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Review

Perceived barriers to leisure-time physical activity during pregnancy: A literature review of quantitative and qualitative evidence

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ABSTRACT

Objectives: Identify perceived barriers to leisure-time physical activity during pregnancy to inform future interventions aimed at improving physical activity levels in pregnancy.
Design: PubMed/Medline and Web of Science databases were systematically searched using a reference period between 1986 and January/2016.
Methods: A comprehensive search strategy was developed combining the following keywords: (barriers OR constraints OR perceptions OR attitudes) AND (physical activity OR exercise OR motor activity) AND (pregnancy OR pregnant women OR antenatal OR prenatal). Thematic synthesis was conducted to analyze the data. A socioecological model was used to categorize the reported barriers.
Results: Twelve quantitative studies and 14 qualitative studies were included. Barriers belonging to the intrapersonal level of the socioecological model were the most reported in the studies and were categorized in five themes as follows: (1) Pregnancy-related symptoms and limitations; (2) Time constraints; (3) Perceptions of already being active, (4) Lack of motivation and (5) Mother–child safety concerns. At the interpersonal level, barriers were coded into two descriptive themes: (1) Lack of advice and information and (2) Lack of social support. Two other themes were used to summarize Environmental, Organizational and Policy barriers: (1) Adverse weather and (2) Lack of resources.
Conclusions: A range of relevant barriers to leisure-time physical-activity engagement during pregnancy were identified in this literature review. Pregnancy-related symptoms and limitations barriers were the most reported in studies, regardless of study design. Mother–child safety concerns, lack of advice/information and lack of social support were also important emphasized pregnancy-related barriers to be targeted in future interventions.

1. Introduction

As recommended for the general population, pregnant women should engage in at least 30 minutes of moderate-intensity physical activity on most days of the week to obtain health-related benefits.[1,2] Participation in leisure-time physical activity (LTPA) during pregnancy is especially important to prevent excessive weight gain,[3] increase fitness,[4] reduce the risk of gestational diabetes and preeclampsia,[5,6] lower anxiety, reduce depression and improve body Image.[7–10] Furthermore, numerous child health benefits have also been demonstrated in the literature.[3,11,12]

However, pregnancy is a critical period in women's life that is associated with significant physical, psychological and behavioral changes which usually result in decreased overall physical activity levels.[13,14] Accordingly, several studies have shown that as pregnancy progresses LTPA engagement decrease and this decline tend to persist during the postpartum period or longer, significantly affecting exercise behavior among women.[15–18] Although the gestational period is temporary, physical inactivity during this period is particularly relevant and may predict long-term future risk of chronic diseases such as obesity, diabetes and cardiovascular disease.[19,20]

The reasons for the low levels of participation in LTPA among pregnant women are complex and could be influenced by various factors. While sociodemographic correlates of exercise during pregnancy such as education, income, age and parity are largely informative and difficult to modify, psychosocial cognitive factors represents modifiable characteristics that could be targeted by interventions.[16] In this context, perceived barriers to physical activity engagement are among the most frequently

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mentioned correlates and predictors of physical inactivity during pregnancy.[16,21] As in the general population, personal, social and environmental factors can act as barriers to LTPA participation, but many specific barriers such as the pregnancy physical changes and the maternal concerns about the safety of exercise during pregnancy have been cited as preventing healthy pregnant women from participating and maintaining adequate LTPA levels during this period.[21,22]

While the literature on this topic has increased in the past years and studies have identified many perceived barriers related to LTPA engagement during pregnancy, there is still a lack of research conducted with this specific population.[16] Studies identifying barriers for physical activity have been systematically reviewed for different ages and subgroups of the population[23,24] but no attempt to review barriers to LTPA among pregnant women has been made. A full understanding of barriers preventing women from being physically active during pregnancy is a crucial step to guide the design and implementation of effective interventions to promote physical activity among pregnant women. The aim of the present study is to identify and summarize perceived barriers to LTPA participation during pregnancy in different contexts and countries to inform future interventions aimed at increasing physical activity levels in this population group around the world.

