Maternal Dietary Counseling in the First Year of Life Is Associated with a Higher Healthy Eating Index in Childhood\textsuperscript{1–4}

Marcia Regina Vitolo,\textsuperscript{5*} Fernanda Rauber,\textsuperscript{6} Paula Dal Bo Campagnolo,\textsuperscript{7} Carlos Alberto Feldens,\textsuperscript{8} and Daniel J. Hoffman\textsuperscript{9}

\textsuperscript{5}Department of Nutrition and \textsuperscript{6}Graduate Program in Health Sciences, University of Health Sciences of Porto Alegre, Porto Alegre 90050-170, Brazil; \textsuperscript{7}Department of Nutrition, Vale do Rio dos Sinos University, São Leopoldo 93022-000, Brazil; \textsuperscript{8}Department of Pediatric Dentistry, Lutheran University of Brazil, Canoas 92425-900, Brazil; and \textsuperscript{9}Department of Nutritional Sciences, Rutgers University, New Brunswick, NJ 08901-8554

Abstract

Food preferences are established in early childhood and track later in life. Therefore, it is important to promote healthy feeding practices as early as possible. A randomized field trial was conducted with 500 mother-child pairs from a low-income area of São Leopoldo, State of Rio Grande do Sul, Brazil, to evaluate the impact of a nutritional intervention in the first year of life on the dietary quality of 3- to 4-y-old children. Mother-child pairs were randomized either to intervention and control groups and dietary counseling was provided for mothers in the intervention group during 10 home visits in the course of the first year of life. These visits were carried out by fieldworkers who counseled the mothers about the Ten Steps for Healthy Feeding from Birth to Two Years of Age, based on the WHO guidelines. Dietary intake was assessed at 3–4 y of age for 345 children using two 24-h food recalls. Overall diet quality was determined by the Healthy Eating Index. The prevalence of poor diet in the intervention group was lower compared with the control group (relative risk (RR) = 0.30; 95% CI = 0.13–0.71). The number of children who achieved the 75th percentile for the vegetable and fruit component score was higher in the intervention than in control group (RR = 1.95; 95% CI = 1.31–2.89 and RR = 1.49; 95% CI = 1.07–2.07, respectively). Such data provide evidence that dietary counseling for mothers during the first year of life improves the overall dietary quality of children in a low-income population. J. Nutr. 140: 2002–2007, 2010.

Introduction

Studies concluded that the quality of children’s diet worsened in the last decade, becoming more dense in energy, lipids, and sugar and less dense in micronutrients (1–3). The intake of fruits and vegetables, key determinants of dietary quality, is inversely associated with the risk of obesity in adults and children (4–6). In the US, fruit and vegetable intake is low among children (7,8) and one-third of toddlers do not consume any fruits or vegetables in a whole day (8). These observations may be mediated by family income, because the prevalence of obesity in the US is 50% higher among low-income children than in the general population (9). It has been suggested that the higher cost of fruits and vegetables (10) and the lower cost of energy-dense foods (11) may partially explain the link among income, dietary quality, and risk for obesity.

Changing dietary patterns in adulthood is often difficult, suggesting that prevention programs targeting healthful behaviors in childhood, such as improving diet quality, are important and necessary to promote healthy food choices throughout life (12,13). Therefore, the Ministry of Health in Brazil, based on the WHO (14) guidelines for breast-feeding and proper complementary feeding, established the Ten Steps for Healthy Feeding from Birth to Two Years of Age (15). It was recently reported that complementary feeding interventions during the first 2 y of life may have positive outcomes, but it depends on the strategy implemented (16). Thus, we designed the present study to evaluate the impact of the national policy program on the diet quality of preschool children, using the Healthy Eating Index (HEI)\textsuperscript{10} (17).

Participants and Methods

The primary hypothesis of this study was that home visits furnishing dietary advice, using the Ten Steps, would promote healthy dietary behaviors in childhood, as indicated by a higher HEI at 3–4 y of age. A

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\textsuperscript{3} This study was registered at ClinicalTrials.gov as NCT00629629.

