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A Comparison of Low Glycemic Index and Staged Portion-Controlled Diets in Improving BMI of Obese Children in a Pediatric Weight Management Program

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Introduction

Pediatric obesity is a major health issue with 12% of children ages 2 to 19 having a body mass index (BMI) greater than the 95th percentile for their age.[1] Traditionally, a low-calorie, low-fat diet is recommended for obesity treatment in both adults and children.[2] Although studies in children less 13 years show a modest benefit in lowering BMI in the short -term, long-term adherence of low-calorie diets is problematic.[3] The glycemic index (GI) is a measure that characterizes the rate of carbohydrate absorption of a food.[4] Foods with a low GI trigger a low insulin response and ultimately lead to satiety.[5] Several studies show decreased appetite and weight loss with a low glycemic index diet (LGD) in adults.[6,7] Pediatric studies are more limited, but also demonstrate short-term BMI improvement with the LGD.[8,9] Young et al[10] combined both the "Traffic Light" approach with an LGD in children aged 5 to 12 years. In this 12-week intervention, 15 of 35 children had a significant decrease in BMI *z* score. In our study, we describe our experience using a heart-healthy LGD in a hospital-based pediatric weight management program.

Methods

In October 2009, our hospital-based pediatric weight management center instituted a protocol of starting children on our "Healthy Eating Plan" (HEP) at the time of their initial medical evaluation. The HEP is a dietary intervention that is "Heart Healthy" in that less than 10% of the food items calories are saturated fat and low glycemic index in that items have a GI of less than or equal to 50. A 2-page handout was developed that organizes common food items into a table using a "Traffic Light Approach" in which low GI foods are listed as green, high GI foods as red, and middle GI foods as yellow. The HEP educational packet also included sample menus, how to identify 100% whole grain products, and guidelines for limiting the intake of "red" or high GI foods. It is suggested that our patients follow-up with our program's dietitians. The first dietitian visit is 1 month later, at which time patients' progress is reviewed as well as families' satisfaction with the HEP. A family can then elect to have the child stay on the HEP or switch to our staged approach (SA) in which the family is guided to a portion/calorie controlled diet in a stepwise manner. Thus, patients can be categorized into 1 of 3 groups: (*a*) those that switch to the SA under the care of the medical provider working in collaboration with a dietitian, (*b*) those that use the HEP with the medical provider working in collaboration with a dietitian, and (*c*) those that use the HEP with the medical provider's instructions without a dietitian (see Figure 1). Regardless of diet, the dieticians use behavioral tools that include using goal setting, a daily tracking system, incentives provided by the family, and motivational interviewing. Medical follow-up is suggested in 3 months. Patients are also invited to attend 1-hour group exercise sessions that are done every weekday evening. Children have a fasting laboratory evaluation that includes lipid panel, liver enzymes, glucose, and $HgbA_1C$ and insulin level. Abnormal laboratory studies are repeated at the follow-up visit.

The charts of all new children seen at the Center for Better Health and Nutrition from October 1, 2009, to March 1, 2010 were reviewed. Data were collected for age, sex, weight, race, height, blood pressure, BMI,

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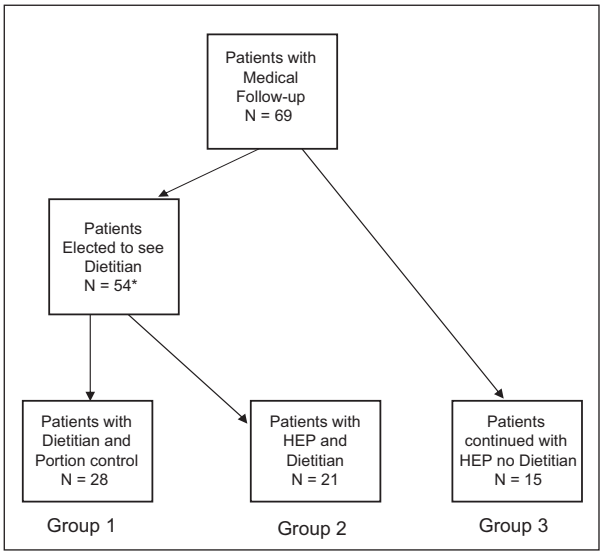

Figure 1. Dietary intervention scheme based on patient/family preference[a]

[a]5 families developed their own program that was neither HEP or Staged Approach

laboratory studies, number or dietitian visits, and number of exercise visits. The study was approved by the Cincinnati Children's Hospital Internal Review Board.

