BMC Pregnancy and Childbirth

RESEARCH

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Barriers to physical activity in pregnant women: a cross-sectional study

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Abstract

Background Despite the American College of Obstetricians and Gynecologists' (ACOG) recommendations on the benefits of physical activity during pregnancy, low levels of physical activity are reported worldwide. This research aims to identify the barriers to physical activity (PA) and their predictors among pregnant women.

Methods In this cross-sectional study, data were collected from 351 pregnant women aged 18–45 with gestational ages of 10–37 weeks through convenience sampling. These women took part in the study from May 2022 to August 2024 and completed a demographic-obstetric scale and the Barriers to Physical Activity during Pregnancy Scale (BPAPS). Data were analyzed using univariate and multivariate linear regression.

Results The total BPAPS score was 78.07 ± 16.25(range 29 to 145). The highest and lowest scores among the subscales were related to environmental barriers (43.67 ± 17.80) and interpersonal barriers (38.74 ± 17.93). The most commonly reported environmental barriers were limited access to sports facilities and the difficulty of exercising in hot or cold weather. In multivariate analysis, educational level (B = 4.39), employment status(B = 9.54), regular physical activity before pregnancy (B = 7.34), and maternal age (B = 0.91) were identified as strong independent predictors of physical activity barriers.

Conclusions This study found that environmental barriers were the most prominent obstacles to physical activity among pregnant women, while interpersonal barriers were perceived as less influential. Higher education, employment, regular physical activity before pregnancy, and younger maternal age were associated with fewer perceived barriers during pregnancy. These findings suggest that addressing physical inactivity in pregnancy may require multilevel approaches that extend beyond individual counseling and consider environmental conditions. The results highlight modifiable factors that may inform future interventions and support healthcare providers in identifying women who are more likely to experience greater barriers to physical activity during pregnancy.

Keywords Physical activity, Barriers, Pregnant women, Pregnancy, Cross-Sectional Studies, Women

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Background

Pregnancy involves significant physiological and psychological changes to prepare the body and uterus for the growth and development of the fetus [1]. These changes can lead to discomforts and complications in some women, such as back pain, gestational diabetes, obesity, hypertension, and psychological disorders [1, 2]. Engaging in physical activity (PA) during pregnancy reduces the likelihood of physical and psychological complications [1, 3] and lowers the risk of gestational diabetes, hypertension, cesarean delivery, obesity, postpartum depression, and other pregnancy-related complications [4, 5]. Moreover, regular PA is associated with reduced musculoskeletal complaints, improved body image, and enhanced psychological well-being [6]. It also benefits the fetus by improving placental function, increasing the newborn's Apgar score, and potentially preventing excessive birth weight [7]. Additionally, studies suggest that infants born to mothers who exercised during pregnancy show better neurodevelopment [8].

The American College of Obstetricians and Gynecologists (ACOG) has stated that pregnant women who do not engage in at least 150 min of moderate-intensity PA per week are classified as inactive [9]. It is recommended that pregnant women perform 30 min of moderate-intensity PA daily [10]. Despite recommendations, pregnant women often face multiple barriers and insufficient support to engage in regular PA [11]. Studies from various countries have demonstrated low levels of PA among pregnant women [12, 13]. A recent study in Sweden, which assessed PA and inactivity in 2,203 pregnant women, reported that only 27% followed the recommended guidelines for PA during pregnancy [13]. Similarly, a study by Zhou T. et al. (2022) found that among a population of 1,636 pregnant Chinese women, only 2.8% met ACOG's recommendation of at least 150 min of moderate-intensity PA per week [14]. In an Iranian study, it was also reported that in a group of 165 pregnant women, only 26.7% engaged in high levels of PA during pregnancy [15].

Various individual, interpersonal, social, and environmental factors may influence the level of PA among pregnant women. These include low educational attainment [16], employment status [17], pregnancy-related discomforts [7], fatigue [18], lack of access to facilities [12], and insufficient social support [19]. Findings across studies, however, are inconsistent. For instance, while some research suggests that higher education is associated with greater PA during pregnancy [20, 21], others have reported no such link [22, 23]. Similar discrepancies exist regarding employment status [24, 25], number of children [26, 27], and age [12, 28]. Moreover, few studies have focused specifically on the barriers to PA during pregnancy [29], with most assessing general activity levels [16].

Recent studies have relied on researcher-developed tools to assess PA during pregnancy; however, this study focuses on using a validated and psychometrically tested instrument (BPAPS) to explore barriers and their predictors among Iranian pregnant women [1, 16, 30, 31]. For example, many studies have used the Pregnancy PA Questionnaire (PPAQ) to assess PA levels. However, it has been reported that the PPAQ lacks sufficient structural validity in evaluating total and high-intensity PA [32]. As a result, certain aspects of the predictors of PA barriers in pregnant women may have been overlooked. Understanding these barriers is not only important for explaining low levels of PA but also for informing clinically relevant and context-sensitive interventions during prenatal care. Given the lack of relevant data on Iranian pregnant women and the cultural, attitudinal, and climatic variations across provinces that influence lifestyle choices, this study uniquely used a validated and psychometrically tested tool (BPAPS) to identify barriers to PA and their independent predictors among Iranian pregnant women, providing context-specific insights that extend previous research.

