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Promoting Weight Loss Before Pregnancy: Feasible or Futile?

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Abstract

Pre-pregnancy obesity is a well-established risk factor for several adverse maternal and fetal outcomes, including gestational diabetes, hypertension, cesarean sections, and fetal macrosomia. Weight loss before pregnancy could help prevent such complications, but the feasibility of such an approach remains unknown. The current study examined the feasibility of a 3-month pre-pregnancy behavioral weight loss program in 12 overweight/obese women planning pregnancy. The 3 month program resulted in an average 5.4 ± 3.0 kg weight loss and significant improvements in self-monitoring, physical activity, eating and exercise self-efficacy, and healthy eating ($p < 0.04$). By the end of the 9 month follow-up, half of sample ($n = 6$) had conceived. Women reported significant increases in weekly or more frequent self-weighing ($p < 0.0001$), counting calories ($p < 0.001$), consuming fruit and vegetables ($p = 0.007$), and cutting out fat ($p = 0.0001$) and junk foods ($p = 0.002$). A lifestyle modification program to promote weight loss before pregnancy promoted clinically significant weight loss and appeared feasible.

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Introduction

Obesity in pregnancy has several adverse effects on women's health, including increased risk of gestational diabetes, hypertension, pre-eclampsia, cesarean section delivery. Maternal obesity may also impact offspring health, including increased risk of offspring macrosomia, future obesity, asthma, cardiovascular disease, and type 2 diabetes. Retrospective reports suggest that weight loss through bariatric surgery before pregnancy can prevent several comorbidities and also reduce the risk of obesity in offspring aged two through adulthood (Abodeely, Roye, Harrington, & Cioffi, 2008; Dixon, Dixon, & O'Brien, 2005; Kral et al., 2006). Observational research has found that women who maintain or lose weight in between pregnancies have lower risk of gestational and type 2 diabetes (Ehrlich et al., 2011; Pole & Dodds, 1999; Whiteman et al., 2011), large for gestational age infants (Getahun, Ananth, Peltier, Salihu, & Scorza, 2007), and other perinatal complications (Villamor & Cnattingius, 2006). Lifestyle intervention has been shown to reduce cardiovascular risk factors and prevent type 2 diabetes in other populations (Knowler et al., 2002; Pi-Sunyer et al., 2007); however, no study to date has examined the feasibility and effects of lifestyle intervention before pregnancy. The dearth of research in this area may reflect perceptions that such a program unfeasible, as many pregnancies are unplanned (Gipson & Santelli, 2010); also, women planning pregnancy may not want to participate in a weight loss program that requires them to wait before actively attempting conception. The purpose of this study was to examine the feasibility of recruiting and administering a lifestyle intervention before

pregnancy in a community-based sample of women planning pregnancy.

Methods

Recruitment

In the current study, participants were recruited in central California over a 4 month period through two local radio station advertisements, two local internet sites, and flyers at local OB/GYN practices. To be eligible, women had to be overweight or obese (body mass index [BMI] >24.9), non-pregnant, aged 18-40 years, non-smoking, and English or Spanish speaking. Women had to report plans to become pregnant within the next 3-12 months and agree to use birth control during the 3-month weight loss program. To increases chances of conception after the weight loss program, women were ineligible if they reported a history of infertility or more than 3 miscarriages. Women were also excluded if they reported any major medical or psychiatric illness that would require medical monitoring during weight loss (i.e., diabetes) or prohibit physical activity or dietary intervention. Women with a history of bariatric surgery or >5% weight loss in previous 6 months were also excluded, as these could confound interpretation of intervention effects.

Forty-two women responded to advertisements and were screened; of these, 10 (24%) were ineligible due to breastfeeding (n = 8) or current pregnancy (n = 2); 6 (14.2%) were unwilling to use birth control; 7 (17%) had medical/psychiatric contraindications; 4 (9%) had recent weight loss; 7 (17%) had time conflicts with group meeting time; and, 5 (12%) were eligible but did not attend orientation. The remaining 12 women were eligible and enrolled in the study (Table 1). In full, 58% of enrolled participants were recruited through radio advertisements, 17% through local internet sites, and 24% through OB/GYN practices.

