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Role of Medical Nutrition Therapy in the Management of Gestational Diabetes Mellitus

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Abstract Medical nutrition therapy (MNT) plays an important role in the management of gestational diabetes mellitus (GDM), and accordingly, it has a significant impact on women and newborns. The primary objective of MNT is to ensure adequate pregnancy weight gain and fetus growth while maintaining euglycemia and avoiding ketones. However, the optimal diet (energy content, macronutrient distribution, its quality and amount, among others) remains an outstanding question. Overall, the nutritional requirements of GDM are similar for all pregnancies, but special attention is paid to carbohydrates. Despite the classical intervention of restricting carbohydrates, the latest evidence, although limited, seems to favor a low-glycemic index diet. There is general agreement in the literature about caloric restrictions in the case of being overweight or obese. Randomized controlled trials are necessary to investigate the optimal MNT for GDM; this knowledge could yield health benefits and cost savings.

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Introduction

Gestational diabetes mellitus (GDM) is a frequent metabolic condition associated with pregnancy that leads to substantial maternal and perinatal complications. Medical nutrition therapy (MNT) remains the main strategy for the treatment of gestational diabetes [1•]. However, there is still insufficient evidence as to which is the optimal type of dietary advice. This paper revises the available evidence from studies on this matter and the recommendations provided by the main treatment guidelines.

Gestational Diabetes Mellitus

GDM is a type of diabetes diagnosed in the second or third trimester of pregnancy that is not clearly overt diabetes [1•]. Its prevalence depends, among other factors, on geographic location, race/ethnicity, prepregnancy body mass index (BMI), and age. Therefore, the range of GDM is widespread, and it affects approximately 5–20 % of pregnancies.

The prevalence of GDM also depends on the screening criteria. There is a consensus that the screening should be universal at 24–28 weeks of gestation or even earlier in women with risk factors (Table 1) [1•, 2]. There are two main approaches for screening for GDM. On the one hand, there is the "two-step" approach, with a 50-g (nonfasting) screening followed by a 100-g oral glucose tolerance test (OGTT) or a 75-g OGTT for individuals who screen positive; this strategy is supported by the National Institutes of Health (NIH) of the United States [3] and the American College of Obstetricians

Table 1 Risk factors for developing gestational diabetes mellitus

Age ≥25 years
Overweight or obesity
Family history of diabetes
Personal history of abnormal glucose metabolism
Personal history of poor obstetric outcome
Member of any of these ethnic/racial groups: Hispanic American, Native American, Asian American, African-American, Pacific Islander, and others

and Gynecologists [4], among others. There is no consensus about the optimum thresholds for a positive test (Carpenter and Coustan vs. National Diabetes Data Group (NDDG) criteria). On the other hand, there is the "one-step" approach, with a 75-g OGTT, which was proposed by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) based on the results of the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study [5]. The use of the IADPSG criteria implies an increased prevalence of GDM by 200–350 % [3, 6, 7]. Despite the potential benefits of diagnosing more women with GDM, there are uncertainties about whether it would improve perinatal outcomes in a cost-effective way [3, 7].

GDM has been associated with many adverse, short-term maternal and newborn outcomes such as serious perinatal outcomes in infants (defined by rates of death, shoulder dystocia, bone fracture, and nerve palsy) [8], macrosomia and being large for gestational age (LGA) [5, 8, 9], neonatal hypoglycemia [5, 9], stillbirths, neonatal erythrocytosis and hyperbilirubinemia [9], and higher rates of women with preeclampsia, cesarean deliveries, or postpartum depression [8]. The cause of these negative consequences is the fetal hyperinsulinism state due to maternal hyperglycemia. In the long term, GDM can also be associated with negative consequences for the mother, such as an increased risk of impaired glucose tolerance, type 2 diabetes, and cardiovascular disease, and for her offspring (e.g., obesity [10] and type 2 diabetes [11]).

A diagnosis of GDM followed by appropriate therapy can decrease fetal and maternal morbidity [8]. Therefore, treating the hyperglycemia is crucial, and nutritional intervention is the first step.

Treatment of GDM

Diet and exercise are the first-line therapy to prevent and correct the hyperglycemia related to GDM. If good metabolic control cannot be achieved with these measures, the literature recommends adding pharmacologic treatments with insulin and/or oral agents [1•].

To control the course of GDM and adjust the therapy if necessary, maternal capillary blood glucose control and urine or blood ketone monitoring is required.