\textsuperscript{4} Supplemental Figure 1 and Supplemental Table 1 are available with the online posting of this paper at jn.nutrition.org.

\textsuperscript{*} To whom correspondence should be addressed. E-mail: vitolo@ufcspa.edu.br.

\textsuperscript{10} Abbreviations used: HEI, Healthy Eating Index; NNT, number needed to be treated; RR, relative risk.
secondary hypothesis was that maternal dietary counseling in the first year of life would be associated with a lower proportion of children with a poor diet (HEI ≤ 50) and a higher proportion of children with a good diet (HEI > 80) at 3–4 y of age.

This trial was conducted with low-income mothers who gave birth to healthy, singleton, full-term (≥37 wk) babies with birth weight > 2500 g between October 2001 and June 2002 in São Leopoldo, Brazil. Exclusion criteria were impediments to breast-feeding, HIV/AIDS, or congenital malformation.

The sample size was previously calculated based on the main objective of the study, improvement of the exclusive breast-feeding duration, a variable collected at the 1-y assessment. A sample of 363 children was determined to detect an increase of 67% in the frequency of exclusive breast-feeding in the intervention group [relative risk (RR) = 1.65] with a power of 80%, a significance of 5%, an unexposed/exposed ratio of 3:2, and a 21.5% frequency of exclusive breast-feeding up to 4 mo in the control group (18). Allowing for losses of 25% of the children during the follow-up, 500 mother-child pairs were recruited. For the objective of this study, the sample required was estimated to be 138 children, using as reference a mean HEI score of 58.7 ± 8.2 (1), power of 90%, and α of 1% to estimate a difference of 10% between the groups.

Randomization was conducted by an investigator not involved in the eligibility and entry of participants into the study to ensure the randomization was conducted without knowledge of the treatment groups, and block randomization was used to avoid imbalance at any point of the randomization process. Mothers who had agreed to participate were sequentially included in a list based on time of delivery, grouped in blocks of 5, and their names were separated and placed in opaque, sealed envelopes. Two mothers from each block were assigned to the intervention group and the others were allocated to the control group. This process was repeated for consecutive blocks until the samples were completed. Fieldworkers were informed of this allocation and then proceeded with the study.

The intervention consisted of dietary advice about breast-feeding and the adequate introduction of complementary foods. It was carried out by home visits within 10 d of the child’s birth on a monthly basis up to 6 mo and at 8, 10, and 12 mo. Dietary counseling was given by 12 trained fieldworkers (undergraduate students in groups of 2) who counseled mothers on the Ten Steps for Healthy Feeding Children from Birth to Two Years of Age (15) (Supplemental Table 1). The main purpose of the program was to promote exclusive breast-feeding for 6 mo followed by healthy complementary foods. During each home visit mothers received dietary advice in accordance with the baby’s age and baby food recipes when appropriate. Mothers were advised against the addition of sugars (cane sugar, honey) to fruit, porridge, juices, milk, or other liquids. They were encouraged to avoid fried food, soft drinks, sweets, and salty snacks and to use salt in moderation. Advice on hygiene practices in food preparation and handling was provided. A simple colored leaflet with food pictures composing a healthy meal was used to guide the dietary advice and was given to the mother as a reminder. The writing material was simplified to take into consideration the mothers’ level of education. During each visit, which lasted ~30–40 min, the fieldworkers clarified and reinforced recommendations while respecting the mother’s level of cognition as well as cultural and economic background.

The fieldworkers who carried out the dietary advice were trained in the Ten Steps and received 8 h of theoretical training based on detailed guidelines prepared for the study and 8 h of practical training, including anthropometric measures of children and experiences in applying 24-h dietary recalls. During the intervention program, quality control was ensured by a weekly schedule meeting with all fieldworkers and the coordinator of the program. All dietary advice provided to mothers was discussed with the team.