Methods

Participants

Iranian pregnant women aged 18–45, at 10–37 weeks of gestation, who could read and write in Persian, were included in the study (They were chosen to represent low-risk women of reproductive age, excluding very early and late stages of pregnancy where medical restrictions on PA are more common), had no medical restrictions on PA during pregnancy as determined by a physician or midwife (Medical restrictions were determined through self-report by asking participants whether their physician or midwife had advised them to avoid PA. Women with any contraindications, including signs of threatened preterm labor (regular painful contractions, vaginal bleeding, or amniotic fluid leakage), were excluded from the study), and did not exhibit conditions such as severe disability or symptoms like excessive shortness of breath, severe chest pain, dizziness or fainting that did not improve with rest. Additionally, participants were excluded if they showed signs of preterm labor (regular painful uterine contractions, vaginal bleeding, or continuous fluid leakage from the vagina). Eligible women were required to provide informed written consent to participate. Samples who left more than 10% of the questionnaire items unanswered were excluded from the study [33].

Study design

This cross-sectional study is the quantitative part of a sequential explanatory mixed-methods study conducted at all women's clinics and prenatal care facilities under Babol University of Medical Sciences. These educational treatment centers provide prenatal services by obstetricians and midwives. Sampling was carried out from May 2022 to August 2024 using a convenience sampling method among eligible pregnant women. Participants completed the self-reported surveys in person at the women's clinics. All quantitative data were de-identified and treated confidentially. The protocol for this sequential explanatory mixed-methods study has been published in the Journal of Client-Centered Nursing Care [34].

Instruments

We invited pregnant women to voluntarily complete a demographic-obstetric questionnaire. Additionally, we used the Barriers to PA During Pregnancy Scale (BPAPS) to assess barriers to PA. Both questionnaires were self-reported by eligible pregnant women.

Demographic-obstetric scale

This scale included questions about participants' age, spouse's age, education, occupation, pre-pregnancy/early pregnancy BMI, place of residence, gestational age, number of children, engagement in regular PA before pregnancy (Pre-pregnancy PA was defined as engaging in regular exercise (≥ 3 times per week of moderate-intensity activity) before conception), and participation in childbirth preparation classes.

BPAPS Scale

This questionnaire was created and psychometrically validated among 320 pregnant women attending perinatal clinics at health centers in Ilam, Iran, by Amiri Farahani, a co-author of this study, in 2021 and contains 29 items with four subscales: pregnancy-related intrapersonal barriers, non-pregnancy-related intrapersonal barriers, interpersonal barriers, and environmental barriers. It uses a five-point Likert scale, ranging from Strongly Disagree = 1 to Strongly Agree = 5. The total BPAPS score ranges from 29 to 145, with higher scores indicating greater barriers to PA during pregnancy. The internal consistency of the 29-item BPAPS scale was reported with a Cronbach's alpha of 0.824. The intraclass correlation coefficient (ICC) between test and retest was 0.87, confirming the high reliability of the scale. Cronbach's alpha values for the overall scale and its subscales were 0.82, 0.81, 0.73, 0.73, and 0.72, respectively. The construct validity of BPAPS was confirmed through known-group validity and exploratory factor analysis [35]. Additionally, for the present study sample (n = 351), we calculated the internal consistency, which yielded a Cronbach's alpha of 0.899, indicating good reliability.

Statistical analysis

For statistical analysis, after collecting the data and verifying its accuracy, descriptive statistics were reported using measures of central tendency (mean) and dispersion (standard deviation), or as frequencies and percentages. For the BPAPS subscales, higher scores were interpreted as greater barriers. To standardize the subscale scores and make them comparable, each score was adjusted by subtracting the minimum possible score for that subscale. This difference was then divided by the range of possible scores for the subscale (i.e., the difference between the maximum and minimum possible scores). Finally, the result was multiplied by 100 to express the standardized score as a percentage, making it easier to interpret and compare across subscales.

To predict PA barriers scores, both univariate and multivariate linear regression analyses were conducted. Multivariate analysis was employed to control for confounding variables, with both standardized and unstandardized regression coefficients, along with their 95% confidence intervals, reported. All analyses were performed using SPSS software version 23, with the significance level set at $P < 0.05$. In the absence of established clinical cut-off points for BPAPS, clinical relevance was interpreted based on relative differences between subscales and the identification of modifiable predictors associated with higher barrier scores.

Sample size

The sample size was calculated based on the study's objectives, with the largest required sample size taken into account. To achieve this, the sample size was calculated using data from previous studies on the mean total score of PA barriers [27], applying the formula for estimating a population mean. The calculation was based on the reported mean of 88.55 and a standard deviation of 19.28. With a 95% confidence level, a standard deviation of 19.28, and a margin of error of 1.5, the initial required sample size was 325 participants. Considering a 10% dropout rate, the final sample size was set at 358 participants.

Results

A total of 351 pregnant women responded to all the questionnaire items and were included in the analysis. The mean ± SD age of the participating women and their spouses was 29.06 ± 5.99 years and 33.55 ± 5.21 years, respectively. Most participants (74.4%, n = 261) were in the second half of their pregnancy (21 weeks or more), with a mean gestational age of 27.43 ± 8.45. Additionally, 72.1% of participants were either first-time mothers or

Table 1 Examples of the most commonly reported barriers in each subscale

Subscale	most commonly reported barriers in each subscale	Number of questions	Mean ± SD
Pregnancy-related intrapersonal barriers	"I cannot be physically active because of pain (such as back pain, hip pain, and/or headache)"	Q13	3.09 ± 1.14
Non-pregnancy-related intrapersonal barriers	"Physical activity is too hard for me"	Q1	3.06 ± 1.12
Interpersonal barriers	"I do not engage in physical activity because I lack access to complete information about physical activity during pregnancy"	Q20	2.80 ± 1.09
Environmental barriers	"There is too great a distance from my home to facilities designed for physical activity"	Q28	3.05 ± 1.17

