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Nutrition Education in Medical Schools: What do Medical Students Think?

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ABSTRACT

OBJECTIVE: To examine medical students' perceptions of the nutrition education received and their ability to apply that knowledge in clinical settings.

METHODS: This is a qualitative study using a structured survey with free responses to solicit the perspective of US medical students regarding their nutrition education. A national online survey was distributed by the American Academy of Pediatrics, Section on Pediatric Trainees. An expert committee in nutrition education evaluated and conducted a thematic analysis of the survey responses.

RESULTS: Twenty-four surveys were completed (10 medical students and 14 pediatric interns). The survey revealed students were not satisfied with the nutrition education they received in several areas including nutritional recommendations for obesity and prediabetes/diabetes; nutritional needs during pregnancy, childhood, and adolescent age-related dietary recommendations; cultural influences on diet and eating habits; and food insecurity. Students also reported a lack of confidence in providing healthful nutrition counseling to adolescent patients and delivering culturally appropriate nutrition advice.

CONCLUSIONS: Survey responses revealed the need for improvements in several areas of nutrition curricula related to health and chronic disease management and suggest broader social determinants of health such as cultural influences on nutrition practices and food insecurity. The results of this survey provide unique insight into the medical student perspective on nutrition education and can inform the development of future medical school nutrition curriculums.

KEYWORDS: nutrition education, medical student, perceptions

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Introduction

Obesity is a serious public health issue in the United States¹ The prevalence of obesity, defined by body mass index (BMI) in children ages 2 to 19 years in the United States was 18.5%, or 13.7 million children,² and approximately 42.4% among American adults in 2017 to 2018.³ The literature reports unhealthy diets are a risk factor for developing chronic diseases such as obesity, hypertension, and dyslipidemia.⁴ This risk is present throughout the lifespan and can impact subsequent generations.⁴

Several interventions aim to address obesity including community-based, school-based, work-based, family-based, and hospital-based interventions.^{1,5–7} Furthermore, food pharmacies have emerged to increase public access to healthy foods, offer coupons to alleviate financial barriers, and offer nutrition and culinary education.⁸ Upstream approaches are also

important to address this public health issue, such as increasing the nutrition education of future physicians preventing obesity, and managing obese patients.^{9–11}

To address obesity as a serious public health issue and to inform the development of interventions addressing obesity, we need to look at the training of healthcare providers. Several studies highlight the need for improved nutrition education for healthcare providers. A national survey created by the Nutrition in Medicine Project at the University of North Carolina at Chapel Hill found only 9 medical schools consistently met the recommended 25 h of nutrition instruction.¹¹ Medical residents also demonstrate weaknesses in providing nutrition counseling to patients.¹² At a university-based internal medicine training program, 77% of the respondents agreed nutrition assessments were important during routine primary care visits, but only 14% felt adequately trained to



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provide nutrition counseling.¹² Among practicing providers, similar sentiments are felt. According to a scoping literature review, primary care doctors and nurses were more likely to provide nutrition counseling only when BMI was increasing, and the quality of that advice may be poor.¹³

What is missing from prior studies examining nutrition education is the perspective of the learners themselves. Systematic reviews detail shortcomings in medical education including “poor integration of nutrition in the curricula,” “absence of priority for nutrition education,” “poor application of nutrition science to clinical practice,” and “poor collaboration with nutrition professionals.”¹⁴ Our present qualitative study focuses on the medical student’s perspective of the nutrition education they receive, especially surrounding pediatric care, and their ability to apply that knowledge in clinical settings. The overarching goal of this report is to enable medical educators to inform, shape, and improve nutrition curricula.

Methods

We conducted a qualitative study using a structured survey with free responses about nutrition education and delivered it electronically to US medical students. The target population/ inclusion group included fourth-year medical students and first-year pediatric residents who are members of the Section of Pediatric Trainees (SOPT) in the American Academy of Pediatrics. These groups were chosen as they can comment on the nutrition education received in the preclinical years of medical school and on their clinical clerkship experiences applying that knowledge and counseling to patient interactions. Responses from other groups of medical students such as first-, second-, or third-year students were excluded.