Research assessment questionnaires. Data on weight and length at birth, as well as gestational age, were obtained from maternity records. Dietary and anthropometric data were assessed at 6 mo, 12–16 mo, and 3–4 y of age through face-to-face interviews with mothers or caregivers. The fieldworkers who carried out those interviews were unaware of the group assignment. Sociodemographic, economic, and environmental characteristics such as maternal age, annual household income, maternal employment, and family structure (i.e. nuclear, child living with mother and father vs. nonnuclear, other conditions of living) were assessed when the children reached 6 mo.

Outcome assessment. Dietary patterns were determined by administering two 24-h dietary recalls for each child on 2 randomly selected and nonconsecutive days when the children were 3–4 y old. Nutrition students not involved in the intervention program and unaware of group allocation performed the dietary recall. To quantify the food portion size, pictures were used to illustrate the units of measure, such as teaspoons, tablespoons, cups, and food portions. Dietary data were entered into the Nutrition Support Program software from the Federal University of São Paulo based on the USDA (19) chemical composition tables.

HEI. The mean nutritional composition of the 2 dietary recalls for each child was classified according to the HEI (17). The HEI is a 10-component index and the number of recommended servings depends upon an individual’s energy requirement. In this study, the criterion for determining the number of recommended servings was 6700 kcal (1600 kcal), because that is the recommended dietary intake for 3-to 4-y-old children (20).

The first 5 components of the index are based on the 5 major food groups of the USDA Food Guide Pyramid (21): grains, fruits, vegetables, meat and alternatives, and milk. Intakes at or above recommended amounts were awarded the full score of 10 points, whereas intermediate numbers of servings were scored proportionately. Components 6–9 are based on aspects of the 2000 Dietary Guidelines for Americans (22). A full score of 10 points each was awarded for diets with <30% of energy from fat, <10% of energy from saturated fat, <300 mg/d cholesterol, and <1500 mg/d sodium. The HEI score was calculated using procedures developed by the USDA (23). However, some modifications to the USDA food groups were made in this study. Potatoes and other related root vegetables were included in the grain group instead of the vegetable group, because they are considered a starchy food; beans and lentils were included only in the meat group and not in the vegetable group; fried food, processed meat products (e.g. sausages, ham, salami), candied foods, and sweets were not included in any of the first 5 food groups, because they are energy-dense foods. Each of the 10 components ranges in score from 0 to 10. Thus, the composite HEI score can potentially range from a minimum of 0 to a maximum score of 100. A total score of >80 was considered good, scores of 51–80 indicated needs improvement, and scores of <51 were considered poor. The upper quartile (75th percentile) of each HEI component score was previously defined as the cutoff for classifying children with a high score for each HEI component. Ten points was defined as the cutoff for milk, total fat, sodium, cholesterol, and saturated fat, because a high proportion of children (>40%) achieved this full score.

Anthropometry. Maternal and child weight were measured using a portable digital scale (Techline) and height was measured using a portable stadiometer (Seca) with the child dressed in light clothing and no shoes. Children were classified as at risk of overweight when BMI-for-age Z-score was >1 using the WHO Growth Standards (24). Maternal overweight was classified when BMI > 25 kg/m².

Statistical analysis. Analyses were by intention to treat, because participants were analyzed according to their original group assignment. The effect of the intervention on the mean HEI score was evaluated by Student’s t-test for independent samples. The proportion of children with poor or good diets and those who achieved the highest scores for HEI component were compared between groups with chi-square statistics, the size of associations using RR with 95% CI. The impact of intervention was evaluated by the number of child-mother pairs needed to be treated/counseled (NNT) to prevent 1 child with poor diet (25). Student’s t test or Mann-Whitney test was used when the scores had normal or skewed distribution, respectively, according to a Kolmogorov-Smirnov test. A 2-tailed P-value of <0.05 was considered significant and all statistical analyses were performed using SPSS 13.0.

