

Physical activity and associated factors among Indonesian pregnant women: a mixed-method study

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ABSTRACT

Exercise is recommended for pregnant women, but many are sedentary. Studies on barriers to physical activity and exercise among pregnant women in West Java Province, Indonesia, are scarce. This study aims to identify and explore the underlying factors associated with physical activity during pregnancy in West Java, Indonesia. This study was conducted using a mixed-methods strategy that integrates quantitative and qualitative data. The study surveyed pregnant women in West Java, Indonesia, from January to March 2023. The study involved 18-year-olds, married women, and fluent Bahasa participants. It used a questionnaire to assess physical pregnancy activity intention, and analyzed data using descriptive, correlation with $p < 0.025$ included in linear regression analysis. While in a qualitative study used semi-structure interview. A study of 200 pregnant women found that age negatively correlated with total metabolic equivalent of task (MET), while gestational age, education level, body mass index (BMI), and pregnancy complications positively impacted it. Pregnancy symptoms, limited time, and low social support were identified as themes impacting adhering to physical activity recommendations. The study reveals that factors such as age, gestational age, education level, BMI, and pregnancy complications significantly influence total MET in pregnant women, suggesting the need for personalized interventions.

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1. INTRODUCTION

The Ministry of Health reports that in 2020, there would be 189 maternal fatalities for every 100,000 live births in Indonesia, which is a 9.49% rise from 2019's rate. The country has made significant strides in reducing its maternal mortality rate, but it is still far from the Sustainable Development Goals (SDG) target of 70 deaths per 100,000 live births. Pregnancy-related haemorrhage and hypertension disorders were found to be the leading causes of maternal mortality in an Indonesian study [1]. Sanabria-Martínez *et al.* [2] verified the importance of physical activity in reducing maternal complications during pregnancy. Increased physical activity during pregnancy has been shown to decrease the risk of developing gestational diabetes, preeclampsia, caesarean section rates, and postpartum weight gain, as well as improve cardiorespiratory fitness and mental health [3]-[5].

The American College of Sports Medicine defines exercise as “physical activity consisting of planned, structured, and repetitive body movements.” Physical activity is defined as any bodily movement caused by the contraction of skeletal muscles. Without exception, pregnant women should try to build up at

least 150 minutes per week of moderate-intensity physical activity [5]. The benefits of exercise exceed the risks; thus, it's recommended to be active at least three times per week, but every day is even better [6]. A systematic review of 44 studies indicated that participants had a low level of physical activity during pregnancy [7]. Yet another Indonesian survey found that 33.5% of expecting moms were sedentary. Similar to other countries in Saudi Arabia, less than 15% of women comply with the recommended physical activity per week, with most having concerns regarding exercise and fetal wellbeing [8]. Similarly, European studies show only 21–30% of women maintain adequate activity during late pregnancy, despite supportive health systems [7]. Across African and Asian regions, cultural beliefs, fatigue, and limited facilities further constrain engagement [7].

Pregnant women face a complex and regionally nuanced set of barriers to engaging in regular physical activity. Pregnancy often presents barriers to physical activity, including fatigue, pregnancy symptoms, lack of motivation, time, social support, and concerns about safety for the baby and mother [9]-[13]. Cultural and religious views [13], as well as children, employment, and family duties or commitments [14], [15], are also frequently cited as barriers to prenatal exercise. Bad weather and a lack of convenient facilities are cited as environmental barriers to exercise [16].

Future efforts to increase prenatal exercise should be informed by a thorough understanding of the factors that discourage women from engaging in physical activity. However, studies assessing the barriers to physical activity and exercise among pregnant women in West Java Province are extremely scarce, as is research on prenatal physical activity and exercise among pregnant women in Indonesia as a whole. Applying a mixed-methods strategy, which integrates quantitative and qualitative data, would provide novel, deeper insights or understanding of the barriers to prenatal physical activity than either technique alone [17]. Therefore, the objective of this study was to identify and explore the underlying factors associated with physical activity during pregnancy in West Java, Indonesia.