Table 2 Demographic and obstetric characteristics of pregnant women

Variables	Items	Mean ± SD
Age		29.06 ± 5.99
Spouse's age		33.55 ± 5.21
GA (in weeks)		27.43 ± 8.45
BMI		26.08 ± 4.70
		Number (%)
Education	High school completion at most	234 (66.7)
	University education	117 (33.3)
Employment	Unemployed	316 (90.0)
	Employed	35 (10.0)
Place of Residence	Village	186 (53.0)
	City	165 (47.0)
Number of Children	One child at most	253 (72.1)
	Two children	73 (20.8)
	At least three children	25 (7.1)
Preparation Class for Childbirth***	No	211 (78.7)
	Yes	57 (21.3)
Regular PA before pregnancy	No	247 (70.4)
	Yes	104 (29.6)

*Body mass index

**gestational age

*** Childbirth preparation classes are conducted after the 20th week of pregnancy. Therefore, 83 women who were less than 20 weeks pregnant were excluded from the analysis

had only one child. The mean pre-pregnancy/early pregnancy BMI was 26.08 ± 4.70, and about one-third of the participants reported having a university-level education (Table 1).

As shown in Table 2, the total score for barriers to PA during pregnancy was 78.07 ± 16.25. Subscale scores were standardized on a 0-100 scale, with higher scores indicating greater barriers. The most significant barriers were related to environmental factors. The environmental barrier subscale had the highest mean score (43.67 ± 17.80), indicating that environmental factors represented the most prominent perceived barrier to PA during pregnancy. While interpersonal barriers were the least prominent (38.74 ± 17.93). To facilitate interpretation, standardized scores above 40 on the 0–100 scale were considered indicative of moderate to high perceived barriers. Based on this threshold, environmental barriers represented a clinically relevant obstacle to PA during pregnancy in this population. Examples of the most commonly reported barriers in each subscale included in Table 3. All barriers mentioned in Supplementary file 1.

In the univariate and multivariate linear regression analyses aimed at investigating the relationship between barriers to PA and several demographic-obstetric factors, four key variables emerged as strong independent predictors: education, employment, pre-pregnancy PA, and age. These predictors significantly influenced the barriers experienced by pregnant women in engaging in PA. Higher education was associated with fewer barriers to PA. In the univariate regression, each additional level of education was associated with an average reduction of 6.35 points in the barriers score. In the multivariate regression analysis, a one-unit increase in education level was linked to a reduction of 4.39 points in the barriers score. These findings were statistically significant ($P < 0.05$).

Also, Pregnant women who were employed reported better PA status. The barriers score for employed women was 7.85 points lower than that of non-employed women

Table 3 Total score of barriers to physical activity and subscale scores

Variables	Total Mean (SD)	Median (IQR)	Minimum-Maximum
Intrapersonal barriers related to pregnancy	27.26(6.56)	27.00(22.00_31.00)	10.00_49.00
	43.16(16.40) [a]	52.50(30.00-52.50)	0-100
Intrapersonal barriers non-related to pregnancy	13.33(3.76)	13.00(11.00_16.00)	5.00_25.00
	41.68(18.80) [a]	40.00(30.00–55.00)	0-100
Interpersonal barriers	12.74(3.58)	12.00(10.00_15.00)	5.00_25.00
	38.74(17.93) [a]	35.00(25.00–50.00)	0-100
Environmental barriers	24.72(6.40)	24.00(20.00_28.00)	9.00_44.00
	43.67(17.80) [a]	41.66(30.55–52.77)	0-100
Total score	78.07(16.25)	78.00(67.00_87.00)	29.00_142.00

[a]Scores were standardized to a 0-100 scale for comparability across subscales. Scoresare based on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Higher scores indicate greater perceived barriers to physicalactivity

Table 4 Relationship between total score of barriers to physical activity and demographic and obstetric characteristics based on univariate linear regression analysis

Variables	β (SE)	Beta	95% (CI)	*P**
Education (High school completion at most/ University education)	-6.35 (1.81)	-0.18	-9.91 To -2.79	**0.001**
Employment (unemployed/employed)	-7.85 (2.86)	-0.14	-13.50 To -2.21	**0.006**
Number of Children (One child at most/ Two children/ At least three children)	4.87 (1.40)	0.18	2.11 To 7.63	**0.001**
Residence (Village/City)	4.23 (1.72)	0.13	0.84 To 7.62	**0.015**
Preparation Class for Childbirth (no-yes)	-5.49 (2.45)	-0.13	-10.33 To -0.66	**0.026**
Pre-pregnancy PA (no/yes)	-8.97 (1.84)	-0.25	-12.59 To -5.35	**0.000**
Age	0.41 (0.14)	0.15	0.13 To 0.69	**0.004**
Spouse's Age	0.23 (0.16)	0.07	-0.09 To 0.55	0.167
BMI	0.29 (0.18)	0.08	-0.07 To 0.65	0.116
GA (in weeks)	-0.13 (0.10)	-0.06	-0.33 To 0.07	0.204

*$p < 0.05$

Bold values indicate statistically significant results ($p < 0.05$)

in the univariate analysis and 9.54 points lower in the multivariate analysis ($P < 0.05$). Women who engaged in regular PA prior to pregnancy experienced fewer barriers during pregnancy. The univariate regression analysis revealed that women who participated in regular PA before pregnancy faced barriers that were approximately 9 points lower. In the multivariate analysis, those who were physically active prior to pregnancy showed a barriers' score reduction of 7.34 points compared to their inactive counterparts ($P < 0.05$). Younger pregnant women reported fewer barriers to PA compared to older participants. In both the univariate and multivariate regression analyses, for each additional year of maternal age, the barriers score increased by 0.41 points and 0.91 points, respectively ($P < 0.05$) (Tables 4 and 5).