Survey creation and distribution

We created survey questions de novo (as no prior survey existed) using published nutrition survey data obtained from faculty instructors across US medical schools.^{11,15} The survey was piloted with 5 fourth-year medical students (11.5% of the total survey population) to assess the quality and clarity of questions. The Charles R. Drew University of Medicine and Science (CDU) Institutional Review Board approved the data collection as an exempt study (FWA00002736, Date of study 9/17/2019). The survey was submitted to the SOPT section manager for distribution. The SOPT is comprised of over 16,000 members who are medical students, resident physicians, and fellowship trainees. The survey was distributed via monthly “What’s New” emails to SOPT members between September and November 2019 and between March and May 2020. Participation was by self-selection. Participants voluntarily opted to complete the survey by clicking on the survey link within the emails. After clicking on the survey link, participants were provided with the study background and information sheet informing them of the risks and benefits of participating

and the approximate time of the survey (30 min) before being directed to another link to access the survey. Completion of the survey was considered as informed consent and this method of obtaining informed consent was approved by the CDU Institutional Review Board. The completed surveys were collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools hosted at Charles R. Drew University of Medicine and Science.¹⁶ REDCap is a secure, web-based software platform designed to support data capture for research students, providing (1) an intuitive interface for validated data capture; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads as to common statistical packages; and (4) procedures for data integration and interoperability with external sources.

The survey consisted of 4 subject domains: educational history, nutrition education before medical school, nutrition education during medical school, and application of nutritional knowledge in clinical settings. Questions focused on nutritional competencies from the Society for Nutrition Education and Behavior related to obesity and its comorbidities, nutritional competencies through the life course from prenatal to adolescence, and nutritional competencies related to culture and food justice. Likert Scale questions with free responses were used and survey respondents were instructed to provide comments if not satisfied with the nutrition education received in the area being questioned. These free responses served as the basis for the qualitative study. The answers to the free responses were exported to an excel document for analysis.

Research team

An expert committee of 6 medical doctors and educators specializing in pediatrics and a nursing educator and epidemiologist (PhD) was convened to analyze the results of the survey. All members of the research team have experience with qualitative research methods.

Survey analysis

The expert committee read the open-ended responses individually, and then as a group, coded the free responses. Using an inductive content analysis approach, the expert committee identified 2 recurring categories: Medical student-identified barriers in nutrition curricula and medical student-identified needs in nutrition curricula. After the data was coded, the expert committee assigned the free responses to the 2 codes and conducted a thematic analysis across the 2 codes and survey topic areas. Two themes were identified: “barriers,” areas respondents identified as receiving limited or no education, and “needs,” based on respondents’ suggestions of how to improve their nutritional knowledge and competencies in the areas identified (Tables 3 and 4). The expert committee met as a group several times to discuss and refine the themes

across each code and survey topic area until all members agreed that saturation was achieved, and the themes established accurately reflected the free responses of respondents.

Results

We received 43 total survey responses of which 39 surveys were complete and 4 surveys were incomplete. Of the 39 surveys that were complete, 24 surveys were from participants in the target population/inclusion group of Pediatric interns and fourth-year medical students and were analyzed for discussion. See the flowchart of surveys analyzed below Figure 1.

Table 1 shows the demographics of the study respondents. The majority of participants were female (84%), between 19 and 29 years of age (86%), self-identified as non-Hispanic Caucasian (65%), and had no prior nutrition education before medical school (70%). In addition, pediatric interns reflecting on their medical school nutrition curriculum made up a slightly higher percentage of participants (35%) compared to fourth-year medical students (26%).

Fourth-year medical students and pediatric interns indicated they were satisfied or very satisfied with their curricula in nutritional recommendations for hypertension and breastfeeding recommendations for infants. Table 2 highlights that most students indicated they were neutral, dissatisfied, or very dissatisfied with nutritional recommendations for obesity, prediabetes/diabetes, and dyslipidemia; nutritional needs during pregnancy; solid food recommendations during infancy; childhood and adolescent age-related dietary recommendations; childhood and adolescent age-related parenting skills related to eating habits; childhood and adolescent media practices that influence eating behavior; cultural factors that influence diet and eating habits; food insecurity; and nutrition assistance programs for vulnerable populations.

