Maternal diet does make a difference in Gestational Diabetes Pregnancy

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Maternal diet and lifestyle in GDM

• Prevalence of GDM and its impact on mothers/babies
• Dietary management of GDM
• Prevention of GDM/Type 2 diabetes
• The role of new technologies (Continuous Glucose Monitoring)
Gestational Diabetes (GDM)

- Hyperglycaemia commonest medical condition
- 87.5% GDM (One in six livebirths)
- Low and Middle Income Countries (LMICs) 80% global diabetes burden
  - 90% maternal/perinatal deaths
- Prevalence context dependent & rising: 5-15%
  - UK/North USA 20% in Asia, >33% Middle East
Risk factors for GDM

- Age >30 yrs
- BMI >30 mg/kg²
- Previous GDM
- Previous LGA infant
- Family history T2D
- Ethnicity South Asian, Hispanic, Afro-Caribbean, Middle Eastern
- PCOS, infertility, IVF
Maternal risks

- Pre-eclampsia
- Preterm delivery
- C-section
- GDM/Type 2 diabetes
Infant risks

- Birthweight/adiposity
  - LGA, shoulder dystocia
  - Neonatal hypoglycaemia, jaundice, RDS
  - Childhood adiposity

<table>
<thead>
<tr>
<th>Glucose Outcomes for Mothers</th>
<th>Defined Using IADPSG Criteria&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Defined Using Carpenter-Coustan Criteria&lt;sup&gt;d,e&lt;/sup&gt;</th>
<th>Mothers Without Gestational Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediabetes&lt;sup&gt;d&lt;/sup&gt;</td>
<td>200/508 (39.4)</td>
<td>75/155 (48.4)</td>
<td>728/3945 (18.5)</td>
</tr>
<tr>
<td>Type 2 diabetes&lt;sup&gt;e&lt;/sup&gt;</td>
<td>40/508 (7.9)</td>
<td>31/155 (20.0)</td>
<td>63/3945 (1.6)</td>
</tr>
<tr>
<td>Disorder of glucose metabolism&lt;sup&gt;d,e&lt;/sup&gt;</td>
<td>240/508 (47.2)</td>
<td>106/155 (68.4)</td>
<td>791/3945 (20.0)</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Adiposity Outcomes for Children</th>
<th>Defined Using IADPSG Criteria&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Defined Using Carpenter-Coustan Criteria&lt;sup&gt;d,e&lt;/sup&gt;</th>
<th>Mothers Without Gestational Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overweight or obesity&lt;sup&gt;f&lt;/sup&gt;</td>
<td>192/522 (36.8)</td>
<td>77/159 (48.4)</td>
<td>1172/4094 (28.6)</td>
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<tr>
<td>Obesity&lt;sup&gt;f&lt;/sup&gt;</td>
<td>91/522 (17.4)</td>
<td>39/159 (24.5)</td>
<td>405/4095 (9.9)</td>
</tr>
<tr>
<td>Body fat % &gt; 85th percentile&lt;sup&gt;g,h&lt;/sup&gt;</td>
<td>100/511 (19.6)</td>
<td>45/158 (28.5)</td>
<td>553/3990 (13.9)</td>
</tr>
<tr>
<td>Waist circumference &gt; 85th percentile&lt;sup&gt;g&lt;/sup&gt;</td>
<td>108/519 (20.8)</td>
<td>39/160 (24.4)</td>
<td>571/4114 (13.9)</td>
</tr>
<tr>
<td>Sum of skinfolds &gt; 85th percentile&lt;sup&gt;g&lt;/sup&gt;</td>
<td>110/510 (21.6)</td>
<td>43/154 (27.9)</td>
<td>553/4039 (13.7)</td>
</tr>
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</table>
Treatment of GDM
Crowther et al, *NEJM* 2005