Discussion

The present study aimed to identify the barriers to PA and their predictors among pregnant Iranian women. By quantifying the relative contribution of different types of barriers, the present study provides clinically meaningful insights into which factors may be most amenable to intervention during pregnancy. Unlike previous studies that primarily described general barriers to PA, our study uniquely applied a validated tool to quantify specific types of barriers and their predictors within a culturally distinct population. This study focused on identifying and quantifying perceived barriers to PA, providing a foundation for future research to examine how these barriers translate into actual PA behaviors. The results revealed that the most significant barriers to PA were environmental factors, whereas interpersonal barriers were the least significant. Women with higher education levels, those who were employed, those who engaged in regular PA before pregnancy, and younger women reported fewer barriers to PA during pregnancy.

The most significant environmental barriers included limited access to exercise facilities (such as being far from home, unsuitable conditions, and a lack of available locations) and difficulties in engaging in PA during extreme cold or hot weather. Koleilat et al. [36] also reported that extreme temperatures were among the most important barriers to exercising during pregnancy [36]. A recent qualitative study conducted in Iran with 40 participants found that urban congestion and the prevalence of numerous residential buildings limited the availability of suitable walking spaces for pregnant women [37]. Similarly, Dolatabadi et al. [27] identified these factors as environmental barriers affecting pregnant Iranian women; however, their research indicated that

Table 5 Relationship between barriers to physical activity score and demographic and obstetric characteristics based on multivariate linear regression analysis

Variables	β (SE)	Beta	95% (CI)	P^*
Education (High school completion at most/ University education)	-4.39 (2.20)	-0.12	-8.73 To -0.5	**0.047**
Employment (unemployed/employed)	-9.54 (3.46)	-0.16	-16.37 To -2.71	**0.006**
Number of children (One child at most/ Two children/ At least three children)	2.66 (1.72)	0.09	-0.73 To 6.06	0.124
Residence (Village/City)	0.31 (2.01)	0.009	-3.64 To 4.26	0.877
Preparation Class for Childbirth (no-yes)	-1.54 (2.50)	-0.03	-6.45 To 3.38	0.538
Pre-pregnancy PA (no/yes)	-7.34 (2.07)	-0.20	-11.43 To -3.25	**< 0.001**
Age	0.91 (0.24)	0.32	0.43 To 1.38	**< 0.001**
Spouse's Age	-0.59 (0.27)	-0.18	-1.14 To -0.04	**0.035**
BMI	0.38 (0.21)	0.10	-0.04 To 0.80	0.075
GA (in weeks)	-0.18 (0.19)	-0.05	-0.57 To 0.20	0.357

*$p < 0.05$

Adjusted for women's education, women's job, number of children, place of residence, preparation class for childbirth, pre-pregnancy physical activity, women's age, spouse's age, women's BMI, GA

*R square = 0.19 and adjusted R square = 0.16

Bold values indicate statistically significant results ($p < 0.05$)

environmental barriers received the lowest overall scores [27]. This discrepancy in results may be attributed to the differing geographical contexts of the studies, particularly between northern and southwestern Iran. Furthermore, the current study had a larger representation of participants from rural areas, where lower socio-economic status and geographic location may lead to reduced access to essential facilities for PA compared to those in urban settings. From a clinical and public health perspective, the prominence of environmental barriers suggests that individual-level counseling alone may be insufficient, and structural interventions are required to meaningfully reduce PA barriers during pregnancy.

Regarding intrapersonal barriers related to pregnancy, the most significant obstacles were related to pain (such as back pain, pelvic pain, or headaches) and pregnancy-related changes, such as a growing abdomen and changes in appearance. This finding is likely due to the physiological changes associated with pregnancy that are necessary for the growth and maintenance of the pregnancy. Additionally, many pregnant women reported viewing pregnancy as a time for rest, which made PA difficult due to lack of energy and fatigue. The belief that pregnancy is a time for rest may be because there is still no culture of exercise for pregnant women in developing countries like Iran, and such beliefs have persisted over time [27]. Similarly, previous studies identified intrapersonal barriers related to pregnancy, including lack of energy, pain, and swelling [27, 36]. In a population of Saudi Arabian women, 25% identified fatigue as a barrier to engaging in PA during pregnancy [38]. Additionally, back pain and pelvic discomfort are prevalent, with nearly half of pregnant women reporting these issues, which can further hinder PA participation [39]. Pregnancy-related pain may be an important predictor of reduced PA during pregnancy. Addressing this factor through pain management education and physiotherapy support could help improve activity levels among pregnant women.

In terms of intrapersonal barriers unrelated to pregnancy, participants most frequently reported that "PA is too hard" and a lack of motivation. Additionally, many women cited multiple responsibilities such as childcare, and time constraints as reasons for their reduced PA. Given the rising trend of sedentary lifestyles outside of pregnancy, it is not surprising that many women find it difficult to engage in PA during pregnancy [9, 36], particularly in the current study, where approximately 70% reported no history of PA prior to pregnancy. Furthermore, in Iranian culture, the responsibility for raising and caring for children predominantly falls on women, which significantly impacts their personal time. It should be noted that in this study, PA refers to structured exercise rather than daily movement. Although caring for young children involves physical effort, it typically limits the time and opportunity mothers have for planned exercise. These findings highlight the importance of educating and encouraging spouses to share household responsibilities and parenting duties, allowing mothers to have more personal time and engage more effectively with their children. Supporting evidence from previous studies reinforces these findings [27, 40], indicating that shared responsibilities can lead to improved maternal well-being and increased opportunities for PA, ultimately benefiting both mothers and their children.

