

Falling Short of Guidelines? Nutrition and Weight Gain Knowledge in Pregnancy

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Abstract

Objectives: The objective of this study was to characterize pregnant women's gestational weight gain (GWG) knowledge and awareness of healthy eating behaviors known to impact GWG.

Methods: Formative research was conducted including semi-structured individual interviews and focus group interviews. The participants were mostly Caucasian pregnant women ($N = 30$; $Age = 28$ years old) residing in a suburban/rural region of Central Pennsylvania. Descriptive and thematic analyses were used to examine the primary outcomes of GWG and healthy eating knowledge and informational sources.

Results: Many women had no knowledge of how much GWG they should gain in pregnancy (42%). Women appeared to have adequate knowledge on foods they should avoid eating during pregnancy. However, one-fourth of women indicated that they did not feel as though they received adequate information from their healthcare provider about the foods they should be eating and how to meet the healthy eating recommendations. Therefore, one-fourth of women reported using non-healthcare provider resources (e.g., magazines, internet) with questionable reliability to obtain healthy eating guidance.

Conclusion: These exploratory findings show that pregnant women have some knowledge of the GWG and healthy eating guidelines; however, most women received this information from a non-healthcare provider resource. Focused efforts are needed to educate pregnant women about GWG and healthy eating using accurate and reliable sources and encourage strategies to meet guidelines in an effort to promote healthy GWG.

Keywords: Gestational weight gain; Diet; Pregnancy

Introduction

Over 50% of normal weight and 60% of overweight/obese women exceed the Institute of Medicine [1] gestational weight gain (GWG) guidelines (normal weight: 25-35 lb, overweight: 15-25 lb, obese: 11-20 lb [2]). High GWG leads to complications such as preeclampsia, [3,4] gestational diabetes, [5-7] postpartum weight retention, [8,9] and long-term obesity development [1,8,10]. There are also negative health implications for offspring; elevated risk for macrosomia [3,5,7] accelerated weight gain in infancy [11,12] and obesity/diabetes in childhood and later in life [11,13]. Due to the negative implications of high GWG, effective strategies are needed to promote healthy pregnancy weight gain. Engaging in healthy eating behaviors is one way to manage GWG; however, little is known about pregnant women's knowledge of healthy eating behaviors as it relates to GWG.

A growing concern is that most pregnant women are not meeting national guidelines for healthy eating (United States Department of Agriculture [USDA; [14]). Prenatal healthy eating recommendations include adequate intake of vegetables, fruits, grains, milk, and meat/beans, and nutrients (e.g. iron, folate, calcium), to meet nutrient and energy needs to further support fetal growth and development [1,14,15]. However, evidence suggests that less than half of pregnant women are meeting the national recommended guidelines for each individual food group [16].

One explanation for why pregnant women fall short of meeting guidelines may be due to inaccurate knowledge about healthy eating behaviors or a lack thereof altogether. Fowles [17] found that most pregnant women had inadequate general nutritional knowledge, and their dietary intake did not meet all the nutritional requirements of pregnancy. However, Fowles did not examine women's knowledge of the GWG recommendations and how this related to their actual GWG. Also, the limited studies examining GWG advice from physicians have

reported that pregnant women were either given no advice or were advised to gain weight outside of the IOM guidelines [18-20]. Most physicians are not specifically trained to counsel pregnant women about healthy eating behaviors and how it relates to GWG as this is not a part of the standard of care [20]. Thus, little is known about the extent to which prenatal care providers are delivering adequate information to their patients about healthy eating behaviors for managing GWG.

Few studies to date have examined women's knowledge of healthy eating and GWG guidelines and the extent to which this knowledge relates to their GWG and healthy eating behaviors. One study by de Jersey, Nicholson, Callaway, and Daniels [21] did examine knowledge of dietary recommendations and found that participants knew limited information about the correct recommended daily number of servings of fruit (8%) and vegetables (36%); only 4% of participants actually consumed the recommended five servings/day of vegetables. Another study by Shub, Huning, Campbell, and McCarthy [22] found that 64% of obese women and 40% of overweight women overestimated their GWG and had poor knowledge of the risks associated with high GWG and maternal obesity. However, research examining pregnant women's knowledge of healthy eating behaviors as they relate to GWG is scant.