Evidence

The Role of Medical Nutrition Therapy in the Management of GDM

MNT is the cornerstone of treatment of GDM [12] and has been shown to improve glycemic control [13]. The primary goal of MNT is to achieve normal blood glucose levels while promoting adequate weight gain and nutritional status without ketosis [12]. Moreover, MNT for GDM may be a starting point to induce nutritional changes toward a healthy diet that could persist after delivery, with protective effects against long-term consequences such as type 2 diabetes.

The National Institute for Health and Care Excellence (NICE) guideline development group noted that important outcomes were improved when diet was prescribed compared with no diet at all. This group also concluded that some women could manage their blood glucose using diet alone and that the use of insulin at the time of diagnosis should not be a routine practice [14••].

However, some reviews detected there was little evidence to support one diet over another [15–17], and although several trials comparing various diets have been published in the last few years, there is currently no consensus about an optimal diet. The few studies focused on this topic typically were associated with limitations such as a small sample size, differences in maternal ethnicities, the relevance of the outcomes, or a short duration of the interventions. In fact, in three recent systematic reviews (SRs) with and without meta-analyses [18•, 19•, 20••], only nine randomized studies (429 women with GDM), six randomized studies (250 women with GDM), and nine randomized studies (884 women with GDM or glucose intolerance or hyperglycemia during pregnancy), respectively, met the criteria for inclusion, and these studies often overlapped. As Hernandez et al. stated: "The field of GDM has moved from establishing that treatment of GDM is effective, to the current state where the challenge is to identify which treatments of GDM are most effective" [19•].

Energy Balance

Research on caloric requirements and optimal weight gain for women with GDM has been limited. The Institute of Medicine (IOM) does not recommend gestational weight loss [21]. If a caloric restriction is necessary, it must be controlled because food restriction during pregnancy leads rapidly to a predominantly fat-utilizing and glucose-sparing metabolic state [22]. A recent SR and meta-analysis that analyzed pregnancy outcomes in obese women (with or without diabetes) with weight loss, compared to weight gain within the 2009 IOM guidelines for gestational weight gain, found decreased rates of LGA, macrosomia, and cesarean births but increased odds of small for gestational age (SGA) and low birth weight. This study

was characterized by a lack of information about important pregnancy outcomes. None of the included studies distinguished between intentional or unintentional gestational weight loss, so there was no information about whether a caloric restriction was imposed [23].

Some studies compared diets characterized by different caloric contents for GDM [24–27], but these studies were nonrandomized and/or small and/or did not include data about perinatal outcomes. A randomized controlled trial (RCT) ($n = 124$) compared a diet with moderate energy restriction providing 70 % of the dietary reference intake (DRI) for pregnancy [28] (1590–1776 kcal/day) vs. a diet that was unrestricted (2010–2220 kcal/day). After taking into account the estimated intake analysis, no significant difference was found between the groups. Perhaps as a result, there was no difference in outcomes (frequency of insulin use, mean birth weight, ketonemia). No adverse effects were reported with any of the energy restrictions [29].

Carbohydrates

The cornerstone of MNT in GDM is carbohydrates (CHO) because they are the major nutrient affecting postprandial blood glucose levels [30]. For this reason, CHO are the main macronutrient where research is focused. Nevertheless, evidence of CHO in GDM is also scarce.

There is no consensus regarding how to control CHO. Some approaches are based on the modification of CHO distribution, and other approaches modify any of the components of the glycemic load (GL) (i.e., the amount of CHO and their glycemic index (GI)).

CHO Distribution

Manipulating CHO distribution over several meals and snacks can be useful for controlling postprandial glucose levels, but there have been no trials about this intervention [31].

CHO Amount

Our group developed a RCT pertaining to CHO restriction for GDM. One hundred and fifty-two participants were included and were randomized onto a low-CHO diet (40 % CHO, 40 % fat) or a conventional diet (55 % CHO, 25 % fat). We found that low-CHO diet did not reduce the need for insulin therapy (the rate of women requiring insulin was the same in both groups, 54.7 %; $p = 1$) and there were no significance differences between groups regarding insulin dose or time to insulin. No differences were found in the obstetric and perinatal outcomes between the two groups [32•]. Hernandez et al., in a randomized crossover design (16 participants examined over a duration of 12 days) compared a low-CHO diet (40 %) with a higher complex CHO (60 %)/low-fat diet. These authors found that liberalizing complex CHO intake and reducing fat also achieved glycemia below target levels and lowered free fatty acids (FA). No analysis was performed about the need for insulin or perinatal outcomes [33]. These authors concluded in a latter pilot study ($n = 12$) that the same higher complex CHO/lower fat diet might improve maternal insulin resistance and infant adiposity and result in increased adipose tissue sensitivity and decreased proinflammatory gene expression [34].