In the context of interpersonal barriers, the highest scores were related to the lack of access to sufficient information about PA and discouragement from friends and relatives. Similarly, previous studies have noted that women often have limited knowledge about PA [27, 41] and that discouragement from peers [27, 37] serves as a barrier to engaging in PA during pregnancy. The lack of awareness may result from incomplete information

transfer and the limited time that healthcare providers allocate for delivering prenatal care during pregnancy. Additionally, many healthcare providers lack the necessary skills to educate patients about PA [42]. Therefore, empowering healthcare providers, such as midwives and obstetric specialists responsible for prenatal care, could improve the quality of services and enhance the health outcomes of pregnant women. In a qualitative study by Kianfard et al. [37], some pregnant women identified their spouses as a significant barrier to maintaining PA [37]. This discouragement may arise from concerns about potential harm to both the mother and fetus, underscoring the need for interventions such as counseling sessions for couples and childbirth preparation classes that involve spouses.

In the present study, regular PA before pregnancy, education level, employment status, and maternal age were identified as the most significant predictors of barriers to PA. The results indicated a significant association between regular pre-pregnancy PA and barriers to engaging in PA. Similarly, previous studies have shown that pregnant women who did not have a routine exercise habit before pregnancy were less likely to adhere to PA recommendations during pregnancy [43, 44]. Coll et al. [45] found that women who engaged in regular PA before pregnancy encountered similar barriers to PA during pregnancy as those who were inactive beforehand; however, they typically made an effort to uphold their pre-pregnancy exercise routines [45]. Additionally, it has been reported that if women are inactive before pregnancy, this inactivity can become habitual, making it difficult to modify their behavior later on [46]. For instance, Haakstad et al. [26] found that only 3.4% of women who were inactive before pregnancy started exercising during pregnancy [26]. Such findings emphasize the importance of PA among women of childbearing age. Educating women before pregnancy can lead to a reduction in the consequences of inactivity during pregnancy; however, such educational approaches should be supported by broader systemic and environmental measures that facilitate equitable access to PA opportunities.

Educating women before pregnancy can lead to a reduction in the consequences of inactivity during pregnancy.

In relation to education level, the present study found that women with a university education reported significantly fewer barriers to PA on average. Similarly, previous studies have also reported this association [13, 28]. These findings may be attributed to the fact that educated women are generally more aware of the benefits of PA. Therefore, it is crucial to ensure that women with lower educational levels receive comprehensive information regarding how to participate in PA and the associated benefits during pregnancy. To achieve this, prenatal care centers could create and distribute brochures on this topic to women or provide in-person or telephone counseling services conducted by trained professionals to encourage PA [26, 27, 30] In contrast to the current study, Haakstad et al. [26] reported no significant relationship between exercise in the third trimester and education level [26]. This contradictory finding may be attributed to the fact that most pregnant women participating in their study were at a favorable educational and socio-economic status.

Women's employment emerged as one of the strongest predictors of barriers to PA in the current study. Pregnant women who were employed reported fewer barriers to PA. Similarly, a previous study indicated that unemployment led to reduced adherence to the recommendations from ACOG and American College of Sports Medicine (ACSM) among pregnant women [24]. However, two studies conducted in the Netherlands and Africa found that unemployed women were more physically active during pregnancy than their employed counterparts [17, 28]. Additionally, Evenson et al. [47] found no significant relationship between employment and PA levels among pregnant women [47]. This discrepancy in results may stem from cultural variations and differences in how PA is defined across various studies.

Our study indicated that older women reported more barriers to PA during pregnancy. Similarly, Hailemariam et al. [1] found that pregnant women aged 26 to 35 were significantly more likely to be inactive compared to their counterparts aged 16 to 25 [1]. However, the study by Okafor et al. [12] showed that pregnant women under the age of 19 were less compliant with PA recommendations than those aged 19 to 34 [12]. Other studies have indicated that the relationship between the age of pregnant women and PA during pregnancy is ambiguous [19, 27]. Consequently, additional research is necessary to explore PA and its barriers across various age groups of pregnant women to provide more comprehensive insights.

The univariate analysis of the present study revealed a significant relationship between the number of children, place of residence (urban/rural), and participation in childbirth preparation classes with the overall barriers to PA among pregnant women. Women who were first-time mothers or had at most one child reported fewer barriers to PA compared to those with multiple children. Similarly, Meander et al. [13] reported that not having children was associated with higher levels of PA [13]. However, a recent study conducted in Iran found no significant relationship between the number of children and barriers to PA [27]. On the other hand, the results of a study by Mendinueta et al. [48] indicated that the number of previous children had a positive correlation with light to moderate PA during pregnancy [48]. Such findings necessitate further investigations into the

role of parity and the number of children on PA, as previous children may be perceived as barriers to women's PA during pregnancy in societies where caregiving and household responsibilities predominantly fall on women [27, 40]. Conversely, women with higher socio-economic status who may not be solely responsible for caring for their previous children, as well as those receiving social support from spouses and peers, may have greater motivation and more time to dedicate to PA [48].