2. Methods

2.1. Search strategy

A literature review was carried out to identify studies that evaluated perceived barriers to LTPA during pregnancy, including evidence from both quantitative and qualitative methodological approaches. To identify potentially relevant studies, PubMed/Medline and Web of Science electronic databases were systematically searched including all papers published in the last thirty years, using the referencing period between 1986 and 15th of January/2016. A comprehensive search strategy was developed combining the following keywords: [(barriers OR constraints OR perceptions OR attitudes) AND (physical activity OR exercise OR motor activity) AND (pregnancy OR pregnant women OR antenatal OR prenatal)]. The search was only limited to studies conducted with humans. Additional relevant studies were identified by manually searching the reference lists of included studies and by citation tracking. In addition, experts in the field were contacted to identify potentially relevant studies. The searches were performed in August 2015 and updated in January 2016.

2.2. Criteria for inclusion and exclusion of studies

Original studies were included if they had reported perceived barriers to LTPA among pregnant women as their primarily or secondary outcomes. Therefore, studies with other outcomes but with information on barriers to LTPA during pregnancy were included. Articles were excluded if: (1) evaluated only barriers to other types of physical activity than those practiced during leisure time; (2) assessed the impact of specific elements of behavior on pregnancy LTPA (e.g. how fear affects LTPA participation during pregnancy); or (3) have evaluated the role of a specific barrier in LTPA behavior (e.g. the role of social support in LTPA beliefs during pregnancy). Two of the reviewers (CVNC and MRD) screened search results and when a decision regarding the relevance of the study could not be made based on the title and abstract alone, the full text of the article was obtained. Discrepancies in the decisions made were discussed until a consensus was reached.

2.3. Quality assessment of studies

The methodological quality of the quantitative studies was assessed according to a checklist specifically designed for the evaluation of descriptive cross-sectional studies.[25] The appraisal tool is composed of eleven items addressing the following aspects of the studies: issue, methods, recruitment of participants, accuracy of measurements, data collection, sample size, results presentation, data analysis, statement of findings, results extrapolation and validity of the research. Regarding the qualitative studies, the methodological quality was assessed using the assessment tool from the National Institute for Health and Clinical Excellence (NICE).[26] The checklist is comprised of fourteen items covering six major themes as follows: theoretical approach, study design, data collection, validity, analysis and ethics. For studies with more than one aim, only the methodological aspects related to the investigation of barriers to LTPA among pregnant women were considered in the assessments. All quality assessments were performed by two independent authors (CVNC and MRD for the quantitative studies and CVNC and HG for the qualitative studies). When scores were distinct between authors, papers were reassessed and discussed and a final score was attributed. No study was excluded based on scoring, since new insights, grounded in data, might be generated even in studies with poor methodological quality.

2.4. Data extraction and synthesis

For data extraction, each study was read and a data sheet was used to collect information about the study author and year, country of research, aims, sample size and characteristics, data collection methods and key findings. Data synthesis was conducted in three stages. Firstly, the results of each selected study were read and summarized in a data extraction form taking into account the barriers to LTPA physical activity reported by the pregnant women. Following this, a thematic synthesis of the extracted data was conducted and all reported barriers were coded into key descriptive themes (reflecting the main barriers to LTPA during pregnancy). Key descriptive themes were identified through linking and categorizing the individual reported barriers together (e.g. tiredness, fatigue, nausea, pain and other physical limitations were coded as Pregnancy-related symptoms and limitations). Finally, the socio-ecological model was used to guide analysis by categorizing the themes into (1) intrapersonal, (2) interpersonal and (3) environmental, organizational and policy barriers.[27] Two of the reviewers (CVNC and HG) independently undertook all stages of data syntheses and all reviewers agreed with the emerged themes and its categorizations. No discrepancies in coding were evident.

3. Results

The initial search strategy retrieved 1329 references, of which 1068 were screened excluding the duplicates found between databases. After title and abstract screening, 42 potentially relevant publications were selected to be examined in more detail by the authors. During the full-text reading stage, 18 studies were excluded because they did not meet the inclusion criteria and one new study was included after reading the previously included articles. Finally, 25 publications investigating perceived barriers to LTPA during pregnancy were selected, accounting for a total of 26 studies (12 with a quantitative design[21,28–38] and 14 studies with a qualitative design[29,39–51]). One study with a mixed-method design approach was found and accounted in both types of data.[29] All stages of the search strategy for the studies selection are described in detail in the supplemental Fig. S1.

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Table 1
Characteristics of the included studies.

