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Improving Food Security in Medical Students Using a Cooking Program

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ABSTRACT

Food insecurity has not been assessed in medical students. This pilot study assessed food insecurity in medical students and used a cooking program of plant-based recipes that included olive oil to see if food security could be improved by program participation. Fifty-four students completed the 16 week program. At baseline, 37% reported food insecurity (mean score 2.6 ± 1.6), with an improvement at the two month follow-up (mean score 1.7 ± 1.9 ; $p = .02$). Identifying medical students who are food insecure early in medical school and providing programs to decrease food insecurity may help to improve the overall well-being of medical students.

KEYWORDS

Food insecurity; medical students; plant-based; olive oil recipes

Food insecurity is defined as the lack of reliable access to sufficient quantities of affordable, nutritious food.¹ While most early literature assessed food insecurity in the general population, recent studies have assessed food insecurity in undergraduates at colleges in the United States. Studies using the USDA Food Security Module, which is a six or 18-item survey, assessing students in higher education found food insecurity ranging from 21 to 58.8% with a mean of 43.5% for the past 30 days to 12 months²

Studies demonstrate food insecurity in undergraduates lead to poor health and adverse academic outcomes.³ In the study assessing food insecurity in college students in Georgia, food insecurity was associated with poorer psychosocial health, which was associated with a lower GPA with the effect of food insecurity status accounting for the largest effect (73%)⁴ Food insecure adolescents, in general, are four times as likely to be chronically depressed and five times as likely to attempt suicide.⁵ Studies demonstrate the impact of long term food insecurity on adult health may lead to depression⁶, obesity⁷, type 2 diabetes^{7,8} and more likely to have unhealthy glycemic control ($A1c > 8.5\%$)⁹ and heart disease.⁷ Thus, food insecurity has the potential to impact immediate and long term health and adversely impact scholastic achievement.

As noted, food insecurity has been associated with depression and higher rates of depression have been found in medical students (27%)¹⁰ compared to 9.3% in similar aged general population (18 to 25 years old).¹¹ Reasons for the high level of depression in medical students are typically attributed to the intensity of the medical school curriculum.¹² To our knowledge though, food insecurity has not been assessed in medical students and if present, possibly contributes to the depression seen in this group. Identifying and subsequently working to decrease food insecurity in medical students may be critical to at least their mental health, but also the medical school experience.

One of the authors (MMF) developed a cooking program of recipes that were plant-based and included extra virgin olive oil that was designed to teach recipes to low income, food pantry clients using a plant-based, olive oil diet approach. The author developed a plant-based, olive oil diet in 1999 and an early protocol comparing the diet to the National Cancer Institute diet in women who were breast cancer survivors resulted in more weight loss with the olive oil diet and more improved lipids.¹³ Most of the participants in this study reported how inexpensive the plant-based, olive oil diet was compared to the NCI diet. This led to the author developing the cooking program for the food pantry clients. A research protocol using the cooking program with these clients decreased food insecurity in the participants.¹⁴ This protocol used the U.S. Household Food Security Survey Module: 18-Item scale and found a baseline food insecurity score for the previous six months in the participants of 3.2 ± 3.6 which was reduced to 2.07 ± 2.9 ($p < .01$) at the six-month follow-up appointment. In a follow-up study, a seven day meal plan of the recipes was found to cost \$14.36 less per week or \$746.46 less per year per individual compared to the most economical meal plan of the USDA,¹⁵ providing evidence that the plant-based diet that included daily extra virgin olive oil was economical.

The objectives of this study were to: 1. Assess food insecurity in first- and second-year medical students at The Warren Alpert Medical School, Providence, RI; and 2. To test if a 4-week cooking program that was effective in decreasing food insecurity and food costs for a low-income community cohort will be effective in medical students who reported being food insecure at baseline.

Methods

An e-mail was sent to all first ($n = 144$) and second ($n = 144$) year medical students offering them participation in the cooking program (titled *Food is Medicine*) and the subsequent study. The program was not offered to third and fourth year students due to their curriculum. Recruitment started in February 2017 and ended in October 2018. The cooking program took place at The Warren Alpert Medical School, Providence, RI. Prior to the start of the program and 2 months post program participants completed U.S.

