Original Article

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Barriers and Incentives to Physical Activity: Findings from Indonesian Pregnant and Postpartum Mothers

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Abstract

Objective: The current study intends to inquire if pregnant and postpartum mothers are meeting the recommended level of physical activity, that is, 150 minutes of moderate-intensity activity throughout a week. The study also explores possible barriers and facilitating factors to exercising regularly to see differing patterns among the regularly exercising mothers and the non-exercisers. *Method:* A total of 190 mothers (69 pregnant) participated in an online-based survey. They answer questionnaires that gather their demographic information, physical activity pattern, and barriers-incentives to exercise. *Results:* The ones who do not exercise regularly outnumber those who regularly do. Both pregnant and postpartum mothers were not meeting the recommended physical activity level, although the postpartum mothers reported significantly higher engagement in physical activity. The mothers, however, did not differ in total time spent sitting. The pregnant and non-pregnant mothers differed in their perception of barriers and incentives to exercise, with non-exercising mothers reporting significantly more obstacles than their counterparts. The mothers' lack of motivation, self-efficacy, and absence of social support were the primary hindrances to participants exercising regularly. *Conclusion:* Mothers, especially pregnant and postpartum mothers, continue to be a high-risk group for physical inactivity. Understanding the mother's primary barriers and incentives to exercise may be crucial in improving their physical activity level and reducing their sedentary time.

Keywords: physical activity, exercise, mothers, pregnancy, postpartum

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INTRODUCTION

Research has shown that regularly exercising is beneficial to the overall physical and mental health [1–5]. Engaging in physical activity can help you reduce the risk of diseases, improve stamina, and improve mental health. As a general rule, the World Health Organization recommends that adults engage in 150 minutes of moderate-to-vigorous physical activity per week [6]. This activity should be spread equally over a week.

Experts have considered adjusting the general recommendation for physical activity to specific populations, including the pregnant and postpartum mothers (up to 12 months after delivery). The U.S. Department of Health and Human Services recommends that pregnant and postpartum mothers engage in 150 minutes of moderate-intensity exercise spread throughout the week [7]. The mothers can do the exercise throughout pregnancy terms, as long as they have no medical conditions preventing them from being active physically. This recommendation was echoed by the government of Australia [8]. A 30-minutes bout of aerobic exercises (e.g., walking, jogging, swimming, or yoga) is preferred on most days if not all days [9]. Experts recommend mothers can resume exercising as early as six weeks after labor [7,8,10,11]. However, return to exercising post-labor should be done gradually.

Benefits of regularly exercising during the pregnancy and after delivery include better maternal weight control, maintenance of fitness level for labor, prevention of gestational diabetes, maternal health, and emotional well-being [10,12]. Regularly exercising during pregnancy also reduces the risk of preterm labor [13] and results in better breastfeeding outcomes at 12 months after delivery [14]. Exercising during the lactation period has no negative interfering effect on milk production or the infant's growth in postpartum mothers [15].

Prior research has shown that pregnant and postpartum mothers had inadequate physical activity levels [11,16–20]. Few studies suggested a declining trend amount of moderate to vigorous activity that started during pregnancy which might continue to persist after [19–21]. Other studies showed that there might be an increase in physical activity in the post-pregnancy period as opposed to the pregnancy period [22,23]. However, the increment is marginal. Despite the differing results on whether physical activity level changes before and after the labor process, the studies indicate that pregnant and postpartum mothers are inactive.

Prior studies have also explored the possible determinants for pregnant and postpartum mothers to be inactive. Of these determinants, lack of time to exercise, the absence of social support, concern about childcare, and obligation to other roles are the most often cited perceived barriers preventing mothers from regular exercise [24–26]. Mothers tend to have more prominent roles in household and childcare that it takes their time and energy to take care of themselves, including regularly exercising [27–33].