2. METHOD

2.1. Study design and setting

This study employed a health-facility-based sequential explanatory mixed-methods design, integrating quantitative and qualitative approaches to investigate barriers to engaging in prenatal physical activity and exercise. Data were collected between January and March 2023 from pregnant women attending antenatal clinics across 12 randomly selected primary health centers in West Java, Indonesia. Quantitative data were obtained through structured questionnaires, followed by semi-structured qualitative interviews to gain deeper insights into perceived barriers not captured in the survey.

2.2. Operational definitions

To enhance conceptual clarity, the following operational definitions were applied:

- Physical activity during pregnancy: Any bodily movement produced by skeletal muscles that results in energy expenditure above resting levels, including household, occupational, transport, and leisure-time activities, as measured using the physical pregnancy activity questionnaire (PPAQ).
- Barriers to physical activity: Self-reported personal, environmental, or social obstacles that hinder engagement in regular physical exercise during pregnancy.
- Intention to perform physical exercise: The degree of motivation or readiness to engage in recommended prenatal physical activity, operationalized through responses to intention-related items in the questionnaire.
- Prenatal period: The duration from conception until the onset of labor, limited in this study to women in any trimester attending antenatal care.

2.3. Sample

Participants were eligible if they were aged ≥ 18 years, had a singleton pregnancy, were attending antenatal care, and could read or interpret Bahasa Indonesia. Exclusion criteria included physical disability or medical contraindications to exercise, such as persistent shortness of breath, vaginal bleeding, or severe chest pain. A total of 184 participants were recruited based on a sample size calculation using G*Power (version 3.1), assuming a medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, and power $(1-\beta) = 0.80$ for multiple regression with eight predictors. Convenience sampling was applied among women who met the inclusion criteria and consented to participate. For the qualitative phase, 20 women were invited; however, data saturation was reached after 15 interviews.

2.4. Measure

Demographic data, including age, gestational age, body mass index (BMI), educational level, marital status, parity, and having a pregnancy complication (yes/no).

2.4.1. Quantitative data

The physical pregnancy activity questionnaire comprised a total of 32 distinct activities, categorized as follows: household/caregiving activities (12 activities), occupational activities (5 activities), sports/exercise activities (9 activities, including 7 structured questions and 2 open-ended questions to capture any additional activities not previously listed), transportation activities (3 activities) and periods of inactivity (3 activities). The survey assesses energy expenditure associated with overall physical activity, as well as physical activity of mild intensity and above, using metabolic equivalent of task (MET) units (MET-h-week⁻¹). The activities were categorized based on their energy expenditure and further classified according to their intensity levels: i) sedentary activity, which has an energy expenditure of less than 1.5 METs; ii) light intensity activity, with an energy expenditure between 1.5 and less than 3.0 METs; iii) moderate intensity activity, with an energy expenditure between 3.0 and 6.0 METs; and iv) vigorous-intensity activity, with an energy expenditure above 6.0 METs. The assignment of MET values was based on the values provided in the questionnaire instructions and the compendium of physical activities. The present investigation observed a range of CVI values spanning from 0.73 to 1.00. The Cronbach's alpha values ranged from 0.779 to 0.887.

2.4.2. Qualitative data

The interview guideline was derived from a prior study conducted by [17] and supplemented with expert recommendations. The subsequent dialogue constituted an initial interview: i) What is your perspective on engaging in physical activity during pregnancy? ii) Can you elaborate on the rationale behind abstaining from physical activity during pregnancy? iii) Could you provide an explanation on how to manage various pregnancy scenarios?

2.5. Data collection

2.5.1. Quantitative design

The researchers obtained quantitative data from a sample of 12 health clinics. A standardized closed-ended questionnaire, administered by an interviewer, was utilised to gather quantitative data pertaining to the socio-demographic characteristics of the participants. The subsequent section of the questionnaire requests participants' input regarding the perceived obstacles to engaging in physical exercise during the perinatal period. The perceived barriers to prenatal physical activity and exercise were derived from a comprehensive literature analysis, and the items were devised by the researchers themselves.

