Structured Dietary Interventions in the Treatment of Severe Pediatric Obesity: A Pilot Study

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Background: Structured dietary interventions have been associated with improved outcomes in adult weight-control programs, but virtually no research has focused on children. Thus, we conducted an uncontrolled pilot study to determine the potential utility of structured approaches to enhance the dietary component of family-based treatment of severe pediatric obesity (body mass index [BMI] >97th percentile for age and sex).

Method: Children aged 8–12 years participated with a parent or guardian. Individualized menu plans were provided (MENU, $n=12$) alone, or along with meals and snacks for the child (MENU + MEAL, $n=6$). All families received up to \$30/week reimbursement for foods included in the menus.

Results: Median BMI change was -1.2 kg/m^2 for MENU ($n=12$), and -1.8 kg/m^2 for MENU + MEAL ($n=6$). Both approaches were associated with significant reductions in BMI ($p < 0.05$).

Conclusion: Structured dietary interventions for severe pediatric obesity are acceptable to families and warrant further development.

Introduction

A SUBSTANTIAL BODY OF RESEARCH has documented the efficacy of lifestyle interventions in the treatment of childhood overweight.^{1,2} Our previous work on family-based treatment of severe pediatric obesity documented significant reductions in percent overweight relative to usual care, as well as favorable changes in blood pressure, waist circumference, and body fat.³ However, the absolute magnitude of weight loss was modest relative to the prescribed calorie intake, indicating that severely overweight children were not fully compliant with the eating plan.

The adult obesity literature has shown that food provision,⁴ use of packaged entrees,⁵ partial meal replacements,⁶ and a structured diet that includes shopping vouchers⁷ lead to enhanced weight loss and reduced attrition from weight-control programs. Among adults, it appears that these types of structured dietary interventions reduce time spent planning meals and deciding what to eat.^{8,9} Additionally, a randomized, controlled trial showed that use of meal replacements significantly improved short-term weight loss among adolescents aged 13–17,¹⁰ but there have been no published studies with children.

Child eating occurs in the context of the family, and child outcomes in family-based treatment are positively associated with parent weight loss.³ Accordingly, novel approaches to structured dietary interventions may be required to meet the

needs of not only the child but also the parent. Therefore, we explored the potential utility of menu plans and meal provision as an adjunct to an abbreviated family-based treatment of severe pediatric obesity in an uncontrolled pilot study.

Materials and Methods

Children aged 8 to 12, with a body mass index (BMI) >97th percentile for age and sex, participated with a parent or guardian. Exclusion criteria included diabetes, concurrent enrollment in another weight-control program, or significant psychiatric symptomatology. Families were also excluded if any member of the household was pregnant or <2 years old. Nineteen children and parents signed assent/consent forms approved by the University of Pittsburgh Institutional Review Board, and one family withdrew prior to beginning treatment. All families received \$50 for completing research assessments, including height, weight, and satisfaction with treatment.

MENU

Families were given menu plans in conjunction with an abbreviated, 8-week behavioral program adapted for the needs of severely overweight children,¹¹ including a calorie range prescribed based on initial body weight (<68 kg = 1,200–1,400 kcal; 69–113 kg = 1,400–1,600 kcal; >113 kg = 1,600–1,800 kcal). Session topics covered motivation, healthy eating and portion

sizes, physical and sedentary activity, behavior change techniques, and relapse prevention. Child handouts were written for a 3rd grade reading level, and parent handouts for a 5th grade level. A variety of daily menus, each including three meals and two snacks, were developed in conjunction with a registered dietitian in accordance with the United States Department of Agriculture (USDA) Dietary Guidelines for Americans.¹² Each family was assigned a coach who met briefly with the parent and child before or after the group meetings to tailor the menus to their lifestyle and food preferences. Parents/guardians were given a weekly shopping list, along with recipes, including serving size and calorie content. Families turned in their grocery receipts and received up to \$30 reimbursement for buying foods from their shopping list each week. We subsequently evaluated a second approach to structured dietary intervention, as described below.