Study	Country	Methods	Sample size	Participants' characteristics	Data collection (barriers assessment)
Kieffer et al. (2002)[39]	United States	Qualitative	13	Latino-American (Mexican) pregnant women, recruited from a health center in southwest Detroit during prenatal care.	Focus group in the later part of the third trimester of pregnancy (30–36 weeks' gestation).
Cramp and Bray (2009)[28]	Canada	Quantitative	161	Pregnant women recruited from prenatal programs offered by regional public health units in Southern Ontario. Study brochures were distributed by nurses to potential participants.	Self-administered questionnaire (website) during four time points (18, 24, 30 and 36 weeks' gestation). Open-ended questions.
Dumcombe et al. (2009)[21]	Australia	Quantitative	158	Pregnant women recruited from the population of Melbourne. Advertisements placed in local newspapers, community newsletters and websites requesting volunteers.	Self-administered questionnaire over three pregnancy time points (16–23, 24–31 and 32–38 weeks' gestation). List of barriers to choose and a possibility to describe others.
Evenson et al. (2009)[29]	United States	Quantitative	1535	Pregnant women from diverse ethnic backgrounds, recruited from University of North Carolina Hospital during prenatal visits.	Questionnaire administered in the third trimester (27–30 weeks' gestation) by phone interviews. Open-ended question about their primary barrier.
Evenson et al. (2009)[29]	United States	Qualitative	58	Pregnant women from diverse ethnic backgrounds, recruited from University of North Carolina Hospital during prenatal visits.	Focus groups in the third trimester of pregnancy (20–37 weeks' gestation).
Marquez et al. (2009)[40]	United States	Qualitative	20	Sedentary/low active Latina and non-Latina white pregnant women, recruited from public Obstetrics and Gynaecology Clinic in Massachusetts.	Focus groups (<28 weeks' gestation).
Haakstad et al. (2009)[30]	Norway	Quantitative	467	Healthy pregnant women recruited from a University Hospital in Oslo.	Self-administered questionnaire in the third trimester (32–36 weeks' gestation). List of barriers to choose (two main reasons for not engage in regular exercise during pregnancy).
Cioffi et al. (2010)[41]	Australia	Qualitative	19	Pregnant women at different stages of pregnancy recruited from two public health clinics in Sidney.	Focus group and face-to-face interviews at any gestational age.
Weir et al. (2010)[42]	UK	Qualitative	14	Overweight and obese pregnant women recruited from a previous study among physical activity levels during pregnancy.	Semi-structured in-depth interviews in the third gestational trimester (weeks' gestation not reported).
Hegaard et al. (2010)[43]	Denmark	Qualitative	19	Nulliparous pregnant women active before pregnancy but with different levels of physical activity during pregnancy, recruited from a previous multi-center cohort study.	Personal interviews 3–4 years postpartum.
Ribeiro and Milanez (2011)[31]	Brazil	Quantitative	161	Healthy pregnant women recruited from the National Public Health System during prenatal care in Southeast Brazil.	Questionnaire administered in the third trimester (≥28 weeks' gestation) by face-to-face interviews. Pre-coded question. Only women who do not exercise during pregnancy were asked about barriers.
Doran and Davis (2011)[32]	Australia	Quantitative	72	Pregnant women and postpartum women (who experienced gestational diabetes in a previous pregnancy) recruited from antenatal clinics, community health centers and the local media.	Self-administered survey. Gestational period not reported. Close-ended question. List of 14 potential factors that hindered participation in physical activity during pregnancy. Women were asked to indicate a response from a scale of 4 ranging from "no" to "yes, quite a lot".
Leifermann et al. (2011)[44]	United States	Qualitative	25	Pregnant women of low socioeconomic status recruited from health care clinics and community organizations throughout Denver, Colorado.	Individual and paired interviews during the second and third gestational trimesters (17–40 weeks' gestation).
Krans and Chang (2011)[45]	United States	Qualitative	34	Low-income, African American pregnant women recruited from community health clinics in Pittsburgh, Pennsylvania.	Focus groups in any gestational age (majority on the third trimester of pregnancy).
Sui et al. (2013)[46]	Australia	Qualitative	26	Overweight and obese pregnant women recruited from three public maternity hospitals in the South Australian metropolitan area. Study nested within an antenatal intervention to limit weight gain among overweight and obese pregnant women.	Face-to-face semi-structured interviews in the third trimester (28 weeks' gestation).

