Applied nutritional investigation

A nonrestrictive, weight loss diet focused on fiber and lean protein increase

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ABSTRACT

Objective: We examined the feasibility and acceptability of a non-restrictive diet that was focused on increasing dietary fiber and lean protein intake for weight loss.
Methods: Dietary intake was assessed using three randomly selected 24-h dietary recalls. Fifteen obese adults enrolled in a 12-wk study that included six biweekly individual dietary counseling sessions to attain a daily goal of higher fiber (35 g/d) and lean protein (0.8 g/kg/d of individual's ideal body weight) intake. Feasibility was determined by retention and attendance and dietary adherence was measured.
Results: One participant dropped out of the study before the 12-wk assessment visit. Fourteen participants completed all six counseling sessions and one participant completed five sessions. At week 12, 93% of participants approved of the diet and 92% of participants did not feel hungry while on the diet. Mean fiber intake increased by 6.8 g/d (95% confidence interval [CI], 3.2 to 10.5 g/d) and total protein intake increased by 5.7 g/d (95% CI, –3.7 to 15.0 g/d). The mean change in energy intake was –265.5 kcal/d (95% CI, –454.8 to –76.2 kcal/d). The dietary quality score as measured by the Alternative Healthy Eating Index increased by 6.1 (95% CI, 1.5 to 10.7). The mean change in weight was –2.2% (95% CI, –3.6 to –0.7%).
Conclusions: A diet that promotes increased fiber and lean protein intake demonstrates feasibility and high acceptability ratings, which resulted in calorie and weight reductions and an improvement of the dietary quality.

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Introduction

According to the World Health Organization, more than 1.9 billion adults age ≥18 year were overweight and more than 600 million adults obese worldwide in 2014 [1]. Excess weight significantly increases the risk for morbidity including hypertension, stroke, cardiovascular disease, type 2 diabetes, osteoarthritis, and some types of cancers [2,3]. In the United States, obesity remains a leading public health problem with 34.9% of adults and 16.9% of children who were obese between 2011 and 2012 [4]. A modest weight loss (5 to 10%) will improve obesity risk factors and potentially decrease their severity [5]; therefore, effectively treating obesity is a crucial goal for public health. Energy imbalance is the well-known primary dietary cause of overweight and obesity. Therefore, most weight loss studies have emphasized appreciable reductions in energy intake and increases in energy expenditure; however, these strategies may cause feelings of hunger and dissatisfaction, which can limit their acceptability, sustainability, and effectiveness [6]. Innovative weight-loss strategies are considered in the present study with the potential of improving macronutrient intakes without specific advice on restricting energy intakes [7].

Dietary fiber has physiological effects on the prevention of coronary heart disease, type 2 diabetes, colorectal and other types of cancers [8] and is inversely associated with body weight by suppressing energy intake through increasing satiation [9]. Dietary protein, through its influence on satiety, thermogenesis, energy efficiency, and body composition, also plays an important role in weight loss [10].

The present study builds on previous explorations in the area of high-fiber, high-protein, low-fat diets that included either caloric limits or portion-controlled provisions of food [11–13]. These studies presented unique sustainability challenges for participants. Morenga et al. conducted a study with moderate increases in protein and fiber and a restriction of foods that are higher in carbohydrate and fat [14]. The results showed that participants on the relatively high-protein and high-fiber diet lost 1.3 kg of body weight and 1.0 kg of fat mass at week 10, but improvements to the dietary quality were not assessed.

In the present pilot study, participants were given dietary recommendations of increasing fiber and lean protein [15] but no restrictions in caloric or macronutrient intake. The outcomes of interest were whether increases in fiber and lean protein are effective strategies for weight loss and dietary quality improvement. We hypothesized that this non-restrictive dietary intervention would be feasible as measured by retention, adherence, daily intakes of fiber, protein, and energy, acceptability measures of diet, weight loss, and dietary quality improvement after 12 wk.

Methods

The study protocol was approved by the institutional review board at the University of Massachusetts (UMass) Medical School in Worcester, MA. All participants gave informed consent before entering the trial (ClinicalTrials.gov Identifier: NCT02968615).

Study design and subject eligibility

This is a single-arm, clinical trial that was conducted between June 2015 and April 2016 at UMass Medical School. Participants were recruited through UMass Medical School and UMass Memorial employee Intranet advertisements, community flyers, and the UMass Conquering Diseases volunteer database.

The eligibility criteria were: 1) interested in losing weight and have a body mass index (BMI) of 30 to 45 kg/m^2, 2) age 21 to 70 year, 3) able to provide informed consent, 4) have physician's approval to participate, and 5) non-smoker status (given nicotine's effect on weight suppression and high-density lipoprotein and smoking cessation's effect on weight [16]).