2.5.2. Qualitative data

The interviews were carried out in the Bahasa language and had a duration ranging from 45 to 60 minutes. These interviews took place in a tranquil room within a health institution, with the intention of creating an atmosphere that was non-intimidating, pleasant, and conducive to open communication. The participants provided their informed agreement to have their interviews audio-recorded, and subsequently, these recordings were transcribed in an exact and unaltered manner. The participants openly articulated their perspectives regarding the obstacles encountered in engaging in physical exercise throughout the perinatal period. In order to enhance precision and reliability, the transcripts were subjected to a process of cross-validation with the audio-recorded interviews. Likewise, the participants were furnished with the interview transcripts and emergent themes, affording them the opportunity to provide feedback and verify the accuracy of the interviews.

2.6. Data analysis

2.6.1. Quantitative design

Data analysis was performed using two statistical software packages: IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA) and R statistical software version 4.3.3 (R Foundation for Statistical Computing, Vienna, Austria). Each software was applied for different analytical purposes to ensure the rigor and accuracy of both descriptive and inferential analyses. IBM SPSS Statistics was primarily used for data cleaning, coding, and descriptive and inferential analyses of the quantitative dataset. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were calculated to summarize participants' demographic and clinical characteristics. Tests of normality were conducted using skewness and kurtosis (acceptable range -1.96 to +1.96). For bivariate analysis, Pearson correlation tests were used for continuous variables and Chi-square tests for categorical variables to examine the association between demographic factors and physical activity. Variables with a $p < 0.20$ in bivariate analysis were entered into multiple linear regression models to identify independent predictors of intention to engage in physical activity. Assumptions of linear regression, including linearity, normality of residuals, multicollinearity, and outliers, were verified before model interpretation. Variance inflation factor (VIF) values < 10 indicated acceptable

multicollinearity, and R^2 was used to assess model explanatory power. Statistical significance was determined at $p < 0.05$ (two-tailed) [18].

R software was used to perform advanced statistical modeling and visualization. Specifically, R was utilized to validate regression assumptions through residual diagnostics and normality plots; generate graphical visualizations (e.g., scatter plots, regression fit lines, and confidence intervals) for enhanced interpretation of results; and compute the coefficient of determination (R^2) and model fit indices to cross-verify findings obtained from SPSS.

2.6.2. Qualitative data

Qualitative data were analyzed using thematic content analysis following the six-phase framework proposed. All interview recordings were transcribed verbatim in Bahasa Indonesia and subsequently translated into English for analytical accuracy. The researchers first engaged in data familiarization through repeated reading of transcripts to gain a holistic understanding of participants' narratives. Next, initial codes were generated inductively to capture meaningful features related to barriers, facilitators, and perceptions of physical activity during pregnancy. Codes were then collated into potential themes and subthemes that represented patterns across the dataset. These themes were further reviewed, refined, and defined through iterative discussion among the research team to ensure credibility, dependability, and confirmability.

To enhance trustworthiness, triangulation was applied by comparing findings from different researchers and by conducting member checking, in which participants reviewed and confirmed the accuracy of the interpretations. Field notes and reflective memos were used to maintain an audit trail throughout the analysis process. NVivo version 12 (QSR International, Melbourne, Australia) was used to assist in data organization, coding, and retrieval, while interpretive synthesis and visualization of emerging patterns were further supported using R software version 4.3.3.

3. RESULTS AND DISCUSSION

3.1. Result

3.1.1. Quantitative results

In a quantitative study, a total of 200 pregnant women were included in this study, with a response rate of 85%, as shown in Table 1. The mean age of pregnant women was 30.2 (SD = 3.71), and the gestational age was 21.5 (SD = 2.34). The majority (44.5%) had a secondary education level, 74% married, and 57% were nulliparous. About 13.5% of participants reported having a complication, as shown in Table 1.