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Table 1 (*Continued*)

Study	Country	Methods	Sample size	Participants' characteristics	Data collection (barriers assessment)
Muzigaba et al. (2013)[47]	South Africa	Qualitative	34	Pregnant women at different stages of pregnancy and racial ancestries recruited from a Maternal and Obstetrical Unit attending eight low socioeconomic status communities.	Focus groups discussions at any gestational age (majority in their second trimester).
Bennet et al. (2013)[48]	Canada	Qualitative	9	First-time pregnant women previously active, recruited from community centers and maternity stores.	Semi-structured interviews at two time points during pregnancy (10–35 and 31–39 week's gestation).
Marshall et al. (2013)[33]	United States	Quantitative	88	Healthy pregnant women recruited from regional obstetrical offices from a rural community in Georgia.	Self-administered questionnaire answered at the obstetrical office at any gestational age. Open-ended question.
Da Costa and Ireland (2013)[34]	Canada	Quantitative	82	Healthy pregnant women who consent to take part in a randomized intervention to increase LTPA during pregnancy, recruited in the waiting rooms at the offices of obstetricians/gynecologists affiliated with the McGill University Health Centre in the Montreal area.	Self-administered questionnaire in the first gestational trimester (13 mean weeks' gestation). Scale assessing perceived barriers across four factors: exercise milieu, time expenditure, physical exertion and family discouragement. Items were scored on a 4-point Likert scale.
Santos et al. (2014)[35]	Portugal	Quantitative	82	Healthy pregnant women recruited from obstetrics clinics at São João Hospital in Porto.	Self-administered questionnaire in the first (10–12 weeks' gestation) and second (20–22 weeks' gestation) trimesters of pregnancy. List of barriers to choose and a possibility to describe others in a free response section. Only inactive pregnant women were questioned about barriers
Leppanen et al. (2014)[36]	Finland	Quantitative	399	Pregnant women at increased risk of Gestational Diabetes and who participated in a randomized controlled trial to prevent it (physical activity counseling), recruited from maternity clinics of primary health care centers in 14 municipalities in Southwestern Finland.	Self-reported questionnaire administered in the second gestational trimester (26–28 weeks' gestation). Open-ended questions. The participants were permitted to list as many barriers as they wanted but only the first three were taken into account.
Mbada et al. (2014)[37]	Africa	Quantitative	189	Pregnant women recruited from 6 selected hospital in Nigeria.	Self-administered questionnaire. Gestational period not reported. Pre-coded question. Only women who do not exercise during pregnancy were asked about barriers.
Fieril et al. (2014)[49]	Sweden	Qualitative	17	Pregnant women who perform resistance training during pregnancy and were previously active, recruited from an intervention study on the efficacy of a resistance training program during pregnancy or at fitness centers.	Individual semi-structured face-to-face interviews at any gestational age (majority 25–35 weeks' gestation).
Conelly et al. (2015)[38]	Australia	Quantitative	133	Postpartum women who did not meet physical activity guidelines during pregnancy, recruited from existing first-time mothers groups within Maternal and Child Health Centres, in seven local government areas throughout Victoria.	Self-reported survey on average 3 months postpartum. Open-ended written response regarding the key barriers preventing them from meeting physical activity guidelines during pregnancy.
Denison et al. (2015)[50]	UK	Qualitative	13	Pregnant women recruited from an antenatal clinic for women with Class III obesity.	Semi-structured interviews with a topic guide in the second and third trimesters (17–37 weeks' gestation)
Chang et al. (2015)[51]	United States	Qualitative	96	Low-income overweight and obese pregnant women recruited from 4 Nutrition Program for Women, Infants and Children sites in Michigan	Focus groups at any gestational age (majority in the second trimester of pregnancy)

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A summary of the studies characteristics is provided in Table 1 for both the quantitative and qualitative publications. The selected studies were published between 2002 and 2015, including data from 11 different countries. Most studies were conducted in the United States ($n = 8$) followed by Australia ($n = 5$), Canada ($n = 3$), Africa ($n = 2$) and the United Kingdom ($n = 2$), with one study carried out in Denmark, Sweden, Norway, Finland, Portugal and Brazil. Sample size of the quantitative studies ranged from 72 to 1535 participants, while in the qualitative studies it ranged from 9 to 96. Characteristics of the participants varied across the studies (first-time or non-first time mothers, inactive or active during pregnancy, previously active women, women from different gestational ages and, Body Mass Index strata, living in rural or urban settings, from different socioeconomic backgrounds, diverse ethnicities, women at increased risk of gestational diabetes and healthy pregnant women).

