Perceived Barriers to Exercise in the First Trimester of Pregnancy

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ABSTRACT

Regular physical activity has been shown to improve pregnancy outcomes. We sought to identify barriers to exercise during the first trimester of pregnancy. Five hundred forty-nine pregnant women in their first trimester rated barriers to exercise on a scale of 1 (*not a barrier*) to 5 (*a huge barrier*) and recorded physical activity (minutes/week). Women were placed into one of three classifications, nonexercisers (zero exercise), infrequent exercisers (<150 minutes/week), or exercisers (≥ 150 minutes/week). The greatest barriers (mean) were nausea/fatigue (3.0) and lack of time (2.6). Exercisers reported significantly lower barrier levels. Nausea/fatigue was a greater barrier for nonexercisers compared to exercisers (3.6 vs 2.8, $p < .001$). Focusing education and interventions on these barriers may help pregnant women achieve healthy exercise levels.

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INTRODUCTION

Physical activity is an important component of a healthy pregnancy. The Centers for Disease Control and Prevention (CDC), the American College of Sports Medicine, and the 2008 Physical Activity Guidelines for Americans recommend that healthy

women should get at least 150 minutes of moderate-intensity exercise every week during pregnancy (American College of Sports Medicine, 2013; CDC, 2015; U.S. Department of Health and Human Services, 2008). Guidelines from the American Congress of Obstetricians and Gynecologists (ACOG) state, “In

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the absence of either medical or obstetric complications, 30 minutes or more of moderate exercise a day on most, if not all, days of the week is recommended for pregnant women” (ACOG, 2003).

These guidelines are based on numerous studies that have shown that pregnant women who met these exercise guidelines have a reduced risk of gestational diabetes mellitus, preeclampsia, preterm birth, excessive gestational weight gain, and improved insulin sensitivity (Downs, Chasan-Taber, Evenson, Leiferman, & Yeo, 2012; Ferraro, Gaudet, & Adamo, 2012; Pivarnik et al., 2006; Tobias, Zhang, Van Dam, Bowers, & Hu, 2011). Regular aerobic exercise also appears to improve or maintain maternal physical fitness throughout a healthy pregnancy (Kramer & McDonald, 2006). Women who participate in exercise programs during pregnancy have been shown to have improved stamina, muscle strength, and energy levels compared to nonexercisers (Kalisiak & Spitznagle, 2009). Physical activity may also reduce or prevent lower back, pelvic, and joint pain; and prevent or manage hypertension, obesity, and other chronic conditions (ACOG, 2003; Pivarnik et al., 2006). In addition, exercise has psychological benefits for pregnant women, including improved maternal self-image, self-confidence, body image, and emotional well-being (Hegaard, Kjaergaard, Damm, Petersson, & Dykes, 2010; Kalisiak & Spitznagle, 2009; Leiferman, Swibas, Koiness, Marshall, & Dunn, 2011; Pivarnik et al., 2006).

Physical activity during pregnancy is also beneficial for the fetus. Exercise has been associated with a higher index of placental function and may be protective against extremes of birth weight (Ferraro et al., 2012; Kalisiak & Spitznagle, 2009). Neonates of obese women are at increased risk for morbidity, mortality, preterm birth, and neonatal hypoglycemia; and have higher rates of requiring resuscitation at birth (Furber et al., 2013). Furthermore, fetal outcomes such as birth weight, Apgar score, and gestational age at birth may be improved by physical activity during pregnancy (Giroux, Inglis, Lander, Gerrie, & Mottola, 2006; Kardel & Kase, 1998).

Despite the numerous and important maternal and fetal benefits, women tend to decrease their physical activity during pregnancy, and many do not meet exercise recommendations during this important time (Borodulin et al., 2008; Clarke & Gross, 2004; Downs, Devlin, & Rhodes, 2015; Rousham, Clarke, & Gross, 2006). Currently, the demographic factors influencing physical activity level in pregnancy are not well understood. For example, some studies have indicated that higher education is associated with higher amounts of exercise during pregnancy (Downs et al., 2012; Evenson, Savitz & Huston, 2004; Gaston & Cramp, 2011; Zhang & Savitz, 1996), although others have not found such an association (Gaston & Vamos, 2013; Haakstad, Voldner, & Bø, 2013; Santos et al., 2014). Some studies have indicated that unmarried women may be more likely to exercise (Petersen, Leet, & Brownson, 2005; Zhang & Savitz, 1996), but others have found no relation between marital status and exercise level (Evenson et al., 2004; Gaston & Vamos, 2013; Santos et al., 2014). Other factors that have been reported to predict greater levels of physical activity during pregnancy include younger age, higher income level, White race, no previous children, and active occupations (Connelly, Brown, van der Pligt, & Teychenne, 2015; Downs et al., 2012; Gaston & Vamos, 2013; Guelfi et al., 2015; Pereira et al., 2007; Petersen et al., 2005; Watson et al., 2016; Zhang & Savitz, 1996). However, others have reported no association between these demographic factors and prenatal physical activity level (Evenson et al., 2004; Evenson & Wen, 2010; Santos et al., 2014).