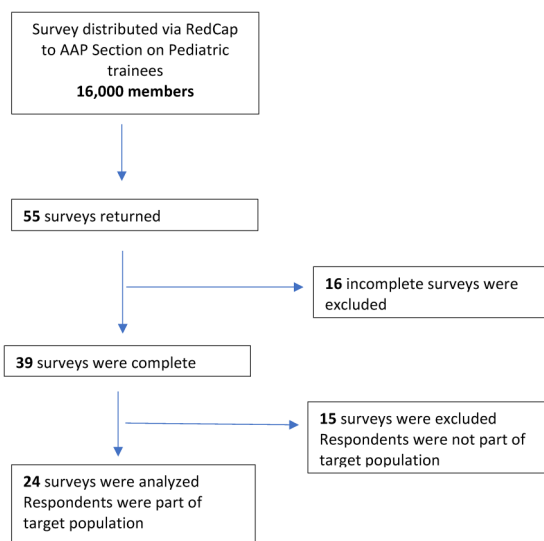


Figure 1. COREQ flow chart.

Students also provided feedback about why they were dissatisfied or very dissatisfied. Table 3 highlights the nutritional topics identified by students who did not receive adequate coverage in the medical school curriculum.

Students also provided nutritional information they wished they had received before starting their medical school clinical rotations. Table 4 shows the nutritional education needs identified by students.

Discussion

The results of the nutrition survey highlight the areas in nutrition education that medical students and pediatric interns deemed unsatisfactory. To the best of our knowledge, this is the first survey to provide this perspective. Furthermore,

Table 1. Demographics of survey respondents.

	Number (% of total respondents)
<i>Number of participants</i>	
Complete surveys	39 (90.7%)
Incomplete surveys	4 (9.3%)
<i>Gender</i>	
Male	6 (14.0%)
Female	36 (83.7)
<i>Age</i>	
19-29 years of age	37 (86.0%)
30-36 years of age	6 (13.9%)
<i>Race</i>	
Black/African American	5 (11.6%)
Asian/Asian American	5 (11.6%)
White/Caucasian	28 (65.1%)
Other	5 (11.6%)
<i>Ethnicity</i>	
Hispanic/Latino	5 (11.6%)
Non-Hispanic/Non-Latino	38 (88.4%)
<i>Educational History: Ranking in Medical School or Pediatric Residency</i>	
Fourth Year in Medical School	10 (23.3%)
Pediatric intern	14 (32.6%)
First, second, third year, leave of absence (LOA) in Medical School	15 (34.8%)
<i>Nutrition education prior to Medical School</i>	
Yes	13 (30.2%)
No	30 (69.8%)

Table 2. Areas of nutrition education dissatisfaction for medical students.

Indicate your level of satisfaction with each of the following nutrition topics in medical school	Very dissatisfied, dissatisfied, neither satisfied nor not satisfied (Number of respondents)	Satisfied, very satisfied (number of respondents)	N/A (Did not receive) (Number of respondents)
Nutritional recommendations for obesity	12	8	5
Nutritional recommendations for dyslipidemia	11	11	4
Nutritional needs during the life course of pregnancy and lactation	16	4	6
Solid food recommendations for infants	11	11	5
Childhood and adolescent nutrition: Age-related dietary recommendations	13	5	8
Childhood and adolescent nutrition: Age-related parenting skills related to positive/negative eating habits	13	4	8
Childhood and adolescent nutrition: Media industry practices that influence eating behaviors	16	4	6
Cultural influences on diet and eating habits	17	5	4
Food insecurity	16	6	3
Nutrition assistance programs for vulnerable populations	18	4	4
Understanding and interpreting food labels	11	9	6

students identified important topics to address and future directions for inclusion in medical education. The topics identified emphasized the role of food as medicine and preventing illness, the role of nutrition throughout the life course, and the role nutrition plays in different cultures and populations.