Regarding data collection, barriers to LTPA were evaluated through open-ended questions in five quantitative studies,[28,29,33,36,38] while six were based on closed questionnaires (list of barriers to choose)[21,30–32,35,37] and one study used a barrier scale.[34] Data collection methods used in the qualitative studies were focus groups in six studies,[29,39,40,45,47,51] interviews in seven studies[42,46,48–50] and a combination of both methods was used in one study.[41] Only six studies assessed barriers in more than one time point during pregnancy.[21,28,35,44,48,50]

3.1. Methodological assessment of studies

Detailed information on quality assessment scores for the qualitative and quantitative studies can be found on supplemental Tables S1 and S2, respectively.

3.2. Qualitative studies

No study obtained maximum score in all components of quality assessment. The theoretical approach of the qualitative studies was good: the qualitative approach was appropriate and all studies were clear in what they sought to do, except for one article in which the theory was not discussed and there was inadequate reference to the literature.[41] For one publication the study design was not defensible or dubious[43] and data collection was inadequately reported in another.[46] Regarding validity, the role of the researcher was clearly described in only three of the fourteen studies[43,47,48] and the context was not clearly described in one article.[41] Methods were reliable in all studies. All items related to data analysis were appropriate reported in the studies, except for the richness of the data in four articles.[39,41,50,51] Ethical approval was not reported in one article.[39]

3.3. Quantitative studies

Overall the quality of the quantitative studies was lower than for the qualitative studies. Only one study obtained maximum score in all components of quality assessment.[29] All studies addressed a clearly focused issue and used an appropriate method to answer their research question. For half of the studies the recruitment process of the participants was potentially biased; participants were recruited through convenience sampling.[31,37,38] Four studies raised questions regarding the accuracy of measurements used.[31,32,34,37] Four studies provided either no evidence[21,31,33] or unclear evidence of the data collection process.[37] Only three studies provided sample size calculation.[29,31,36] Four studies presented poor description of results.[28,33,34,36] With the exception of one study,[38] all studies demonstrated sufficiently rigorous data analysis. Similarly, a clear statement of findings was presented for all studies, except for one.[31] For only two of the twelve studies, the reported findings can be applied for the local population.[29,36] Eight of the twelve studies were considered very valuable in terms of their proposed research.[21,28–30,34–36,38]

3.4. Themes identified and synthesis of quantitative and qualitative findings

The thematic syntheses of perceived LTPA barriers extracted from the studies are described in Table 2. Nine major descriptive themes were identified reflecting pregnant women's barriers to LTPA participation. Barriers belonging to the intrapersonal level were the most reported in the studies and were categorized into five key descriptive broad themes: (1) Pregnancy-related symptoms and limitations; (2) Time constraints; (3) Perceptions of already being active, (4) Lack of motivation and (5) Mother–child safety concerns. At the interpersonal level, barriers were categorized into two descriptive themes: (1) Lack of advice and information and (2) Lack of social support. Finally, two other descriptive themes were used to summarize Environmental, Organizational and Policy barriers as follows: (1) Adverse weather and (2) Lack of resources.

Fig. 1 shows the proportion of quantitative and qualitative studies according to the types of barriers reported. The most notable barriers to LTPA among pregnant women reported in the quantitative data were the Pregnancy-related symptoms and limitations and Time constraints (reported in all studies), followed by lack of motivation (91.7% of the studies). Regarding the qualitative data, Pregnancy-related symptoms and limitations and Lack of social support were the most reported barriers (reported in all studies), followed by Mother–child safety concerns (85.5% of the studies), Lack of advice and information (78.6% of the studies) and Time constraints (71.4% of the studies).

4. Discussion

The present review summarized perceived barriers to LTPA among pregnant women in many different contexts covering the quantitative and qualitative literature available on the topic. Overall, the synthesis of both types of data revealed several consistent barriers to LTPA during pregnancy. Despite of the wide differences in study design, sample size and participants' characteristics of the studies, only a few variations in the barriers reported and emphasis placed on different themes depending on the type of data and characteristics of the population studied were observed.