LITERATURE REVIEW

Several studies have shown that women are highly motivated to establish healthy behaviors during pregnancy (Haakstad et al., 2013; Petrov Fieril, Fagevik Olsén, Glantz, & Larsson, 2014; Phelan, 2010). In general, research has shown that when individuals receive a new medical diagnosis, this presents a powerful opportunity for health-care provider counseling. To effectively counsel patients, barriers need to be identified and understood. In the published scientific literature, reported barriers to exercise during pregnancy include nausea, fatigue, lack of time, physical limitations, lack of social support, and lack of access to exercise facilities (Clarke & Gross, 2004; Coll, Domingues, Gonçalves, & Bertoldi, 2017; Connelly et al., 2015; Da Costa & Ireland, 2013; Downs et al., 2012; Duncombe, Wertheim, Skouteris, Paxton, & Kelly, 2009; Gaston & Cramp, 2011; Kardel & Kase, 1998; Petrov Fieril et al.,

2014; Watson et al., 2016). It is possible that barriers may change over the course of pregnancy, and most published studies have focused on surveying women in their second and third trimesters. An Australian study that surveyed 158 women in both their first and third trimesters showed that nausea peaked as a barrier in the first trimester, and fatigue remained present throughout pregnancy (Duncombe et al., 2009). A Portuguese study reported survey results from 123 women in their first trimester and found that lack of time was a barrier to physical activity for 57.7% of respondents (Santos et al., 2014). Unfortunately, this study did not include survey questions about nausea during the first trimester. More research regarding physical activity levels and barriers to exercise for pregnant women is clearly needed, especially in the first trimester, as the beginning of pregnancy may be the time of the women's highest level of motivation for positive lifestyle changes. A better understanding of the barriers to exercise in the first trimester could inform interventions and guide provider counseling at an opportune time, establishing healthy habits for the remainder of pregnancy.

METHODS

From September 1, 2013 through August 31, 2014, we administered a prospective survey to pregnant women in their first trimester who were receiving prenatal care in the Obstetrics and Gynecology or Family Medicine Departments in our tertiary care academic medical center. For a woman to be included in the study, she had to speak and understand English, be at least 18 years old, and intend to receive at least half of her prenatal care and birth at our institution. Exclusion criteria were medical or obstetric contraindications to exercise in pregnancy, multiple gestations, and gestation beyond 13 weeks at study enrollment. The study was approved by our institutional research review board and participants provided written informed consent. This study was part of a larger study of exercise behaviors in pregnant women who received care at our institution. In the larger project, we found that exercise level was related to quality of life (Campolong et al., 2018). Our objective in this study was to evaluate barriers to exercise for women during the first trimester of pregnancy, comparing the differences in barriers with varying levels of exercise.

Study participants were recruited by intake nurses at the patient's first obstetrics appointment. The consent form allowed study investigators access to the patients' demographic and pregnancy-related clinical

data in their electronic health records. Participants completed the paper survey during their first obstetrics appointment.

Measures

Barriers to Exercise. Women reported the degree to which each of the following factors was a barrier to exercise during pregnancy: (a) not enough time in the day for exercise; (b) not a regular exerciser; (c) uncomfortable with all the changes in my body; (d) lack of access to facilities or equipment; (e) advice from friends, family, or both against exercise in pregnancy; (f) nausea or too tired; (g) fear of hurting the baby or miscarriage. Responses were based on a 5-point Likert scale with 1 indicating *not a barrier at all* and 5 indicating *a huge barrier*.