Ethical aspects. The Ethics Committee of the Federal University of Health Sciences of Porto Alegre approved this study. Parents gave

Dietary counseling and children’s diet quality 2003
Results

Among the 500 initially recruited children (2001–2002), 469 were assessed at the follow-up and 354 underwent the 4th-y assessment in 2005–2006. Seventy-two children (intervention, \( n = 34/200, 17.0\% \); control, \( n = 38/300, 12.7\% \)) were lost at the first-year assessment and 48 additional children (intervention, \( n = 18, 9.14\% \); control, \( n = 30, 11.0\% \)) at the 4th-y assessment. The main reason for losses at the 1-y assessment was the inability to locate the child’s home, usually due to the family having moved to another city. Losses between the first- and 4th-y assessment were again mainly due to family relocation (intervention, \( n = 11 \); control \( n = 17 \)), inability to locate the address (intervention, \( n = 6 \); control, \( n = 8 \)), and refusal (intervention, \( n = 1 \); control, \( n = 5 \)). For this study, data from 345 children with complete dietary recalls (3–4 y) were obtained (Supplemental Fig. 1).

Of the 345 children examined at the 4th-y assessment, 197 (57.1%) were boys and 148 (42.9%) were girls. The maternal level of education range was 1–13 y of schooling (mean 6.9 ± 2.7; median 7.0). All mothers had the basic skills for reading and writing. Family income was low for most families; 69.8% had an annual income ≤ US$3000, which represents a monthly income lower than or equal to the National Minimum Wage (approximately US$250/mo).

The groups did not differ in sex, maternal level of education, maternal age, family income, family structure, maternal employment, or health care follow-up at first year of life (Table 1). The proportion of children whose diets were classified as good was 96.6% and those whose diets need improvement was 79.7%. The HEI score mean was 66.8 ± 11.2 for all children. Other effects of the intervention on the diet quality of preschool children are shown in Table 2.

The prevalence of overweight children in the lowest HEI score category was significantly higher (34.3%) compared with children whose diet HEI scores were ≥50 (19.5%). The risk of being overweight in the poor diet category (HEI ≤50) was 75% greater (RR ≈ 1.75; 95% CI = 1.05–2.93) compared with children with higher scores (data not shown).

The following HEI component scores were higher for the intervention group than for the control group: vegetables (\( P = 0.005 \)), fruits (\( P = 0.018 \)), and variety (\( P = 0.010 \)). The score for the cholesterol component was lower in the intervention group (\( P = 0.011 \)). The groups did not differ for the other components such as grains, meat group, milk, sodium, total fat, and saturated fat (Table 3).

The proportion of children who achieved the 75th percentile for vegetable was twice as much in the intervention group compared with the control group. This positive impact for fruit was ~50% higher for the intervention group. For the variety component, the possibility of having a score higher than 8 was 43% higher in the intervention group. The proportion of children who achieved the higher score for cholesterol was 10% lower for the intervention group, because children in this group consumed more cholesterol in their diets (Table 4).

Discussion

Our findings suggest that providing maternal dietary counseling during the first year of life improves the diet quality of preschool-aged children, as assessed by the HEI (17). The HEI has been validated as a tool to quantify the diet quality among preschoolers in Greece (1). The HEI scores obtained for children from our sample of low-income families were better compared with the Greek study (1) and similar to those for low-income American children (23,26). However, the majority of children in our study had an HEI score indicating needs improvement and only 9.6% had a score indicating a good diet. Moreover, this is the first study, to the best of our knowledge, to evaluate the HEI in preschool children in Brazil. For this study, the HEI score was not calculated according to the 2005 recommendations (HEI-2005) (27), because this newer version emphasized some group foods (e.g. whole grains, nuts, and seeds) that are not often consumed by children in Brazil. Therefore, the HEI score considering the 2005 version would be difficult to assess among the population group studied.

There are 2 potential explanations for the results we obtained. First, healthy feeding practices promoted during the first year of life may provide the basis for food habits in childhood. This hypothesis is consistent with existing literature that suggests that although taste preferences may be genetically determined (28), early contact and continuous exposure to different foods may increase the acceptance of such foods (29,30). In addition, it has been reported that children who were breast-fed have better acceptance of complementary foods than formula-fed babies, because they were exposed to different flavors from the mother’s diet passed through breast milk (31–33). A previous study with this same sample of children demonstrated a positive impact on breast-feeding practices in the intervention group (34). In addition, longitudinal studies showed that healthier diets in school-age children are predicted by breast-feeding duration, food-related experiences during early life, or mother’s preferences (35,36), which reinforces the importance of that period for healthy feeding practices. Therefore, it is clear that early exposure to vegetables and fruits may influence their acceptance of such foods later in life (37).

