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Level of nutrition knowledge and its association with weight loss behaviors among low-income reproductive-age women

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Abstract

Objective—To examine influence of nutrition knowledge on weight loss behaviors among low-income reproductive-age women.

Methods—we conducted a self-administered cross-sectional survey of health behaviors including socio-demographic characteristics, nutrition knowledge, and weight loss behaviors of 16–40 year old women (n=1057) attending reproductive health clinics located in Southeast Texas between July 2010 and February 2011. Multiple linear regression and multivariable logistic regression analyses were performed to identify correlates of nutrition knowledge and examine its association with various weight loss behaviors after adjusting for confounders.

Results—The mean nutrition knowledge score was low (5.7 ± 2.8) (possible score 0–15). It was significantly lower among African American women than whites ($P < .001$). Obese women ($P = .002$), women with high school enrollment/diploma ($P = .030$), and some college hours/degree ($P < .001$) had higher nutrition knowledge scores than their counterparts. The higher score of nutrition knowledge was significantly associated with higher odds of engaging in healthy weight loss behaviors: eating less food (odds ratio (OR) 1.12, 95% confidence interval (CI) 1.06–1.18), switching to foods with fewer calories (OR 1.10, 95% CI 1.04–1.16), exercising (OR 1.10, 95% CI 1.04–1.16), eating more fruits/vegetables/salads (OR 1.11, 95% CI 1.06–1.17) and less sugar/candy/sweets (OR 1.09, 95% CI 1.04–1.15). However, it was not associated with unhealthy weight loss behaviors, such as using laxatives/diuretics or inducing vomiting.

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Conclusions—Nutrition knowledge is low among reproductive-age women. An increase in nutrition knowledge may promote healthy weight loss behaviors.

Keywords

Reproductive-age women; nutrition knowledge; weight loss behavior; healthy weight loss behavior; unhealthy weight loss behavior

Introduction

The prevalence of obesity in the US has more than doubled in the last three decades (1, 2). In fact, two-thirds of women aged 20 to 39 years residing in the US are currently overweight or obese, placing them at increased risk of developing diabetes, hypertension, or hypercholesterolemia at a young age (3–5). In addition, reproductive-age women are prone to gain excess body weight during pregnancy and the postpartum period (2, 3, 6–8). To combat obesity, consumption of low-energy diets in combination with adequate fruits and vegetables and increased physical activity are recommended (9). However, these recommendations often are not followed among adults (10–12). Furthermore, the burden of obesity is disproportionately high among low-income and minority women in the US (4, 13), and their lack of nutrition knowledge might be a contributing factor (14–16).

Several intervention studies based on small sample size with short follow-up duration observed that improved nutrition knowledge may promote weight loss and reduce postpartum weight retention among low-income reproductive-age women (14–16). However, the association between nutrition knowledge and healthy and unhealthy weight loss behaviors has not been examined based on a large sample of reproductive-age women. Based on available evidence in the literature, there is a consensus that healthy dietary intakes, specifically decreased intake of fat (calorie) and increased consumption of fruit and vegetable are the most effective healthy behaviors for weight loss (17–19). Moreover, a positive association has been observed between nutrition knowledge and these healthy dietary behaviors (20–24). However, other than these healthy dietary behaviors for weight loss, very little is known about its association with other healthy and unhealthy weight loss behaviors, such as exercise, use of liquid diet products, prescription diet pills or nonprescription diet pills/medicines/herbs, use of laxatives/diuretics, excessive smoking, fasting for long hours, self-induced vomiting, joining weight loss programs, or others. Examining this association is especially important among reproductive-age women, as they are more likely than similarly aged men to be obese (1, 2) and remain engaged in unhealthy behaviors for weight loss (10, 25).

The objectives of this study were to identify correlates of nutrition knowledge and examine its association with various healthy and unhealthy weight loss behaviors among a large sample of low-income reproductive-age women of multiethnic origin.