Level of Exercise. Women self-reported the amount of moderate-to-vigorous activity that they engaged in per week during their first trimester by answering the questions relating to exercise from the Pregnancy Physical Activity Questionnaire (PPAQ) (Chasan-Taber et al., 2004). Total amount of weekly physical activity was calculated from the series of specific exercise questions by using the midpoint of each time interval in the calculation. In keeping with CDC recommendations, women with 0 minutes of exercise per week were defined as "nonexercisers"; women reporting 1 to 149 minutes were classified as "infrequent exercisers"; and women reporting 150 minutes or more of physical activity, were classified as "exercisers" (CDC, 2015).

Data Handling and Analysis

Survey responses, demographic information, and clinical data were collected and entered by study investigators into the web-based Research Electronic Data Capture (REDCap) management tool (Harris et al., 2009), hosted at our institution.

All data analyses were performed by using SAS 9.0 software (SAS Institute Inc). Demographic characteristics were compared between exercise groups by using the analysis of variance (ANOVA) *F* test or the Kruskal-Wallis test, as appropriate, for continuous or ordinal variables and the χ^2 test for categorical data. The mean barrier rating was compared between exercise groups by using ANOVA *F* tests. The percentage in each group reporting at least 1 barrier was compared with χ^2 tests. A *p*-value less than .05 was considered statistically significant.

TABLE 1.

Demographic Characteristics of Pregnant Women Responding to a First-Trimester Survey About Barriers to Exercise

Characteristic	Nonexercisers No. (%) ^a (n = 46)	Infrequent Exercisers No. (%) (n = 180)	Exercisers No. (%) (n = 346)	Total No. (%) (N = 572)	p Value
Marital status					
Married	35 (76.1)	141 (78.3)	301 (87.0)	477 (83.4)	.02
Not married	11 (23.9)	39 (21.7)	45 (13.0)	95 (16.6)	
Race/ethnicity					
White	39 (84.8)	153 (85.0)	319 (92.2)	511 (89.3)	.02
Nonwhite	7 (15.2)	19 (10.6)	20 (5.8)	46 (8.0)	
Unknown	0 (0)	8 (4.4)	7 (2.0)	15 (2.6)	
Insurance category					
Employer	30 (65.2)	117 (65.0)	253 (73.1)	400 (69.9)	.13
Nongovernment	9 (19.6)	48 (26.7)	67 (19.4)	124 (21.7)	
Government	7 (15.2)	15 (8.3)	26 (7.5)	48 (8.4)	
Education					
8th grade or less	1 (2.2)	1 (0.6)	0 (0)	2 (0.3)	<.001
Some high school	2 (4.3)	3 (1.7)	0 (0)	5 (0.9)	
High school degree or GED	2 (4.3)	10 (5.6)	17 (4.9)	29 (5.1)	
Some college/2-year degree	18 (39.1)	55 (30.6)	64 (18.5)	137 (24.0)	
4-year college degree	12 (26.1)	62 (34.4)	134 (38.7)	208 (36.4)	
Postgraduate studies	11 (23.9)	49 (27.2)	131 (37.9)	191 (33.4)	
Children					
No children	13 (28.3)	77 (42.8)	156 (45.1)	246 (43.0)	.10
At least 1 child	33 (71.7)	103 (57.2)	190 (54.9)	326 (57.0)	
Pre-pregnancy BMI ^b					
Healthy (BMI ≤ 25)	21 (45.7)	90 (50.6)	213 (61.9)	57.0	
Overweight (BMI, 25–30)	18 (39.1)	49 (27.5)	87 (25.3)	27.1	
Obese (BMI > 30)	7 (15.2)	39 (21.9)	44 (12.8)	15.8	

Note. BMI = body mass index; GED = general educational development test.

^aBecause of rounding, percentages may not total 100%.

^bBMI values were not available for 4 patients (2 infrequent exercisers and 2 exercisers). Therefore, reported percentages are based on the cohort of patients with available information.

RESULTS

The study survey was completed by 572 pregnant women. The mean (SD) (range) age of participants was 30.5 (4.5) (18.1–45.3) years. The mean (SD) (range) gestational age was 8.5 (1.6) (4.3–14.4) weeks. The majority of study participants were White (89.3%), married (83.4%), insured through their employer's insurance plan (69.9%) and had a normal pre-pregnancy BMI (57.0%). Most had at least a 4-year college degree (69.8%), and over half (57.0%) had at least 1 living child. Of the 572 women, 46 (8.0%) were nonexercisers and did not engage in any physical activity during their first trimester, 180 (31.5%) were infrequent exercisers, and 346 (60.5%) were exercisers. Therefore, 39.5% of women in this first-trimester study did not meet CDC exercise recommendations for at least 150 minutes of exercise per week.

