



Be Healthy in Pregnancy: Exploring factors that impact pregnant women's nutrition and exercise behaviours

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Abstract

Excess gestational weight gain is associated with short- and long-term pregnancy complications. Although a healthy diet and physical activity during pregnancy are recommended and shown to reduce the risk of complications and improve outcomes, adherence to these recommendations is low. The aims of this study were to explore women's view of nutrition and physical activity during pregnancy and to describe barriers and facilitators experienced in implementing physical activity and nutrition recommendations. In a substudy of the Be Healthy in Pregnancy randomized trial, 20 semistructured focus groups were conducted with 66 women randomized to the control group when they were between 16 and 24 weeks gestation. Focus groups were recorded, transcribed verbatim, coded and thematically analysed. The results indicate that women felt motivated to be healthy for their baby, but competing priorities may take precedence. Participants described limited knowledge and access to information on safe physical activity in pregnancy and lacked the skills needed to operationalize both physical activity and dietary recommendations. Women's behaviours regarding diet and physical activity in pregnancy were highly influenced by their own and their peers' beliefs and values regarding how weight gain impacted their health during pregnancy. Pregnancy symptoms beyond women's control such as fatigue and nausea made physical activity and healthy eating more challenging. Counselling from care providers about nutrition and physical activity was perceived as minimal and ineffective. Future interventions should address improving counselling strategies and address individual's beliefs around nutrition and activity in pregnancy.

KEYWORDS

behaviour, experiences of pregnancy, nutrition education, physical activity, pregnancy and nutrition, weight gain

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1 | INTRODUCTION

Being overweight and gaining too much weight during pregnancy have been linked to short- and long-term complications for both mother and her offspring. For the mother, there is a greater risk of gestational diabetes, gestational hypertension, caesarean delivery, postpartum weight retention, pre-eclampsia, long-term obesity and future co-morbidities such as diabetes and cardiovascular disease (Poston et al., 2016; Vézina-Im, Nicklas, & Baranowski, 2018). Complications for the offspring include increased risk of stillbirth, shoulder dystocia, preterm birth, large for gestational age infants and greater risk of childhood obesity (Poston et al., 2016; Vézina-Im et al., 2018).

Physical activity is safe for both mother and fetus and is associated with the prevention of excess weight gain and its related conditions (Davenport et al., 2018; Ruchat et al., 2018). Likewise, a healthy diet in pregnancy has been demonstrated to be one of the most important factors that promotes optimal maternal and neonatal health outcomes (Ramakrishnan, Grant, Goldenberg, Zongrone, & Martorell, 2012).

At the time of study implementation, the Health Canada nutrition guidelines for pregnant women recommended a varied diet with servings from four food groups, two to three extra servings per day and a multivitamin containing folic acid and iron (Health Canada, 2011). The Canadian guidelines at the time of data collection for exercise during pregnancy recommended participation in physical activity, regardless of prior fitness, and broadly outlined the types, intensity and duration of exercise that were safe (Davies, Wolfe, Mottola, & MacKinnon, 2003).

Despite the evidence to support the associated positive health outcomes, adherence rates to prenatal physical activity and nutritional guidelines are low. Only 15%–38% of pregnant women are reported to follow physical activity guidelines (Broberg et al., 2015; Evenson et al., 2014), and up to 60% of women are inactive in pregnancy (Poudevigne & O'Connor, 2006). Adherence to the nutritional recommendations is similarly low, with only half of Canadian pregnant women, across all body mass index categories, meeting recommended fruit and vegetable intake (Jarman, Bell, Nerenberg, & Robson, 2017). The pregnant population also has been found to have poor intake of the recommended food groups (Bookari, Yeatman, & Williamson, 2016; Morton et al., 2014). Most women's dietary modifications upon becoming pregnant are limited to avoiding alcohol, caffeine and foods with safety concerns, rather than improving their overall diet (Bookari et al., 2016; Guelinckx, Devlieger, Beckers, & Vansant, 2008).

