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Stress, Depression, Social Support, and Eating Habits Reduce Dietary Quality in the 1st Trimester in Low-Income Women: A Pilot Study

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Abstract

Maternal diet quality influences birth outcomes. Yet little research exists that assesses women's diet quality during the 1st trimester of pregnancy, a crucial time of placental and fetal development. This cross-sectional study describes diet quality and its relationship with stress, depression, social support, and eating habits in the 1st trimester that may identify low-income women needing intensive dietary intervention. Seventy-one low-income women completed validated instruments measuring stress, depression, social support, and eating habits, had their height and weight measured, received training on portion-size estimation, and completed three 24-hour dietary recalls (1 weekend day and 2 nonconsecutive weekdays) from July, 2009 to February, 2010. Comparative and correlational analyses were performed. Women with diet quality scores below the median ($n = 35$) had more depression (9.6 ± 5.1 vs. 6.7 ± 5.1) and stress (22.1 ± 5.4 vs. 19.3 ± 4.8) and less control over meal preparation (5.0 ± 1.5 vs. 4.2 ± 1.5) and support from others (52.0 ± 12.0 vs. 57.4 ± 7.2) than did women with high diet quality scores ($n = 36$). Diet quality was negatively related to depression ($r = -.41$), stress ($r = -.35$), skipping meals ($r = -.41$), and control over meal preparation ($r = -.33$), and positively related to support from others ($r = .38$). Low-income women experiencing life stressors represent an at-risk group for low diet quality and may need intensive dietary intervention before and during pregnancy. Efforts targeting this group to test hypotheses aimed at improving diet quality should be undertaken.

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Keywords

Dietary Quality; Pregnancy; Low Income; Stress

INTRODUCTION

Diet quality is an integrative means of assessing dietary intake that reflects the recommendations for pregnancy established by the United States (U.S.) Department of Agriculture and the Institute of Medicine (1). Before and during pregnancy, diet quality can affect pregnancy outcomes (2–4). The early work of Phillips and Johnson showed a significant positive relationship between diet quality and infant birth weight, with diet quality explaining 6% - 8% of the variance in birthweight after controlling for maternal age, gestational age at delivery, maternal weight at delivery, and smoking status. Overall diet quality measurement had a direct effect on birth weight, whereas 10 of the 12 individual nutrients examined did not (5). The complex synergistic effect of food and nutrients in relation to pregnancy outcomes highlights the need to examine diet quality broadly in pregnant women (6–7).

Diet quality is especially important in the 1st trimester of pregnancy, when the developing placenta and fetus are particularly susceptible to alterations in maternal nutrition. During the early weeks of pregnancy, nutrients must be present in proper balance for successful implantation (8). For example, protein intake in the 1st trimester has a positive relationship with both placental and birth weight that is independent of maternal age, parity, smoking status or maternal nutritional status, and weight gain during the remainder of the pregnancy (9). Thus, poor diet quality in the 1st trimester can adversely affect birth outcomes regardless of gestational weight gain and maternal nutritional status in the 2nd and 3rd trimesters (10–11).

Diet quality during the 1st trimester may be affected by social and economic factors. Diet quality may be reduced in low-income women due to limited finances to purchase nutrient-rich foods (12). Although little is known about depression and diet quality in recently pregnant low-income women, a relationship between prenatal depression and low gestational weight gain has been observed in an economically diverse sample of women (13). Well-educated and married pregnant women reporting greater stress have been shown to consume energy-dense, nutrient-poor comfort foods, thus decreasing their diet quality during pregnancy (14), and chronic stress experienced by some low-income mothers is associated with low infant birth weight (15). Social support, however, is associated with improved diet quality in financially advantaged adolescents, African American populations, and low-income women during the 1st trimester of pregnancy (16–19). Poor eating habits, such as skipping meals, contribute to poor diet quality. Regardless of household income, pregnant women who skipped meals, thus failing to follow the IOM guideline of eating “small to moderate-sized meals at regular intervals, and eat[ing] nutritious snacks” (20) had lower overall energy intake and were at higher risk for preterm delivery than were women who did not skip meals (21–23). Thus, low income, the presence of stressors and/or depression, and poor eating habits may negatively affect diet quality, whereas support from family and friends may boost the likelihood of consuming a healthy diet. But there is minimal research regarding the quality of diet intake in low-income women during pregnancy (6), particularly in the 1st trimester. While dietary quality and stress have been examined previously, to our knowledge, this was the first study to examine the relationship between depression and dietary quality. The aim of this study was to investigate dietary quality and its relationship to stress, depression, social support, and eating habits in the 1st trimester to identify women needing more intensive dietary intervention.