Exercisers were significantly more likely to be White and married, have a normal BMI, and have a higher educational level ($p < .05$ for all) (see Table 1). Exercisers also had a significantly lower mean number of children compared with nonexercisers (0.9 vs

1.2, $p < .05$). Exercise group classifications were no different in age or insurance category, although there was a nonsignificant tendency suggesting that a larger proportion of nonexercisers were government insured (see Table 1).

Of the 572 respondents, 549 answered the questions about barriers (45 nonexercisers, 177 infrequent exercisers, and 327 exercisers). Women rated the barriers on a 5-point Likert scale with 1 indicating *not a barrier at all* and 5 indicating *a huge barrier*. The greatest barriers to exercise for all groups were being too nauseated, tired or both and not having enough time in the day (see Figure 1). Women rated the barriers nausea or fatigue at a mean of 3.0 and lack of time at a mean of 2.6. Advice from friends or family not to exercise in pregnancy was not a barrier at all with a mean barrier score of 1.0.

Of the respondents, 91.0% of the nonexercisers and 92.1% of infrequent exercisers rated one or more barriers as at least somewhat of a barrier (3.0–5.0) compared with 77.1% of exercisers ($p < .001$). Nonexercisers and infrequent exercisers also rated

Figure 1. Barriers to exercise in the first trimester of pregnancy are shown for all study participants (5-point scale: 1, *not a barrier at all*; 5, *a huge barrier*).

more barriers as at least somewhat of a barrier compared with exercisers (mean, 2.4 vs 1.6, $p < .001$).

Being too nauseated and/or tired was a greater barrier for nonexercisers than exercisers (3.6 vs 2.8, $p < .001$). Infrequent exercisers had the highest mean rating for lack of time as a barrier (2.9, compared with 2.5 for nonexercisers and 2.4 for exercisers, $p < .001$). Nausea or fatigue, or both, not being a regular exerciser, and not having access to exercise equipment were significantly greater barriers for infrequent and nonexercisers as compared with women who met exercise guidelines (see Figure 2). No significant differences existed between exercise groups in patients' feeling uncomfortable with body changes, fear of miscarriage, or family or friend influences as barriers.

DISCUSSION

Maintaining a regular exercise regimen can be difficult, and many women do not meet exercise recommendations during their first trimester of pregnancy (Downs et al., 2012; Gaston & Cramp, 2011; Gaston & Vamos, 2013). Therefore, it was surprising that in this study of women in their first trimester of pregnancy, 60.5% surveyed reported meeting CDC recommendations for achieving at least 150 minutes of physical activity each week. This is encouraging because it may

show that exercise levels among women are increasing during pregnancy. However, given that other studies have found that as few as 13.8% of women in the United States meet exercise recommendations during pregnancy (Evenson & Wen, 2010), and that amount of exercise often decreases in pregnancy (Borodulin, Evenson, & Herring, 2009; Clarke & Gross, 2004; Duncombe, Wertheim, Skouteris, Paxton, & Kelly, 2009) it is more likely that the participants of this study were more active than the national average. However, in looking across studies it appears that many women fail to meet exercise goals throughout their pregnancies, and in this study 40% of women were not meeting guidelines for physical activity, therefore effective strategies to help healthy women be physically active during their pregnancies need to be identified.

Although women are highly motivated to maintain a healthy lifestyle during pregnancy, barriers to exercise can prohibit them from being physically active (Phelan, 2010). Multiple studies suggest that certain socioeconomic factors are important for a woman's maintaining an adequate level of physical activity during pregnancy (Cramp & Bray, 2009; Gaston & Cramp, 2011; Haakstad, Voldner, Henriksen, & Bø, 2009; Jukic et al., 2012; Petersen et al., 2005; Poudevigne & O'Connor, 2006; Zhang & Savitz, 1996). In the present

Figure 2. Comparison of barriers to exercise in the first trimester of pregnancy are shown by exercise group (5-point scale: 1, *not a barrier at all*; 5, *a huge barrier*). Exercise groups were defined as those who reported weekly minutes of moderate-to-vigorous exercise as 0 minutes (nonexercisers), less than 150 minutes (infrequent exercisers), and at least 150 minutes (exercisers).

study, higher education, White race, being married, and having a normal BMI were associated with meeting CDC exercise guidelines during the first trimester of pregnancy. Addressing these factors could help decrease the gap between exercisers and nonexercisers during pregnancy. For example, nonexercisers had a statistically significant, higher mean number of living children compared with exercisers and infrequent exercisers, and more nonexercisers tended to have at least one child. Creating safe, affordable places for mothers to exercise that also provide childcare could help eliminate this disparity.