ACHOIS n=1000 24-34 weeks

- Australian population, 75% white

- FPG <7.8 mmol/L, median 8.8 mmol/L post 75g OGTT

- ↓ serious complications 4 vs 1%; P=0.01 but increase IOL (39 vs 29%) and NICU (71 vs 61%)

- Improved QoL (n=573)
Treatment of “mild-moderate” GDM
Landon et al, NEJM 2009

MFMU n=958 24-31 weeks

- Mixed ethnicity, 75% multiparous
- FPG< 5.3 mmol/L, median glucose 8.2 mmol/L post 100g OGTT
- Primary outcome unchanged - no deaths
- Birth weight 3.3 vs 3.4kg, macrosomia 5.9 vs 14.3%, LGA 7 vs 14%, neonatal fat mass 427 vs 464g,
- CS, PET, PIH, maternal weight gain
Summary and Recommendations of the Fifth International Workshop-Conference on Gestational Diabetes Mellitus

MNT and planned physical activity
MNT is the cornerstone of treatment for GDM. However, relatively little information is available to allow evidence-based recommendations regarding specific nutritional approaches such as total calories and nutrient distribution to the management of GDM. The food plan should be designed to fulfill minimum nutrient requirements for pregnancy set by the Institute of Medicine and to achieve glycemic goals without inducing weight loss or excessive weight gain. Adequate energy intake that provides appropriate weight gain is recommended during pregnancy. For overweight and obese women with GDM, modest energy and carbohydrate restriction may be appropriate. Ketonemia from starvation ketosis should be avoided.

MNT is best prescribed by a registered dietitian or qualified individual with experience in the management of GDM. Food plans should be culturally appropriate and individualized to take into account the patient’s body habitus, weight gain, and physical activity and modified as needed throughout pregnancy to achieve treatment goals. Adjusting the amount and type of carbohydrate to achieve the target for postprandial glucose concentrations is an important part of the treatment regimen. Training patients in “carbohydrate counting,” use of food records, and testing postprandial fingerstick capillary blood glucose can facilitate this goal. Nutrition interventions for GDM should emphasize overall healthy food choices, portion control, and cooking practices that can be continued postpartum and may potentially help prevent later diabetes, obesity, cardiovascular disease (CVD), and cancer. Training patients for subsequent lifestyle modifications aimed at losing weight and increasing physical activity are recommended.

Boyd E. Metzger, MD1
Thomas A. Buchanan, MD2
Donald R. Coustan, MD3
Alberto de Leiva, MD, PhD4
David B. Dunger, MBBS, MD, FRCP5
David R. Hadden, MD, FRCP6
Moshe Hod, MD7
Jan L. Kitzmiller, MD8
Siri L. Kjos, MD9
Jeremy N. Oats, DM10
David J. Pettitt, MD11
David A. Sacks, MD12
Christos Zoupas, MD13

Diabetes Care, volume 30, Supplement 2, July 2007
S251

12/17/2018
Energy restriction and low carbohydrate diets had no effect. “low-glycemic diet” reduction insulin use and decreased birth weight.
Different types of dietary advice for women with gestational diabetes mellitus (Review)

Han S, Middleton P, Shepherd E, Van Ryswyk E, Crowther CA

ABSTRACT

Background
Dietary advice is the main strategy for managing gestational diabetes mellitus (GDM). It remains unclear what type of advice is best.

Objectives
To assess the effects of different types of dietary advice for women with GDM for improving health outcomes for women and babies.

Search methods
We searched Cochrane Pregnancy and Childbirth’s Trials Register (8 March 2016), PSANZ’s Trials Registry (22 March 2016) and reference lists of retrieved studies.

Selection criteria

Authors’ conclusions
Evidence from 19 trials assessing different types of dietary advice for women with GDM suggests no clear differences for primary outcomes and secondary outcomes assessed using GRADE, except for a possible reduction in caesarean section for women receiving a DASH diet compared with a control diet. Few differences were observed for secondary outcomes.