Food as medicine and preventing illness (primary and secondary prevention)

Emerging research indicates nutrition interventions tailored to patients and their health conditions may be associated with improved health outcomes and decreased healthcare usage and costs.¹⁷ This aligns well with precision nutrition, which is personalized nutrition focused on the individual, their DNA, dietary patterns, metabolic response to specific foods, and microbiome.¹⁸ Nutrition education focused on patient health conditions is lacking. Our nutrition survey revealed medical students believe they received inadequate nutrition training on obesity, dyslipidemia, and prediabetes/diabetes. They identified gaps in their counseling skills to support patients and their families in these areas. This correlates with findings from international studies, which assessed students' confidence in providing nutrition care and showed that some students were not confident to counsel patients and were not confident that patients would improve their eating behaviors after nutrition care.^{14,19,20} It was also found that students rarely recognized their role in obesity prevention and treatment and reported not feeling prepared to provide weight loss

interventions for overweight and obese patients with health-related issues.^{21,22} In addition, more education on specific dietary recommendations for chronic medical conditions was identified. This information is timely as many medical schools are redesigning their curricula.²³ Furthermore, these findings align well with the "Food is Medicine" initiative that includes therapeutic meals, food pharmacies, and produce prescription programs.¹⁷

Nutrition through the life course

The nutritional needs of children change from infancy to adolescence. Similarly, during pregnancy, adequate nutrition is important to meet the needs of the growing fetus. Our results suggest that students perceived insufficient education on dietary recommendations during pregnancy. The results of a systematic literature review showed that women do not receive adequate nutrition counseling during pregnancy.²⁴ While providers recognize the importance of nutrition education, barriers include lack of time, lack of resources, and lack of relevant training.²⁴ The results also suggest a need for age-related dietary recommendations and healthy eating practices, ie, restrictive eating and eating in front of the screen. These areas could be supported by understanding how parents and the home environment shape dietary and eating practices.²⁵

Table 3. Medical student-identified barriers in nutrition curricula.

Topic	Theme (Barriers)
Nutritional recommendations for obesity	Not enough education and training on nutrition recommendations for obesity and how to support patients in incorporating recommendations.
Nutritional recommendations for dyslipidemia	Not enough education/training on dyslipidemia.
	Limited recommendations to provide for parents and patients.
Nutritional recommendations for prediabetes and diabetes	Not enough education or training on this topic.
	Not enough specific recommendations versus other complications of metabolic syndrome. There was a desire to hear from other allied health professionals.
Nutritional needs during the life course of pregnancy	Not enough education and training on nutrition during pregnancy and lactation.
	SUBTHEME: Vitamins and minerals were emphasized but there was not enough emphasis on the why (ie without a deeper dive into these topics).
Solid food recommendations during infancy	No education or training on this topic.
	No age-related dietary recommendations on childhood and adolescent nutrition.
Childhood and adolescent age-related dietary recommendations	No education or training on this topic.
Childhood and adolescent age-related parenting skills related to positive/negative eating habits	No education or training on this topic.
Childhood and adolescent media practices that influence eating behavior	No education or training on this topic.
Cultural factors that influence diet and eating habits	No education or training on this topic.
Food insecurity	Limited education and training received.
	The topic was superficially addressed but no in-depth or practical instruction was given.
Nutrition assistance programs for vulnerable populations	No education or training on this topic.

Nutrition, culture, and vulnerable populations

It is well-known culture influences the types of food, preparation of food, and frequency of certain foods people eat.²⁶ Students in the survey called for more education on the role cultural and societal norms have on food choices and eating behaviors as well as more practical strategies to support healthful adjustments to cultural diets.