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This research is needed to develop effective interventions promoting healthy eating behaviors in an effort to better manage GWG. The purpose of this study was to conduct formative research examining pregnant women's knowledge of the GWG and healthy eating guidelines and identifying sources of this information.

Methods

Study procedures

The University's IRB approved this study and consent was obtained from a local OBGYN clinic to recruit pregnant women. Interested participants completed a recruitment form with their contact information and gave it to a clinic nurse. A member of the study team collected these forms weekly to contact participants. Pregnant women were also recruited via flyers displayed at local businesses (e.g., gyms, churches) and in buildings on the University campus. Interested women who saw the flyers contacted the study team. Once interested pregnant women were contacted, they were screened for initial eligibility (i.e., able to speak/read English, pregnant, 18 years or older, and singleton pregnancy). Thirty-eight women were interested in participating in the study, from which 79% ($N = 30$) participated. Reasons for not participating included no response (10%), no time to participate (8%), and miscarriage (3%). Interested women who met eligibility criteria were asked to attend an on-site visit at which time written informed consent was obtained and a mixed method approach was conducted consisting of completing a brief self-report measure of women's knowledge of the GWG and healthy eating recommendations and participation in a semi-structured individual interview or focus group interview. Five semi-structured individual interviews (due to scheduling conflicts) and seven focus group interviews (4 interviews with $n = 4$ participants; 3 interviews with $n = 3$ participants; 5 semi-structured individual interviews) were conducted and lasted approximately 30 minutes in duration. The interviews were audio tape recorded using an Olympus DM-420 digital voice recorder.

Measures

GWG and healthy eating knowledge questionnaire: GWG Knowledge was assessed with four open-ended questions: "According to the 2009 IOM guidelines (2009) how much weight should an: 1) underweight, 2) normal weight, 3) overweight and 4) obese woman gain during pregnancy?" Responding to these questions within recommended ranges (i.e., underweight: 28-40 lbs, normal: 25-25 lbs, overweight: 25-35 lbs, and obese: 11-20 lbs) was indicative of having knowledge of GWG guidelines.

Healthy Eating Knowledge was assessed with the following four questions:

"How many ___ are recommended per day?" [Cups of fruits; cups of vegetables; ounces of grains; ounces of whole grains, cups of milk, and ounces of meat]. National intake recommendations, specifically the My Pyramid Plan [14] that was displayed by the two local healthcare providers, were used to determine intake knowledge.

Semi-Structured individual interviews and focus group interview questions: Four open-ended questions (Table 2) were developed based on prior research [20,23-25] to understand women's knowledge of the GWG guidelines and healthy eating recommendations. An interview script was used to guide delivery of the questions. The moderator read the questions and asked the participant(s) to discuss the responses. If there was little or no discussion, the moderator prompted with additional contextual questions (e.g., "How many calories should you be consuming during each trimester?") to facilitate discussion

Sample demographics: Demographic information on participants' race, education, marital status, family income, prepregnancy weight status and body mass index, age, and gestational age were assessed based on items developed in previous research [25].

Data analyses

Descriptive statistics were used to examine the frequency of women with knowledge of the GWG and healthy eating guidelines. Interviews were downloaded and transcribed. Principles of thematic analysis based on Green and Browne [26] were used to code each semi-structured individual interview and focus group interviews (i.e., initial review/coding main concepts, identify coding schemes, sort notes into subcategories, adapt/finalize schemes). Two research assistants independently reviewed each transcribed interview and developed categories of responses from the data. The broad response categories were then sorted into higher-order themes and examined to generate a consensus on the final coding strategy. The coauthors reviewed, clarified, and confirmed the data and finalized the themes. Data were analyzed with SPSS version 21.