Main results
In this update, we included 19 trials randomising 1398 women with GDM, at an overall unclear to moderate risk of bias (10 comparisons). For outcomes assessed using GRADE, downgrading was based on study limitations, imprecision and inconsistency. Where no findings are reported below for primary outcomes or pre-specified GRADE outcomes, no data were provided by included trials.
ILSI Expert group

Nutritional Management of Gestational Diabetes

- Whether among women with GDM, the level of energy intake, individual nutrients or foods, or overall dietary components are associated with improved maternal glycemic and/or neonatal birthweight outcomes?

**Academic Participants**

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<tr>
<th>Name</th>
<th>Institution</th>
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<td>KCL, London, UK</td>
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<td>Petra Rust</td>
<td>Univ Vienna, AT</td>
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**Industry Participants**

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<th>Organization</th>
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<td>Euridice Castañeda Gutiérrez</td>
<td>Nestlé Nutrition Inst, CH</td>
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<td>Ana Piekarz</td>
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<td>Ricardo Rueda</td>
<td>Abbott Nutrition, ES</td>
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<td>ILSI Europe, BE</td>
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<tr>
<td>Lilou van Lieshout</td>
<td>ILSI Europe, BE</td>
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**Extra experts**

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Eran Hadar</td>
<td>Tel-Aviv Univ, IL</td>
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<td>Joanne Kellett</td>
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<td>Jennifer Yamamoto</td>
<td>University of Calgary, Canada</td>
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<td>Montserrat Balsells</td>
<td>Hospital de la Mútua de Terrassa, ES</td>
</tr>
<tr>
<td>Apolonia García</td>
<td>Hospital de la Santa Creu i Sant Pau; E</td>
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Prospero registration
CRD42016042391

Search keyword terms:
Gestational diabetes mellitus, GDM, diabetes pregnancy glucose intolerance, hyperglycaemia, pregnant, glycaemic index
AND
Diet*, nutrition*, food or dietary intake, food consumption, calorie or energy intake, kilojoule intake, calorie restriction, diet therapy, vitamin, nutrition therapy, dietary carbohydrates, dietary fibre, beverage, nutrient, macro- or micro nutrient, dietary intervention, diet supplement
AND
Randomized, controlled, trial, clinical, placebo, drug therapy, randomly, groups [Cochrane search]

18 studies, n=1,151 women with GDM
Gestational Diabetes Mellitus and Diet: A Systematic Review and Meta-analysis of Randomized Controlled Trials Examining the Impact of Modified Dietary Interventions on Maternal Glucose Control and Neonatal Birth Weight

Jennifer M. Yamamoto,¹ Joanne E. Kellett,² Montserrat Balsells,³ Apolonia García-Patterson,⁴ Eran Hadar,⁵ Ivan Solà,⁴,⁶,⁷ Ignasi Gich,⁷,⁸,⁹ Eline M. van der Beek,¹⁰,¹¹ Euridice Castañeda-Gutiérrez,¹² Seppo Heinonen,¹³,¹⁴ Moshe Hod,⁵ Kirsi Laitinen,¹⁵,¹⁶ Sjurur F. Olsen,¹⁷ Lucilla Poston,¹⁸ Ricardo Rueda,¹⁹ Petra Rust,²⁰ Lilou van Lieshout,²¹ Bettina Schelkle,²¹ Helen R. Murphy,²,²²,²³ and Rosa Corcoy²⁴,²⁵,²⁶
DiGest: A randomised, controlled, double blind nutritional intervention study

DiGest Dietbox
Delivered fresh to participant’s home

- Appealing, tasty food
- Mediterranean diet, low GI
- Nutritionally balanced for GDM & pregnancy
- 50% carb, 25% protein, 25% fat