Household Food Security Survey Module: Six-Item Short Form¹⁶ using a three month period for assessment with additional questions included that were designed to assess potential reasons for any student reporting food insecurity, including an open ended line for additional reasons. Participants also completed a survey that asked questions about their eating behavior

All classes were provided at the medical school in the student lounge either at the lunch break or at the end of the academic day. One of the authors (MMF) who was the PI and is a Ph.D. registered dietitian administered all the cooking classes and provided the nutrition education. Each group had up to five participants and there was one class per week for a four-week period. The cooking classes were provided using an electric skillet and lasted approximately 30 minutes. Each class demonstrated the preparation of a recipe that was plant-based and included extra virgin olive oil. The participants observed the recipe being prepared. The diet would be considered a traditional Mediterranean diet. The recipes required 10 to 15 minutes of preparation time. A nutrition topic was presented as the recipe was tasted by the group. The nutrition topics focused on the foods that are part of the plant-based, olive oil diet and the topics were: the health benefit of extra virgin olive oil and the amount and time needed to see improvement in risk factors for chronic diseases; the health benefits of frozen produce compared to retail fresh; and plant sources of dietary protein and how animal protein is not needed to provide sufficient dietary protein. There was a general discussion each week around using food to improve health or “food as medicine.” “Health” was defined as the absence of chronic diseases and/or healthy values for risk factors. Participants were asked to prepare at home three dinners per week that were plant-based, and included extra virgin olive oil from packets that contained 19 recipes, a grocery list and a 500 ml of EVOO.

Statistical Analysis

The Wilcoxon signed-rank test was used to compare the food insecurity score for the three months prior study entry from the USDA Household Food Security Module: Six-item Short Form at baseline to those at the two month follow-up, which would reflect a time period of three months as it included the four-week cooking program. We used an alpha probability of 0.05 as the threshold for statistical significance. Means are presented with SD throughout. All statistics were performed with Stata ver 14 (StataCorp, College Station, Texas).

This protocol was approved by the Institutional Review Board at The Miriam Hospital, the PI's institution.

Results

Fifty-five students enrolled in the program and 54 completed the protocol. There were 30 (54.5%) women, mean age of 24.0 ± 2.6 years. The majority

($n = 49$) were first year students. At follow-up (FU), 90.7% ($n = 49$) reported using the program recipes for an average use of 2.1 ± 1.7 meals a week (range 0–9 meals a week). Twenty-six percent ($n = 14$) reported spending less on groceries at follow-up, and 63% reported no change in grocery expenses.

Food Insecurity

At baseline, 20 (37% of the 54 participants) reported food insecurity (mean score 2.6 ± 1.6), which was decreased for these 20 participants at two months follow-up (1.7 ± 1.9 ; $p = .02$). Based on the coding for the Six-Item Short Form of the USDA Food Security Module, these scores represent an average “low food security” at baseline that was decreased to an average of slightly below “low food security” after participation in the cooking program. Participants were provided with four potential reasons for food insecurity. The questions were developed by the PI and represented reasons the participants might be food insecure based on anecdotal comments from food pantry clients. Participants were told to select all that applied. Nine (34%) reported “did not have sufficient money for food” at baseline; this was reduced to three (7%) at FU. Four (9%) reported “not able to get to a store that sold the food I wanted” at baseline; this value did not change at FU. Sixteen (37%) reported “did not have enough time to grocery shop” at baseline; this was the factor least changed by study participation and was 14 (33%) at FU. Four (9%) reported “not able to cook for myself (do not know how, do not have cookware, etc); this value was three (7%) at FU. No student provided an additional reason in the area that would allow for “other reasons”. While participation in the program seemed to have improved having funds to grocery shop, not having time to grocery shop remained high and was the major reason at both timepoints.

Discussion

The first objective of this study was to assess food insecurity in medical students and we found that the prevalence of food insecurity in the medical students who participated was comparable or higher to that found in studies of undergraduate students. A number of medical schools are educating their students to identify food insecurity in patients and some also provide programs designed to decrease the food insecurity in patients,¹⁷ yet to our knowledge, this is the first study that demonstrates food insecurity may be prevalent in medical school students, which may promote deleterious health outcomes for students. The second objective was to test if a four-week cooking program of plant-based, olive oil recipes would reduce food insecurity in medical students who reported being food insecure at baseline.

Participation in the cooking program and weekly use of the recipe led to a reduction in food insecurity as measured by a standard questionnaire. The cooking program used in this study is efficient to administer as it can be done in less than 30 minutes and can be conveniently provided at the medical school, was widely accepted by the participants.