A disconnect exists between the evidence for the benefits of healthy eating and activity and women's behaviours during pregnancy. This could be a result of the guidelines not being effectively disseminated through health care provider counselling practices. The literature suggests that care providers offer appropriate counselling for pregnant women on nutrition and physical activity guidelines (Duthie, Drew, & Flynn, 2013; Lutsiv et al., 2012). Yet in contrast, women report receiving little to no

Key messages

- Pregnant women face significant barriers in implementing nutrition and physical activity recommendations.
- Counselling by care providers needs to be more specific and in depth to address physical activity and nutrition in pregnancy, such as individualized counselling, in-depth conversations, follow-up throughout pregnancy, addressing concerns proactively and providing additional resources.
- Information resources need to be more accessible and understandable for women during pregnancy.

advice and having a limited understanding of how to operationalize the guidelines (Vanstone, Kandasamy, Giacomini, DeJean, & McDonald, 2017). The aims of the current study were to explore women's view of nutrition and physical activity during pregnancy and to describe the barriers and facilitators that may influence the disconnection between implementing physical activity and nutrition recommendations and daily experiences.

2 | METHODS

This qualitative study presents data from focus groups conducted with healthy pregnant women between 16 and 24 weeks gestation. The study was nested within a large randomized controlled trial (RCT) examining the likelihood of attaining optimal gestational weight gain (GWG) through a physical activity and nutrition intervention introduced in early pregnancy, compared with usual prenatal care: ClinicalTrials.gov identifier: NCT01689961 (Perreault et al., 2018). Protocols for the primary study and the nested study are described in detail elsewhere (Murray-Davis et al., 2019; Perreault et al., 2018).

Healthy pregnant women were recruited from three urban centres in south-western Ontario using posted advertisements at local hospitals, service organizations and medical and midwifery offices. All women gave written informed consent at baseline and after randomization to the intervention or control group. All participants were instructed by the interventionist research assistant in the recommendations by Health Canada for GWG, nutrition and physical activity during pregnancy (Health Canada, 2010, 2011; Wolfe & Davies, 2003). After this initial consultation, the control participants received only usual care from their health care practitioners with no further intervention. Those assigned to the control group were invited to attend a focus group between 16 and 24 weeks gestation as part of the nested qualitative study, in an effort to maintain engagement and retain participants in the RCT. The focus groups were 30–60 min in duration and were audio recorded. Focus groups were facilitated by a trained research assistant and scheduled when at least two participants could attend. Evidence

suggests that smaller focus group sizes provide participants with more opportunity and comfort in sharing their experiences, while still generating rich discussion (Braun & Clarke, 2013; Krueger & Casey, 2000). Open-ended questions in the semistructured interview guide (Figure S1) were used to explore participants' experiences related to pregnancy nutrition, physical activity and weight gain. The semistructured interview guide was developed from themes in the literature (Campbell, Johnson, Messina, Guillaume, & Goyder, 2011; DiPietro, Millet, Costigan, Gurewitsch, & Caulfield, 2003; Gaston & Vamos, 2013; McDonald et al., 2011). The interview guide was piloted with three women and then continually refined during the study as themes became saturated. Decisions to refine the interview guide were carried out by the focus group facilitators and the research team through interim peer debriefing meetings. Typically, data collection ceases once saturation has been reached; however, data collection continued until all controls had been given the opportunity to participate in the focus groups. Data saturation was tested iteratively and was reached prior to the final few focus groups (Sandelowski, 1995).

Focus groups were transcribed and sent to participants for member checking to ensure accuracy (Lietz, Langer, & Furman, 2006; Rolfe, 2006). Each transcript was read line by line and coded by a non-clinician research assistant using NVivo software (Braun & Clarke, 2006). Next, two researchers identified relationships between codes and organized them into categories. Categories were then organized into overarching themes that were used to understand and describe women's beliefs and behaviours (Braun & Clarke, 2006; Seale, 1999).