GDM diagnosis

28w 30w 36w Delivery 6w PP

1200 kcal Dietbox

2000 kcal Dietbox

Visit 1
Weight, CGM
Food diary
Accelerometry

Visit 2
Weight, CGM
Food diary
Accelerometry

Visit 3
Weight
OGTT
The road to obesity and T2DM

<table>
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<tr>
<th>Young women</th>
<th>1st Pregnancy</th>
<th>2nd Pregnancy</th>
<th>3rd Pregnancy</th>
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<tr>
<td>BMI kg/m²</td>
<td>24.2</td>
<td>24.5</td>
<td>24.9</td>
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<tr>
<td>GDM</td>
<td>27.8</td>
<td>28.8</td>
<td>30.4</td>
</tr>
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High gestational weight gain & obesity
- Increases pregnancy risks
- Increases long-term diabetes risk

? Intervention during or after pregnancy

Maternal obesity

**BMJ Open** Obesity in pregnancy: a retrospective prevalence-based study on health service utilisation and costs on the NHS

Kelly L Morgan,¹ Muhammad A Rahman,¹ Steven Macey,² Mark D Atkinson,¹ Rebecca A Hill,¹ Ashrafunnessa Khanom,¹ Shantini Paranjothy,³ Muhammad Jami Husain,⁴ Sinead T Brophy¹

- Strong association between maternal BMI and healthcare costs
- Mean costs 23% higher among overweight women
- Mean costs 37% higher among obese women

UK: normal weight £3546; overweight £4244; obese £4717
Reduced gestational weight gain
Low quality evidence for GDM prevention
36 teams
17 countries
12,526 women

i-WIP International Weight Management in Pregnancy IPD network
Effect of diet and physical activity based interventions in pregnancy on gestational weight gain and pregnancy outcomes: meta-analysis of individual participant data from randomised trials

BMJ 2017;358:j3119
A Mediterranean diet with additional extra virgin olive oil and pistachios reduces the incidence of gestational diabetes mellitus (GDM): A randomized controlled trial: The St. Carlos GDM prevention study

<table>
<thead>
<tr>
<th></th>
<th>Crude</th>
<th></th>
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<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
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<tr>
<td></td>
<td>RR</td>
<td>95% CI</td>
<td>P</td>
<td>RR</td>
<td>95% CI</td>
<td>P</td>
<td>RR</td>
<td>95% CI</td>
<td>P</td>
<td>RR</td>
<td>95% CI</td>
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<tr>
<td>GDM</td>
<td>0.73</td>
<td>0.56-0.95</td>
<td>0.020</td>
<td>0.73</td>
<td>0.55-0.95</td>
<td>0.019</td>
<td>0.75</td>
<td>0.58-0.99</td>
<td>0.041</td>
<td>0.73</td>
<td>0.56-0.97</td>
</tr>
<tr>
<td>IT-GDM</td>
<td>0.43</td>
<td>0.24-0.78</td>
<td>0.006</td>
<td>0.44</td>
<td>0.25-0.81</td>
<td>0.008</td>
<td>0.51</td>
<td>0.28-0.93</td>
<td>0.028</td>
<td>0.43</td>
<td>0.24-0.78</td>
</tr>
</tbody>
</table>
ESTEEM: Mediterranean diet in pregnancy

3439 mothers recruited
1229 randomised
Weight Matters

• 40% risk GDM second pregnancy, 60% third pregnancy

• Up to 70% risk of progression to T2D in 5-10 years

• Among women with T2D – 33% previous GDM

• Women with higher BMI or higher GWG are most at risk

• Women GWG < IOM retained 3kg less @ 6/12 follow up

• Women GWG > IOM retained 3kg more @ 3 and 15 years

• Every 1kg increase pre-preg weight - 40% increase T2D

  • Kim et al, Diab Med 2013
Food Matters

• Treatment ↓ risk of serious complications and ↓ GWG, CS, PET, PIH, and birth weight, LGA and neonatal adiposity

• All dietary interventions are effective for improved maternal glycaemia and infant birthweight outcomes

• Dietary interventions (Med diet) reduces risk of developing GDM

• New technologies may help to personalise dietary interventions