Students also identified gaps in knowledge about food insecurity and nutrition assistance programs. It is recognized that the economic resources of the family impact nutrition status. Food insecurity affected 13.9% of US households in 2018, and 7.1% of children in these households were food insecure.²⁷ Given the high prevalence of food insecurity, medical professionals need to feel confident about discussing available resources with families. Additionally, students voiced wanting more education on food insecurity and chronic diseases. A study conducted by the University of California showed that providing a nutrition course with an integrated hands-on teaching kitchen component to undergraduate students contributed to increased food literacy and associated reduction in food insecurity among the participants.²⁸ This nutrition course offered to UCLA health professional students and medical students

during the 2019 to 2020 academic year used a blended approach to deliver educational nutrition content including in-class didactics, interactive hands-on cooking sessions, and a service-learning experience.^{23,28,29} This upstream approach to increasing food literacy benefits medical students and future patients.^{23,28,29}

Lastly, students acknowledged the extremely problematic and common cultural issue of weight stigma. In the nutritional survey, students acknowledged the need to develop counseling skills sensitive to addressing weight in patients. There is overwhelming evidence of weight bias among medical students, physicians, and nurses.³⁰ More teaching in this area is critical given the physical and mental health issues obese individuals experience compounded by decreased health services utilization due to stigma experienced during health care visits.³¹ Awareness of internal biases is important especially when counseling patients on sensitive topics, like weight.³²

Future directions

Four recommendations to improve nutrition education in medical school were identified from the survey results. The first is to include education on food as a form of medicine

Table 4. Medical student-identified needs in nutrition curricula.

Topic	Theme (Needs)	Comments
Nutritional recommendations for obesity	More education on dietary recommendations for chronic medical conditions such as cardiovascular disease, obesity, diabetes, Cystic Fibrosis, etc	"I feel like I only was given basics—don't skip meals, eat fruits and veggies—but these feel unhelpful to tell a person who is obese".
Nutritional recommendations for dyslipidemia		
Nutritional recommendations for prediabetes and diabetes		"Would have liked more time spent and more specific recommendations". "I know basic concepts, like avoid high carbohydrate foods and food high in sugar, and use protein to keep your blood sugar stable, but I don't recall any formal education". "Would have liked more time spent and more specific recommendations. I think we would have benefited from spending time with a diabetes educator".
Nutritional needs during the life course of pregnancy	More information and education on dietary recommendations for lactation.	"I don't remember learning much about nutrition during pregnancy other than it is not much extra calories per day and what foods to avoid. I also don't remember learning anything about lactation nutrition information."
Solid food recommendations during infancy		"I can recall basic concepts such as 'take your prenatal vitamins', folic acid needs, and 'eat a balanced diet', but I can't recall any in-depth education about specific nutritional needs during pregnancy and lactation." Re: Solid food recommendations in infancy—"I didn't receive education on this during medical school".
Childhood and adolescent age-related dietary recommendations Childhood and adolescent age-related parenting skills related to positive/negative eating habits	More education on age-related dietary recommendations related to nutrition and caloric needs for growth and development.	"My medical school courses did not cover the above topics. I am personally interested and sought out information individually".
	More education on how to support common barriers parents face in making sure their children's nutritional needs are met. Recommendation: To have a module or workshop at the beginning of pediatric or family medicine clerkships covering such information.	"I don't recall any education or grand rounds topics pertaining to this topic".
Childhood and adolescent media practices that influence eating behavior	More education to increase understanding of how media and marketing shape and reinforce eating behaviors.	"No education on this, but I think it would be really interesting".
	More education on fad diets including what they are, the types of foods included in those diets, and what is healthy and safe for growing children	
Counseling-specific skills in advising and providing dietary recommendations to patients and families.	Education and training that goes beyond increasing fund of knowledge of diet and nutrition and builds counseling-specific skills to support patients and families in the outpatient setting including the provision of practical advice that can be provided to patients.	"I don't think we discussed any parenting tips in any of my classes or clerkships".
	For example, counseling skills on how to best address eating disorders and body shaming with pediatric patients and counseling skills to support parents in addressing food neophobia and increasing intake of fruit and vegetables in children.	

(continued)

Table 4. Continued.

