

Tielemans M.J., Garcia A.H., Peralta Santos A., Bramer W.M., Luksa N., Luvizotto M.J., et al. (2016) **Macronutrient composition and gestational weight gain: a systematic review**. *American Journal of Clinical Nutrition* 103, 83-99.

## Introduction

Adequate weight gain during pregnancy is important for the short-term and long-term health of mother and child. If gestational weight gain is too low, there is an increased risk of low birth weight and preterm birth (1). In contrast, if gestational weight gain is excessive, there is an elevated risk of gestational diabetes, excessive intrauterine growth, caesarean delivery, maternal postpartum weight retention and childhood obesity (2, 3). The effect of different macronutrients (i.e. carbohydrates, protein, and fat,) in the diet on gestational weight gain are uncertain. This issue of NNA summarizes a review article published in the *American Journal of Clinical Nutrition* which aimed to assess whether energy intake and macronutrient intake during pregnancy were associated with gestational weight gain (4).

## Methods

Tielemans and colleagues (4) performed a systematic review of randomized controlled trials, intervention studies, cohort studies and case-control studies. They considered studies that included participants who were pregnant with a single child. Studies were eligible if either the dietary intake of macronutrients was measured or if a macronutrient-containing intervention was provided. The gestational weight gain was either self-reported or measured. Studies that included only adolescent pregnant women were excluded because of the different energy requirements of adolescents.

Among 7623 identified references, 7141 did not meet the inclusion criteria. After further evaluation, 56 studies were accepted for the analyses including 10 intervention and 46 observational studies. Only 2 studies were randomized controlled trials. A total of 78,362 pregnant women 12 to 46 years of age participated in these studies. The size of the studies ranged from 20 to 46,262 participants per study, most of whom were studies of healthy pregnant women. Half of the studies (n=28) were conducted in high-income countries and the other half (n=28) in low- and middle-income countries. The authors assessed the quality of each study by using a predefined scoring system. The quality score of studies ranged from 2 (very low) to 10 (high) with a median score of 5. Only 11 of 56 studies received a quality score of 7 or above.

## Results and Conclusions

The provision of macronutrient supplements was investigated in 11 studies, of which 9 were performed in low- and middle-income countries. The only intervention study judged to be of high quality found no difference in gestational weight gain between women who received a macronutrient supplement (400 kcal/d) compared with women who received <50 kcal/d in addition to their usual diet throughout the pregnancy (5). Besides the supplement, the food intake was reportedly similar in the two comparison groups. The remaining 10 studies which provided an

energy supplement, were of lower quality and findings were inconsistent. Six studies found no consistent difference, whereas 4 found higher gestational weight gain.

Studies of associations between maternal macronutrient dietary intake and gestational weight gain were also considered. Results of 9 high-quality studies imply that higher energy intakes during pregnancy were associated with higher gestational weight gain. Studies of lower quality found inconsistent results. The 29 studies investigating the association of protein intake and gestational weight gain found inconsistent results. Similarly, 18 studies found inconsistent results between carbohydrate intake and gestational weight gain. Among 21 studies investigating the association between fat intake and gestational weight gain, only 4 were of high quality. Of these 4, only one study found that higher fat intake is associated with greater gestational weight gain. The remaining 3 found no association. Similarly, the majority of lower quality studies found no consistent association. There may be an association between specific fats, such as saturated fats, and gestational weight gain, but findings were inconsistent and the number of studies was too small to draw a final conclusion. The findings did not differ between studies in high-income countries and low- and middle-income countries.

### **Policy Implications**

The review by Tielemans et al (4) found that higher total energy intake during pregnancy is associated with an increased gestational weight gain. However, it is unclear whether different macronutrients have a different impact on gestational weight gain independent of the overall energy intake. A limiting factor of this review was the low quality of most of the available studies. Dietary assessments are challenging and it is difficult to obtain accurate information on energy intake using self-reports. Moreover, potential confounding factors, for example pre-pregnancy body mass index (BMI) and physical activity, were not considered in many of the studies. Therefore, the authors concluded that further studies of higher quality are needed to assess the association between specific macronutrients and gestational weight gain.

### **NNA Editor's Comments\***

Although there were no new insights gained into the contribution of different macronutrients on gestational weight gain, two recent systematic reviews concluded that a balanced energy-protein supplement is an effective intervention to reduce the prevalence of low birth weight and small-for-gestational-age births in undernourished women (6, 7). Thus, macronutrient intake can improve certain pregnancy outcomes, although the specific macronutrient source was not considered in the latter analyses.

The present review confirmed that total energy intake is associated with gestational weight gain. Thus in low- and middle-income countries, where gestational weight gain is often inadequate, the recommendation to consume more energy overall remains appropriate. As an example, the Essential Nutrition Actions Framework propose that behavior change communications focus on the information that 'Pregnant women should have an additional meal every day to maintain their strength' (8).

\*These comments have been added by the editorial team and are not part of the cited publication.

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