Relative validity of an image-based method for the assessment of dietary intake in pregnant women

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Image-based food records
- Image contains intake data +/- additional information
- Not reliant on literacy or numeracy skills
- Active vs passive capture
- Manual, semi-automated, automated analysis

Aims
- Assess food group and nutrient intakes of pregnant women
- Establish the validity of an image-based dietary assessment method in pregnant women relative to 24-hr recalls
- Assess the validity of a brief tool for nutrient assessment, SNaQ, relative to nutrient analysis software
- Assess the usability of the DietBytes method and the acceptability of a smartphone platform for receiving dietary feedback

Methods
Eligibility criteria:
- Adult women, ≤24 weeks gestation
- Residing in Newcastle (2nd largest city in NSW, Australia) or Tamworth (regional NSW town)
- Willing to attend 2 in-person sessions
- Ownership or access to a smartphone
- Willing to use it to capture an image-based dietary record
- No current medical conditions (including GDM)
DietBytes image-based food record

Participant’s smartphone via third party app used to collect image-based dietary record on 3 non-consecutive days.

An entry consists of:
- Image
- Text and/or voice description
- Fiducial marker

Plus 3x 24-R on random days, one/week

Results: Participants
- 27 enrolled, 1 withdrawal, 1 only recorded 1 day
- Participant characteristics (n=25):
  - Median age 29 years (range 20 - 50 years)
  - 8 Aboriginal Australians
  - Gestation 6 - 24 weeks
  - 18 iPhone, 7 Android phones
  - All born in Australia and spoke only English at home
  - 14 hold a University Degree or higher
  - 15 primiparas

Results: Food group intakes (n=25)

<table>
<thead>
<tr>
<th>Food group</th>
<th>Mean (SD) Intake</th>
<th>AGTHE Pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>4.8 (2.0)</td>
<td>8.5</td>
</tr>
<tr>
<td>Vegetables</td>
<td>2.4 (1.4)</td>
<td>5.0</td>
</tr>
<tr>
<td>Fruit</td>
<td>1.9 (1.6)</td>
<td>2.0</td>
</tr>
<tr>
<td>Meats and alts</td>
<td>2.0 (1.0)</td>
<td>3.5</td>
</tr>
<tr>
<td>Dairy and alts</td>
<td>2.1 (1.3)</td>
<td>2.5</td>
</tr>
<tr>
<td>Unsaturated spreads/oils</td>
<td>1.9 (1.4)</td>
<td>0-2.5</td>
</tr>
<tr>
<td>Discretionary foods</td>
<td>3.7 (1.9)</td>
<td>0-2.5</td>
</tr>
</tbody>
</table>

Source: www.eatforhealth.gov.au

Results: Selected micronutrient intakes (n=25)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Median (IQR) Intake</th>
<th>EAR</th>
<th>Proportion with intakes below EAR % (count)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron (mg)</td>
<td>11 (5, 19)</td>
<td>12</td>
<td>84 (23)</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>847 (804, 1192)</td>
<td>640</td>
<td>40 (12)</td>
</tr>
<tr>
<td>Folate (pg)</td>
<td>562 (285, 1196)</td>
<td>520</td>
<td>44 (11)</td>
</tr>
<tr>
<td>Iodine (mg)</td>
<td>187 (94, 311)</td>
<td>180</td>
<td>44 (11)</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>13 (10, 20)</td>
<td>9</td>
<td>12 (3)</td>
</tr>
</tbody>
</table>

Relative validity of the SNaQ tool

Correlations between the SNaQ tool and nutrient composition software:
- Energy: $r=.898$, $P<.001$
- Micronutrients (iron, calcium, zinc, folate, and iodine): $p$ range = .510-.955, all $P<.05$ both with and without supplements included
Relative Validity of DietBytes method

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Mean±SD (DBBB)</th>
<th>Mean±SD (24-R)</th>
<th>Pearson correlation</th>
<th>Mean±SD difference</th>
<th>t(DF), P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kJ)</td>
<td>7503±1864</td>
<td>8020±1884</td>
<td>.696 (P&lt;.001)</td>
<td>517±1461</td>
<td>1.77(24), P=.089</td>
</tr>
<tr>
<td>CHO (g)</td>
<td>188.1±55.4</td>
<td>215.3±55.4</td>
<td>.580 (P=.002)</td>
<td>17.4±58.1</td>
<td>1.69(24), P=.107</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>85.4±23.6</td>
<td>81.5±23.6</td>
<td>.619 (P&lt;.001)</td>
<td>-3.9±20.7</td>
<td>-3.9±20.7, P=.355</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>69.2±21.5</td>
<td>77.3±23.4</td>
<td>.584 (P&lt;.001)</td>
<td>7.8±58.7</td>
<td>7.8±58.7, P=.049</td>
</tr>
<tr>
<td>Fibre (g)</td>
<td>22.2±8.7</td>
<td>22.2±8.7</td>
<td>.644 (P&lt;.001)</td>
<td>0.0±4.8</td>
<td>0.0±4.8, P=.516</td>
</tr>
</tbody>
</table>

1Analysis based on DietBytes image-based food records; 2Analysis based on 24-R; 3Mean difference (24-R intake – DietBytes image record intake) calculated for each participant; 4One-sample t-test (degrees of freedom)

For more information...


Relative validity of the SNaQ tool

- Agreement between the SNaQ tool and nutrient composition software:
  - Kappa range = .488-.803 (all P<.001) for iron, calcium, folate, iodine and zinc when supplements included
  - Kappa range = .554-.632 (all P<.001) for calcium, iodine and zinc when supps excluded.
- Both tools identified that no participant met iron requirements without supps

Conclusion

The DietBytes method of dietary assessment has demonstrated relative validity, usability, and acceptability as a method of dietary assessment during pregnancy.

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