Measures

At study entry and after the 3 month program, participants completed validated questionnaires assessing eating self-efficacy (Cronbach's alpha >.80) (Clark, Abrams, Niaura, Eaton, & Rossi, 1991), exercise self-efficacy (Cronbach's alpha =.91) (Linde, Rothman, Baldwin, & Jeffery, 2006), and calories expended in physical activity (Cronbach's alpha = .80) (Craig et al., 2003). Participants also completed questions assessing past week frequency of self-weighing, counting calories, decreasing fat intake, cutting out junk foods, and increasing fruits and vegetables; these questions were adapted from prior research (Klem, Wing, McGuire, Seagle, & Hill, 1997). Weight was measured in kilograms using a standard balance beam scale; height was measured in centimeters, using a stadiometer; BMI (kg/m^2) was calculated. Chart abstractions were conducted after delivery in women who had become pregnant to document gestational weight gain and occurrence of gestational diabetes, hypertension, preeclampsia, preterm birth, and other complications.

Intervention

Participants underwent a 3-month, weekly group standard behavioral lifestyle modification program designed to induce $\geq$ 5% weight loss. The behavioral intervention was rooted in Social Learning Theory (Bandura, 1977) and adapted from the Diabetes Prevention Program (Knowler et al., 2005). Thus, participants were encouraged to consume a low calorie and low fat, portion-controlled diet and to achieve at least 150 minutes of physical activity per week. Behavior modification features included daily self-monitoring,

stimulus control strategies, goal-setting, self-reinforcement, problem-solving, social assertion, and cognitive strategies (Wing & Phelan, 2002). Participants were given a scale, self-monitoring records, measuring cups and spoons, a calorie counting book, and a pedometer to facilitate adherence. After 3 months, women were instructed to discontinue birth control and maintain their current reduced body weight. Monthly group check-in sessions were conducted for nine subsequent months or until reported conception. The Institutional Review Board at California Polytechnic State University approved this study. Paired t-test results were used to examine within subject changes in dependent variables. As this was a feasibility study with a small sample size, multivariate analyses were not conducted.

Results

Participants

Participants were 12 women with an average age of 31 and BMI of 35 kg/m^2. All participants were married and most (66%) were college-educated and non-Hispanic white (66%). In full, 75% of participants had previous pregnancies, and during previous pregnancies, excessive gestational weight gain and other complications were quite common (Table 1).

Three-month Outcome

During the 3 month program, two (17%) women became pregnant after having lost 3.3 kg at 3 weeks (3% of initial body weight) and 3.5 kg at 6 weeks (3% of initial body weight). At 3 months, the remaining intervention participants (n = 10; 83%) had lost an average of 5.4 ± 3.0 kg (6.2% of initial body weight). In intent-to-treat analyses (that included the two women who conceived), the 3 month program resulted in an average 5.0 ± 2.8 kg weight loss from baseline to the end of the program (p = 0.0001).

Among program completers (n = 10), paired t-tests indicated significant improvements from baseline to 3 months in eating self-efficacy (59.7 ± 17.8 vs 76.0 ± 12.0; p =0.04), exercise self-efficacy (6.3± 3.4 to 9.5± 4.8; p = 0.04), and calories expended in physical activity (1715 to 1788 kcal/week; p = 0.003). Significant increases were also observed in proportions reporting weekly or more frequent self-weighing (0% to 40% p = 0.0001), past week counting calories (0% to 66.7% p = 0.001), decreasing fat intake (8.3 vs 83.3%; p = 0.0001), cutting out junk foods (8.3 to 66.7%; p = 0.002), and increasing fruit and vegetables (41.7 to 91.7%; p = 0.007).