2.1 | Ethical considerations

Ethical approval for this study was obtained from the Hamilton Integrated Research Ethics Board, Joseph Brant Memorial Hospital Research Ethics Committee and the Western University Health Sciences Research Ethics Board.

3 | RESULTS

Of the 122 women randomized to the control group, 66 participated in focus groups, resulting in a 54% participation rate. Twenty focus groups took place between September 2013 and June 2017 with a median of three participants and a range of two to six participants. Baseline characteristics of the control group were collected between 12 and 17 weeks gestation and are summarized in Table 1.

Analysis of the data identified themes that impacted pregnant women's experiences adhering to recommendations regarding physical activity and nutrition. We organized the themes by organizational level (internal versus external factors) and across sources of influence (individual and environmental) (Table 2; Francis, O'Connor, & Curran, 2012; Marshman et al., 2016).

TABLE 1 Baseline characteristics at 12–17 weeks gestation

Characteristics	Control group (n = 122)
Maternal age (years), mean ± SD	31.3 ± 4.3
University education, n (%)	91 (74.6)
Pre-pregnancy BMI (kg/m ²), mean ± SD	25.3 ± 4.6
Pre-pregnancy BMI (kg/m ²) category, n (%)	
Underweight (<18.5)	2 (1.6)
Normal weight (18.5–24.9)	62 (50.8)
Overweight (25.0–29.9)	37 (30.3)
Obese (≥30)	21 (17.2)
Race/ethnicity, n (%)	
European descent	107 (87.7)
Mixed/other	13 (10.7)
Unknown	2 (1.6)
Total family income, n (%)	
<\$45,000	10 (8.2)
\$45,000–\$74,999	25 (20.5)
>\$75,000	78 (63.9)
Unknown	9 (7.4)
Married/living with significant other, n (%)	114 (93.4)
Nulliparous, n (%)	56 (45.9)

Abbreviations: BMI, body mass index; SD, standard deviation.

3.1 | Individual/internal

Individual-/internal-level factors were grounded in women's personal circumstances, over which they have varying degrees of control.

3.1.1 | Motivation and priorities

The participants described the role of motivation and priority setting in influencing their actions. All the women described that juggling their day-to-day responsibilities, including work and other children, meant that time was limited; they had to make choices and prioritize:

I think part of it for me is multiple roles. So I am still working full-time hours ... And then I have a two-year-old ... And then I am primary income as well ... and I think what happens is you get less and less and less and less time to do the things that you need to do to stay healthy (Focus Group 6).

Some women prioritized nutrition and physical activity above other interests and responsibilities competing for their time, often citing the baby's health as the primary motivation. Other women, despite understanding the importance of physical activity and healthy eating, felt their other duties took precedent:

TABLE 2 Factors influencing women's experiences with exercise and healthy eating in pregnancy

		Organizational level	
		Internal	External
Source of influence	Individual	Motivation and priorities	Counselling
		Knowledge and skills	Values and beliefs of others
		Previous experiences	Social support
		Values and beliefs	
	Environmental	Pregnancy symptoms	Sources of information

In my first pregnancy, I did prenatal yoga all the time, religiously. [Now] I have no time. I tried several times, 'this is going to be the day, I'm going to make it there at 7:00 o'clock', and you just do not, with a two-year-old (Focus Group 8).

Finances were described as a competing priority because gym memberships, physical activity programmes and healthy meals can be expensive. This limited access for some women.

3.1.2 | Values and beliefs

Our participants highlighted the role that values and beliefs played in shaping healthy behaviours. Those women who valued physical activity and nutrition were more likely to continue these behaviours during the pregnancy. Those who believed that there would be direct health benefits to their baby described this as a source of motivation. However, there were some participants who did not think healthy behaviours impacted the health of their baby. These opposing perspectives are highlighted in the following quotes:

If you are not eating healthy then your baby's not eating healthy either ... if you are not eating healthy when you are pregnant, that kind of follows your baby on after. They have a higher chance of being obese later in life (Focus Group 4).