Barriers pertaining to the intrapersonal level were the most commonly cited in the studies and accounted for five of the nine key descriptive themes that emerged in data analysis. Among these themes, the pregnancy-related symptoms and limitations were the most reported perceived barriers to LTPA engagement during pregnancy, regardless of the design approach of the studies. Symptoms and limitations such as tiredness, fatigue, nausea, physical pain and the bodily changes were frequently reported as preventing women from being active during pregnancy. In this sense, there was a tendency for barriers to change over the course of the gestational period. Nausea, tiredness and sleepiness were the main reported barriers to LTPA participation in the first gestational trimester while the physical limitations related to the growing body such as shortness of breath and back/pelvic pain, were frequently experienced in the last gestational trimester.

Another consistent pregnancy-related barrier on the intrapersonal level was the mother–child safety concerns regarding LTPA engagement, most evident in the qualitative studies. Women constantly reported the fear of harming the baby or themselves doing LTPA and this perception was evident even among pregnant women who were previously active and chose to maintain an active lifestyle during pregnancy.[43] Besides, studies conducted with overweight

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Table 2
Barriers to LTPA among pregnant women reported in the studies according to key descriptive themes and level of the socioecological model.

Level	Descriptive themes	Barriers reported in the studies	Reference number of studies
Intrapersonal	Pregnancy–related symptoms and limitations	Fatigue, tiredness, lack of energy, felling unwell or uncomfortable, nausea, back and pelvic pain, swelling, soreness, shortness of breath, leg cramps, morning sickness, contractions, headache, anemia, disease, bodily changes, the growing body, physical limitations	21,28–51
	Time constraints	No time, being too busy duo to work, childcare and family responsibilities	21,28–42,44–47,50
	Perceptions of already active	Daily life activities provide sufficient exercise	29,30,33,38–40
	Lack of motivation	Lower self-efficacy or discipline, pregnancy is a time to rest, dislike of exercise, no habit of exercise, no pre-pregnancy physical activity routine, problems with body-image, embarrassment about appearance	21,28–35,37,38,40–42,44,46,49–51
	Mother–child safety concerns	Fear of harm the baby or yourself, concern with pregnancy complications such as miscarriages and premature labor	21,29–31,33,35,37,40–44,46–51
Interpersonal	Lack of advice and information	Lack of knowledge about how to exercise safely during pregnancy, lack of health care provider guidance or counseling, lack access to consistent information, advice and support on the benefits of physical activity during pregnancy, insufficient and contradictory information, lack of accessible information	29,32,37–47,49,50
	Lack of social support	No one to exercise with, advice to avoid exercise, no support from family and friends, partner and family attitudes disapproving physical activity engagement, conflicting advice from others, sense of exclusion at the fitness center, lack of social norms that encourage physical activity	29,30,32,34–36,38–51
Environmental, organizational and policy	Adverse weather	Too cold, too hot, bad weather	28,29,36,39,40,42,44,46,51
	Lack of resources	Unsafe neighborhood, lack of transportation, lack of recreational facilities, too costly, lack of specific programs to pregnant women	28–30,32,34–36,39,41,42,44–47