The exclusion criteria were: 1) clinically diagnosed diabetes or an hemoglobin A1c ≥6.5%; 2) acute coronary event within the previous 6 mo, 3) pregnant or lactating, 4) plans to move out of the area within the 12-wk study period, 5) diagnosis of a medical condition that precludes adherence to study dietary recommendations (e.g., inflammatory bowel disease, active diverticulitis, or renal disease), 6) following a low-carbohydrate, high-fat dietary regimen such as the Atkins' diet or participating in a weight-loss program, 7) previous bariatric surgery, 8) currently using weight-loss medication, 9) diagnosis of an eating disorder (i.e., anorexia nervosa, bulimia nervosa, or binge eating), and 10) unable to provide consent.

Participant recruitment

Potential participants received an explanation of the study and were screened by telephone using a brief questionnaire with 10 questions to exclude subjects who had a fiber intake >35 g/d [17]. If eligible, participants were scheduled for a 90-min baseline visit. Physician approval was obtained to determine eligibility before the baseline visit.

Dietary recommendations

Participants were instructed to increase both their dietary fiber intake to 35 g/d and lean protein intake to 0.8 g/kg/d of their ideal body weight. Ideal body weight was calculated according to the method by Peterso et al. [18], which was based on the height and BMI of the individual. Based on the U.S. Department of Agriculture (USDA) dietary guidelines, 0.8 g of protein per kg/d of ideal body weight meets 97.5% of the population's needs [15]. A loss of 5% of body weight was the weight-loss goal [19]. The intervention included 6 biweekly, 30-min, individual, dietary counseling sessions over 12 wk. Behavioral strategies including self-monitoring, problem solving, goal setting, stimulus control, food substitution, and relapse prevention were taught to assist participants in meeting their fiber and protein goals. Topics and details of the dietary intervention contents are shown in Table 1.

Measurements

Dietary measures

Three randomly selected, 24-h, dietary recalls were conducted within a 3-wk period (2 weekdays and 1 weekend) around the baseline, week 6, and week 12 visits. The dietary recalls were done via telephone by a registered dietitian who was not involved with the intervention and participants were provided with 2-dimensional food-portion models before the call to facilitate portion recall accuracy. The 24-h recalls were analyzed using the University of Minnesota's Nutrition Coordinating Center's 2015 Nutrition Data System for Research software. The nutrient contents of foods including total energy, fiber, protein, saturated fat, and other nutrients were determined by Nutrition Data System for Research software using food-composition data that were adapted from the USDA National Nutrient Database for Standard Reference.

Dietary quality was measured with the Alternative Healthy Eating Index (AHEI), which is an instrument that is designed to evaluate nine criteria of a healthy cardiovascular diet [20,21] including fruits, vegetables, nuts and legumes, ratio of white to red meat, cereal fiber, trans-fat, ratio of polyunsaturated fat to saturated fat, and alcohol. All individual component scores were summed for a total AHEI score that ranged from 2.5 (worst) to 87.5 (best). The AHEI score was calculated as described previously [22,23]. Nutrient scores from three 24-h recalls were averaged at each time point for data analyses. Lean protein is defined as a calculation of total protein and saturated-fat intake to indicate changes in lean protein intake.

Weight measures

Height was measured at baseline and weight was measured at each time point using a balance scale (Detecto 339 Model scale; Webb City, MO). Participants wore light clothes and removed shoes for height and weight measurements.

Table 1
Contents of dietary intervention for increasing fiber and lean protein

Week/session	Topic	Content
Week 1/session 1	The power couple: Fiber and lean protein	Participants learned how to eat more foods that are higher in fiber and lean protein. Fiber-rich foods (vegetables and fruits, whole grain products, nuts and seeds) and lean-protein foods (seafood, shellfish, poultry, lean beef, and beans [also good source of fiber]) were encouraged.
Week 3/session 2	Supermarket savvy: How to shop for the ideal foods.	Participants learned how to read labels and choose fiber-rich and lean-protein foods at the supermarket.
Week 5/session 3	The science of taste: Eating outside the home	Several keys to higher fiber and lean protein while eating out were covered: 1) planning ahead, 2) asking for extra servings of vegetables, whole grain options, beans, and portion control of those foods not high in fiber or lean protein, 3) taking charge of the nutrition environment by avoiding the influence of what others order, 4) removing foods from the table that they did not want to eat, and 5) expanding knowledge of food ingredients in mixed dishes.
Week 7/session 4	Staying with it: Motivation and problem solving	Participants learned about the five important steps to solve a problem when trying to increase fiber and lean-protein intake: 1) describe the problem in detail, 2) brainstorm options, 3) choose one option to try, 4) make a positive action plan, and 5) active engagement and evaluation of results.
Week 9/session 5	Food review: Food record review and goal attainment	Participants reviewed their food records and strategies to increase their confidence for planning to increase high-fiber and lean-protein intake.
Week 11/session 6	In it for the long haul: A plan for the future	Participants were encouraged to evaluate their weight and eating habits and make a positive food and action plan for the future.