Studies also suggest that having a supportive partner is pivotal for mothers to exercise. A spouse who motivates mothers to exercise or helps them with domestic chores and takes more responsibilities with childcare were reported as significant predictors of exercise engagement in mothers [19,32,34–36].

Personal and environmental factors might play a part in whether or not mothers exercise regularly. Postpartum mothers indicated that the lack of knowledge, interest, and drive to exercise impedes engaging in an active lifestyle [33,35,37]. The lack of access to proper facilities and personal safety for exercising due to the poor quality of the available public facilities hinders the mothers from exercising, especially those from low socioeconomic status [33,38].

Despite the mounting knowledge about mothers' physical activity, past studies have mainly been conducted in western countries [25] or developed countries [39–41]. The nature of mothers' physical activity in other regions is less known. The current study aims to identify if currently expecting and postpartum mothers meet the recommended level of physical activity in the Southeast Asian setting, specifically Indonesia. A recent report indicated that the Southeast Asian region had the lowest rate of physical inactivity among women (16.7%) [42]. However, a recent report by the Ministry of Health of the Republic of Indonesia indicates that one out of three adults (including women) in Indonesia are insufficiently active [43]. However, these studies make no specific reference to pregnant and postpartum mothers.

Experts in Southeast Asia acknowledge the importance of improving physical activity for mothers. However, no specific data about pregnant and postpartum mothers' physical activity is reported [44]. To the author's knowledge, this is the first study to evaluate pregnant and postpartum mothers' physical activity and factors impacting their decisions to engage in such activity in Indonesia. There has been one study that explored the association between physical activity and birth outcomes in Indonesia. Still, the focus was on whether physical activity levels affect birth outcomes and not on whether mothers comply with the recommended physical activity level [45]. Hence, the study intends to explore if Indonesian pregnant and postpartum mothers are sufficiently active and identify the possible barriers and facilitators to engaging in exercise for this mother.

MATERIAL AND METHODS

Participants

The researcher distributed the invitation to participate via a university's bulletin boards advertisement and the researcher's social media. The inclusion criteria were women over the age of 18 who had recently given birth (defined as within the last 12 months of the data collection process) or were pregnant at the time. The mothers should have no medical condition that prevents them from being physically active. Participants were given a thorough explanation of the study before informed consent to participate. Then, participants completed the questionnaire on sociodemographic variables, perceived health, exercise habit, and perceived barriers-incentives to exercising. The process was conducted on an online platform.

In total, 287 mothers replied to the invitation. However, the analytic sample consisted of 190 mothers (a 66.2% response rate) because the remaining mothers did not complete the questionnaires. Only 69 of the remaining participants (36.3%) reported being pregnant at the time, while 121 (63.7%) said they had recently given birth. The mothers who took part in the study mainly were college graduates (65.8%), with some having a master's degree (30.5%). Only 3.7% of the participants had a secondary school diploma or less as their highest level of education.

Nearly half of the participants were working full-time (47.9%). It is followed by a housewife (33.2%) and part-time arrangement (13.2%). A small fraction of the mothers were unemployed but looking for one (3.2%) and students (2.6%). None of the mothers felt that they had a poor health condition, with 60.5% reporting they have a good shape, and 39.5% reported having a fair health condition. Table 1 describes the general demographic data of the respondents. Since the data distribution deviates from a normal distribution, the demographic is presented using a median and interquartile range instead of mean and standard deviation. No significant differences were detected between the pregnant and non-pregnant subgroups in age, height, weight, and BMI.

Almost two-thirds of the current study's participants were postpartum mothers, while the remaining were pregnant at the data collection phase. More than half of the expectant mothers were primiparous (mothers who are pregnant for the first time)—only four mothers reported that the current pregnancies were their third experience. More than half of the postpartum mothers gave birth to their first offspring, while only 9.1% gave birth to their third child.