Statistical Analysis

Groups were analyzed for differences in initial and follow-up values by paired Student's *t* test. Change in BMI was tested between the 3 groups of children by ANOVA.

Results

Of 162 patients evaluated between October 1, 2009, and March 1, 2010, 43% (n = 69) returned for a medical reassessment. Those with follow-up visits had the following characteristics: initial BMI, 32.8 ± 6.8; mean age, 11.3 ± 3.3 years; 63.6% female; 35% African American; mean duration from initial visit to reassessment, 4.5 months. For these active patients, 78% (n = 54) met with a dietitian (mean visits = 2.2 ± 2.0). For patients followed by a dietitian, 39% (n = 21) continued with HEP, 52% (n = 28) switched to SA, and 9% (n = 5) did not follow either approach. Fifteen patients were seen by a medical practitioner alone and followed the HEP. Table 1 summarizes the characteristics and outcomes of the 3 natural, self-selected groups. For HEP patients followed by a dietitian, 95% (20 of 21) had a decrease in BMI, with a significant improvement (−1.25 ± 1.2, $P < .001$). Insulin and alanine aminotransferase levels also decreased ($P < .05$). BMI changes for the other groups were not significant, but the SA group had a decrease in triglycerides ($P < .05$).

Table 1. Mean Characteristics and Changes in Treatment Groups

	Portion Control	HEP Plus Dietitian	HEP
Age (years)	11.6	10.02	12.5
Dietitian visits	2.4	3.4	0
Exercise visits	2.5	6.6	3
BMI, initial	32.5	32.0	34.0
BMI, final	32.3	30.8[a]	34.4
% with BMI reduction	57%	95%	33%
Weight (kg)	91.3	71.2	87.6
Weight, final (kg)	82.2	70.5	90.6[b]
Insulin, initial (μlu/mL)	24.2	26.0	36.3
Insulin, final (μlu/L)	27.2	21.0[c]	38.2
Cholesterol, initial (mg/dL)	170	150.9	164.8
Cholesterol, final (mg/dL)	157.6	143.4	156.3
Triglycerides, initial (mg/dL)	119.6	105.7	76.3
Triglycerides, final (mg/dL)	92.4[c]	84.4	72.0
LDL, initial (mg/dL)	104.7	85.9	103.5
LDL, final (mg/dL)	98.0	84.3	98.3
HDL, initial (mg/dL)	43.7	44.6	46.1
HDL, final (mg/dL)	42.2	42.3	43.7
ALT, initial (u/L)	50.0	30.6	23.8
ALT, final (u/L)	31.2	17.1[b]	21.5

Abbreviations: HEP, Healthy Eating Plan; BMI, body mass index; LDL, low-density lipoprotein; HDL, high-density lipoprotein; ALT, alanine aminotransferase.

[a]$P < .0001$.

[b]$P < .005$.

[c]$P < .05$.

Discussion

Children referred to weight management centers are most often treated with low-calorie diets that have a modest effect on BMI and are plagued with poor adherence.[11] The LGD with a "Traffic Light Approach" is an attractive option as it is easy to describe and may lead to better adherence as it causes less hunger. With our study, we demonstrate that it is feasible to implement an LGD in a pediatric weight management program and that the regimen can be initiated by a medical provider. The intervention led to a lowering of BMI in 95% of the children who saw a dietitian in collaboration with a medical provider. This group, it should be noted, was self-selected and may be a marker for those families that are particularly motivated as evidenced by higher attendance to our

exercise program than the other 2 groups. The HEP-alone group was perhaps the least motivated as evidenced by the low number of exercise visits. Yet this group still had BMI reduced in more than one third of the children. This suggests that the HEP may be a useful tool when a dietitian is not available and an effective first-stage intervention in a primary care setting.

There are several limitations to this study as it was retrospective, small in number, and patients self-selected their treatment arms. Still we demonstrate that it is feasible to implement the HEP in a weight management setting. Our results suggest that the HEP is most effective when used in collaboration with a dietitian but can achieve favorable results when used by a medical practitioner alone. Further studies are needed to assess the HEP, what level of intervention is needed to support the HEP, and in what settings it can successfully be used.

Declaration of Conflicting Interests

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Robert Siegel is a member of the Scientific Advisory Board of Atkins Nutritonals Inc.

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