The IOM states that the minimum amount of CHO for pregnant women should be 175 g per day [28].

Glycemic Index, Glycemic Load, and Fiber

The first randomized trial ($n = 63$) assessing the effect of a low GI for women with GDM found that treatment failure (defined as the need to commence insulin) was reduced by 50 % in women with a low-GI diet compared with women who ate a high-fiber/low-sugar diet with high-to-moderate-GI foods (low-GI group 29 % vs. the high-GI group 59 %; $p < 0.05$). Moreover, 9 out of 19 women in the higher-GI group were able to avoid needing insulin by moving toward a low-GI diet. There were no significant differences in any other reported pregnancy outcomes [35]. In a latter RCT with a larger sample ($n = 99$), authors compared a low-GI diet and a high-fiber/moderate-GI diet [36]. The authors did not find significant differences between groups in terms of the number of women requiring insulin or the rates of cesarean sections, macrosomia, or LGA. However, there were no statistical differences in the GI content of the diets, and the trial was stopped prematurely because it was unable to detect a difference in its main outcome (infant birth weight).

By including these two RCTs and two others [37, 38], the most recent SR and meta-analysis noted that a low-GI diet was associated with beneficial outcomes in GDM, mainly a lower percentage of women requiring insulin and a lower birth weight without an increase in the number of SGA or macrosomia cases [20••].

Regarding fiber on GDM, one small RCT ($n = 31$) compared two groups with a low-GL diet by adding a supplement of fiber to one of the diets [39]. These authors found that this intervention resulted in fewer women requiring insulin. However, we note that this study did not report dietary compliance.

There have been no RCTs in GDM patients in which the GL of diets was measured.

Fat

The previous approach of restricting CHO intake could imply an increase in fat intake if protein consumption remained regular. In pregnancy, maternal lipids (triglycerides and free FA) have been associated with excessive fetal growth because

triglycerides, which are sensitive to dietary fat intake, are hydrolyzed, and free FA transported across the placenta are important substrates for fetal fat accretion [40–42]. The maternal plasma fuel abnormalities that occur in GDM may contribute to macrosomia since there are correlations between baby birth weight and maternal plasma amino acids, free FA, and triglycerides [43]. Furthermore, higher free FA may worsen maternal insulin resistance [44].

Lauszus et al. performed a RCT ($n = 27$) and found that a diet high in monounsaturated FA (at least 20 % total energy from monounsaturated fats) did not increase the 24-h diastolic blood pressure compared with a high-CHO diet (at least 50 % total energy from CHO). Nonetheless, this diet yielded a decrease in insulin sensitivity compared with the high-CHO diet [45].

Sweeteners

Based on limited human research data, sugar alcohols and non-caloric sweeteners are safe for women during pregnancy when consumed within the acceptable daily intake levels established by the Food and Drug Administration (FDA) [46] or the European Food Safety Agency (EFSA). However, moderation is prudent. The non-caloric sweeteners approved by the FDA for pregnant women include aspartame (with the exception of women suffering from phenylketonuria), acesulfame potassium, sucralose, neotame, advantame, steviol glycosides, and extracts from monk fruit. Cyclamates and its salts are currently prohibited in the USA [46]. There are no data about these additives for women with GDM.

The American Medical Association advises women to avoid saccharin during pregnancy because the fetus may not be able to clear the substance quickly enough, as reported by the Academy of Nutrition and Dietetics (AND) [47].

Other Relevant Issues Related to MNT in GDM

Regarding diet distribution, the most common approach for GDM is the same as for patients with other types of diabetes: a constant distribution of CHO throughout the day to maintain stable blood glucose levels. Additionally, Sacks et al. recommended the establishment of a uniform duration of a fast (time since the last meal) to enable a valid day-to-day intraindividual comparison of fasting glucose concentration [48]. However, there have not been studies comparing different number or distribution of meals.