Topic	Theme (Needs)	Comments
Cultural factors that influence diet and eating habits	More education on the role cultural and societal norms may have on food choices and eating behaviors.	"I do not remember learning this—outside of a basic understanding of, honestly, stereotypes (ie, people of Mexican heritage eat rice and beans.....)"
	Examples: Food choices and nutritional content of traditional cultural-specific foods. The role of celebrations around food and how it shapes food choices and eating behaviors. Changes in eating behaviors while in the company of friends and family.	"I can use my critical thinking skills to develop stereotypical thoughts about what this might mean (ie, excess carbohydrate consumption in Hispanic population), but I don't recall any education or grand rounds topics pertaining to this topic".
	More practical knowledge on replacements or adjustments to cultural diets that make them more healthful.	"I didn't receive education on this during medical school nor did I see it taken into account when talking to patients throughout all the clinics I worked in. Only some providers recognized and addressed this".
Food insecurity	More education on describing, identifying, and managing food insecurity. More education on food Insecurity and the relationship it has on shaping food choices and eating behavior.	"I was made aware this exists, but I feel weak in my ability to address this. I feel like my education was, well, 'it depends where you are and if you have a good social worker'. Therefore, as a physician, I feel fairly helpless when addressing food insecurity".
	More education on the implications of food insecurity, particularly in terms of long-term health status and the development of chronic diseases including diabetes, obesity, and atherosclerosis.	"I can infer what this might mean, possibly regarding disordered eating and eating disorders, but I don't recall any education or grand rounds topics pertaining to this topic". "No education at all on this topic."
Nutrition assistance programs for vulnerable populations	More education on the US nutritional policies and programs that shape food choices, eating behaviors, and nutritional intake of Americans.	"Picked up a few things on clinical rotations, but no formal teaching on this. It would be very practical knowledge".
	Examples: USDA National Lunch Program; WIC, SNAP.	"I do not remember learning this. Maybe one Grand Rounds I happened to be at during a clerkship?"
		"Never was discussed."
Understanding and interpreting food labels	More education on how to interpret nutritional labels to effectively and efficiently counsel and advise patients. Example: USDA Organic Labeling	"My medical school courses did not cover the above topics. I am personally interested and sought out information individually".
		"Don't think I had any education on this at all".

and prevention of chronic illnesses. The second is to include education on the nutritional needs of children along the life course including prenatally as nutritional needs change at each stage of development. The third is to increase students' knowledge of specific cultural dietary practices and alternatives to address medical conditions that arise. Fourth is to increase students' education on food justice including food insecurity and nutrition assistance programs.

Limitations

An identified limitation of this study is that the regional distribution of respondents was not part of the survey questionnaire and is unknown. This information would have been useful to determine if regional differences exist in satisfaction levels of the medical school nutrition curriculum. Lastly, most

respondents were non-Hispanic Caucasian, limiting the diversity of perspectives obtained from the survey.

Conclusion

This study offers insight into medical students' perspectives on the nutrition education received during medical school. Nutritional guidance is a core ingredient in the prevention and treatment of chronic illnesses such as obesity. As medical students learn about these illnesses, dietary and nutrition education should be integrated to improve their knowledge and counseling skills. Medical students must also be aware of the changing nutritional requirements along the life course to effectively counsel patients and families. Furthermore, knowledge of cultural dietary practices, and an understanding of the association between food insecurity and health and well-being is important. Additional studies should be conducted with a greater number of

participants to determine the generalizability of the results and to gain greater insight into the needs and barriers related to medical student nutrition education and counseling.

Author Contributions

Shanika Boyce conceptualized the study, developed the survey, analyzed the data, prepared the first draft of the manuscript, and made revisions to the manuscript. Huan Dong assisted in developing the survey and uploading it to RedCap, analyzed the data, and revised the manuscript. Alma Guerrero and Wendelin Slusser assisted in developing the survey. Alma Guerrero, Cambria Garell, Catherine Carpenter, Christine Thang, and Wendelin Slusser all analyzed the data and revised the manuscript. All authors approved the final draft of the manuscript.

Ethical Approval

The Charles R. Drew University of Medicine and Science (CDU) Institutional Review Board approved the data collection as an exempt study (FWA00002736, Date of study: 9/17/2019). Completion of the survey was considered as informed consent and this method of obtaining informed consent was approved by the CDU Institutional Review Board.

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