Results

Participants

Participants were 30 pregnant women ($M = 22$ weeks gestation; range = 11-38 weeks; Table 1) with a mean age of 28 years ($SD = 2.9$). They were mostly Caucasian (86%), married (96%), worked full time (63%), had a college or graduate/professional degree (95%), and were of middle-high income (\$40,000-\$100,000; 65%). Pre-pregnancy Body

Variable	<i>M</i>	<i>SD</i>	%
Race			
Caucasian			85.7
Hispanic			4.8
African American/Black			4.8
Other			4.8
Education			
High School			4.8
College			47.6
Graduate/Professional			47.6
Marital Status			
Married			95.7
Single			4.3
Family Income			
\$10-20,000			5.0
\$20-40,000			25.0
\$40-100,000			65.0
>\$100,000			5.0
Prepregnancy Weight Status			
Normal Weight			62.0
Overweight			24.0
Obese			14.0
Age	27.9	2.9	
Gestational Age	21.8	8.8	
Prepregnancy Body Mass Index	24.9	5.9	
Gestational Weight Gain (pounds)			
1 st Trimester	5.7	3.8	
2 nd Trimester	8.1	6.0	
3 rd Trimester	13.5	4.6	

1 Note. *M* = mean, *SD* = standard deviation, % = percent.

Table 1: Demographic Characteristics of the Sample ($N = 30$).

Mass Index (BMI) was calculated by using women's self-reported height and weight prior to pregnancy, indicating a mean prepregnancy BMI of 25 kg/m² (*SD* = 6), placing most women in the overweight category prior to pregnancy [24]. Mean pregnancy BMI was also calculated by using women's self-reported height and weight at the time the participants completed the study (around 22 weeks gestation) was 27.9 (*SD* = 5.6).

Knowledge questionnaire

Most women correctly identified GWG within the recommended IOM guidelines [1] for underweight (58%), normal weight (80%), overweight (93%), and obese (60%). Adequacy of GWG knowledge was also assessed by examining women's responses across the weight category groups. Women that had a correct response for three out of the four weight status categories were considered to have adequate knowledge of the GWG guidelines. Fifty-seven percent of women had adequate knowledge across the weight status categories for the IOM (1) GWG recommendations. For healthy eating knowledge, the range was more diverse as women incorrectly identified the recommended daily intake of fruit (12%), vegetables (58%), total grains (42%), dairy (75%), and meat (58%). We further examined the data to understand the percentage of women that under-estimated the recommended daily servings of each food group. Out of the women who incorrectly identified the recommended daily servings of food, we observed the following under estimations of the daily recommendations: four percent for fruits, 12% for vegetables, 25% for total grains, 28% for dairy, and 58% for meat.

Semi-structured interviews and focus groups

Because so few women are aware of the amount of weight they need to gain based on their pre pregnancy weight, we further examined women's perspectives about GWG through the semi-structured individual interviews and focus group interviews. This revealed three higher-order themes (i.e., some knowledge of GWG guidelines, no knowledge of GWG guidelines, and no knowledge of GWG guidelines but knowledge that GWG impacts baby's health) were generated from 15 response categories (Table 2, question 1). Forty-two percent of women had no knowledge of GWG guidance. For example, one woman stated "But we never talked about how much I should expect to gain or if my weight gain is on track [in regards to discussions about GWG with her physician]." However, 51% of the women indicated having some knowledge of the GWG guidelines with the most frequently reported responses being "gaining 25-30 pounds" regardless of prepregnancy BMI category (43%) and "recommended amount of weight varies per person" (14%). Some women (34%) reported having no knowledge of GWG guidelines with the most salient responses being "completely unaware of GWG guidelines" (42%) and "physician did not provide information on healthy GWG" (33%). Lastly, a small proportion of women (8%) were not knowledgeable about the amount of weight they should gain, but did report that they knew that GWG impacted their baby's health.