The Association of American Medical Colleges includes “health and well-being of learners” in their recommendations to improve medical education.¹⁸ A systematic review of programs designed to address this recommendation found current programs could be categorized as offering pass/fail grading, mental health programs, mind-body skills education and training, curriculum structure, and miscellaneous wellness programs.¹⁹ The authors of this review noted that the overall quality of the studies available was low, but some were associated with improvement in well-being. While some of the programs currently used to improve well-being have been shown to improve emotional well-being of the students who participate¹⁹, identifying and then working to alleviate food insecurity may help to remove a known cause of poor mental health and would contribute to the health and well-being of the students.

Identifying students who are food insecure early in their medical school education and providing programs designed to improve food security are needed. Cooking programs have become popular at medical schools as a practical tool to teach nutrition.^{20,21} The cooking program used in the current study was designed to provide the students with nutrition education and to provide practical information that could be used by both the student themselves and for counseling patients, besides teaching the students how to cook healthful, low cost meals. The cooking program was administered using an electric skillet, which could increase accessibility of the program for other medical schools. The ingredients used are readily available, shelf-stable and low in cost (averaging \$1.41/serving; range \$1.04 to \$1.94 per serving; 2018 pricing at a regional large chain grocery store using non-sale prices), and require very basic cooking skills. An overwhelming majority of the participants reported continued use of the recipes two months after the program ended and some reported spending less on groceries as result of study participation.

The plant-based, olive oil recipes were developed based on research protocols of one of the authors (MMF). The recipes all use extra virgin olive oil, which was included mainly for its health benefits and is the main food that the author researches. Daily use of approximately two tablespoons of extra virgin olive oil has been shown to decrease fasting blood glucose and insulin^{22,23}, improve insulin sensitivity²³, decrease blood pressure²⁴, decrease oxidation^{25,26}, decrease inflammation²⁷, and increase high density lipoprotein cholesterol^{28–30}, compared to vegetable seed oils. While extra virgin olive oil would cost more than vegetable seed oil (canola, corn, safflower, soybean), it is not expensive when considered as price per tablespoon of a bottle of extra virgin olive oil which has 32 tablespoons per 500 ml bottle. In addition, the

many health benefits should outweigh any additional cost. The recipes all included frozen or canned vegetables. This was intentional as frozen and canned vegetables have a similar vitamin content compared to “retail fresh”³¹ but frozen and canned are higher in some phytonutrients³², because they are kept on the plant longer before processing. Frozen and canned produce can also be purchased when on sale and stored for later use, which would help to lower overall grocery cost. The plant-based, olive oil recipes do not include any meat, poultry, or seafood. During one week of the program, dietary protein was discussed with the students being provided with information on dietary protein needs, in order to educate them about appropriate dietary consumption of protein. They were also told about plant sources of dietary protein. Animal products are the most expensive part of a food budget³³ and frequent inclusion would increase total food costs and not provide the health benefits of plant sources of protein. In addition, as protein consumed in excess of need is stored as fat, and studies have shown higher meat protein diets are related to higher body weight.^{34–37} It is well established that vegan and vegetarian diets contain sufficient dietary protein^{38–40} and that, obtaining dietary protein from plant sources for several days per week would decrease both body weight and overall food costs.

The USDA Household Food Security Module: Six-Item Short Form included additional questions that attempted to identify potential reasons for a student’s food insecurity. Of the four choices and an open-ended choice that addressed reasons for food insecurity, the largest number of students (baseline: 35%, n = 19; FU 31%, n = 17) stated that insufficient time to grocery shop was their primary barrier to healthy eating. If this is the main cause of food insecurity in medical students, this could potentially be alleviated by programs that increase access to groceries, such as having major food chains deliver groceries to the medical school.

This study demonstrates that food insecurity does exist in a specific group of medical students attending The Warren Alpert Medical School and that a four-week, plant-based cooking program that included extra virgin olive oil was successful in helping students spend less money on groceries and eat more plant-based meals and was related to an improvement in food insecurity score as measured by the U.S Household Food Security Survey Module: Six-Item Short Form.

Limitations

The main limitation of this study was the small sample size, which was due to the availability of funds to provide the program and the time commitment of the PI. A larger group at additional medical schools would show if the program could be generalized to a majority of medical students. In addition, it is possible that students who were food insecure at baseline were more

likely to participate, however the e-mail announcing the study did not indicate that the study would be addressing food insecurity.

Future Research

Food insecurity in medical students should be assessed and attempts made to improve food insecurity in students who are found to be food insecure. This study demonstrates that simple interventions may reduce food insecurity in medical students and promote better health for these future caregivers. We believe that programs, such as the one described in this study, designed to both identify and treat potential food insecurity early in the medical school experience might help to improve the overall well being of the medical students.

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