High-protein diet promotes a moderate postpartum weight loss in a prospective cohort of Brazilian women

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Postpartum recommendations: energy intake/breastfeeding (no orientation about diet composition)

Studies concerning protein consumption
- non-pregnant women: more effective weight loss diet (Layman & Baum, 2004; Hu, 2005)
- Postpartum women: exclusion criteria (Westman et al., 2002; Foster et al., 2003)

High-protein diets (HP ≥ 1.2 g/kg): occidental standard
- Coronarian disease (Tucker et al., 2005; Dauchet et al., 2006)
- Cancer incidence (Key et al., 2004; Uauy & Solomons, 2005)

Prospective study: diet composition (HP/LP) ↔ postpartum weight variation
Methods

Figure 1a.

Eligibility criteria:
- Childbearing age: 15 - 45 years;
- Less than 30 days between the date of the first interview and delivery;
- Absence of chronic diseases;
- No history of actual multiple birth;
- Gestational age > 35 weeks.

Exclusion criteria for analyses:
- 47 women with age <18 years;
- 2 women with high energy intake during pregnancy.

709 women were invited

479 enrolled the cohort

430 entered the analyses

0.5 month
430 women
100%

2 months
380 women
88.4%

6 months:
311 women
72.3%

9 months
283 women
65.8%
Methods

Figure 1b.

Postpartum: 9 months of follow up

0.5 mo 2 mo 6 mo 9 mo

Delivery Baseline (until 30 d) End

FFQ 1 FFQ 2

FFQ1: during pregnancy FFQ 2: last 6 months postpartum
Methods

Models were fitted in five steps as follows:

**Model A:** unconditional mean model describing partition of the outcome variation

**Model B:** unconditional growth model which includes time variable

**Model C:** conditional model that includes the effect of the HP diet

**Model D:** conditional model adjusted for time-invariant variables: energy intake, percent body fat, stature, age, race, schooling and smoking during postpartum and their interaction with time.

**Model E:** final model with interactions between stature, age and race with time
Methods

Socio-economic and demographic variables
- Age
- Income
- Schooling
- Race
- Marital status
- Parity

Mother’s nutritional variables
- Pre-pregnancy body mass index (BMI)

Energy expenditure
- Leisure
- BF%
- Stature
- Lactation

Energy intake
- Smoking
- Diet
- Energy
- Foods
- Macronutrients

Body weight change
Results

HP/LP at baseline (Table 1)

**Weight:** Thinner ($p<0.0001$)

**Stature:** Lower stature ($p=0.0012$)

**Body fat:** Lower BF% e BMI ($p<0.0001$)

**Age:** Younger ($p=0.05$)

**Race:** Lower proportion of whites ($p=0.04$)
Results

HP/ LP intake at baseline (Table 2)

Energy intake: 2623 kcal versus 1791 kcal, p<0.01

Protein intake: higher

Protein intake per kg of body weight (g/kg/d):
1.54 g/kg/d (±0.32 g/kg/d) versus 0.83 g/kg/d (±0.20 g/kg/d)

Density of the protein: was higher at HP diet except for chicken and bean
Figure 2.a - Mean body weight difference in women with high-protein diet (HP): ■ High protein intake during postpartum (≥ 1.2 g/kg/d; n = 97, 97, 97, 87); ● Low protein intake during postpartum (< 1.2 g/kg/d; n = 181, 181, 181, 164); * significant time by group interaction.
Figure 2.b – Adjusted mean body weight loss by energy intake, energy intake*time, stature, BF%, BF%*time, age, race, smoking, smoking*time, schooling and schooling*time in women with high-protein diet (HP) ■ High protein intake during postpartum (≥ 1.2 g/kg/d; n = 97, 97, 97, 87); ● Low protein intake during postpartum (< 1.2 g/kg/d; n = 181, 181, 181, 164); * significant time by group interaction.
Table 3. Regression coefficients and (standard error) of multilevel models for body weight (n=278) for high (HP) † and low (LP) †† protein intake during postpartum.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Model A</th>
<th>Model B</th>
<th>Model C‡</th>
<th>Model D‡‡</th>
</tr>
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<tbody>
<tr>
<td><strong>Fixed Effects</strong></td>
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<tr>
<td>Intercept</td>
<td>Weight</td>
<td>62.246**</td>
<td>62.757**</td>
<td>66.678**</td>
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<td></td>
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<td>(0.590)</td>
<td>(0.594)</td>
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<tr>
<td></td>
<td>HP/LP</td>
<td>-10.153**</td>
<td>-4.975**</td>
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<td></td>
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<td>(1.465)</td>
<td>(1.023)</td>
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<tr>
<td>Rate of Time</td>
<td>Time</td>
<td>-0.153**</td>
<td>-0.123**</td>
<td>-0.123**</td>
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<tr>
<td></td>
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<td>(0.021)</td>
<td>(0.027)</td>
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<td></td>
<td>HP/LP</td>
<td>-0.104**</td>
<td>-0.103*</td>
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<td>(0.047)</td>
<td>(0.046)</td>
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<td><strong>Variance Components</strong></td>
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<tr>
<td>Level 1 within-person</td>
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<td>5.905**</td>
<td>5.591**</td>
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<td>(0.267)</td>
<td>(0.253)</td>
<td>(0.285)</td>
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<td>Level 2 between-person</td>
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<td>(10.208)</td>
<td>(10.216)</td>
<td>(11.329)</td>
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<td><strong>Goodness-of-fit:</strong></td>
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<td>-2 Res Log Likelihood</td>
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<td>Akayke Information Criterion</td>
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<td>8293.8</td>
<td>6229.3</td>
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</tbody>
</table>

† HP = Protein intake ≥ 1.2 g/kg. †† LP = Protein intake < 1.2 g/kg.
‡ Unadjusted model. ‡‡ Adjusted model. *p ≤ 0.05; **p ≤ 0.01.
Discussion

- **HP**: higher body weight loss/strategy (lose and maintain)

Body weight loss ⇔ Dietary change
↑ energy restriction/↑ protein

- **Sustainable weight loss**: small X over time

- **Nutritional requirements/Lactation**
  - OMS: 0.91 g/kg + 16.0 g
  - IOM: 1.3 g/kg
  - Study: 1.54g/kg
Discussion

Advantages of HP diet

- Promotes body weight loss (Westman et al., 2002 and others)
- Preserves body lean mass (Motil et al., 1998)
- Satiety (Mikkelsen et al., 2000; Layman et al., 2003; )
- Blood lipid profiles (Westman et al., 2002; Hu, 2005)
- Energy expenditure (Mikkelsen et al., 2000)
- Thermogenesis (Johnston et al., 2004)
**Losses of follow-up**

- *Random* (Kac et al., 2003; Castro et al., 2006)
- *6 months: 72% of participants*

**FFQ: Fatter (underestimate)**

Obese ↓ CH e ↑ protein (Sichieri & Everhart, 1998).

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↑ alternative hypothesis

- *Usual consumption, validity and reproducibility* (Erkola et al., 2001)


- **HP: high proportion of participants**
- **Confounding: adjusted analysis**
- Positive relation: HP/weight loss

- Strategy: loss/maintenance during postpartum

- Clinical trials/prospective studies: risks and benefits