Furthermore, which methods are appropriate for establishing and following a dietetic plan is not well established. These aspects are poorly described in the literature, and we could not identify studies comparing different approaches.

It is well known that folic acid supplementation reduces the prevalence of neural tube defects. Women with diabetes have an increased risk of having a baby with a neural tube defect, and there is no evidence that folic acid metabolism differs between women who do or do not have diabetes [14••]. No studies had been conducted addressing this issue in GDM, but it has been proposed that dosages of folic acid should be increased to 5 mg/day for women with any kind of diabetes [49].

Finally, patient adherence to a prescribed diet is an important issue that should never be ignored by the clinician. Some studies provided the meals to their participants [33, 34], and these studies accordingly may have had higher compliance rates. However, this procedure is not routine. The majority of studies evaluated dietary compliance by estimating food intake methods, which revealed good dietary adherence in some trials [32•, 37] and poorer outcomes in others [29, 45, 50]. Adherence can also be confirmed by postprandial self-monitored blood glucose, ketone testing, weight of the pregnant woman [48], or FA distribution in a blood sample [45].

Nevertheless, Balas-Nakash et al. did not find any relationship between treatment adherence and an adequate glycemic control [50], consistent with previously published studies [51].

Recommendations

We are hereby providing a brief summary of the different guidelines that pertain to MNT recommendations for GDM. A SR on the quality of the guidelines available until the end of 2011 found that there was still room for improvement [52]. Table 2 summarizes the information discussed below.

Role of MNT in GDM

The guidelines of the Australasian Diabetes in Pregnancy Society (ADIPS) [53], the AND [47], the Endocrine Society Clinical Practice Guidelines [54•], and the American Diabetes Association (ADA)'s most recent workshop-conference on GDM [12], the Canadian Diabetes Association (CDA) [55•], and the NICE in the United Kingdom [14••] recognize that MNT/diet is the first therapeutic strategy for GDM.

Energy Balance

There is limited evidence supporting a particular caloric intake recommendation in GDM. The AND, ADA, and CDA state that for normal and underweight women, an adequate caloric intake should be encouraged to attain an appropriate weight gain, based on IOM recommendations for pregnant women [12, 47, 54•, 55•]. The ADIPS states that a diet has to meet the nutritional requirements of pregnancy; this organization and the CDA stress that it is important to avoid a calorie-restricted diet [53, 55•].

For overweight and obese women, there are recommendations for a modest caloric restriction [12] (~70 % of the DRI

Table 2 Summary of more recent recommendations of different organizations on medical nutrition treatment of gestational diabetes mellitus

Organization	Year	Energy	CHO	GI/GL	Fiber	Fat	Protein	Number of meals	Diet method	Diet monitoring	Dietitian
ADIPS [53]	1998	NR but avoid a severe caloric restriction	NR[a]	NR[a]	NR[a]	NR[a]	NR[a]	NR[a]	NR[a]	NR[a]	Yes
AND [47]	2008	DRI For overweight and obese, a modest caloric restriction Not weight loss	DRI A minimum of 175 g/day <45 %[b]	NR	NR	DRI	DRI	NR	NR	Food records	Yes
ADA [12]	2007	DRI For overweight and obese, 30 % of restriction Not weight loss	DRI A minimum of 175 g/day	NR	NR	NR	NR	3 meals + 2 to 4 snacks	"CHO counting"	Daily food records	Yes
Endocrine Society [54•]	2013	NR for normal weight, underweight, and overweight For obese, approximately one-third of restriction with a minimum of 1600 to 1800 kcal/day	35 to 45 %[b]	NR	NR	NR	NR	3 meals + 2 to 4 snacks	NR	NR	NR
CDA [55•]	2013	NR but no hypocaloric diets	40 to 50 %[b]	NR	NR	Up to 40 %[b]	NR	3 meals + 2 to 4 snacks	NR	NR	Yes
DDG-DGGG [56•]	2014	Based on the following prepregnancy body mass index: ~35 to 40 kcal/kg for underweight ~30 to 34 kcal/kg for normal weight ~25 to 29 kcal/kg for overweight A maximum of 24 kcal/kg for obese or a reduction of 30 to 33 % of daily energy requirements with a minimum of 1600 to 1800 kcal/day	40 to 50 %[b] 15 to 30 g for breakfast	Avoid high-GI foods	30 g/day	30 to 35 %[b]	20 to 25 %[b] A minimum of 60 to 80 g/day	3 meals + 2 to 3 snacks	German units to measure CHO	Dietary records	NR
NICE [14••]	2015	NR No dieting [57]	NR	Replace high-GI foods per low-GI foods	NR	NR	NR	NR	NR	NR	Yes