MENU + MEAL

Menus were provided along with portion-controlled, prepared food for the child only. Three meals and two snacks for five weekdays were provided in insulated cooler bags with instructions for reheating; weekend meals and snacks were to be prepared from the menu plans and recipes provided. We conducted a 9-week group, with the additional week included to allow for meal preparation and delivery.

Results and Discussion

For MENU ($n=12$), children were 67% male and 58% white. Mean age was $10.4 (\pm 1.1)$ years, weight was $69.5 (\pm 20.2)$ kg, and BMI was $31.1 (\pm 4.82)$ kg/m². Most participating parents/guardians had at least some education beyond high school (9/12; 75%). The average number of members in the household was 4.1, and 50% (6/12) had a household income >\$50,000. On average, families attended 6.3 sessions out of 8, and 83.3% (10/12) of families completed the intervention. Child weight change ranged from 4.3 to -8.5 kg, with a median of -1.2 . Median BMI change was -1.2 kg/m².

For MENU+MEAL ($n=6$), children were 67% male and 67% white. Mean age was $10.0 (\pm 1.0)$ years, weight was $59.3 (\pm 14.2)$ kg, and BMI was $28.38 (\pm 1.07)$ kg/m². Most parents/guardians had at least some education beyond high school (4/6; 66.7%). The average number of members in the household was 4.5, and 83.3% (5/6) had a household income >\$50,000. On average, families attended 8.5 sessions out of 9, with all families completing the intervention. Weight change ranged from 1.2 to -7.3 kg, with a median of -3.0 . Median BMI change was -1.8 kg/m².

Due to the small sample size and variability (see Fig. 1), nonparametric signed rank tests were utilized. MENU was associated with a significant reduction in BMI ($p=0.007$) and a marginally significant reduction in weight ($p=0.064$). MENU+MEAL was associated with a significant reduction in both BMI ($p=0.031$) and weight ($p=0.031$). Outcomes did not differ significantly for the two approaches, so we pooled the data. Responsiveness was calculated as standardized response mean (SRM, mean change divided by the standard deviation of change scores). SRM was 0.8 for weight and 1.2 for BMI, suggesting that the observed changes were clinically meaningful. Participant ratings of program features, including provision of menus, meals (if applicable), shopping lists, grocery money, meetings with coaches, group meetings, and

FIG. 1. Child weight and BMI change ($n=18$). BMI, body mass index.

overall helpfulness of the program averaged at least 9 out of 10, with 10 being most satisfied.

In summary, results of this uncontrolled pilot study establish the acceptability of adding structured menus with monetary reimbursement and meal provision to a standard family-based program. Promising short-term weight loss was observed among children, along with excellent retention of families and high ratings of satisfaction. Children's lifestyle changes occur in the context of the family, and additional research is needed to evaluate potential predictors of outcome, such as weight-loss readiness, change in weight status among household members, and the number of meals consumed with the family.

Conclusions

Structured dietary interventions hold promise in the treatment of adult and adolescent obesity, but studies of children are lacking. Thus, we evaluated structured dietary interventions as an adjunct to family-based treatment of severe pediatric obesity. Although both approaches were associated with significant reductions in child BMI, this was a small, uncontrolled pilot study, and additional research is warranted to evaluate the relative efficacy of the two different interventions. Furthermore, the impact of individual intervention components, such as menus, meal provision,

shopping lists, and financial incentives cannot be determined from the study design. However, use of structured menus may facilitate compliance with calorie and nutrition guidelines during treatment. Provision of prepared meals along with the menu provides added convenience and portion control. The use of financial incentives may also increase attendance and compliance.

Notably, the Diabetes Prevention Program (DPP)¹³ and Look AHEAD (Action for Health in Diabetes)¹⁴ have utilized a "toolbox" approach to weight control among high-risk adults, including menus and meal replacements. Findings from these trials have had implications for the management of obesity in adults in real-world practice settings.¹⁵ Similarly, it is possible that work evaluating structured dietary interventions as a component of a family-based treatment of childhood obesity may also yield strategies suitable for translation to community settings. Future trials to evaluate structured dietary interventions for children should include larger samples, appropriate comparison groups, greater duration of treatment, and longer-term follow-up.

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Disclosure Statement

No competing financial interests exist.

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