The second potential explanation for our results stems from the concept that providing dietary counseling for mothers empowers them to make better choices regarding foods they offer to their children. There is support for this hypothesis, because children’s dietary intake is associated with mothers’ attitudes and beliefs (38), reinforcing the importance of educating mothers about their children’s food habits, because healthy feeding practices during childhood reduce the risk for obesity in adulthood (39). Also, the source of a mother’s information about feeding her infant (2–54 mo) generally comes from multiple origins and may conflict with other sources such as relatives, friends, and professionals (37). Many studies to

### TABLE 1 Characteristics of mothers and children at enrollment

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>( n )</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male children</td>
<td>345</td>
<td>82 (57.7)</td>
<td>115 (56.7)</td>
</tr>
<tr>
<td>Maternal schooling &lt; 8 y</td>
<td>344</td>
<td>85 (60.3)</td>
<td>105 (51.7)</td>
</tr>
<tr>
<td>Only child</td>
<td>341</td>
<td>52 (38.9)</td>
<td>79 (39.5)</td>
</tr>
<tr>
<td>Maternal age at child’s birth &lt; 20 y</td>
<td>345</td>
<td>23 (16.2)</td>
<td>41 (20.2)</td>
</tr>
<tr>
<td>Annual household income ≤ US$3000</td>
<td>337</td>
<td>102 (72.9)</td>
<td>132 (67.0)</td>
</tr>
<tr>
<td>Nuclear family</td>
<td>339</td>
<td>98 (70.0)</td>
<td>141 (70.9)</td>
</tr>
<tr>
<td>Health care follow-up at first year of life</td>
<td>335</td>
<td>72 (52.2)</td>
<td>88 (44.7)</td>
</tr>
<tr>
<td>Maternal employment</td>
<td>334</td>
<td>48 (34.5)</td>
<td>67 (34.4)</td>
</tr>
<tr>
<td>Maternal overweight</td>
<td>322</td>
<td>68 (51.5)</td>
<td>79 (42.0)</td>
</tr>
</tbody>
</table>
improve breast-feeding (40–44) promote healthy complementary feeding (16,45,46) and increase fruit and vegetable consumption have been conducted (47), but our study is the first to our knowledge to evaluate the impact of an early intervention program 3–4 y later. The NNT, a useful measure for clinical decision making (25), showed a moderate effect of the intervention. However, it is remarkable that the dietary counseling during the first year of life provided a clinical impact on the diet quality years later.

In terms of specific scores for particular nutrients, it was of interest that a lower score was found for the cholesterol component in the intervention group compared with the control group. It means that children from the intervention group had higher levels of cholesterol in their diets. To better understand this, we studied these data by deconstructing foods rich in cholesterol in the dietary recalls and found that cholesterol-rich foods, such as eggs and liver (data not shown), were more often consumed by the intervention group compared with the control group. These foods were often found on the list of foods given to mothers to use as complementary foods as a cheap source of protein. In fact, the Brazilian nutrition guidelines (15) recommend liver consumption once a week to children under 2 y as a good source of iron. The negative effect on the cholesterol scores requires further investigation to identify if this dietary pattern in the intervention group would have a negative impact on children’s health.