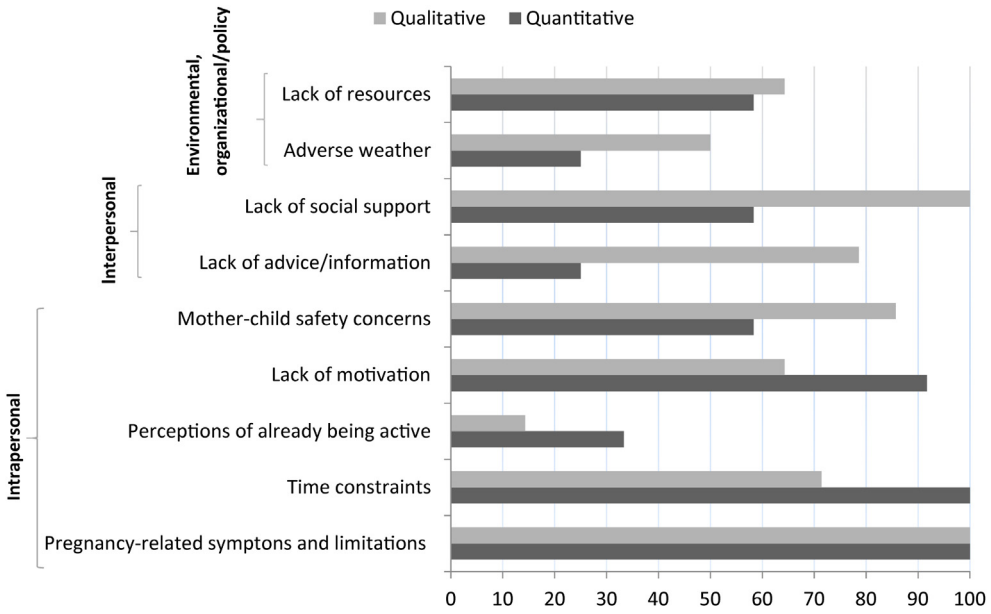

Fig. 1. Proportion of quantitative and qualitative studies according to reported barriers to LTPA among pregnant women.

and obese participants brought to light specific concerns about the safety of exercising due to maternal size, with many of them expressing concerns about possible negative consequences to the baby. Giving support to our findings, recent studies have shown that safety concerns and risk perceptions predicted the amount and intensity of physical activity during pregnancy.[21,52,53]

Time constraints due to work and family commitments and lack of motivation were also frequently mentioned intrapersonal barriers. Time constraints were particularly reported among non-first time mothers from a low-socioeconomic position due to childcare demands and family commitments.[33,39,45] Regarding the lack of motivation to engage in LTPA during pregnancy, although it has been reported in general, subtle differences were present for studies conducted with overweight and obese women. The variations were mainly related to issues concerning body size and image such as the lack of confidence and the societal judgements regarding to their size.[42,50,51] Among barriers classified as intrapersonal, some women also mentioned their perceptions of being sufficiently

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active in the daily activities such as work and home tasks, especially noted in the study conducted among pregnant women living in a rural community.[33] However, unlike the pregnancy-related symptoms and limitations and the mother–child safety concerns, barriers related to lack of time and motivation and perceptions of being sufficiently active are not specifically related to the gestational period and have also been found in studies conducted in the general population.[54,55]

On the other hand, the lack of pre-pregnancy exercise routines, classified in our data synthesis as being part of the lack of motivation barriers theme, seems to be an important barrier to consider in the design and implementation of effective interventions. In our literature review, the studies conducted with previously active women had shown that although they reported similar barriers to LTPA during pregnancy, they usually show a desire to maintain their pre-pregnancy exercise routine during pregnancy.[43,48,49] In this context, the strategy of modifying and/or adapting usual activities is frequently used to overcome the perceived barriers to LTPA engagement during the gestational period. Similarly, many studies have found the intensity of perceived barriers to differ according pre-pregnancy levels of LTPA and that previous LTPA is one of the strongest predictors for maintaining LTPA during pregnancy.[34,36,43]

Within the interpersonal level barriers, the "lack of advice and information" and "lack of social support" were relevant barriers to LTPA engagement among pregnant women and were most often reported in the qualitative studies. Regarding "lack of advice and information", the lack of knowledge about how to exercise safely during pregnancy and the lack of health care provider guidance and support on the benefits of LTPA during pregnancy, were frequently reported in the studies. Accordingly, previous research suggests that health care providers often give little or no advice about exercise during pregnancy.[22,56] However, as counseling can have a great influence on pregnant women's beliefs and decisions,[57] efforts to enhance pregnant women's knowledge about the recommendations of LTPA should be considered a priority given the significant associations between adequate knowledge and attitudes toward exercise during pregnancy.[37,58]

When we analyze the "lack of social support" theme, the contradictory sort of information regarding LTPA during pregnancy given to women, including the relatives' attitudes disapproving physical activity engagement, were consistent reported barriers. In this context, a strong encouragement to avoid activities or even rest in order to protect the baby was reported by women. In the same direction, a recent study had shown that women's relatives and friends affect them by expressing their anxieties and telling negative stories about exercise habits during pregnancy.[54] Furthermore, among ethnic minority groups, the fear of appearing sexually available was a reason given for not engage in LTPA, particularly when alone outside home.[39] Therefore, taking into account that advice about health patterns, including physical activity behaviors, appeared to be strongly influenced by the comments and views of the peer support during the gestational period, involving them in the prenatal routine visits could be a good strategy to dispel myths and misconceptions about pregnancy and physical activity.