Our study results indicated that rural pregnant women reported higher scores of barriers to PA. This finding may be attributed to a lack of facilities and limited access to parks and recreational venues. Urban women might utilize parks and streets for light to moderate physical activities such as walking. Similarly, a study by Szubert et al. [49] in Poland reported that women living in rural areas were less physically active during pregnancy compared to those living in urban areas [49]. However, Evenson et al. [47] did not report such a relationship [47]. Future research aimed at examining factors influencing PA during pregnancy and the role of place of residence may provide insights for implementing interventions to promote PA during pregnancy, addressing residence-related factors.

The current results indicated that participation in childbirth preparation classes was linked to fewer barriers to PA among pregnant women. Prior research has also demonstrated that attending these classes enhances pregnant women's understanding of the benefits of PA, which can lead to increased levels of activity and improved quality of life [50, 51]. Consequently, childbirth preparation classes may serve as an effective and accessible strategy for addressing physical inactivity during pregnancy.

Strengths and limitations

Among the limitations of this study are the lack of objective tools (such as accelerometers or pedometers) for assessing PA and the reliance on self-reported, closed-ended questions. Furthermore, although a validated and reliable instrument was used, there are no established clinical cut-off points for the BPAPS, which limits the interpretation of absolute barrier scores. In addition, due to the cross-sectional design of the study, causal relationships between the identified predictors and PA barriers cannot be inferred. Moreover, we did not explore the influence of socio-economic status on the barriers to PA among pregnant women, as establishing rapport with participants to accurately disclose their economic information through household income questionnaires proved to be challenging. Future research is recommended to investigate the impact of socio-economic characteristics and other factors, such as personality traits and social support, that may influence PA in pregnant women. Although gestational age (10–37 weeks) was adjusted in the multivariate analysis, the inclusion of participants from all trimesters remains a design limitation, as trimester-specific variations in perceived barriers could not be explored.

We included only healthy women without pregnancy complications in this study, so the findings do not be representative of all pregnant women in diverse regions and communities. Therefore, future studies should involve a more diverse sample of pregnant women, including those with underlying health conditions or from different ethnic backgrounds. Also, the convenience sampling limits the study's generalizability. Despite these limitations, we collected valuable background information that aids in addressing barriers to PA among pregnant women, thereby complementing prior research. Additionally, we utilized a specific scale designed to assess barriers to PA for pregnant women, which has seen limited application in earlier studies.

Conclusions

The results of our study indicated that environmental barriers constituted the most prominent obstacles to PA among pregnant women, whereas interpersonal barriers were perceived as less influential. Higher educational attainment, employment, engagement in regular PA prior to pregnancy, and younger maternal age were associated with lower perceived barriers to PA during pregnancy. From a clinical and public health perspective, these findings suggest that individual-level counseling alone may be insufficient to address PA during pregnancy. Instead, multilevel approaches that combine education with improvements in environmental conditions, such as access to safe and suitable spaces for PA, may be required. Healthcare providers involved in prenatal care may benefit from using these findings to identify women who are more likely to experience higher barriers and to tailor counseling accordingly. While this study does not establish causal relationships, it highlights modifiable factors that may inform the design of future interventions aimed at reducing PA barriers during pregnancy. Further longitudinal and interventional research is warranted to examine how addressing these barriers may influence PA behaviors and maternal health outcomes.

Abbreviations

PA	Physical Activity
ACOG	American College of Obstetricians and Gynecologists
BPAPS	Barriers to Physical Activity in Pregnant Scale
PPAQ	Pregnancy Physical Activity Questionnaire
BMI	Body Mass Index
GA	Gestational Age

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12884-026-09034-z.

Supplementary Material 1.

Acknowledgements
The authors would like to thank the Shahid Yahyanejad Clinical Research Development Center and all the pregnant women who participated in the study.

Authors' contributions
F.B. & R.F. Conceptualization, Methodology, Software. HA.N. Validity tests, Data curation, R.F. & F.B. Writing- Original draft preparation. F.B. Supervision, Visualization, Investigation. R.F., F.B., A.O., L.A.F., S.N., & HA.N. Writing- Reviewing and Editing.

Funding
This study was financially supported by Babol University of Medical Sciences. Grant Number: 724134896.

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The present cross-sectional study was part of a mixed-methods research project approved by the Ethics Committee of Babol University of Medical Sciences (IR.MUBABOL.HRI.REC.1401.238). Participation was voluntary, and only women who provided informed written consent completed the questionnaires. Participants were assured that their choice not to participate or to withdraw from the study would not affect the quality of their prenatal care. Additionally, confidentiality and the privacy of the participants were strictly upheld. Research conducted in accordance with the Helsinki Declaration.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 30 January 2025 / Accepted: 30 March 2026
Published online: 06 April 2026