The mean of total activity of pregnant women as measured by physical pregnancy activity questionnaire was 183.3 hours/week (SD = 23.2), and the activity of light intensity and above was 152.9 (SD = 21.9). By the intensity, the mean sedentary time was 30.4 hours/week (SD = 21.6), and light activity was 110.4 hours/week (SD = 27.4). Moreover, by type, the highest total MET was household/caregiving (56.4, SD = 19.3), as shown in Table 2.

Table 3 shows the correlation between demographic characteristics with total MET of pregnant women. Age was negatively associated with total MET, while gestational age, educational level, current BMI, and having pregnancy complications were positively associated with total MET. In linear regression, it showed that age, gestational age, educational level, current BMI, and having pregnancy complications were significant factors of PA, with an adjusted R-square was 31.5%, as shown in Table 4.

Table 1. Demographic characteristics of pregnant women (n = 200)

Variables	n (%)
Age (years), Mean \pm SD	30.2 \pm 3.71
Gestational age (week), Mean \pm SD	21.5 \pm 2.34
Educational level	
Primary education level	81 (40.5)
Secondary education level	89 (44.5)
Tertiary education level	30 (15)
Marital status	
Married	148 (74)
Single/widow/divorced	52 (26)
Parity	
Nulliparous	114 (57)
Multiparous	86 (43)
Any complication	
Yes	27 (13.5)
No	173 (86.5)

Table 2. Pregnancy physical activity based on (MET-h/week)

Variables	Mean \pm SD
Total activity scores	
Total activity	183.3 \pm 23.2
Total activity of light intensity and above	152.9 \pm 21.9
By intensity	
Sedentary (<1.5 METs)	30.4 \pm 21.6
Light (1.5–<3.0 METs)	110.4 \pm 27.4
Moderate (3.0–6.0 METs)	42.7 \pm 15.2
Vigorous (>6.0 METs)	1.78 \pm 0.35
By type:	
Household/caregiving	56.4 \pm 19.3
Occupational activity	37.8 \pm 10.9
Sports/exercise	12.8 \pm 11.8
Transportation	30.9 \pm 9.13
Inactivity	42.7 \pm 7.91

Table 3. Correlation between demographic characteristics with total MET of pregnant women (n = 200)

Variables	Total MET	p-value
Age (years), Mean ± SD		r = -0.321, 0.002
Gestational age (week), Mean ± SD		r = 0.307, 0.010
Current BMI, Mean ± SD		r = 0.421, 0.001
Educational level		
Primary education level	173.42 ± 57.2	t = 5.08, 0.001
Secondary education level	187.22 ± 61.9	
Tertiary education level	180.54 ± 59.4	
Marital status		
Married	189.1 ± 52.9	t = 1.36, 0.217
Single/widow/divorce	185.6 ± 55.2	
Parity		
Nulliparous	179.9 ± 60.3	t = 0.57, 0.562
Multiparous	180.5 ± 57.5	
Any complication		
Yes	170.2 ± 57.3	t = 6.72, 0.001
No	183.8 ± 52.9	

Table 4. Linear regression of physical activity (Total MET) in pregnant women (n = 200)

Variables	β (SE)	p-value
Age (years)	-0.158 (0.074)	0.020
Gestational age (week)	0.187 (0.081)	0.002
Current BMI	0.193 (0.078)	0.001
Educational level	0.158 (0.029)	0.001
Any complication	0.227 (0.109)	0.003
Adjusted R2	31.5%	

3.1.2. Qualitative results

About 15 pregnant women participated in individual in-depth semi-structured interviews during antenatal visits. The mean age of pregnant women was 31.7 (SD = 4.25), and the gestation age was 22.5 (SD = 3.10). About 10 of participant had a secondary education level, all were married, and 7 of them were nulliparous. About 3 of participant reported having a complication.

