DIETARY CHANGES FROM PRE-CONCEPTION TO PREGNANCY: A SYSTEMATIC REVIEW

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WEIGHT GAIN & PREGNANCY

- Almost 30% of pregnant women gain more weight than is recommended by the IOM guidelines (IOM, 2009).

<table>
<thead>
<tr>
<th>Pre-pregnancy BMI category</th>
<th>Total weight gain (lb, kg)</th>
<th>Rate of weight gain 2(^{nd}) and 3(^{rd}) trimester (lb/wk, kg/wk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (&lt; 18.5 kg/m(^2))</td>
<td>28-40, 12.5-18</td>
<td>1.0 (1.0-1.3), 0.51 (0.44-0.58)</td>
</tr>
<tr>
<td>Normal-weight (18.5-24.9 kg/m(^2))</td>
<td>25-35, 11.5-16</td>
<td>1.0 (0.8-1.0), 0.42 (0.35-0.50)</td>
</tr>
<tr>
<td>Overweight (25.0-29.9 kg/m(^2))</td>
<td>15-25, 7-11.5</td>
<td>0.6 (0.5-0.7), 0.28 (0.23-0.33)</td>
</tr>
<tr>
<td>Obese** (≥ 30.0 kg/m(^2))</td>
<td>11-20, 5-9</td>
<td>0.5 (0.4-0.6), 0.22 (0.17-0.27)</td>
</tr>
</tbody>
</table>

*Calculations assume a first-trimester weight gain of 1.1-4.4 lb (0.5-2.0 kg)
**1990 IOM Recommendation: for obese women (BMI > 29), weight gain at least 6.8 kg (15 lb)

- The more weight gained during pregnancy, the more likely that it may be retained postpartum (Johnson et al., 2013).
- In the Stockholm Pregnancy and Women’s Nutrition (SPAWN) study weight retention at the end of the postpartum year was the main predictor of being overweight 15 years later (Linne et al., 2004).
**RISKS ASSOCIATED**

Women who enter a subsequent pregnancy overweight or obese - have a higher risk of adverse outcomes for themselves and their infants (Kuhlmann et al., 2008 and Marchi et al., 2015).

<table>
<thead>
<tr>
<th><strong>Maternal Outcomes</strong></th>
<th><strong>Infant Outcomes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational hypertension</td>
<td>Inter-uterus growth restriction</td>
</tr>
<tr>
<td>GDM</td>
<td>Neural tube defects</td>
</tr>
<tr>
<td>Pre-eclampsia</td>
<td>Congenital anomalies</td>
</tr>
<tr>
<td>C-Section</td>
<td>Small Gestational Age (SGA)</td>
</tr>
<tr>
<td>Preterm delivery</td>
<td>Large GA</td>
</tr>
<tr>
<td>Infections</td>
<td>Micronutrients deficiencies</td>
</tr>
<tr>
<td>Miscarriage</td>
<td>Overweight/Obesity</td>
</tr>
<tr>
<td>Postpartum haemorrhage</td>
<td>Earlier onset of NCDs (CVDs,T2DM)</td>
</tr>
<tr>
<td>Postpartum depression</td>
<td>Shorter period of exclusive breastfeeding</td>
</tr>
</tbody>
</table>

Women who enter a subsequent pregnancy overweight or obese have a higher risk of adverse outcomes for themselves and their infants (Kuhlmann et al., 2008 and Marchi et al., 2015).
THE IMPORTANCE OF ADEQUATE DIETARY INTAKE

- Adequate nutritional intake during pregnancy is vitally important to ensure appropriate fetal growth both physically and mentally (Anderson et al., 2001).

- Poor maternal nutritional status is well reported to affect pregnancy and subsequent child health outcomes (Barker et al., 1986 & 1992; Osrin and de L Costello, 2000 and Keen et al., 2003).

- As such dietary intake both pre-pregnancy and during pregnancy is a major public health issue (Barker et al., 2013).
AIM

• To ensure appropriate and effective interventions are successfully developed to improve dietary intake during pregnancy, the dietary changes women make when they become pregnant are important to understand (Skreden et al., 2014).

• In addition to knowing what dietary changes women make when becoming pregnant, it is also important to understand who makes these changes.

The primary aim was to review the existing literature on dietary intake change before and during pregnancy.

Our secondary aim was to identify the key characteristics of the women who report changing their dietary intake.
METHODS & DESIGN

Search terms included those relating to:

preconception, pregnancy and diet

(e.g. nutrition, dietary intake, food intake, beverages, caffeine, fruit and vegetables).

• Studies were included if they measured women’s dietary intake before and during pregnancy, either prospectively or retrospectively.

