this study used diet history for the past seven days to obtain information about nutrients intake, which may have reflected the actual dietary intake of GDM women. Furthermore, with the limited data on the nutritional status of GDM in Malaysia, this study holds

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the strength of describing more about GDM dietary practices.

CONCLUSION

Suboptimal maternal nutritional status in GDM women was evident, and the exposure to self-reported NEd among GDM women was relatively low. Nonetheless, for women with recurrent GDM, they had good acceptance of NEd. Those with self-reported NEd exposure had better parameters of nutritional status in terms of pre-prandial blood glucose profiles, systolic blood pressure and proportion of protein intake from energy as compared to GDM women without prior NEd exposure. Understanding the nutritional characteristics of women with GDM can facilitate the delivery of proper nutritional education in preventing maternal and foetal complications. It is essential to provide early nutrition education to those with recurrent GDM to optimise their nutritional status.

Conflicts of Interest

Authors declare none.

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