To our knowledge, this is one of the largest studies to examine exercise habits and barriers to exercise during the first trimester of pregnancy. Study limitations include the self-reporting nature of the survey and the subjective evaluation of exercise levels by study participants. The survey also did not distinguish between moderate and

vigorous levels of physical activity. Seventy-five minutes per week of vigorous activity would meet CDC exercise guidelines; therefore, the number of women meeting the exercise guidelines may be higher than reported. Conversely, participants may have over-reported exercise levels, or self-selection for participation in the study may have contributed to high exercise rates in study participants. Only 15.8% of survey respondents were obese. It is also possible that obese patients declined the survey, potentially skewing the results.

Generalizing study findings to other populations may be difficult because the patient population described was from a homogeneous suburban area and may not be applicable, for example, to a more diverse or inner-city population. Participants were also highly educated, well-insured, and likely had access to a greater number of health and activity resources compared with other patient populations. Finally, this was a one-time assessment survey. Randomized clinical trials with more diverse populations are needed to determine causality of the factors identified in this study.

IMPLICATIONS FOR PRACTICE

There are many reported barriers to physical activity during pregnancy with opportunity for education and

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intervention. The results from this study suggest that pregnancy-related concerns, such as fear of hurting the baby and being uncomfortable with body changes, appear to be less important in the first trimester than previously thought. We did not find any differences between exercise groups for these barriers. Thus, these factors may not be ideal for focused counseling or interventions to promote physical activity during pregnancy. Instead, focusing perinatal education and interventions on barriers associated with lower exercise levels such as nausea, fatigue and lack of time may be more effective in helping women have a physically active lifestyle.

Counseling patients regarding the importance of increasing physical activity has been shown to improve physical activity levels in the general population (Petrella & Lattanzio, 2002). By recognizing risk factors for inactivity in pregnant women, childbirth educators may tailor their counseling to emphasize the importance of exercise for a healthy pregnancy. The greatest barriers to exercise found in this study were being too nauseated and/or tired and lack of time, which is consistent with the results of several other published studies (Cramp & Bray, 2009; Evenson, Moos, Carrier, & Siega-Riz, 2009; Jukic et al., 2012). Perhaps discussions regarding exercise and physical activity should be a routine component of gynecologic or pregnancy planning appointments. Educators could discuss potential barriers to exercise with women prior to pregnancy in order to offer support and provide effective strategies early on in a healthy pregnancy. Early in pregnancy, providers can continue to discuss strategies for managing these barriers. Nausea, in particular, could be aggressively addressed by health-care providers in the first trimester, when it is often at its worst. If women know to contact their health-care team for assistance with nausea prior to their first prenatal appointment, perhaps this barrier to exercise could be minimized. Fatigue was also a barrier to exercise for many women in our study, and therefore it is important for educators to emphasize the role physical activity plays in reducing fatigue symptoms. Additionally, as lack of time was a major barrier, educators could discuss problem-solving solutions to time barriers in an effort to help women increase their physical activity.

Addressing barriers to physical activity early may enable more women to exercise consistently throughout pregnancy. As pregnancy progresses, women tend to decrease their physical activity (Borodulin et al., 2009; Evenson & Wen, 2010). Therefore, maintaining

an exercise regimen during the first trimester could help establish a routine that women carry into later trimesters. A pregnant woman who describes herself as *not a regular exerciser* may have negative beliefs about exercise. In this situation, an educator could discuss the general benefits of exercise for a healthy pregnancy and for overall quality of life, thus helping her overcome this barrier. Lack of access to exercise equipment is likely due to socioeconomic factors, which clearly presents a barrier to women. Health disparities are important factors contributing to ability to exercise, and this is an important area for intervention in pregnant women. Educators could incorporate other health-care personnel such as social workers to help make child care more accessible or make memberships to fitness facilities more affordable.

Exercise during pregnancy is important for maternal and fetal health and well-being. Establishing physical activity habits during pregnancy may also be a bridge to lifelong exercise habits, benefiting the mother, child, and family. Understanding the barriers to adequate exercise during pregnancy is essential to improving prenatal counseling regarding physical activity and informing interventions to promote healthy exercise levels.

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