Table 1

Participant characteristics (n = 12)

	n	%
Ethnicity		
Non-Hispanic White	8	66.7
Hispanic White	3	25.0
African American	1	8.3
College educated	8	66.6
Weight		
Overweight	5	41.7
Obese	7	60.3
Married	12	100
Previous pregnancies	9	75
Gestational diabetes	2	17
Gestational hypertension	1	8
Preeclampsia	7	60
Weight gain >2009 IOM recommendations	7	60
	M	**SD**
Age	31.6	3.3
Weight, kg	93.7	13.2
Body mass index, kg/m2	34.6	5.5
Number of children	1.3	1.0

IOM= Institute of Medicine

Twelve-month Outcome

By the 12 month follow-up assessment, 50% (n = 6) of the sample had confirmed pregnancy, 33% were not yet pregnant, and 17% (n = 2) were lost to follow-up. Average time to conception from start of trial was 5.5 ± 4.2 months. Chart abstractions after delivery were conducted for the 6 women who became pregnant during the study period. The average gestational weight gain based on measured pre-pregnancy weight was 11.9 ± 8.1 kg. Similar to published norms (Crane, White, Murphy, Burrage, & Hutchens, 2009; Kiel, Dodson, Artal, Boehmer, & Leet, 2007; Oken, 2009; Olson, Strawderman, Hinton, & Pearson, 2003), most (5/6; 83%) participants exceeded the current Institute of Medicine recommended cap of 9 kg. There were no statistically significant or apparent relationships between magnitude of pre-pregnancy weight loss and subsequent gestational weight gain. Complications during pregnancy were observed in 2 women. Specifically, GDM was diagnosed in two study participants (who were primiparous); both women had conceived before the weight loss program was completed (at 3 and 6 weeks), and each had lost only 3-3.5 kg prior to conception. One of these "early conceivers" also had gestational hypertension and olgohydraminos. No other incidences of preeclampsia or any other major medical problems were observed.

Discussion

This study is one of the first to test and demonstrate the feasibility of a lifestyle modification program to promote weight loss before pregnancy. Recruitment was conducted in a timely fashion via radio and newspaper advertisements and through flyers at local OB/GYN offices. We had an acceptable study inclusion rate of 30%, consistent with other trials (Phelan et al., 2011). Moreover, the 3-month intervention resulted in a clinically meaningful 5% weight loss, and significant improvements were observed in several lifestyle behaviors, including increased daily self-weighing, physical activity, self-efficacy, and healthy eating. Half the sample reported conception by the end of the study period, and retention at the final 12 month study visit was high (>80%). These data suggest that pre-pregnancy lifestyle intervention program may be more feasible than commonly believed (Gipson & Santelli, 2010).

Of interest, a significant minority of potential participants (14%) was ineligible due to refusal to use contraception during the weight loss phase; moreover, two women who enrolled in the study became pregnant during the intervention period, which reduced their total pre-pregnancy weight loss. Thus, future research should carefully screen women to confirm commitment to using birth control during the active weight loss phase and also consider providing women with birth control, as needed.

We had an acceptable conception rate but future research should consider ways to further enhance this rate. After the weight loss phase, providing women with information on discontinuing birth control and ways to enhance conception could be beneficial. In this context, ovulation kits could also be provided as a means to expedite conception rates after weight loss.

Our intervention included structured meal plans, which have been shown to enhance weight loss. However greater weight loss would likely have been achieved with the provision of meal replacements (Wing & Phelan, 2002). Future research should

consider providing women with meal replacements to enhance weight loss outcomes.

The current study was a pilot investigation; thus, the sample size was small and self-selected, and our behavioral measures were based on self-report. Moreover, we were only able to offer intervention and orientation sessions at one weekly day/time, which precluded 17% of people from participation; with additional resources, recruitment likely would have been more expeditious.

Overall, lifestyle intervention before pregnancy appeared feasible in a community-based sample of overweight/obese women planning pregnancy. In prior research, bariatric surgery before conception significantly improves maternal and offspring outcomes (Dixon et al., 2005; Wittgrove, Jester, Wittgrove, & Clark, 1998). Findings from the current study suggest that non-surgical weight loss strategies prior to conception should also be considered. Lifestyle intervention prior to conception has the potential to decrease the serious complications associated with maternal obesity during pregnancy; however, larger, longer term randomized controlled trials are needed to examine the safety and efficacy of this approach.

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