References

1. Hailemariam TT, Gebregiorgis YS, Gebremeskel BF, Haile TG, Spitznagle TM. Physical activity and associated factors among pregnant women in Ethiopia: facility-based cross-sectional study. BMC Pregnancy Childbirth. 2020;20:1–11.
2. Watson ED, Van Poppel MN, Jones RA, Norris SA, Micklesfield LK. Are south African mothers moving? Patterns and correlates of physical activity and sedentary behavior in pregnant black south African women. J Phys Activity Health. 2017;14(5):329–35.
3. De Haas S, Ghossein-Doha C, Van Kuijk S, Van Drongelen J, Spaanderman M. Physiological adaptation of maternal plasma volume during pregnancy: a systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2017;49(2):177–87.
4. Ribeiro MM, Andrade A, Nunes I. Physical exercise in pregnancy: benefits, risks and prescription. J Perinat Med. 2022;50(1):4–17.
5. Davenport MH, McCurdy AP, Mottola MF, Skow RJ, Meah VL, Poitras VJ, et al. Impact of prenatal exercise on both prenatal and postnatal anxiety and depressive symptoms: a systematic review and meta-analysis. Br J Sports Med. 2018;52(21):1376–85.
6. Santini C, Imakawa TS, Moisés ECD. Physical activity during pregnancy: recommendations and assessment tools. Revista Brasileira de Ginecol e Obstetrícia. 2017;39(08):424–32.
7. Sytsma TT, Zimmerman KP, Manning JB, Jenkins SM, Nelson NC, Clark MM, et al. Perceived barriers to exercise in the first trimester of pregnancy. J Perinat Educ. 2018;27(4):198.
8. Connolly CP, Feltz DL, Pivarnik JM. Overcoming barriers to physical activity during pregnancy and the postpartum period: The potential impact of social support. Kinesiol Rev. 2014;3(2):135–48.
9. Obstetricians A, Of. gynecologists. Physical activity and exercise during pregnancy and the postpartum period. Committee opinion 650. Obstet Gynecol. 2015;126(6):e135–42.
10. Flannery C, McHugh S, Anaba AE, Clifford E, O'Riordan M, Kenny LC, et al. Enablers and barriers to physical activity in overweight and obese pregnant women: an analysis informed by the theoretical domains framework and COM-B model. BMC Pregnancy Childbirth. 2018;18:1–13.
11. McKeough R, Blanchard C, Piccinini-Vallis H. Pregnant and postpartum women's perceptions of barriers to and enablers of physical activity during pregnancy: A qualitative systematic review. J Midwifery Women's Health. 2022;67(4):448–62.
12. Okafor UB, Goon DT. Physical activity level during pregnancy in South Africa: a facility-based cross-sectional study. Int J Environ Res Public Health. 2020;17(21):7928.
13. Meander L, Lindqvist M, Mogren I, Sandlund J, West CE, Domellöf M. Physical activity and sedentary time during pregnancy and associations with maternal and fetal health outcomes: an epidemiological study. BMC Pregnancy Childbirth. 2021;21:1–11.
14. Zhou T, Lin Y, Xu F, Ma X, Wang N, Ding Y. Factors influencing physical inactivity status among Chinese pregnant women: a cross-sectional study. BMC Public Health. 2022;22(1):2310.
15. Mirghafourvand M, Mohammad-Alizadeh-Charandabi S, Jafarabadi MA, Soltanpour S, Aghamiri V, Bagherinia M. Physical Activity during Pregnancy and its Relationship with the Functional Status of Primiparous Women Six Weeks after Childbirth: A Cohort Study. J Clin Diagn Res. 2018;12(11). https://doi.org/10.7860/JCDR/2018/36692.12245.
16. Todorovic J, Terzic-Supic Z, Bjegovic-Mikanovic V, Piperac P, Dugalic S, Gojnic-Dugalic M. Factors associated with the leisure-time physical activity (LTPA) during the first trimester of the pregnancy: the cross-sectional study among pregnant women in Serbia. Int J Environ Res Public Health. 2020;17(4):1366.
17. Merkx A, Ausems M, Budé L, de Vries R, Nieuwenhuijze MJ. Factors affecting perceived change in physical activity in pregnancy. Midwifery. 2017;51:16–23.
18. Whitaker KM, Wilcox S, Liu J, Blair SN, Pate RR. Pregnant women's perceptions of weight gain, physical activity, and nutrition using Theory of Planned Behavior constructs. J Behav Med. 2016;39:41–54.
19. Leppänen M, Aittasalo M, Raitanen J, Kinnunen TI, Kujala UM, Luoto R. Physical activity during pregnancy: predictors of change, perceived support and barriers among women at increased risk of gestational diabetes. Matern Child Health J. 2014;18:2158–66.
20. Downs DS, Chasan-Taber L, Evenson KR, Leiferman J, Yeo S. Physical activity and pregnancy: past and present evidence and future recommendations. Res Q Exerc Sport. 2012;83(4):485–502.
21. Gaston A, Cramp A. Exercise during pregnancy: a review of patterns and determinants. J Sci Med sport. 2011;14(4):299–305.
22. Gaston A, Vamos CA. Leisure-time physical activity patterns and correlates among pregnant women in Ontario, Canada. Matern Child Health J. 2013;17(3):477–84.
23. Santos PC, Abreu S, Moreira C, Lopes D, Santos R, Alves O, et al. Impact of compliance with different guidelines on physical activity during pregnancy and perceived barriers to leisure physical activity. J Sports Sci. 2014;32(14):1398–408.
24. AMEZCUA-PRIETO C, LARDELLI-CLARET P, OLMEDO-REQUENA R, MOZAS-MORENO J, BUENO-CAVANILLAS A, JIMÉNEZ-MOLEÓN JJ. Compliance with leisure-time physical activity recommendations in pregnant women. Acta Obstet Gynecol Scand. 2011;90(3):245–52.
25. Juhl M, Madsen M, Andersen AM, Andersen PK, Olsen J. Distribution and predictors of exercise habits among pregnant women in the Danish National Birth Cohort. Scand J Med Sci Sports. 2012;22(1):128–38.
26. Haakstad LA, Voldner N, Henriksen T, Bø K. Why do pregnant women stop exercising in the third trimester? Acta Obstet Gynecol Scand. 2009;88(11):1267–75.
27. Dolatabadi Z, Amiri-Farahani L, Ahmadi K, Pezaro S. Barriers to physical activity in pregnant women living in Iran and its predictors: a cross sectional study. BMC Pregnancy Childbirth. 2022;22(1):815.
28. Okafor UB, Goon DT. Physical activity and exercise during pregnancy in Africa: a review of the literature. BMC Pregnancy Childbirth. 2020;20:1–17.
29. Davoud A, Abazari M. The relationship between quality of life and physical activity, worry, depression, and insomnia in pregnant women. Iran J psychiatry. 2020;15(2):159.