METHODS

Data Collection Procedures

Women interested in participating in this cross-sectional study completed a recruitment card at one of four clinics offering reproductive services to low-income women in Austin, Texas. Data were collected from July, 2009 through February, 2010. Interested women were screened by telephone prior to enrollment using preestablished inclusion/exclusion criteria, and study procedures were explained. Women were included if they were underinsured/uninsured as determined by the recruitment facility, 16 years of age or older, able to read and speak English or Spanish, confirmed pregnant, and in the 1st trimester of pregnancy (14 weeks from last menstrual date). Women were excluded if they were experiencing a preexisting health condition, including type 1 or type 2 diabetes, hypertension, HIV/AIDS, renal disease, heart disease, or lactose and/or gluten intolerance. Written informed consent was obtained from those who were eligible and willing to participate. Parental consent and child assent were obtained from participants under 18 years of age. Following consent procedures, participants completed psychosocial questionnaires (available in both English and Spanish and described below); height and weight were measured. Training on food portion estimation was performed, followed by collection of a 24-hour dietary recall. The study was reviewed and approved by the full Institutional Review Board of the University of Texas at Austin.

Outcome Measure

The Dietary Quality Index–Pregnancy (DQI-P) (1) was used to assess overall diet quality. This index reflects the recommended numbers of servings for grain, fruit, and vegetable intake in the 1st trimester outlined in the 2005 Food Guide Pyramid, which vary with pre-pregnant body mass index (BMI) and activity level. The DQI-P index also scores intake of folate, calcium, and iron recommended by the Institute of Medicine and a meal pattern of 3 meals and 2 snacks per day. Scores for each component range from 0 to 10. A score of 10 is given if the individual met the recommended intake; 0 is given if no amount of the component was consumed. Intermediate scores are calculated proportionately. Scoring for variations in meal/snack patterns are outlined by Bodnar and Seiga-Riz (1). The sum of all components range from 0 to 80, with a composite score ≥ 70 reflecting the most desirable diet quality (1). A daily DQI-P score was computed in Excel, version 2007 for each 24-hour recall using food and nutrient data provided by the Nutrition Data System for Research (NDSR) developed by the Nutrition Coordinating Center at the University of Minnesota. Individual scores were then averaged for data analysis. The median score for the sample was used to identify women with high (DQI-P score ≥ 53) versus low (DQI-P score < 53) dietary quality for data analysis.

Twenty-four hour dietary recall data were obtained using the NDSR. The NDSR uses a computer-prompted multiple-pass methodology of assessing food intake (24). Study participants were given a booklet of food portions to refer to during the 24-hour recalls. Two members of the research team completed training and certification in the use of the NDSR and conducted all recalls. The first recall was completed at the time of enrollment into the study, and two subsequent recalls were conducted via telephone on non-consecutive days. Each woman completed one recall on a weekend and two on non-consecutive weekdays.

Explanatory Measures

Demographics—Participants completed a demographic form that provided information about age; participation in the Women, Infants, and Children Program or other Supplemental Nutrition Assistance Programs; parity; children's birth dates (pregnancy spacing); self-reported pre-pregnant weight; amount of daily activity; date of onset of last menstrual

period; smoking history; frequency of supplemental vitamin intake; and pregnancy intendedness. Pregnancy intendedness was assessed using one question with four responses from the Pregnancy Risk Assessment Monitoring System (PRAMS) (25). Experiences of nausea and vomiting were assessed with each recall; however, the resultant score did not affect any variable and was not included in data analysis.

Depression—The Edinburgh Postnatal Depression Scale (26) was used to measure the experience of feeling depressed. Scores are based on the frequency and severity of symptoms experienced within the past 7 days, and this is one of only two tools recommended to screen for depression during the prenatal period (27). Scores above 10 indicate possible depression and scores above 13 indicate probable depression. Cronbach's alpha in this study was .85.