Abbreviations: *ADIPS* Australasian Diabetes in Pregnancy Society, *AND* Academy of Nutrition and Dietetics, *ADA* American Diabetes Association, *CDA* Canadian Diabetes Association, *DDG-DGGG* German Diabetes Association and German Association for Gynaecology and Obstetrics, *NICE* National Institute for Health and Care Excellence, *CHO* carbohydrates, *GI* glycemic index, *GL* glycemic load, *DRI* dietary reference intakes, *NR* not reported

[a] Not reported but conform with the principles of dietary management of diabetes in general

[b] Percentage of total daily calories

[47] of their usual intake before pregnancy [54•]) so as to slow weight gain without maternal or fetal compromise. Weight loss is not recommended [12, 47] but the German Diabetes Association and German Association for Gynaecology and Obstetrics (DDG-DGGG) downplays a loss of 1–2 kg in the first weeks after changing dietary patterns. This organization states that, in cases of obesity, it is possible not to achieve the minimum weight gain or even showing a weight loss without disadvantages. Women with GDM should record their weight weekly under the same conditions [56•]. The NICE guidelines refer to the NICE guidelines on weight management before, during, and after pregnancy [14••]. According to this document, dieting is not recommended during pregnancy [57].

The DDG-DGGG guidelines recommend the following daily calorie intake per kilogram of prepregnancy weight based on prepregnancy BMI: ~35–40 kcal/kg for underweight, ~30–34 kcal/kg for normal weight, ~25–29 kcal/kg for overweight, and a maximum of 24 kcal/kg for obese or a reduction of 30–33 % of daily energy requirements [56•]. The minimum intake should be 1600–1800 kcal per day [54•, 56•].

Carbohydrates

The minimum amount of CHO recommended for pregnant women is DRI 175 g/day [12, 47]. The range of CHO recommended varies from 35 to 50 % of the total caloric intake [47, 54•, 55•, 56•]. The amount and distribution of CHO should be based on hunger, eating habits [12], weight gain, plasma glucose and ketone levels [12, 54•], and triglyceride concentration [54•]. The majority of guidelines agree with distributing CHO into three small-to-moderate-sized meals and 2–4 snacks [12, 54•, 55•, 56•] (one in the evening after dinner). The DDG-DGGG guidelines recommend 15–30 g of CHO for breakfast [56•]. The ADA adds that the amount of CHO should be consistent at meals and snacks, especially in case of insulin therapy [12]. The ADIPS states that diets need to conform to the principles of dietary management of diabetes in general; these recommendations are not specified in the document [53].

Glycemic Index, Glycemic Load, and Fiber

The NICE and the DDG-DGGG guidelines recommend low-GI CHO [14••, 56]. German guidelines also encourage an intake of 30 g of fiber per day, mainly in the form of grains, fruits, and vegetables [56•]. The AND concludes that research is limited regarding fiber intake and GI and therefore makes no recommendations [47].

Fat

The AND states that evidence is fair to recommend the DRI of fat for GDM [47]. On the other hand, German guidelines state that fat should represent 30–35 % of total energy intake and, in the case of an obese individual, low-fat food should be preferred [56•]. Fat can represent up to 40 % of the total energy intake according to the Canadian guideline development group, and the quality of these fats can follow the same recommendations that apply to the general population [55•].

Sweeteners

Overall, there is clear evidence that sugar alcohols and non-caloric sweeteners are safe when consumed within acceptable daily intake levels [12, 47, 56•].

Other Relevant Issues Related to MNT in GDM

The AND describes that evidence is fair to recommend the DRI of protein for pregnant women [47], but the DDG-DGGG guidelines state that protein should represent 20–25 % of the total energy intake, with a minimum of 60–80 g/day [56•].

With respect to vitamins, the Endocrine Society and the NICE guidelines are the only organizations that make a specific recommendation in terms of GDM, specifically for folic acid. The Endocrine Society supports beginning folic acid doses 3 months before trying to conceive starting with 5 mg daily and reducing to 0.4–1.0 mg daily at 12 weeks of gestation [54•], and the NICE guidelines suggest doses of 5 mg/day as well [14••]. Other guidelines maintain that there is insufficient evidence to recommend a particular supplement of vitamins or minerals for women with GDM [55•] and that a sufficient intake of vitamins and minerals (in particular, folic acid, vitamin B complex, calcium, vitamin D, magnesium, iron, and iodine) should be ensured [56•] and that pregnant women may need a multivitamin supplement [12, 47].