Like my son had zero medical problems, he has no allergies to anything, even though I ate like garbage all the time and drank Coke and ate ice cream ... so that's why I find the healthy eating thing is kind of interesting in pregnancy ... Because I feel like my son was fine (Focus Group 15).

Many participants believed that they had no control over how much weight they gained in pregnancy, what they could eat and what they could physically do:

It's kind of like an uncontrollable goal too ... you can be monitoring everything you are eating and gain three pounds in a week and there's just no correlation between your actions and the weight gain (Focus Group 19).

This left women feeling discouraged and reluctant to continue trying to control their weight.

3.1.3 | Knowledge and skills

We found that the women who participated had a general awareness of the nutritional guidelines; however, they often lacked the understanding or ability to put them into practice. They described having difficulty interpreting and implementing the nutritional guidelines and lacked confidence about whether they were eating all the necessary vitamins and food groups:

I have no idea how much [nutrients] I am actually getting from everything ... and if that's not enough, should I have been supplementing on top of that?... Like, if you have three pieces of cheese and a glass of milk, can you consider that met? (Focus Group 20)

The women also felt overwhelmed keeping their knowledge up to date regarding what they should be eating:

You take your one list of vitamins that's like 15 things and that does not start to count your folic acid and your ... minerals—am I supposed to be tracking [those]? You lose your mind (Focus Group 20).

In terms of physical activity, many women were unsure of what types of activities were safe to continue or begin during pregnancy, as well as the length and intensity of the activity. The one activity most participants agreed was safe was prenatal yoga. The focus group discussions generated debate regarding the safety of some activities in pregnancy, such as running. Several women described discontinuing physical activity regimens due to anxiety about 'overdoing it' or believing them to be unsafe:

Every time I work out and I think oh my God ... have I done something to hurt the baby? So it's scary because you do not want to over exert yourself right; so sometimes it's easier to say, well forget it, I'll just wait till after I've had the baby (Focus Group 8).

3.1.4 | Previous experiences

Having previous experiences and knowledge prior to pregnancy about eating well and exercising was described as an important factor that enabled exercising at a higher level and for longer throughout their pregnancies:

When I got pregnant then I gained 50 pounds because I did not really, did not know how to take care of myself ... I learned a lot about nutrition and exercise and then I sort of kept that with all of my pregnancies and started running after I had my second one. And since then I have kept active (Focus Group 6). Additionally, a working knowledge of exercise helped the women to modify their workouts as they progressed through their pregnancies. This allowed them to stay active:

I used to do yoga in the hot room ... and I cannot do it in the hot heat anymore because I'm pregnant and ... my body just cannot do it anymore. And I just started doing like the same series, but modified and in cold ... And I actually just really, really like the modifications (Focus Group 20).

3.2 | Individual/environmental

There were also individual factors that were context driven or influenced by the environment, rather than being within the woman's control.

3.2.1 | Pregnancy symptoms

The physical symptoms of pregnancy were a contextual factor that impacted the individual experience of nutrition and physical activity. Fatigue, physical discomfort, food aversions, nausea and complications were described as barriers to healthy behaviours. This was articulated best when one person recounted how eating according to the nutritional recommendations was difficult with food aversions and nausea:

I think I had really good intentions to eat healthy and I was so sick, especially in the beginning, that it was just ... anything I could eat I would eat and that has now stuck with me for the rest of it (Focus Group 11). Physical activity was also impacted by the commonly experienced pregnancy symptoms of nausea, fatigue and discomfort:

I was sick every single day from five weeks until 15 weeks ... my energy level and my ability to even just get up and walk and get to work and get home and be functional was a challenge ... Like my body every night felt like I needed to run, but I could not do it. My stomach was like, if you run, you are going to vomit (Focus Group 20). In addition, common pregnancy symptoms such as fatigue influenced motivation for healthy behaviours. One participant described this best:

You're being pulled in a lot of different directions and you are tired, so definitely fatigue plays a lot into it. And then ... when you have a free moment, do you think about 'I'm going to spend that time to prepare some healthy meals or go for a walk?' No. I want to sit on the couch (Focus Group 6).