Stress and Social Support—The Prenatal Psychosocial Profile was used to assess stress and social support. Convergent validity, internal consistency, and test–retest reliability of .90 or greater have been reported (28–29). The stress scale items address financial worries, family, friends, recent moves and losses, work difficulties, drug/alcohol use, the current pregnancy, overall “overwhelmed” feelings, and current sexual, emotional, and/or physical abuse. Participants' responses ranged from “Causes no stress” (score of 0) to “Causes a lot of stress” (score of 3). Cronbach's alpha for the total scale was .76.

The social support subscale assessed partner support and support from others. Responses range from (1) “very dissatisfied” to (6) “very satisfied.” Cronbach's alpha was .94 for partner support and .93 for support from others.

Eating Habits—Women's eating habits were assessed using the Eating Habits subscale from the Project EAT Survey (30), which consists of nine items concerning meal (breakfast, lunch, and dinner) skipping during the past week, location of dinner, frequency of eating at fast-food restaurants, frequency of grocery shopping, and frequency of snacking and eating salty snacks. This tool assesses distinct behavioral constructs that are assumed not to covary. Although the Project EAT survey was developed for use with adolescents, the items in this subscale are particularly salient to low-income pregnant women (Dr. Neumark-Sztainer, personal communication, March 2006). Several items were clustered into two subscales. The first subscale consisted of three items related to skipping breakfast, lunch, or dinner, with a higher score indicating a higher frequency of meal skipping. The second subscale consisted of two items related to “control over meal planning” (shop for groceries and prepare food for dinner), with a higher score indicating less control over meal planning.

Anthropometric Measures—Weight and height measurements were obtained from a digital scale and stadiometer (SECA 703, SECA Corporation, Hanover, MD), using standard protocol, to assess for any gestational weight gain. Calculation of pre-pregnancy BMI was based on self-reported weight (converted to kilograms) and height (converted to centimeters measured during data collection) and was used to calculate BMI. Underweight was defined as a BMI of <18.5, while overweight was defined as a BMI of 25.0–29.9 and obese was defined as a BMI of ≥30 (31).

Statistical Analysis—Analyses were performed using SPSS, version 17.0 (PASW, Chicago, 2009). Descriptive data are presented as means ± standard deviations for continuous variables and as frequencies for categorical data. Chi-square was used to analyze differences between women with high versus low diet quality on demographic variables, and Student's *t* tests were used to identify differences in eating habits, depression, stress, and social support between women with high versus low diet quality stress. After testing for

normal distribution, Pearson's correlation coefficients were calculated to examine the associations among the psychosocial variables and diet quality. A two-tailed p value of $<.05$ was considered statistically significant.

RESULTS and DISCUSSION

One hundred sixty-eight women completed recruitment slips, and, after screening, 77 met the inclusion criteria and completed initial data collection procedures. Six did not complete three dietary recalls and were eliminated from analysis, for a final sample size of 71. Participants were, on average, 24.7 ± 5.4 years old and 8.7 ± 2.3 weeks pregnant. Table 1 presents overall demographic information. Chi-square analysis revealed no significant differences in demographic characteristics when differentiated by level of diet quality. Most participants were unmarried, had completed high school, were sedentary, and had an unintended pregnancy. A large proportion of the women were Hispanic and had a pre-pregnancy BMI categorized as overweight or obese. The mean nutrient intake indicated that women consumed foods that provided a nearly adequate amount of calcium (968 mg/day of the 1,000 mg/day recommended for pregnancy), however intakes of folate (490 mcg/day of the 600 mcg/day recommended for pregnancy) and iron (17 mg/day of the 27 mg/day recommended for pregnancy) were considerably lower than recommended (32).

The median score on the DQI-P was 53.3. Three women (4%) scored above 70, indicating adequate dietary quality; thus, 68 women (96%) included in the study had inadequate dietary quality as measured by the DQI-P. Bivariate analysis revealed that diet quality differed by women's psychosocial state (see Table 2). Women with a low DQI-P score (below the median score) had significantly less control over food preparation and support from others but higher depression and stress scores than women with higher DQI-P scores. Thus, heightened levels of stress and depression, less support from friends and family, and inadequate control food preparation may reduce dietary quality in low-income pregnant women.

Significant relationships between diet quality, eating habits, and mental health variables were noted. Meal skipping and inadequate control over food preparation were positively related to stress scores ($r = .38$ and $r = .37$, respectively) and depression ($r = .25$ and $r = .50$, respectively). Depression was positively related to stress ($r = .63$) but negatively related to partner support ($r = -.44$) and support from others ($r = -.27$) (Data not shown).