Diet quality is often associated with the cost of food (11,48); higher household food expenditure is related to a greater consumption of vitamins and reduced intake of energy-dense foods (49,50). Children from low-income families have less access to nutritious foods (51,52) and a higher risk of not meeting the nutrition guidelines for healthy feeding. There is also evidence that mothers of low socioeconomic status usually provide their children with unhealthy foods (35,53). In an earlier study with the same sample of children, we found that the cost of a diet was positively associated with micronutrient intake (vitamin A, vitamin C, zinc, iron), although costs did not differ between diets with more or less fat and sugar (54). This would suggest that children and adults from a low-income population may have a higher risk of excess energy intake and overweight due to the relatively cheaper cost of nutrient-poor but energy-rich diets. The prevalence of obesity is increasing among children throughout the world (55), even as early as preschool age (56), and is associated with poor food habits (57). In our study, children who had lower HEI scores had higher risk for being overweight. Improving diet quality in children may be a good start to reduce the risk of obesity, which should be tested in further longitudinal studies.

In summary, it is well established that the eating habits of infants and toddlers are strongly influenced by what mothers and caregivers offer them (38,48,58), emphasizing the need for dietary counseling programs for mothers. The guidelines proposed by the Brazilian Ministry of Health based on universal healthy feeding practices for the first 2 y of life are feasible to be attained for low-income population groups. Dietary advice based on those guidelines reduced the incidence of diarrhea (34), symptoms of respiratory morbidity (59), and dental caries among toddlers (60). The results of the present study highlight the wide effect of the intervention program during the first year of life, because it was also effective in promoting a better diet quality across childhood. Therefore, such a nutrition program

### Table 2

<table>
<thead>
<tr>
<th>Primary outcome</th>
<th>Intervention group, n = 145</th>
<th>Control group, n = 200</th>
<th>Difference, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEI score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>67.7 ± 10.5**</td>
<td>64.2 ± 11.6</td>
<td>3.52 (1.18–5.88)</td>
</tr>
<tr>
<td>Minimum maximum</td>
<td>44.4–89.8</td>
<td>31.6–91.0</td>
<td></td>
</tr>
<tr>
<td>Median (Q1-Q3)</td>
<td>68.6 (59.3–75.3)</td>
<td>65.2 (57.3–72.2)</td>
<td></td>
</tr>
</tbody>
</table>

**Secondary outcomes**

<table>
<thead>
<tr>
<th>Children with a poor diet (HEI score &lt; 50)</th>
<th>n, %</th>
<th>RR (95% CI)</th>
<th>NNT (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28 (14.0)</td>
<td>0.30 (0.13–0.70)</td>
<td>10.1 (6.3–24.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Children with a good diet (HEI score &gt; 80)</th>
<th>n, %</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13 (6.5)</td>
<td>2.12 (1.09–4.12)</td>
</tr>
</tbody>
</table>

1 Different from control, P < 0.05; **different from control, P < 0.01.

2 HEI scores: poor diet (HEI score < 50 points); diet needs improvement (HEI score between 51 and 80 points); good diet (HEI score > 80 points).

### Table 3

<table>
<thead>
<tr>
<th>HEI components</th>
<th>Intervention, n = 145</th>
<th>Control, n = 200</th>
<th>Difference, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min-Max Mean ± SD</td>
<td>Min-Max Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td>0.83–10.0 5.07 ± 2.22</td>
<td>0.00–10.0 5.18 ± 2.34</td>
<td>−0.11 (−0.60–0.38)</td>
</tr>
<tr>
<td>Meat group</td>
<td>0.00–10.0 6.19 ± 3.05</td>
<td>0.00–10.0 6.09 ± 3.07</td>
<td>0.10 (−0.56–0.75)</td>
</tr>
<tr>
<td>Vegetables</td>
<td>0.00–10.0 1.53 ± 2.10</td>
<td>0.00–10.0 1.00 ± 1.84</td>
<td>0.53 (0.10–0.95)**</td>
</tr>
<tr>
<td>Fruits</td>
<td>0.00–10.0 4.43 ± 3.56</td>
<td>0.00–10.0 3.56 ± 3.29</td>
<td>0.87 (0.15–1.59)*</td>
</tr>
<tr>
<td>Milk</td>
<td>0.00–10.0 8.95 ± 2.34</td>
<td>0.00–10.0 8.60 ± 2.77</td>
<td>0.34 (−0.20–0.88)</td>
</tr>
<tr>
<td>Variety</td>
<td>0.00–10.0 7.15 ± 2.71</td>
<td>0.00–10.0 6.35 ± 2.95</td>
<td>0.80 (0.19–1.42)*</td>
</tr>
<tr>
<td>Total fat</td>
<td>0.68–10.0 9.15 ± 1.80</td>
<td>0.00–10.0 9.08 ± 1.85</td>
<td>0.07 (−0.32–0.46)</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.00–10.0 8.84 ± 3.22</td>
<td>0.00–10.0 7.73 ± 3.90</td>
<td>0.91 (0.15–1.66)</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0.00–10.0 9.39 ± 1.91</td>
<td>0.00–10.0 9.70 ± 1.50</td>
<td>−0.31 (−0.69–0.07)*</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>0.00–10.0 7.25 ± 3.51</td>
<td>0.00–10.0 6.92 ± 3.59</td>
<td>0.33 (−0.43–1.09)</td>
</tr>
</tbody>
</table>