When women were asked "What do you know about current dietary guidelines for healthy eating during pregnancy?" three higher-order themes were identified (i.e., limit/avoid certain foods, ensure adequate consumption of nutrients, and consume more calories) from 18 response categories (Table 2, question 3). Nearly 65% of participants reported that they knew about certain foods to limit/avoid during pregnancy and 30% had a general idea of foods to avoid (e.g., deli meats, fish with mercury, caffeine, alcohol). Although participants were not told specifically what foods to consume, 19% indicated that consuming adequate nutrients throughout pregnancy was a key

component of the healthy eating guidelines. Women reported the main nutrients to increase were calcium (dairy; 30%) followed by protein (20%), fruits and vegetables (20%), grains (10%), folic acid (10%), and healthy nutrients in general (10%). About 16% of participants identified consuming more calories and 88% reported that calories should be increased by about 200-300 per day.

Participants were also asked: "What, if any, dietary information was given to you during your prenatal care and from whom did you receive this information?" Four higher order themes were identified (Table 2, question 4). Forty-two percent of women indicated they had received dietary information during their pregnancy; however, 100% of the semi-structured individual interviews and focus group interviews reported they would have benefited from receiving more dietary information during prenatal care (i.e., information on portion sizes and the recommended servings of each food group they should be eating). Twenty five percent of women reported the dietary information they received from their physician was inadequate, and thus, women indicated that most of the dietary information they had was not from their physician but from other sources (i.e., books, magazines, journals, friends, family, nurses, midwives, programs/classes). Furthermore, 32% attributed this lack of information to physician's assumptions that women already had dietary knowledge from prior pregnancies or other sources. For example, one woman stated "At the physician's office they thought I wouldn't need a lot of information because it wasn't my first pregnancy so they thought I knew a lot of the stuff, but I didn't remember." If women had not been previously pregnant, they attributed the insufficient information to a lack of monitoring by the physician (14%), physician/nurse not providing any information (9%), and not enough time spent with the physician (9%).

While 25% of participants did not receive dietary information from their physician, 8% received dietary information from their physician that focused on general dietary information, emphasized the importance of fruits/vegetables, and briefly targeted GWG. Regardless of how the dietary information was obtained, 32% of participants expressed frustration with the quality of information. For example, 21% said little to no information was provided on the food pyramid and portion size and 11% reported receiving only information on dietary restrictions but not the actual recommendations.

Participants were also asked: "How does this GWG knowledge relate to your eating habits?" Two higher order themes and 11 lower order themes were identified (Table 2, question 2). Most of the participants reported the GWG guidelines made them more conscientious of their eating habits and 25% reported their knowledge of GWG guidelines helped them avoid unhealthy foods and opt for healthier choices. One woman stated "For me, it [knowing about the GWG guidelines] reflected what choices I was making in terms of snack foods." Six percent of women reported eating healthy because of potential health concerns associated with unhealthy GWG (e.g., gestational diabetes, hypertension). The remaining 27% of participants reported that knowledge of GWG guidelines also affected their physical activity habits. For example, 33% percent of participants reported doing more physical activity rather than trying to eat healthy to meet the GWG guidelines. One participant admitted that GWG guidelines affected her decision to "think less about eating and more about exercising." Among the women engaging in more frequent physical activity, 34% reported to engage in physical activity because of its mood-boosting qualities and positive relationship with healthy GWG.