Measures

The Godin Leisure-Time Exercise Questionnaire

The study employed the Godin-Leisure Time Exercise Questionnaire (GLTEQ) to measure participants' exercise habits. The GLTEQ is among the widely used instrument for measuring physical activity due to its simplicity [46]. The GLTEQ is a 3-items questionnaire that measures the frequency of mild, moderate, and strenuous activities [47,48]. Participants must indicate the number of times they engaged in the activities of different intensities that lasted for a minimum of 15 minutes during participants' free time in a typical week. A response of "0" indicates participants usually do not engage in the activity. There is no upper limit of frequency for each type of activity.

Table 1. Demographic characteristics and physical activity levels of the participants.

Indicator	Non-pregnant (n = 121)	Pregnant (n = 69)
Age	Median = 30	Median = 30
	(interquartile: 28-34)	(interquartile: 28-33)
Height (in centimeters)	Median = 158	Median = 158
	(interquartile: 155-163)	(interquartile: 155-163.5)
Weight (in kilograms)	Median = 60	Median = 63
	(interquartile: 52-66)	(interquartile: 56-71)
BMI	Median = 23.6	Median = 24.8
	(interquartile: 21.4-25.7)	(interquartile: 22.6-27.9)
Level of education		
Postgraduate	28.1%	34.8%
University graduate	69.4%	59.4%
Secondary school or lower	2.5%	5.8%
Employment status		
Housewife	33.9%	31.9%
Fulltime	47.1%	49.3%
Parttime	13.2%	13.0%
Student	1.7%	4.3%
Currently looking for job	4.1%	1.4%
GLTEQ score*	Median = 8.5 (interquartile: 0-20)	Median = 6 (interquartile: 0-14)
MET minutes*	Median = 168 (interquartile: 46.4-588)	Median = 120 (interquartile: 48-396)
Sitting time per day (in minutes)	Median = 270 (interquartile: 120-420)	Median = 300 (interquartile: 120-420)

* Signifies significant difference at 0.05 level

The GLTEQ score is produced by the formula [(frequency of mild activity x 3) + (frequency of moderate activity x 5) + (frequency of strenuous activity x 9)]. Higher scores reflect higher levels of energy expenditure. Despite its simplicity, the GLTEQ offered a moderate level of concurrent validity with objective measures from the accelerometer (i.e., between 0.53 and 0.57)[49,50]. Additionally, previous studies demonstrated an adequate level of test-retest reliability (i.e., between 0.74 and 0.81) in healthy adults [51,52].

The International Physical Activity Questionnaire

The International Physical Activity Questionnaire short form (IPAQ-SF) short measures the frequency and duration of physical activities of differing intensities. Unlike the GLTEQ, which measures only the frequency of physical activities, the IPAQ-SF fast is a 4-items instrument. Participants must recall their frequency and duration of engaging in vigorous, moderate physical activity, walking, and time spent sitting during the past seven days [53]. The IPAQ-SF has been used for analyzing worldwide trends of physical activity [42,54].

The IPAQ-SF can measure the metabolic equivalent of task (MET)-minutes per week. MET is an approximation of total energy spent in different activities, where 1 MET is equal to the energy disposed of when we sit quietly per minute [55–58]. The MET minutes per week is calculated by multiplying the frequency and duration (in minutes) of the vigorous, moderate, and walking activity with specific values (walking = 3.3, moderate activity = 4, vigorous activity = 8). For example, if a participant walked for 10 minutes 5 days a week and reported no moderate nor vigorous activities, then the total MET minutes for the activity are 3.3 x 5 x 10 = 165 MET minutes a week.

In addition to MET minutes, the IPAQ-SF also provided times spent on sitting that can be scrutinized if exercising and non-exercising mothers differed. Studies found that the IPAQ-SF has an

acceptable stability index when assessed between 7 and 14 days [53,59,60]. A recent study suggested that the Indonesian version also offers good psychometric properties [61].