1 Student’s t test.
2 Mann Whitney test.
3 Asterisks indicate that groups differed: *P < 0.05; **P < 0.01.
4 Lower scores indicate greater intake.
TABLE 4  Effect of dietary counseling of mothers during their children’s first year on the proportion of children with higher HEI scores at 3–4 y

<table>
<thead>
<tr>
<th>HEI components</th>
<th>Intervention, 1</th>
<th>Control, 1</th>
<th>RR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains &gt; 6.67</td>
<td>28 (19.7)</td>
<td>48 (23.6)</td>
<td>0.83 (0.55–1.26)</td>
</tr>
<tr>
<td>Meat group &gt; 8.75</td>
<td>35 (24.6)</td>
<td>47 (22.2)</td>
<td>1.06 (0.73–1.56)</td>
</tr>
<tr>
<td>Vegetables &gt; 1.67</td>
<td>45 (31.7)*</td>
<td>33 (16.3)</td>
<td>1.35 (1.31–2.69)</td>
</tr>
<tr>
<td>Fruits &gt; 6.25</td>
<td>51 (35.9)*</td>
<td>49 (24.1)</td>
<td>1.49 (1.07–2.07)</td>
</tr>
<tr>
<td>Milk &gt; 10.0</td>
<td>108 (76.1)</td>
<td>142 (70.0)</td>
<td>1.09 (0.96–1.24)</td>
</tr>
<tr>
<td>Variety &gt; 9.0</td>
<td>57 (40.1)*</td>
<td>57 (28.1)</td>
<td>1.43 (1.06–1.93)</td>
</tr>
<tr>
<td>Total fat &gt; 10.0</td>
<td>98 (69.0)</td>
<td>131 (64.5)</td>
<td>1.07 (0.92–1.24)</td>
</tr>
<tr>
<td>Sodium &gt; 10.0</td>
<td>107 (75.4)</td>
<td>138 (68.0)</td>
<td>1.11 (0.97–1.27)</td>
</tr>
<tr>
<td>Cholesterol &gt; 10.0</td>
<td>122 (85.9)*</td>
<td>191 (94.1)</td>
<td>0.81 (0.85–0.98)</td>
</tr>
<tr>
<td>Saturated fat &gt; 10.0</td>
<td>62 (43.7)</td>
<td>84 (41.4)</td>
<td>1.05 (0.82–1.35)</td>
</tr>
</tbody>
</table>

1 Different cutoffs were used according to the distribution of each HEI component: 75th percentile for grains, meat group, vegetables, fruits, and variety; 10 score for milk, total fat, sodium, cholesterol, and saturated fat.

2 *Different from control, P < 0.05.

has important policy implications, because it can be applied in a broad basis.

Acknowledgments

M.R.V designed the research; M.R.V., F.R., and P.D.B.C. conducted the research and analyzed data; F.R. assessed the diet quality according to the HEI index; C.A.F. performed statistical analysis; and M.R.V. and D.J.H. wrote the paper and had primary responsibility for final content. All authors reviewed the manuscript and approved the final manuscript.

Literature Cited