30. Findley A, Smith DM, Hesketh K, Keyworth C. Exploring womens' experiences and decision making about physical activity during pregnancy and following birth: A qualitative study. BMC Pregnancy Childbirth. 2020;20:1–10.
31. Rabiepoor S, Rezavand S, Yas A, Ghanizadeh N. Influential factors in physical activity amongst pregnant women. Baltic J Health Phys Activity. 2019;11(2):4.
32. Sattler MC, Jaunig J, Watson ED, van Poppel MN, Mokkink LB, Terwee CB, et al. Physical activity questionnaires for pregnancy: a systematic review of measurement properties. Sports Med. 2018;48:2317–46.
33. Nulty DD. The adequacy of response rates to online and paper surveys: what can be done? Assess evaluation High Educ. 2008;33(3):301–14.
34. Fili R, Nazmi S, Behmanesh F, Omrani A, Nikbakht H, Amiri Farahani L. Barriers to Physical Activity in Pregnant Women: An Explanatory Sequential Mixed-method Study (Study Protocol). J Client-Centered Nurs Care. 2024;10(3):191–8.
35. Amiri-Farahani L, Ahmadi K, Hasanpoor-Azghady SB, Pezaro S. Development and psychometric testing of the 'barriers to physical activity during pregnancy scale'(BPAPS). BMC Public Health. 2021;21:1–9.
36. Koleilat M, Vargas N, vanTwist V, Kodjebacheva GD. Perceived barriers to and suggested interventions for physical activity during pregnancy among participants of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in Southern California. BMC Pregnancy Childbirth. 2021;21:1–9.
37. Kianfard L, Niknami S, SHokravi FA, Rakhshanderou S. Facilitators, barriers, and structural determinants of physical activity in nulliparous pregnant women: a qualitative study. J pregnancy. 2022;2022(1):5543684.
38. Alaglan AA, Almousa RF, Alomirini AA, Alabdularazaq ES, Alkheder RS, Alzaben KA, et al. Saudi women's physical activity habits during pregnancy. Women's Health. 2020;16:1745506520952045.
39. Velez S, McCarthy T, Spaeth A. Physical Activity and Pain During Pregnancy. Aresty Rutgers Undergrad Res J. 2024;1(5). https://doi.org/10.14713/arestyrurj.v1i5.223.
40. Tavakoly Sany SB, Vahedian Shahroodi M, Hosseini Khaboshan Z, Orooji A, Esmaeily H, Jafari A, et al. Predictors of physical activity among women in Bojnourd, north east of Iran: Pender's health promotion model. Archives Public Health. 2021;79:1–12.
41. Grenier LN, Atkinson SA, Mottola MF, Wahoush O, Thabane L, Xie F, et al. Be healthy in pregnancy: exploring factors that impact pregnant women's nutrition and exercise behaviours. Matern Child Nutr. 2021;17(1):e13068.
42. Lee A, Newton M, Radcliffe J, Belski R. Pregnancy nutrition knowledge and experiences of pregnant women and antenatal care clinicians: A mixed methods approach. Women Birth. 2018;31(4):269–77.
43. Xiang M, Zhang J, Liang H, Zhang Z, Konishi M, Hu H, et al. Physical activity and dietary intake among Chinese pregnant women: an observational study. BMC Pregnancy Childbirth. 2019;19:1–8.
44. Santo EC, Forbes PW, Oken E, Belfort MB. Determinants of physical activity frequency and provider advice during pregnancy. BMC Pregnancy Childbirth. 2017;17:1–11.
45. Coll CV, Domingues MR, Gonçalves H, Bertoldi AD. Perceived barriers to leisure-time physical activity during pregnancy: A literature review of quantitative and qualitative evidence. J Sci Med sport. 2017;20(1):17–25.
46. Mottola MF, Campbell MK. Activity patterns during pregnancy. Can J Appl Physiol. 2003;28(4):642–53.
47. Evenson KR, Savitz A, Huston SL. Leisure-time physical activity among pregnant women in the US. Paediatr Perinat Epidemiol. 2004;18(6):400–7.
48. Mendinueta A, Esnal H, Arrieta H, Arrue M, Urbieta N, Ubillos I, et al. What accounts for physical activity during pregnancy? A study on the sociodemographic predictors of self-reported and objectively assessed physical activity during the 1st and 2nd trimesters of pregnancy. Int J Environ Res Public Health. 2020;17(7):2517.
49. Szubert M, Ilowiecka M, Wilczynski J, Bilinski P, Wojtyla C. Health-related behaviors of pregnant women residing in urban and rural areas in Poland. Int J Environ Res Public Health. 2020;17(12):4395.
50. Naeeni MR, Simbar M. Effect of child birth preparation classes on empowering Iranian pregnant women: a systematic review. J Educ Community Health. 2018;5(1):61–71.
51. Malekpour AF, Salari P, Azar PH, Ismaeili H. Evaluation of the, effect of the education module preparing for childbirth on the level of anxiety during pregnancy and labor in primigravida women. 2005.

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