Barriers and Incentives to Physical Activity

The current study employed a 36 items survey (23 items of perceived barriers and 13 items of perceived incentives to physical activity) used in a study of Pacific Islands Family [62]. The reason for selecting the survey is related to the items covering a variety of correlates to physical activity. The correlates include role overload concerning mothers' responsibilities (e.g., "Lack of time due to family responsibilities," or "I would have to get someone to get my children). Studies suggested role overload over family responsibilities hinders mothers from exercising [30–33,37,62].

Other items related to self-efficacy to engage in regular exercise are also included in the survey (e.g., "I do not know how to be physically active") [34,63–65]. The survey also covers barriers related to negative self-beliefs (e.g., "I am too old"), motivation (e.g., "There are other things I'd rather do in my free time," "Whenever I was physically active, I would earn points towards free things like magazines, clothes, and travel"), and environmental factors (e.g. "Facilities (parks, gyms) too hard to get to")

Each item of the perceived barriers and facilitators (e.g., "I had an extra hour of free time during the day") is presented on a 5-point Likert scale. A score of one indicates that the perceived barrier/facilitator does not impact the participants' exercising behavior. In contrast, a score of five means that the barrier/facilitator substantially affects the participants' exercise behavior strongly.

Cultural adaptation of the instruments

We translated instruments for the current study, except for the IPAQ. The GLTEQ and perceived barriers-incentives to exercise are adapted using a translation and back-translation process. Two bilingual experts translated the questionnaires from English to *Bahasa Indonesia*. The translators are familiar with the instrument's vocabulary and work independently before discussing any discrepancies. The second phase was the back-translation process, where two different experts translated the questionnaire back to English and discussed any differences. The IPAQ-SF has been translated in *Bahasa Indonesia* and the version has good psychometric properties [61].

Data Analysis

The author first analyzed the categorical data (currently pregnant versus non-pregnant and regularly exercising versus non-exercising) using chi-square to see any association between pregnancy status and exercising habits. The author then proceeded with the analysis of normality of the data of the GLTEQ, MET minutes, and time spent sitting in 7 days among exercising and non-exercising group mothers. We evaluated all statistical analyses against $\alpha = 0.05$ significance level.

Since the sample in the current study is small and was not equal between the pregnant and non-pregnant mothers, we perform a Shapiro-Wilk test. Our preliminary analysis revealed that our data deviates from the normal distribution. The GLTEQ scores significantly indicate non-normal distribution ($W_{pregnant} = 0.828$, $df = 69$, $p < 0.01$; $W_{non\text{-}pregnant} = 0.837$, $df = 121$, $p < 0.01$). We found similar observation with MET minutes ($W_{pregnant} = 0.701$, $df = 69$, $p < 0.01$; $W_{non\text{-}pregnant} = 0.542$, $df = 121$, $p < 0.01$) and total sitting time in a week ($W_{pregnant} = 0.943$, $df = 69$, $p < 0.01$; $W_{non\text{-}pregnant} = 0.882$, $df = 121$, $p < 0.01$).

Based on the outcome, we employed a nonparametric test of independent samples (Mann-Whitney test) to test differences in mothers' physical activity levels. Past studies suggested that the number of children in a household could negatively impact mothers' physical activity levels [40,66]. Hence, we also performed additional analysis to see whether the number of children in the household impact mothers' physical activity levels. We compared physical activity level between mothers of one and mothers of more than one child. Mothers of two and three children were grouped because the number of mothers of three children was minimal (n = 14). We performed the analysis for currently pregnant mothers and non-pregnant mothers separately.

We also performed a differential analysis of the perceived barriers and facilitators to uncover if exercising and non-exercising mothers have varying patterns. We also analyzed the potential impact of having more than one child on physical activity level and perceived barriers-incentives.

RESULTS

Mothers' Physical Activity Level

The analysis of exercise habits reveals that the number of mothers who do not regularly exercise was more than three times the number of mothers who regularly exercise. For the exercising mothers, the most common exercise they do is yoga (35%). It is then followed by aerobic dance (20%), running (13.3%), bodybuilding exercise (13.3%), walking (10%), swimming (10%), and other types of exercise (8.4%).