Question 1: "What do you know about current gestational weight gain guidelines?"			
Higher Order Theme	N (%)	Lower Order Themes	Example Quotation
Some knowledge of GWG guidelines	18 (51.4)	Gain 25-30 pounds; Based on pre-pregnancy BMI; Recommended amount of GWG varies per person; Typical weight gain in first trimester is a few pounds; Weight gain should occur more in second trimester; GWG depends on how many babies woman carries	"[Weight gain] differs based on pre-pregnancy BMI."
No knowledge of GWG guidelines	15 (42.9)	Completely unaware of GWG guidelines; Physician did not provide information on healthy GWG; Can't remember the GWG guidelines; Have own standards for GWG; Focus should be on health of baby; Healthy GWG affects fetal outcome; Gain 60-70 pounds	"My physician never talked about how much weight I should gain or if my weight gain was on track."
Inaccurate knowledge of GWG guidelines	2 (5.7)	Generally not supposed to gain much weight; Not too much weight gain	"...But just going into the second trimester they said some people lose weight if anything, or you're not really supposed to gain much because your baby is only like, what a couple ounces..."
Question 2: "How does this GWG knowledge relate to your eating habits?"			
Higher Order Theme	N (%)	Lower Order Themes	Example Quotation
More conscientious of healthy eating habits	16 (73)	GWG affects eating habits; Avoiding unhealthy foods/choosing healthy foods; Previously ate healthy/enjoy eating well; Eat well because of potential health concerns; Trying to meet nutritional requirements; Trying to eat regularly; Generally thinking about healthy eating more	"For me, it kind of reflected what choices I was making in terms of like snack foods... it basically made me more conscientious of choosing what I was snacking on."
Affects physical activity (PA) habits	6 (27)	Do more PA instead of trying to eat healthy; Go to the gym/exercise facility; PA helps boost mood; PA is beneficial	"So I did a lot of yoga because that helps me just not like reach for a thing of ice cream or something like that-if I'm in a good mood then I don't need that"
Question 3: What do you know about current dietary guidelines for healthy eating during pregnancy?			
Higher Order Theme	N (%)	Lower Order Themes	Example Quotation
Traditional Prenatal Nutrition Education	33 (64.7)	General foods to avoid (or not eat) during pregnancy; Knowledge of dietary restrictions but difficult to follow ; Avoid deli meats; Avoid some cheeses/raw dairy; No sushi; Limited fish with mercury; Limit caffeine; Dietary restrictions are different during pregnancy; Avoid alcohol; Limit grains	"I think the main thing with information that you receive is basically what not to eat rather than what the good things to eat are."
Dietary Guidelines	10 (19.6)	Increase calcium/dairy; Increase protein; Increase fruits and vegetables; Increase healthy nutrients; Increase whole grains; Take folic acid	"Focus on the healthy nutrients as you gain those extra pounds."
Energy Balance	8 (15.7)	Increase calories (200-300 calories/day); Eat more	"I know you're supposed to eat about an extra 300 calories per day."
Question 4: What, if any, dietary information was given to you during your prenatal care and from whom did you receive this information?			
Higher Order Theme	N (%)	Lower Order Themes	Example Quotation
Received traditional prenatal education about food safety and dietary guidelines	18 (20.2)	Physicians provided general information on prenatal vitamins but no specifics on amount/types of vitamins; Received information on specific foods to avoid; Received a handout on general food restrictions; Had been provided some knowledge of the importance of prenatal vitamins in previous pregnancies	"...Just that sheet of paper that you get from the nurse on your very first visit that says, 'Don't eat this, you should only gain about this much weight.'"
Inadequate nutritional information received from physician	39 (43.8)	Assume women already know dietary information from previous pregnancies/ other sources; General lack of dietary information; Lack of monitoring by physician; Physician/nurse explicitly not giving information; Not enough time spent with physician; No nutritional information given; No portion size/food guide pyramid information; Food pyramid not broken down by trimester	"With the plethora of books and information out there, they're assuming the majority of people coming in have... a sense of it so they're not going to go over it in the amount of detail that they would otherwise."
Most dietary information was learned through women's own resources/ other resources	22 (24.7)	Books/magazines/journals; Online; Friends/family; Nurse midwife/doula; Registered nurses; Programs/classes; General research on own	"I just sort of did research on my own."
Dietary information was received from the physician	7 (7.9)	Emphasized importance of fruits and vegetables; Interviewed patient; Told to increase calories consumed; Mentioned pre-pregnancy BMI and relation to GWG; Provided general dietary information; Received information only after questioning	"The advice was given to me that you don't need to gain as much weight as other women based on your pre-pregnancy BMI..."
Women would like more nutrition information from physician	3 (3.4)	Like to receive information on portion sizes; Like to receive guidelines on which foods to choose	"They gave me, instead of what I should be eating, they gave me a lot of what you shouldn't be eating."