Environmental, organizational and policy level barriers were more frequently described in studies conducted with pregnant women from low income and ethnically minority groups.[33,39,40,45] These findings are broadly consistent with the findings of previous reviews focused on barriers to physical activity in other minority populations.[59] External factors such as the adverse weather, limited access to exercise facilities, concern with LTPA costs and the lack of specific programs of LTPA for pregnant women were the more pronounced barriers on this level. Investments to increase the number of safe, low-cost LTPA facilities should be considered by policy-makers to build an environment that promotes active behavior in this group. Provision of organized group physical activity classes for pregnant women at the community health centers and prenatal care clinics can also be an option to encourage regular LTPA practice and introduce women to a new social support network. Additionally, low-cost activities such as walking should be promoted, as it does not require special equipment, requires little skill and does not have to be specifically designed for pregnant women.

5. Strengths and limitations of the study

To our knowledge, this study represents the first attempt to systematic review and summarizes barriers to LTPA among pregnant women. Although other domains of physical activity may influence health outcomes, we opted to focus only on LTPA because most evidence of benefits in the literature is based on LTPA and because domains such as occupational physical activity or household chores are usually mandatory. To give a comprehensive overview and provide a richer understanding of the available literature we opted to report data from both quantitative and qualitative studies. The synthesis of both types of evidence revealed important insights about what may help the success of interventions aimed at preventing physical inactivity during pregnancy. While the quantitative data provided a general idea about the strength and relevance of existing barriers to LTPA among pregnant women, the qualitative data allowed a wider interpretation and in-depth examination of barriers, beliefs and attitudes toward engagement in LTPA with participants bringing to light more personal and confidential issues.

Despite these efforts, some limitations should also be acknowledged. Traditional search strategies such as proposed in this review may not be exhaustive when looking for studies with qualitative approaches[60] and therefore relevant studies might have been missed in our literature review. However, to ensure that no potential relevant publication was lost in our search strategy we contacted the authors about relevant studies in the area and searched the reference lists of the included articles.

6. Conclusion

The present review provided a data synthesis regarding perceived barriers to LTPA among pregnant women from many different contexts and highlights important aspects to be considered when planning interventions aimed at increasing LTPA levels during pregnancy. Although many barriers to LTPA among pregnant women are similar to those reported in the general population, important specific pregnancy-related barriers to LTPA were also identified. The pregnancy-related symptoms and limitations were the most often cited barriers to LTPA participation during pregnancy in the literature, regardless of study design. On the other hand, the mother–child safety concerns, lack of advice and lack of social support were pregnancy-related barriers more reported and emphasized among the qualitative studies. Based on the findings of the current literature review, we recommend that future studies also focus on understanding health care professionals' views regarding LTPA during pregnancy as the literature lacks information on how physicians deal with potential barriers and how their counseling may affect behavior of pregnant women. In addition, there is a need for future intervention studies to understand how changes in perceived barriers can influence LTPA changes during pregnancy.

Practical implications

- When promoting LTPA during pregnancy special attention must be paid to overcome specific barriers that come with pregnancy such as the pregnancy-related symptoms and limitations and the mother–child safety concerns.

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- The involvement of relatives in pregnant women's efforts to be physically active may be of great value, as the family members could be important sources of motivation, information, companionship and support for LTPA.
- There is an important role for health care providers to encourage LTPA among healthy pregnant women, increasing women's knowledge about the mother–child health benefits of LTPA engagement during pregnancy. In this context, increasing awareness of the available physical activity guidelines for pregnant women among them is an essential strategy.
- Future studies addressing barriers to LTPA during pregnancy should also focus on understanding health care professionals' views regarding LTPA during pregnancy.
- Special attention on the promotion of LTPA among women of childbearing age should be given as part of plan for a healthy pregnancy as pre-pregnancy levels of LTPA have great influence on the decision to maintain an active lifestyle during pregnancy.

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The main author performed the search and wrote the article. All authors contributed to reviewing the manuscript, agree on the final draft, and take responsibility for the integrity of the data and accuracy of the analysis performed.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jsams.2016.06.007.

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