3.3 | External/interpersonal

External and interpersonal factors are those that were outside of the direct control of the individual and involved social or interpersonal relationships, such as interactions with friends, family and health care providers.

3.3.1 | Counselling

The participants described mixed experiences of receiving health advice from health care providers. Some women recounted practitioners who helped them in achieving healthy behaviours through in-depth, ongoing conversations about nutrition throughout pregnancy and provided information, support and reinforcement. At the same time, other women in our study reported a lack of counselling from their care provider regarding nutrition and physical activity in pregnancy. It was common to receive pamphlets and to be given the opportunity to ask questions, but they did not feel that they were provided with in-depth counselling about their existing habits and what behaviours are needed to change or be modified:

I'm a little bit disappointed how little it [nutrition] was talked about and brought up. But for all they know, I could be eating french fries for every meal ... I do not know why no one really talked to me about a lot of these things, exercise or diet or weight gain. But, yeah, no, it was not literally brought up at all (Focus Group 16). Pamphlets were often provided, but the participants expressed frustration that they were not receiving more comprehensive counselling in addition to the pamphlets:

I did get a package from the midwife and it had recommended foods for like iron rich foods and healthy choices to make, but it wasn't really discussed in person, it was just like a pamphlet to read on my own (Focus Group 9). The timing of these counselling discussions was an important factor for many participants, as information received too early or too late was ineffective:

I just got it from my doctor last week, so they gave you the information but it's kind of late, like I'm already six months now, so it was just a little late to be getting that information (Focus Group 4). Several participants suggested that involving nutritionists, dietitians and physical activity counsellors, as a routine part of pregnancy care, would complement the information provided by primary health care providers.

3.3.2 | Values and beliefs of others

The values and beliefs of others—family, friends, co-workers and even strangers—were reported as being a source of pressure and judgement. For example, the women described feeling pressure to relax their diet and give into food cravings. They were encouraged to eat what they wanted, as pregnancy was 'a time to relax and indulge':

I've had a supervisor, who was like 'oh, I got these cookies for you, take them to your desk.' ... people wanting to feed you, and not

necessarily good things. No one's going 'here, eat 10 fruits and vegetables.' They're telling you to have ice cream ... which is not helpful when you are trying to walk a line of being healthy (Focus Group 4). At times, the women also experienced judgement regarding what they were eating. One woman described having to justify her food choices:

I get so annoyed when people comment on things that you are eating. Like saying, 'oh you should not be eating that, you are pregnant'. My mom ... she kept saying, 'oh you cannot eat that', I'm like, 'yes I can. I think I'm aware of what I can and cannot eat' (Focus Group 7). Similarly, the women described experiencing judgement around physical activities that others believed to be unsafe, although this was often based on misinformation or a misperception of safety.

3.3.3 | Social support

Having friends or family who they were accountable to with their behaviours encouraged the women to continue towards their health goals. Workout partners, partner support and cooking for the family were all factors the women described as helping encourage physical activity and healthy eating. Partner support helped mitigate barriers to physical activity, like family responsibilities:

I have a friend who runs every day and she's been pregnant three times and she still ran every day ... so he understood like, 'okay, I'm coming home to take care of the kids and she's going on her run' (Focus Group 12).

3.4 | External/environmental

The external environment was the final level of impact for our participants. This included influences that were outside of the woman's control and external to the other people who influenced her behaviour like friends, family and health care providers.