Maternal diet quality was found to be negatively related to food-related behaviors such as meal skipping ($r = -.41$) and inadequate control over food preparation ($r = -.33$). The negative relationship between diet quality and meal skipping is similar to the findings in other studies of meal-skipping in low-income women (1) and adolescents (33). While positive relationships between food preparation and diet quality have been reported in adolescents (34, 35), this is the first study to identify a relationship between perceived control over food preparation and diet quality during pregnancy.

The negative relationship between stress and diet quality ($r = -.35$) is similar to findings of poor diet quality in pregnant women reporting higher levels of finance- or environment-related stress (14, 15); however, this is one of the first studies to examine the relationship between diet quality and depression ($r = -.41$) during pregnancy. Overall diet quality among low-income women in the present study was positively related to support from others ($r = .38$) but, surprisingly, was not related to support from the partner ($r = .20$). This finding is at odds with previous research showing that husbands' support helped their wives maintain a healthy diet during pregnancy in Latina women (36). The majority of women included in the present study were unpartnered, which may have affected our ability to fully assess the role of partner support in predicting diet quality; however, this finding suggests that a better

understanding of how and to what extent partner support impacts dietary intake during pregnancy is needed. The results from this study also underscore the role of peer support in promoting healthy behaviors in pregnancy, including dietary intake. The role of social support for enabling or inhibiting women's ability to eat a healthful diet during early pregnancy requires further study in low-income and ethnically diverse populations.

This study has certain limitations. This was a pilot study so had a relatively small sample size which may have limited our ability to detect small differences in nutrient intake, stress, and depression that could influence diet quality. The small sample size limited our ability to conduct multivariate analyses to estimate the effects of depression, maternal control, and social support on dietary quality, while controlling for confounding variables such as level of education and potential nausea and vomiting. Also, participants may have realized that they had poor diets and chose to be in the study to learn how to improve their dietary intake during pregnancy. Lastly, the women included in this study were mainly low-income and unpartnered, with Hispanic women included at a higher proportion than in the general U.S. population; therefore, the results may not be generalizable to the overall population of pregnant women. The present study does have several strengths. The study used validated, standardized measures for dietary intake, diet quality, stress, and social support, specific to pregnancy. Also, the present study identifies maternal food-related behaviors and mental health conditions that can influence diet quality during the critical 1st trimester of pregnancy.

CONCLUSIONS

Low-income women with depressive symptoms and life stressors represent an at-risk group for low diet quality during pregnancy. Initial assessments of low-income pregnant women's diet quality often occur during their first prenatal WIC clinic visit, which opens a window of opportunity to modify their behaviors throughout the remainder of the pregnancy. These women may need more intensive dietary intervention at a time when they may be more receptive to nutrition advice designed to improve diet quality during the rest of the pregnancy (37), which may lead to improve pregnancy outcomes (1). Research should be undertaken that identifies effective interventions designed to improve diet quality in low-income women during the 1st trimester of pregnancy. These interventions should focus on social support and methods for reducing stress in addition to how to eat a healthy diet.

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Table 1

Differences in Percentages of Low-Income Women with Low vs. High Dietary Quality during the First Trimester of Pregnancy by Demographic Characteristics^a

	Total Sample (n = 71)	Low Dietary Quality ^b (n = 35)		High Dietary Quality ^c (n = 36)			
		Count	Percent	Count	Percent		
Race/Ethnicity	White	26	36.6%	13	37.1%	13	36.1%
	African-American	10	14.4%	6	17.1%	4	11.1%
	Hispanic	34	47.9%	16	45.7%	18	50.0%
	Other	1	1.4%	0	0.0%	1	2.8%
Born in the United States	Yes	64	90.1%	32	91.4%	32	88.9%
	No	7	9.9%	3	8.6%	4	11.1%
Marital Status	Married	18	25.4%	12	34.3%	6	16.7%
	Single	53	74.6%	23	65.7%	30	83.3%
Education	Less than High School	10	14%	3	8.6%	7	19.4%
	High School or Equivalent	29	41%	17	48.6%	12	33.3%
	Some College or Higher	32	45%	15	42.9%	17	47.2%
Type of Insurance	None	33	46.5 %	17	48.6%	16	45.7%
	Medicaid	28	39.4%	13	37.1%	15	42.9%
	Private	9	12.7%	5	14.3%	4	11.4%
Pre-Pregnant Body Mass Index	Underweight	6	8.5%	4	11.4%	2	5.6%
	Normal	27	33.8%	12	34.3%	15	41.7%
	Overweight	20	28.2%	11	31.4%	9	25.0%
	Obese	18	25.4%	8	22.9%	10	27.8%
Level of Activity	< 30 min/day	40	56.3%	18	51.4%	22	61.1%
	30–60 min/day	23	32.4%	13	37.1%	10	27.8%
	> 60 min/day	8	11.3%	4	11.4%	4	11.1%
Smoked before Pregnancy	Yes	30	42.3%	15	42.9%	15	41.7%