Materials and methods

A self-administered cross-sectional survey (available in English and Spanish) on health behaviors was conducted between July 2010 and February 2011 among 16–40 year old

women, attending one of three publicly funded reproductive health clinics located in Southeast Texas. These clinics provide care to low-income women, of which 88% have a family income <\$30,000/year. Women visit these clinics for family planning services, pregnancy testing, post-partum care, treatment of sexual transmitted infections, or well women examination. A total of 1714 eligible participants were approached for participation. Of these, 1436 women agreed to participate. The overall response rate was 83.8%. All women who agreed to participate provided oral informed consent. After that, they were asked to complete a survey questionnaire. The survey took approximately 15–25 minutes to complete. Participants were reimbursed \$5 for their time and effort. All procedures were approved by the institutional review board of the University of Texas Medical Branch.

After surveys were collected, a research assistant reviewed those individually for missing items and inconsistencies, and then reconciled and sent to another staff member for data entry. Descriptive statistical procedures were used to evaluate the data for accuracy and consistency. Additionally, to ensure a precise representation of the physical data, 10% of all weekly surveys were contrasted with their corresponding electronic data.

The survey instrument contains 15 items to evaluate nutrition knowledge adapted from USDA's 1994–1996 Diet and Health Knowledge Survey conducted among the general population (26). The first four items based on the following question, "Based on your knowledge, which has more saturated fat?" 1) liver vs. T-bone steak, 2) butter vs. margarine, 3) egg white vs. egg yolk, and 4) skim milk vs. whole milk. The next six items based on the following question, "Based on your knowledge, which has more fat?" 1) regular hamburger vs. ground round, 2) loin pork chop vs. pork spare ribs, 3) hot dogs vs. ham, 4) peanuts vs. popcorn, 5) yogurt vs. sour cream, and 6) porterhouse steak vs. round steak. Response options of these ten items were "either of the two," "both has the same," or "don't know".

The remaining five items were based on five separate questions. 1) "Which kind of fat is more likely to be a liquid rather than a solid? Response options were "saturated fats," "polyunsaturated fats," "both are equally likely to be liquids," or "don't know" 2) "If a food has no cholesterol, is it also what?" Response options were "low in saturated fat," "high in saturated fat," "either high or low in saturated fat," or "don't know" 3) "If a food product is labeled as containing only vegetable oil, is it what?" Response options were "low in saturated fat," "high in saturated fat," "either high or low in saturated fat," or "don't know" 4) "Is cholesterol found in the following products?" Response options were "vegetables and vegetable oils," "animal products like meat and dairy products," "all foods containing fat or oil," or "don't know". 5) "If a food product is labeled as 'light', does that mean that compared to a similar product not labeled 'light' it is lower in calories, lower in fat, lower in calories and/or fat, or does it mean something else? A nutrition knowledge score was calculated using sum of the correct responses of the 15 items (one point for each correct response and zero for incorrect or "don't know" response).

Participants were asked whether, in an effort to lose weight, they engaged in weight loss behaviors in the past 12 months using questions from the 2007–2008 National Health and Nutrition Examination Survey (NHANES) conducted by Centers for Disease Control (CDC) and Prevention (27). Questions on healthy weight loss behaviors included eating less food,

switching to foods with fewer calories, beginning to exercise or exercising more, eating more fruits, vegetables, or salads, eating less sugar, candy, or sweets, using liquid diet products (e.g. Slimfast® or Optifast®), taking diet pills prescribed by a doctor, joining a weight loss program (Weight Watchers®, Jenny Craig®, Tops®), and getting help from a personal trainer, dietitian, nutritionist. Questions on unhealthy weight loss behaviors included taking diet pills, medicines, herbs or supplements without a prescription, using laxatives/diuretics or vomiting after eating, starting/restarting to smoke or smoking more cigarettes, and fasting for 24 hours or more. Responses to all these questions were provided in a “yes” or “no” format.

Demographic information was self-reported. Women’s age was calculated using years and months. Race and ethnicity choices included non-Hispanic white, non-Hispanic black, Hispanic, and others (Asian, American Indian/Alaskan native, native Hawaiian/other Pacific Islander, or other). Information was obtained on education level, annual income, marital status, employment status, internet use, and number of household children and adult. Height and weight data were obtained from anthropomorphic information recorded in the medical chart. Body mass index (BMI) was calculated as weight (in kg) divided by the square of the height (in meters).