Note. GWG = gestational weight gain; BMI = body mass index; PA = physical activity.

Table 2: Semi-Structured Interview Questions, Frequencies of Higher and Lower Order Themes, and Example Quotations.

Discussion

Understanding pregnant women's GWG and healthy eating knowledge has important implications for prenatal education and counseling efforts. This study examined pregnant women's knowledge of the GWG and healthy eating guidelines and sources of this knowledge. The findings illustrate that most women in this study had limited knowledge about HE guidelines. Women are receiving

specific information about food safety and micronutrients but they are not receiving adequate information about how much they should eat or how to meet the recommendations to achieve healthy GWG. The women in this study relied on sources other than their healthcare providers to obtain information about healthy eating during pregnancy. More focused efforts are needed to better educate women about GWG and healthy eating guidelines to further motivate healthy behavior

change in an effort to prevent high GWG in pregnancy. Several findings warrant further discussion.

Some awareness of the GWG guidelines was evident in over half of the women in this study; however, they were also likely to believe that gaining 25-30 pounds was the standard recommendation regardless of a woman's prepregnancy weight status. This is important because this range is the guideline for normal weight women whereas the ranges are lower for overweight (15-25 lbs) and obese (11-20 lbs) women. Evidence from population-based studies suggests that half of overweight/obese women gain more weight in pregnancy than is recommended [1,2]. Overweight/obese pregnant women may have inaccurate perceptions about how much weight they should be gaining. Women may also be unaware of their own BMI classification. An important window of opportunity for intervention is to understand what pregnant women know about the GWG guidelines and correct any misperceptions in early pregnancy before weight gain becomes excessive. Given that most women of child-bearing age are overweight or obese, a shift in the "norm" is warranted whereby it is commonly accepted that women only gain 15-25 pounds in pregnancy. Counseling women about the GWG guidelines before they become pregnant may also help to manage prenatal weight gain.

Consistent with Shub et al. [22], over a third of the women in this study had no knowledge of the GWG guidelines. Some women reported being "completely unaware" or "not being able to remember" the guidelines whereas others said they did not receive GWG information from their physician. Brown and Avery [27] also found that one fourth of pregnant women received weight gain advice from their physician. Consistent with these past researchers' conclusions, our findings suggest there is a lack of awareness of how much weight should be gained, which in turn, is a potential precursor to excessive GWG and its associated complications. Concentrated efforts to increase and/or correct women's GWG knowledge of the guidelines may be a first step in preventing high GWG.

Also similar to the findings of de Jersey et al. [21], women's knowledge of the dietary guidelines was more elusive. When they were asked what they knew about current dietary guidelines in pregnancy, most women were able to report information about particular foods they should be avoiding (e.g., deli meats, raw foods, fish with mercury, caffeine, alcohol), however, only some women were aware of increasing consumption of protein, fruits/vegetables, whole grains, and calcium. While most of the women knew they should increase caloric intake (and some said this intake should be by 200-300 calories/day), there was a lack of knowledge about the overall quality of these calories. For example, one woman said she should "eat more" but was unaware the additional calories should come from healthy foods as opposed to high calorie snacks.