		Total Sample (n = 71)		Low Dietary Quality ^b (n = 35)		High Dietary Quality ^c (n = 36)	
		Count	Percent	Count	Percent	Count	Percent
Smoking Now	No	41	27.7%	20	57.1%	21	58.3%
	Yes	7	9.9%	3	8.6%	4	11.1%
	No	64	90.1%	32	91.4%	32	88.9%
Pregnancy Intendedness	Intended	25	35.2%	11	31.4%	14	38.9%
	Unintended	46	64.8%	24	68.6%	22	61.1%

^aNote: No statistically significant difference found for any categorical variable between women with high (above median score) versus low (below median score) dietary quality (Chi-square)

^bScore on Dietary Quality Index-Pregnancy below median score of 53.3

^cScore on Dietary Quality Index-Pregnancy above median score of 53.3

Table 2

Differences in Components of the Dietary Quality Index-Pregnancy, and Scores on Scales Measuring Eating Habits, Depression, and Social Support by High (Upper Quartile) vs. Normal Stress

DQI-P Component	Amount Recommended in Pregnancy (19-50 yrs)	Average Amount Consumed	High Stress	Normal Stress	t	p
Grains (oz.) ^a	Varies by BMI	7.3 oz	5.95	8.06	2.77	.007
Vegetables (cups) ^a	Varies by BMI	1.4 cups	1.25	1.4	.85	N.S.
Fruits (cups) ^a	Varies by BMI	1 cup	0.75	1.04	1.35	N.S.
Calcium (mg) ^a	1000 mg/day ^b	968 mg	899.0	997.0	.94	N.S.
Folate (mcg) ^a	600 mcg/day ^b	490 mcg	378.0	537.0	2.62	.011
Iron (mg) ^a	27 mg/day ^b	17 mg	14.9	17.9	1.59	N.S.
Meals/Snacks	3 meals/2 snacks ^c	2 meals 2 snacks	5.3	5.4	.25	N.S.
% of calories from Fat	< 30%	32 %	34%	32%	-1.77	N.S.
Overall DQI-P Score ^d	70	49.2	48.0	55.2	2.51	.018
Psychosocial Measures	Range of Possible Scores	Mean Scores	High DQI-P^e	Low DQI-P^e	t	p
Meal Skipping ^f (3 items)	1-15 (high score = more meal skipping)	5.5	5.0	5.7	1.4	N.S.
Control over Meal Preparations ^f (2 items)	1-8 (high score = less control)	4.7	4.2	5.0	2.25	.03
Depression ^g (10 items)	0-30 (high score = more depression)	8.1	6.7	9.6	-2.41	.02
Stress ^h (11 items)	11-66 (high score = more stress)	20.7	19.3	22.0	-2.27	.03
Partner Support ^h (11 items)	11-66 (higher score = more support)	57.7	58.5	56.2	-.86	N.S.
Other Support ^h (11 items)	11-66 (higher score = more support)	54.8	57.4	52.0	-2.10	.04

BMI = Body Mass Index; NDSR = Nutrition Data System for Research (Nutrition Coordinating Center) NS = Non-significant

^a Average intake for food group or nutrient across 3 dietary recalls obtained from NDSR.

^b Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academies Press; 2005.

^c Represents score on Dietary Quality Index-Pregnancy (DQI-P) for adequacy of meal/snack pattern

^d DQI-P refers to the Dietary Quality Index-Pregnancy Scale (8)

^e High DQI-P = above median score of 53.3; Low DQI-P = below Median Score

- f From Eating Habits Scale (30)
- g From Edinburgh Postnatal Depression Scale (26)
- h From Postpartum Psychosocial Profile-Stress or Social Support Subscales (28)