Only two guidelines mention alcohol, and they consider it imperative to avoid this substance [12], even in cooking [47].

The NICE guidelines specify some healthy diet recommendations such as to increasing the intake of fruits and vegetables, not “eating for two,” and avoiding drinking full-fat milk [14••]. The ADIPS and ADA encourage individualizing healthy food plans to each patient’s culture, weight gain [53], and physical activity and modifying these food plans during pregnancy if necessary. The ADIPS and ADA support training patients in “CHO counting” [12]. The DDG-DGGG guidelines recommend explaining a diet using German units to measure CHO in diabetes: the BE (*broteinheit*), which comes out to 12 g of CHO and the KE (*kohlenhydrateinheit*), which corresponds to 10 g of CHO [56•].

Food records can be used to adjust and individualize a CHO-controlled meal plan [12, 47, 56•].

Finally, most guidelines agree with the fact that MNT is best prescribed by a dietitian or a qualified professional with experience in the management of GDM [12, 14••, 47, 53, 55•].

Indian guidelines do not include any recommendation about MNT in GDM [58], and the guidelines of Diabetes UK, the diabetes association in the United Kingdom, only gives one piece of general advice for GDM: offering individualized nutritional education and providing access to a multidisciplinary team [59].

There is clearly a lack of consensus about all of the components of MNT for GDM; the most complete set of guidelines is the German set [56•], because those guidelines make recommendations for most components of MNT.

Conclusion

MNT remains front and foremost in the management of GDM, given it can modulate hyperglycemia with potentially beneficial perinatal outcomes. The most recent studies have suggested a broader approach commonly known as a healthy diet, which is based on low GI, high complex CHO and fiber intake, and with a low amount of sugar and saturated fat. However, based on the majority of practice guidelines, specific diet characteristics still remain unclear due to the lack of sufficient high-quality RCTs. Trials involving nutritional therapies are difficult because intake is conditioned by social, economic, and physiological factors, to name a few. In addition, compliance is a particular issue in these kinds of studies.

Evidence is limited for all components of MNT for GDM. First of all, the issue of gestational weight gain in GDM has not been studied sufficiently despite its importance. It is not clear if obese women should lose weight, but it seems that a moderate energy restriction is safe. There are no interventions concerning CHO distribution and only limited evidence about CHO amounts. Despite the traditional clinical practice of a CHO-restricted meal plan, subsequent studies had shown that higher CHO diets, based on complex CHO or low-GI CHO, are associated with perinatal advantages in GDM [19•]. All in all, evidence, although limited, has demonstrated benefits and no harms of a low-GI diet [60•]. With respect to fat, a high-monounsaturated-FA diet showed no advantages over a high-CHO diet [45]. Furthermore, all of this evidence cannot be applied worldwide because the majority of published studies are derived from Western countries, as noted by some Asian authors [61].

The main guidelines of GDM include recommendations for MNT, and, in general, they do not differ from recommendations for healthy pregnant women. One of the most important components is the energy content, since pregnancy weight gain depends primarily on this factor, which has to be controlled to optimize perinatal outcomes. Caloric restriction is only advised for overweight and obese pregnant women with GDM. In terms of macronutrients, CHO are the focus considering their direct relation to glycemia. Guidelines recommend a minimum CHO intake of 175 g/day constituting 35–50 % of total daily calories; these CHO should be predominantly low GI and distributed over three meals and 2–4 snacks.

The lack of sufficient evidence to make strong recommendations of MNT for GDM should encourage researchers to carry out additional trials. Given the recent NICE guideline recommendations focusing on GI [14••], perhaps more studies will be conducted taking it into account. It is necessary to elucidate the best MNT for GDM because it could reduce short-term health costs by preventing the need for expensive medical management in this growing population. There would be also long-term cost savings because of the prevention of negative future consequences of GDM for mothers and children such as obesity, type 2 diabetes, and their comorbidities.

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Compliance with Ethical Standards

Conflict of Interest Cristina Moreno-Castilla, Didac Mauricio, and Marta Hernandez declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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