3.4.1 | Sources of information

The quality and availability of information and resources on physical activity in pregnancy were described as a barrier inhibiting women from being active. Women most commonly reported using websites, health care providers, friends and family, books, phone apps and prenatal classes as sources of information. Although the participants found many resources addressing nutrition in pregnancy, resources on the amount and types of physical activity that are safe and recommended during pregnancy were difficult to find and limited in both quantity and quality:

It would be interesting to be able to easily access what kind of exercise is safe and/or easily accessed by pregnant women, because I've had a fairly easy time getting hold of information about food and eating ... there are ... many, many activities that you should no longer do as a pregnant woman (Focus Group 4). The women articulated that

the nutritional recommendations were confusing, unclear or even at times contradictory, particularly due to the perceived frequency at which the 'rules' changed. For example, the nutritional guidelines were confusing for many who tried to interpret vitamin requirements, foods to avoid and extra serving requirements. Fish was a major source of confusion, with many women feeling unsure whether to avoid fish due to risks of mercury and food contamination or adding it into their diets for the omega-3 benefits:

Everything I hear about fish keeps changing. Like, first you should eat it, then you should not eat it (Focus Group 17). Assessing the credibility of information was another barrier reported by participants, particularly when using the internet. It was difficult for women to know which sources were evidence based and trustworthy. Some resources were more user friendly than others, which impacted the women's ability to understand and utilize them correctly. Other resources were difficult to access or were outside of the reading comprehension of the average person:

When you Google a pregnancy question, Health Canada does not come up ... and it's not very user friendly ... you have to click quite a few links in order to get where you want to go. You can find the information you want with one click in a million different places (Focus Group 5).

4 | DISCUSSION

Our findings highlight the issues women faced when trying to operationalize healthy nutrition and physical activity guidelines during pregnancy. Previous experiences in maintaining healthy habits, prioritizing these actions and strong social supports and accountability were factors that made it more likely for the women to eat well and be physically active while pregnant. In keeping with previous research, our participants described that limited time, cost, family responsibilities, lack of motivation, working outside the home, fatigue and physical discomforts of pregnancy were challenges that impacted their behaviours (Coll, Domingues, Gonçalves, & Bertoldi, 2017; Harrison, Taylor, Shields, & Frawley, 2018; Vanstone et al., 2017). The key findings that constrained women's healthy behaviours were difficulties operationalizing the information in guidelines, limited availability of physical activity information, inadequate and ineffective counselling from care providers and the beliefs and values of the individual and their peers.

One of the key findings was the difficulty participants had in operationalizing physical activity and dietary guidelines into tangible improvements in health and pregnancy outcomes. We found that the participants had general knowledge of nutritional guidelines but lacked the understanding of specific recommendations and the skills to put them to use, and as a result, they often felt overwhelmed and confused (Nichols, Galesloot, Bondarianzadeh, & Buhler, 2018; Vanstone et al., 2017). Likewise, the women had limited knowledge and ability to implement physical activity in pregnancy, and both women and their peers had concerns about safety of physical activity (Vanstone et al., 2017). The lack of knowledge and skills

appeared to result in reduced physical activity out of fear of harming one's self or the baby.

When seeking information, the internet, books and health care professionals were used most commonly. However, in keeping with existing studies, women found resources related to physical activity and nutrition to be limited (Marquez et al., 2009; Wennberg, Lundqvist, Högberg, Sandström, & Hamberg, 2013) and the information they had access to was often contradictory and unclear (Cioffi et al., 2015; Vanstone et al., 2017). Participants in our study found that far more resources were available regarding healthy nutrition and diet in pregnancy, compared with physical activity. This may be a reflection of Canadian guidelines released in 2003, which were outdated at the time of the study (2013–2017) (Wolfe & Davies, 2003). Since the completion of the study, revised physical activity and nutritional guidelines have been released in Canada (Mottola et al., 2018; Public Health Agency of Canada, 2019). These updated guidelines provide more specific recommendations around length, intensity and types of physical activity and are supported by systematic reviews showing the safety and efficacy of physical activity during pregnancy. The nutrition guidelines have been revised to provide dietary recommendations that are more specific and user friendly.