Statistical analyses

We used nutrition knowledge score as both outcome variable and predictor variable to examine different hypotheses. Bivariate comparisons were performed using Student’s t test or ANOVA as appropriate between outcome variables (nutrition knowledge score) and predictor variables (race/ethnicity, education, BMI, income, hours worked per week, marital status, and internet use), and between outcome variables (each of the healthy and unhealthy weight loss behaviors) and predictor variable (nutrition knowledge score). Multiple linear regression analyses were performed to identify correlates of total nutrition knowledge score. Multivariable logistic regression analyses were used to examine the association between various weight loss behaviors during the past 12 months and nutrition knowledge score after adjusting for confounders. Separate multivariable logistic regression models were used for each of the healthy and unhealthy weight loss behaviors. In addition, in the logistic regression models, we also included the interaction terms between obesity status and nutrition knowledge to examine the effect of obesity status on weight loss behaviors by level of nutrition knowledge. All analyses were conducted using STATA 12 (Stata Corporation, College Station, TX).

RESULTS

A total of 1261 women responded to the nutrition knowledge related questions. Of these, 1057 women responded to all 15 questions on nutrition knowledge and included in this study. The mean age of the sample was 25.9 years (standard deviation 6.1; range 16–40 years). Demographic characteristics are shown in Table 1. The mean total nutrition knowledge score was 5.7 (standard deviation $\pm$ 2.8; range 0–13). Multiple linear regression analysis showed that the nutrition knowledge score was significantly lower among African American women compared to whites (Table 2). Obese women compared to normal weight

women had higher nutrition knowledge score. Women with high school and college education had higher nutrition knowledge than high school drop-outs.

The five most commonly practiced healthy weight loss behaviors among these women were: started eating more fruits, vegetables, or salads (41.3%), eating less food (38.7%), eating less sugar, candy, or sweets (35.4%), beginning to exercise or exercising more (34.6%), and switching to foods with fewer calories (28.3%). Less commonly practiced healthy behaviors included: started taking prescription diet pills (6.3%), using liquid diet products (5.3%), joining a weight loss program (3.7%), and getting help from a personal trainer, dietitian or, nutritionist (3.0%). Unhealthy weight loss practices were: taking non-prescription diet pills, medicines, herbs, or supplements (9.1%), starting/restarting to smoke or smoking more cigarettes (8.3%), fasting for 24 hours (5.5%), and taking laxatives or diuretics, or induced vomiting after eating (3.4%).

Separate multivariable logistic regression models for each of the weight loss behaviors showed that the odds of engaging in five common healthy weight loss behaviors, such as eating less food, switching to foods with fewer calories, beginning to exercise or exercising more, eating more fruits, vegetables, or salad, and eating less sugar, candy, or sweets increased by 9–12% for one point increase in nutrition knowledge score among reproductive-age women (Table 3). However, no significant associations were observed between nutrition knowledge and unhealthy weight loss behaviors. Multivariable logistic regression models also showed that both overweight and obese women were more likely than normal weight women to practice commonly used healthy weight loss behaviors while only obese women were more likely to practice some less commonly used healthy behaviors such as using liquid diet products, joining a weight loss program, or taking prescription diet pills.

DISCUSSION

In this study, we observed that nutrition knowledge is very low among reproductive-age women. African American women and high school drop-outs had even lower knowledge scores than their counterparts. This is a public health concern as the US has experienced a disproportionately high burden of obesity among low-income and minority women (4, 13). The positive association of nutrition knowledge score with practicing healthy weight loss behaviors observed in this study indicates that improvement in the nutrition knowledge could play an important role in obesity prevention strategies.

A study conducted by Wardle et al also observed that adults with increased levels of nutrition knowledge more commonly met the current recommendation of healthy dietary behaviors such as intake of more fruits and vegetables and less fatty foods (17). Similarly, among reproductive-age women, we have observed a positive association between nutrition knowledge and the above mentioned healthy dietary behaviors as well as other healthy weight loss behaviors, such as eating less amount of food, beginning to exercise or exercising more. Together, these studies add to the literature that nutrition knowledge not only associated with healthy intake of food, but also with other healthy behaviors such as beginning to exercise or exercising more.