When women were asked whether they received any healthy eating information during pregnancy, about one-third indicated they had received some information. Importantly, 100% of the women reported they would have benefited from receiving more information on healthy eating, physical activity, and general health during prenatal care. This finding is consistent with de Jersey et al. [21] who found that 80% of participants would have been interested in attending information sessions on nutrition, physical activity, and weight control in pregnancy. Our findings suggest that although dietary information was provided as a part of the standard of prenatal care, the quality and quantity of this information may be lacking. For example, a quarter of women said the information they received from their prenatal care provider was insufficient and consequently, they sought out additional information

from their own sources including books, magazines, and journals, attended community programs or classes, and relied on advice from friends and family members. Women attributed this lack of information on diet to the physician's assumption they already knew about the dietary guidelines from a prior pregnancy. This finding is particularly important because it highlights one easily modifiable strategy for intervention – that is, providing adequate information on the dietary guidelines to all pregnant women during prenatal care regardless of how many pregnancies they have had. In addition, women received little information on the food pyramid, My Plate, or portion sizes, all of which are important for understanding the basics of a balanced diet and caloric control. This information can be easily integrated into the standard of care. For example, women can be referred to online resources such as "My Plate" [28] which provides education and behavioral tools for healthy eating and physical activity and has specific advice on these behaviors for pregnant and breastfeeding women. Findings from Orlander, Atkinson, Edmunds, and French [29] also suggest that women want nutritional information early in pregnancy from their healthcare professionals in order to form routine healthy eating behaviors.

Women were also asked to explain how their knowledge of GWG guidelines impacted their healthy eating behaviors. Among the women with knowledge of GWG guidelines, most reported the guidelines made them more conscious of their eating habits and helped them to make other healthier choices. Some women chose to engage in more physical activity rather than restricting calories to meet the GWG guidelines. One woman even said "I do a lot of exercise so I can eat whatever I want," furthermore indicating a need to target women's healthy eating behaviors. One-third of the women reported engaging in physical activity because of its mood-boosting qualities. Promoting physical activity along with healthy eating behaviors may be one strategy to motivate women for controlling weight because of the positive psychological benefits they may experience.

Without accurate knowledge of the GWG and healthy eating guidelines, it makes it impossible for women to meet the current GWG and healthy eating recommendations. Once women are given accurate knowledge, then supportive behavior change strategies can be used to assist women to meet recommendations, particularly for women who may have sufficient knowledge of the national GWG and healthy eating recommendations but fail to meet these recommendations. Identifying effective strategies to bridge the gap between knowledge and behavior is an important area of future research in an effort to promote healthy behaviors in pregnancy and prevent high GWG.

Although this study provides unique contributions to the literature by examining the influence of women's GWG and healthy eating knowledge on their behaviors, there are also some limitations. Participants in this study were a homogenous sample (i.e., Caucasian, middle-upper income, married, well educated) representative of the population residing in Central Pennsylvania; however, the findings cannot be generalized to all pregnant women. Replication of the study findings with other samples is warranted to extend generalizability. Women's self-reported knowledge of the GWG and healthy eating guidelines were obtained; future studies should consider using more objective measures of these variables.

In summary, most of the women in this study had limited knowledge of GWG and healthy eating guidelines and relied on their own sources to obtain what little information they had. In an effort to improve women's awareness of the GWG and healthy eating guidelines and promote healthy eating behaviors to manage GWG, some potential strategies to integrate into clinical care may include:

- Talk to patients about what they know about GWG and healthy eating guidelines and provide standard information on these guidelines from accurate and reliable sources (e.g., handouts, websites). Provide this information at several prenatal visits over the course of the pregnancy.
- Encourage pregnant women to learn about and use behavioral modification tools such as self-monitoring and goal-setting for achieving healthy GWG within the guidelines.
- Make referrals to meet with a registered dietician in which GWG and healthy eating information can be tailored to the woman's prepregnancy weight status and weight gain recommendations (including specific examples about the type and quality of the additional 200-300 calorie needs over pregnancy), obstetric/medical issues (e.g., gestational diabetes), current healthy eating behaviors, and other lifestyle factors.

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