The information provided by health care professionals regarding nutrition and physical activity during pregnancy was limited. The counselling was often inconsistent, discordant with guidelines or overly broad. Our participants described that the onus was on them to ask questions, or seek information and clarification rather than this being led by the care provider. Previous research with health care providers identified barriers to providing effective counselling, including lack of education and limited resources and time to address these topics (Lee, Newton, Radcliffe, & Belski, 2018; Lucas, Charlton, & Yeatman, 2014; McParlin, Robson, Muirhead, & Araújo-Soares, 2017). Physical activity, in particular, was a topic many health care providers lacked the training and skills to counsel on (Lee et al., 2018; Lucas et al., 2014; McParlin et al., 2017). However, this counselling has been demonstrated to have a strong impact on women's health beliefs and behaviours (Coll et al., 2017; Girard & Olude, 2012), and therefore, further training may help to improve this aspect of prenatal care (Cannella, Lobel, & Monheit, 2010; Ferrari, Siega-Riz, Evenson, Moos, & Carrier, 2013). Our research highlights the importance of counselling all women, including multiparous women. Experienced mothers may be less likely to seek out information about prenatal health than first time mothers, relying instead on their own past experiences and assumptions (Declercq, Sakala, Corry, & Applebaum, 2007). Additionally, care providers have been shown to reduce efforts to engage with pregnant people who they perceive to be 'experienced' (Blondin & LoGiudice, 2018). This may impact multiparous women's knowledge of and access to resources addressing nutrition and physical activity in pregnancy. We found that women's beliefs and values regarding physical activity and nutrition dictated their participation in healthy behaviours. Understanding and valuing the positive maternal and neonatal benefits associated with optimal nutrition and physical activity in pregnancy made some women more likely to participate in those behaviours. Contrasting this viewpoint were participants who

believed that they had little control over weight gain in pregnancy and that nutrition and physical activity had little impact on their own, or the baby's health. These beliefs made women less likely to participate in healthy behaviours because they did not anticipate any benefit. Likewise, the beliefs and values of friends and family had a strong impact on the women's beliefs and behaviours. Women often saw pregnancy as a time to indulge and relax and received encouragement from their families and peers to eat more unhealthy foods and avoid physical activity.

Our findings are limited by the potential for selection bias, as women who were concerned with diet, physical activity and weight gain in pregnancy may have been more likely to participate in the focus groups.

5 | CONCLUSION

Findings from our study highlight the barriers that pregnant women face when attempting to undertake healthy nutrition and physically active behaviours. Difficulties operationalizing the information in guidelines, a lack of knowledge and resources around how to be safely active in pregnancy, outdated beliefs and values of the women and their peers and ineffective counselling from care providers prevented participation in healthy habits. Future interventions need to focus on improving the effectiveness of counselling by health care providers and addressing women's beliefs and values surrounding nutrition and physical activity. Further research should be conducted to evaluate the usability of the updated physical activity guidelines in pregnancy and address strategies to make information resources more accessible to the average population.

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CONFLICTS OF INTEREST

All authors report no conflict of interest.

CONTRIBUTIONS

EKH conceptualized the study and contributed to the study design, and BMD led the study design. SA and MFM were the principal investigators of the core randomized clinical trial and contributed to the study design. CM recruited participants, as well as organized and

scheduled focus groups. JVM assisted with recruitment efforts. BMD performed the data collection. LG performed the data analysis. BMD oversaw the data analysis and interpretation. LG wrote the manuscript in consultation with BMD and EKH. All authors read, contributed critical revision and approved the final manuscript.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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