In our study, black women of reproductive-age had lower nutrition knowledge scores than whites. Other studies also have reported similar findings based on national samples of adult women as well as postpartum women (24, 28). Some studies have argued that these differences were partly attributable to less frequent coverage of nutrition in media targeted to African Americans (28) and differences in seeking nutrition information (24). White women seek information on nutrition from the internet, books, or magazines whereas black women seek advice from friends and family members which is less accurate than printed materials (24). Thus, to ameliorate the racial disparities in nutrition knowledge, race specific targeted awareness programs are essential. Consistent with other previous studies, we also observed that women who had not graduated from high school had significantly lower levels of nutrition knowledge than their counterparts (29, 30).

Our results showed that obese women had significantly higher levels of nutrition knowledge than normal weight women. In contrast, an old study conducted in 1999 among high school students in the US did not observe a significant difference in nutrition knowledge between obese and non-obese adolescents (31). This was also observed in a study among adults living in Europe (32). Due to the cross sectional design used in this study, we do not know whether obesity itself was a motivational factor to learn more about nutrition among the women we surveyed. It is possible that obese women may have sought information and advice about weight control from different sources and, therefore, become more educated with regard to nutrition knowledge.

Previous studies have observed that despite the increased focus on engaging in healthy weight loss behaviors, a certain percentage of US adults and adolescents remain engaged in unhealthy weight loss behaviors (use of diet pills, laxatives, diuretics, self-induced vomiting, skipping meals, excessive smoking, and fasting) (10, 25). Our finding that higher nutrition knowledge was not associated with increased odds of engaging in unhealthy weight loss behaviors implies that nutrition knowledge is the key to improve healthy weight loss behaviors among these women.

The main strength of our study includes the simultaneous investigation of nutrition knowledge and wide range of weight loss behaviors in a large sample of low-income, ethnically diverse young women. Our study also has several limitations. First, self-reported nutrition knowledge and weight loss behaviors may be subject to recall bias. Second, cross-sectional design of this study prevents our ability to establish causal relationships between nutrition knowledge and weight loss behaviors. Third, in this study, nutrition knowledge score was mainly based on fat and calorie. Thus, inclusion of questions on carbohydrate and protein could influence overall nutrition awareness score of the participants. Fourth, we could not look at actual weight loss as an outcome because we did not know women's actual weight before practicing weight loss behaviors. Finally, our study was based on 16–40 year old low-income women attending reproductive health clinics, so we do not know whether similar findings would be observed in population-based sample, other age groups, income groups, or in men. Together, these limitations could impact the overall generalizability of our findings.

In conclusion, the promotion of nutritional awareness among US women may increase healthy weight loss behaviors and, thus, may contribute to the obesity prevention. Multipronged strategies using brochures, media awareness, and health care providers' support are prerequisites to improve nutritional awareness among reproductive-age women.

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Table 1

Characteristics of reproductive-age women (16–40 years) who responded to nutrition knowledge questions

Characteristics	Total (N)	
Age, yr, mean($\pm$ SD; range)	1057	25.9 ($\pm$ 6.1; 16–40 years)
Race/ethnicity, n (%)	1057	
White		291 (27.5)
African American		433 (41.0)
Hispanic		319 (30.2)
Others ^a		14 (1.3)
Education, n (%)	1049	
HS drop-outs		187 (17.8)
Enrolled in HS/HS graduate		485 (46.2)
Some college/college degree		377 (35.9)
BMI (kg/m ²) n (%)	1020	
Normal weight (<25)		376 (36.9)
Overweight (25–29.9)		278 (27.2)
Obese ($\geq$ 30)		366 (35.9)
Household annual income, n (%)	966	
< \$15,000		603 (62.4)
\$15,000–\$29,999		247 (25.6)
\$30,000 or above		116 (12.0)
Work/week, n (%)	1049	
Do not work		543 (51.8)
1–20 hours		100 (9.5)
21 hour or above		406 (38.7)
Marital status, n (%)	1039	
Never married		530 (51.0)
Lived together/married		360(34.7)
Divorced/separated/widowed		149 (14.3)
Internet use, n (%)	1046	
Yes		783 (74.9)
No		263 (25.1)
No of household children, mean($\pm$ SD)	851	2.01 (1.0)
No of household adults, mean($\pm$ SD)	1021	2.00 (0.9)
Nutritional knowledge score, mean($\pm$ SD)(range)	1057	5.66 (2.78) (0–13) ^b