• Studies had to use a within-participants design to limit the bias associated with a between-participant design.
Records identified through database searching (n = 897)

Additional records identified through hand search (n = 1)

Records after duplicates removed (n = 468)

Records screened (n = 468) → Records excluded (n = 445)

Full-text articles assessed for eligibility (n = 23)

Full-text articles excluded
  - Within-subject design (n = 6)
  - No diet data (n = 7)
  - No data collected in pregnancy (n = 1)

Studies included based on systematic search (n = 9)

Forward and backward referencing resulted in another 2 articles

Studies included in qualitative synthesis (n = 11)

**Figure**: Flowchart describing the number of articles retrieved, included and excluded at each stage of the review process
• Quality assessed using the Scottish Intercollegiate Guidelines Network methodology checklist for cohort studies (2016).

• The tool differentiates between prospective and retrospective cohort studies.

• Inter-rater reliability was calculated using percentage agreement (77.8%)

• The prospective studies scored marginally better compared to the retrospective studies, all articles were found to be of acceptable quality.

• Inappropriate to conduct a meta-analysis due to the heterogeneity of the studies.
## RESULTS: OVERVIEW OF STUDIES

<table>
<thead>
<tr>
<th>Authors</th>
<th>Sample Size</th>
<th>Design</th>
<th>When</th>
<th>What</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aden et al, 07</td>
<td>N=50</td>
<td>Retrospective</td>
<td>18wks</td>
<td>Energy &amp; Macro's</td>
<td>FFQ</td>
</tr>
<tr>
<td>Crozier et al, 09a</td>
<td>N=2057</td>
<td>Prospective</td>
<td>Pre-pregnancy: 11 &amp; 34wks</td>
<td>Food groups</td>
<td>FFQ</td>
</tr>
<tr>
<td>Crozier et al, 09b</td>
<td>N=1490</td>
<td>Prospective</td>
<td>Pre-pregnancy: 11 &amp; 34wks</td>
<td>Food groups</td>
<td>FFQ</td>
</tr>
<tr>
<td>Cuco et al, 06a</td>
<td>N=80</td>
<td>Prospective</td>
<td>Pre-pregnancy: 6, 10, 26 &amp; 38wks</td>
<td>Energy</td>
<td>7d Food Diary</td>
</tr>
<tr>
<td>Cuco et al, 06b</td>
<td>N=77</td>
<td>Prospective</td>
<td>Pre-pregnancy: 6, 10, 26 &amp; 38wks</td>
<td>Energy &amp; Macro's</td>
<td>7d Food Diary</td>
</tr>
<tr>
<td>Hellerstedt et al, 97</td>
<td>N=7174</td>
<td>Retrospective</td>
<td>1-20wks</td>
<td>Food groups</td>
<td>Telephone Survey</td>
</tr>
<tr>
<td>Kopp-Hoolihan et al, 99</td>
<td>N=10</td>
<td>Prospective</td>
<td>Pre-pregnancy: 8-10, 24-26, 34-36wks</td>
<td>Energy</td>
<td>3d Food Diary</td>
</tr>
<tr>
<td>Paulik et al, 09</td>
<td>N=349</td>
<td>Retrospective</td>
<td>28wks</td>
<td>Food groups</td>
<td>FFQ</td>
</tr>
<tr>
<td>Pinto et al, 08</td>
<td>N=249</td>
<td>Prospective</td>
<td>Pre-pregnancy: Post-birth</td>
<td>Energy &amp; Macro's</td>
<td>FFQ</td>
</tr>
<tr>
<td>Skreden et al, 14</td>
<td>N=575</td>
<td>Retrospective</td>
<td>Pre-pregnancy: 15wks</td>
<td>Food groups</td>
<td>FFQ</td>
</tr>
<tr>
<td>Smedley et al, 14</td>
<td>N=100</td>
<td>Retrospective</td>
<td>Pre-pregnancy: 12months post-birth</td>
<td>Food groups</td>
<td>FFQ</td>
</tr>
</tbody>
</table>
DIETARY CHANGES – ENERGY & MACRONUTRIENTS

• The studies showed marked heterogeneity within their results.

• 5 studies (out of 11) reported findings in terms of energy intake.

• The majority of studies (n=4) report an increase in energy intake (kcal or kJ) during pregnancy with one reporting no significant change (Pinto et al., 2008).

• However, there was no consistent changes in different macronutrient intake reported (n=3).
FOOD GROUPS

- 6 studies reported changes through food group comparisons.
CHARACTERISTICS

• All 11 studies provided data on study participants
• But only 4 studies provided data on the characteristics of the women
  Crozier et al. (2009b); Cuco et al. (2006a); Skreden et al. (2014); Hellerstedt et al. (1998)
• Both education and age were associated with healthier dietary changes
• However, these factors were only assessed in a small number of studies so no firm conclusions can be drawn
CONCLUSIONS

• The 11 included articles show varied results in dietary intake during pregnancy as compared to pre-conception.

• More research is needed regarding who makes these healthy changes, this includes consistency regarding measurement tools, outcomes and time points.

Implications for Practice:

• Midwives, as well as intervention developers need to be aware of the changes women may spontaneously engage in when becoming pregnant, so that appropriate care and interventions can build on these.
THANK YOU

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