The theme, namely pregnancy symptoms, limited time, and low social support. This study has 7 sub-themes with 11 categories. Analysis of the data identified themes that impacted pregnant women's experiences adhering to recommendations regarding physical activity, as shown in Table 5.

3.2. Discussion

The present study observed a decreased degree of physical activity among pregnant women. Research findings indicate that there is a notable disparity between the favourable views of pregnant women towards physical exercise and their actual involvement rates, which are reported to be low. This observation implies the existence of a knowledge-action gap, wherein there is a disconnect between a pregnant woman's intention to engage in physical activity and her subsequent actions. The theory of planned behaviour (TPB) posits that intention and subsequent behaviour can be influenced by elements beyond attitudes, including barriers, enablers, and social factors [19]. Efforts to address obstacles to engaging in physical activity may focus on leveraging facilitators such as maternal health and well-being, as well as implementing interventions such as pregnancy-specific exercise groups that integrate social support. Additionally, incorporating time efficiency for women by pairing physical activity with antenatal visits, along with emphasising the importance of fun and enjoyment, can play a crucial role in initiating and sustaining behaviour change. The number provided is 104. This approach has the potential to enhance the transition from intention to action, which is crucial for promoting behaviour change. Moreover, it may prove more efficacious in enhancing pregnant women's engagement in physical activity compared to initiatives only focused on information or education.

The study revealed that intrapersonal factors play a significant role in influencing women's engagement in physical activity during pregnancy [20]. These factors can operate as both obstacles and facilitators to women's participation. Therefore, it is crucial to develop strategies that prioritise the individual needs of women and design interventions that are specifically adapted to their unique circumstances, including the stage of their pregnancy [21]. The use of a person-centred strategy has the potential to enhance the translation of favourable attitudes among pregnant women into heightened engagement in physical activity during pregnancy. Consequently, this method may prove to be more efficacious compared to only providing instruction. The study conducted by Grenier *et al.* [22] indicates that intrapersonal barriers experienced during pregnancy vary depending on the stage of pregnancy. For instance, early pregnancy is characterised by fatigue and nausea, while later stages are marked by changes in size and shape.

Consequently, it is imperative for physical activity interventions during pregnancy to be adaptable in order to accommodate these physical changes. This may involve transitioning from land-based physical activity to water-based alternatives as the pregnancy progresses. Hence, it is argued that exercise professionals should continuously assess and promote physical activity during pregnancy [23], [24]. This is necessary in order to customise interventions that accommodate the physiological changes that occur during pregnancy, thereby addressing personal obstacles and ultimately sustaining women's engagement in physical activity.

Table 5. Theme and sub-theme of barriers to doing physical activity in pregnant women