SD, standard deviation; HS, high School; BMI, body mass index

^a Asian, American Indian/Alaskan native, native Hawaiian/other Pacific Islander, or other^b Maximum possible score 15

Table 2

Correlates of nutrition knowledge score among reproductive-age women (N=1057)

Characteristics	Regression coefficient (95%CI)	P value ^a
Age (year)	0.01 (0.03 to 0.04)	.647
Race/ethnicity		
White	Reference	
African American	− 1.00 (−1.44 to −0.56)	<.001 *
Hispanic	−0.27 (−0.76 to 0.22)	.271
Others ^b	-----	
Education		
HS drop-outs	Reference	
HS enrollment/graduate	0.59 (0.06 to 1.12)	.030 *
Some college/college degree	1.42 (0.86 to 2.00)	<.001 *
BMI (kg/m ²)		
Normal weight (<25)	Reference	
Overweight (25–29.9)	0.44 (−0.01 to 0.90)	.055
Obese (>30)	0.67 (0.25 to 1.09)	.002 *
House hold income/year (%)		
< \$15,000	Reference	
\$15,000–\$29,999	0.30 (−0.12 to 0.73)	.166
\$30,000 or above	0.42 (−0.16 to 1.00)	.152
Work/week (%)		
Do not work	Reference	
1–20 hours	−0.26 (−0.86 to 0.35)	.409
21 hour or above	0.33 (−0.05 to 0.72)	.084
Marital status (%)		
Single/never married	Reference	
Live together/married	0.30 (−0.16 to 0.77)	.199
Divorced/separated/widowed	−0.07 (−0.65 to 0.50)	.799
Internet use (%)		
Yes	Reference	
No	0.24 (−0.21 to 0.68)	.304

CI, confidence interval; HS, high school; BMI, body mass index

^aBased on multiple linear regression analysis

Outcome variable: nutrition knowledge score

Main predictor variables: age, race/ethnicity, education, BMI, income, hours worked per week, marital status, and internet use

* P value <0.05 considered statistically significant

^b Asian, American Indian/Alaskan native, native Hawaiian/other Pacific Islander, or other

Table 3

Association of nutritional knowledge score with weight loss behaviors among reproductive-age women (N=1057)

Weight loss behaviors (outcome variables) ^a	Adjusted odds ratios (95% CI)	P value ^b
Healthy		
a. Ate less food	1.12 (1.06–1.18)	<.001*
b. Switched to foods with fewer calories	1.10 (1.04–1.16)	.001*
c. Began to exercise/exercised more	1.10 (1.04–1.16)	<.001*
d. Ate more fruits, vegetables, or salads	1.11 (1.06–1.17)	<.001*
e. Ate less sugar, candy, or sweets	1.09 (1.04–1.15)	.001*
f. Used liquid diet products	0.93 (0.84–1.03)	.176
g. Took diet pills prescribed by a doctor	0.99 (0.90–1.10)	.923
h. Joined a weight loss program	0.94 (0.83–1.07)	.357
i. Got help from a personal trainer, dietitian, or nutritionist	0.98 (0.85–1.13)	.792
Unhealthy		
a. Took diet pills, medicines, herbs, or supplements without a prescription	0.98 (0.90–1.07)	.629
b. Took laxatives/diuretics or induced vomiting after eating	0.95 (0.83–1.08)	.410
c. Started/restarted smoking or smoked more cigarettes	1.00 (0.92–1.09)	.100
d. Fasted for 24 hours	0.95 (0.86–1.06)	.373

CI, confidence interval

^a, Outcome variables: each of the weight loss behaviors (binary)

Main predictor variable: nutrition knowledge score

Adjusted by age, race/ethnicity, education, and body mass index

^b, Based on multivariable logistic regression analysis

A separate logistic regression model was used for each of the weight loss behaviors

* P value <0.05 considered statistically significant