Themes	Sub-themes	Categoric	Example quotes
Pregnancy symptoms	Physical symptoms	Fatigue	<p>"I consistently have fatigue, sister. I like to remain at my residence and engage in the activity of watching television."</p> <p>"During pregnancy, I experience excessive fatigue that hinders my ability to engage in physical exercise."</p> <p>"Typically, I experience a lack of energy to engage in activities; however, I no longer get symptoms of vomiting or morning sickness."</p>
		Nausea and vomiting	<p>"I continue to experience symptoms of nausea and persistent vomiting."</p> <p>"I continue to experience episodes of vomiting, but not as frequently as previously. Specifically, I find that only some foods, particularly those with strong odours, still elicit a vomiting response or induce feelings of nausea in me."</p>
		Discomfort	<p>"In my opinion, if the pregnant lady experiences a sense of comfort, she may choose to engage in physical exercise throughout her pregnancy."</p>
	Psychological symptoms	Lazy	<p>"Personally, I have a tendency to exhibit a lack of motivation towards engaging in physical exercise. I like being at my residence as opposed to engaging in leisurely strolls."</p> <p>"I frequently have a sensation of weightiness, particularly given my proximity to the imminent delivery of my child. I experience a considerable burden, resulting in fatigue and an overwhelming need to engage in uninterrupted sleep when returning from work."</p>
		Feeling afraid	<p>"I am concerned about the potential risks posed to the foetus, such as the possibility of inducing a miscarriage or experiencing haemorrhaging that could harm the developing baby."</p> <p>"There is an undisclosed matter that I failed to communicate to you earlier, particularly about our cultural practises as Africans. It has been ingrained in our beliefs that engaging in physical exercise during pregnancy is discouraged, as it is perceived to pose potential risks of harm to both the expectant mother and the developing foetus."</p>
		Working mother	<p>"The commencement of my classes occurs at 08:00, with their conclusion taking place at 14:00 on a daily basis. This consistent schedule contributes to my perpetual fatigue. I am currently experiencing a lack of sufficient energy to engage in many activities, including the task of studying my academic materials. During periods of inactivity, particularly on weekends, I engage in sedentary behaviour, often involving sitting and watching television."</p>
Time limited	Other responsibilities	Neighbourhood	<p>"I do not engage in regular exercise due to constraints related to time availability."</p> <p>"I am experiencing fatigue; nonetheless, I am compelled to complete the tasks of food preparation, laundry, and cleaning. On numerous occasions, I assume the responsibility of caring for my sister's child for the entirety of the day, which proves to be a fatiguing endeavour."</p>
Low support	Informational support	Lack of knowledge	<p>"I was not provided with information regarding the potential health advantages associated with engaging in physical activity during the course of pregnancy."</p> <p>"I possess an insufficient amount of information regarding the topic of exercising during pregnancy."</p> <p>"I am uncertain about the recommendation of engaging in exercise during pregnancy."</p> <p>"I did not receive any information pertaining to physical activity and exercise during pregnancy, not even from the healthcare professionals."</p>
		No advice from a healthcare professional	<p>"I do not engage in regular physical exercise, but I am actively involved in several other activities. I frequently engage in walking, and after I have employment, I am responsible for performing tasks such as cleaning, washing, ironing, and occasionally cooking. I believe that I have reached a sufficient amount of information for my purposes."</p>
	Financial	Expensive price	<p>"I was not provided with information regarding the potential health advantages associated with engaging in physical activity while pregnant."</p>
		Inconvenience	<p>"I possess an insufficient amount of information regarding the topic of exercising during pregnancy."</p>

While the primary results of all the research exhibited similarities, certain less common themes were shown to have stronger associations with specific socio-cultural groups. These themes hold significance and should be taken into account while providing care for women belonging to these groups. According to Koleilat *et al.* [25], ensuring affordability and facilitating access to secure environments for engaging in physical activity

are crucial factors in promoting the participation of women residing in low-income regions. The significance of social connection and support from fellow pregnant women, including participation in pregnancy-specific exercise groups, was identified as crucial for women belonging to various socio-cultural backgrounds [26], those who were overweight or obese [27], and women in general [28]. When combined with antenatal visits and led by exercise specialists such as physiotherapists, pregnancy-specific exercise groups have the potential to provide a suitable physical activity choice throughout pregnancy. Additionally, these groups can offer reassurance to women who may have reservations about engaging in physical activity while pregnant.

4. CONCLUSION

The study found that age negatively impacts total MET, while gestational age, educational level, current BMI, and pregnancy complications positively impact MET. These factors were significant in the study of physical activity (PA) among pregnant women. The research identified seven sub-themes and 11 categorical themes affecting their experiences with physical activity recommendations. Customizing interventions to accommodate physiological changes during pregnancy can help address personal obstacles and sustain women's engagement in physical activity.

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ETHICAL APPROVAL

Digital informed consent was obtained using an online form prior to baseline assessments. The written approval of the Ethics Committee of Sekolah Tinggi Ilmu Keperawatan Abdi Nusantara was obtained (No. 0121/ETIK/XII/2022). The principles of anonymity and confidentiality were applied, and the participants were provided with the results upon their request.

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