A chi-square analysis revealed no association between pregnancy status and the act of exercising at the .05 significance level. The participating mothers had a median GLTEQ score of 6 (interquartile: 0-17), with non-pregnant mothers scored significantly higher in GLTEQ (U = 1366.50, z = -5.63, p < 0.01). A similar finding can be observed in the MET minutes per week. The non-pregnant participants had a higher median of 168 MET minutes per week, than pregnant mothers (Median = 120 MET minutes per week) (U = 2496.00, z = -2.24, p < 0.05). The groups, however, do not differ in total sitting time per week.

In the expecting mothers, we found that mothers who were expecting their firstborns had significantly higher GLTEQ scores than those expecting a second or third child (U = 386.50, z = -2.22, p < 0.05). However, there are no differences in total MET minutes and total sitting time. In the non-pregnant mothers, we observed no significant differences in GLTEQ score, MET minutes, and total sitting time between those with only one child in the household and those with more than one child.

Barriers and Incentives to Exercise

Table 2 details the differences in perceived barriers among the groups. In general, mothers who do not exercise are significantly different in 17 out of the 23 possible barriers to the exercising mothers. The inactive mothers reported higher perceived barriers to exercise than the regularly exercising mothers. Mothers who do not exercise reported a lack of time due to family responsibility, having too many chores, seeing that exercising takes a lot of effort, and it is hard to stick to a routine. Furthermore, they also express their discomfort at exercising (e.g., do not like the feeling out of breath, sweating, and being watched by others while exercising) and lack of knowledge or motivation to do it.

We observed differences in the perceived barriers between the pregnant and non-pregnant subgroups. For example, the expectant mothers reported feeling too tired to exercise, or others discouraged them from exercising. In the non-pregnant subgroups, discomfort resulting from exercise (e.g., sweating, feeling out of breath) contributes to the act of exercising or not. However, there are also consistent barriers that emerged between the two groups. Lack of time due to family responsibilities, no companion to exercise, and other preferred activities in their leisure time are a few examples of the participants' perceived barriers, regardless of their pregnancy status.

A few incentives could explain the difference between exercising and non-exercising mothers. The first incentive is the availability of a toll-free number to a consulting expert, in which exercising and non-exercising differed significantly (U = 2456.50, z = -2.51, p < 0.05). Mothers who regularly exercised reported lower agreement with the need for a toll-free line. The second factor is the provision of free gym membership by the employer, where non-exercising mothers reported higher agreement with this as a facilitating factor (U = 3964.50, z = 2.43, p < 0.05). Mothers who exercise also expressed less need for a companion for exercising than the non-exercising mothers (U = 1963.50, z = -4.08, p < 0.01). The fourth incentive is providing an enticing bonus system which is a more significant facilitator for the non-exercising mothers (U =2253.50, z = -3.07, p < 0.01).

Table 2. Differences of perceived barriers among pregnant and non-pregnant mothers.

Barriers to Exercise	Non-Pregnant participants (N = 121; exercising = 28, non-exercising = 93)			Currently Pregnant Participants (N = 69; exercising = 16, non-exercising = 53)			Total participants (N = 190; exercising = 44, non-exercising 146)		
	U	Z	p	U	Z	p	U	Z	p
Lack of energy or too tired	1230.00	-.46	0.65	235.00	-2.81	0.01**	2634.00	-1.88	0.06
Lack of time due to work	1130.00	-1.02	0.31	301.00	-1.83	0.07	2598.50	-1.94	0.05*
Lack of time due to family responsibilities	1298.50	-2.62	0.01**	291.00	-1.95	0.05*	2186.00	-3.30	<0.01**
Arthritis or other health problems	1289.00	0.01	0.99	371.50	-1.04	0.30	3051.50	-0.58	0.57
Costs too much (clothes, equipment, etc.)	1183.00	-0.79	0.43	292.00	-2.03	0.04*	2665.50	-1.84	0.07
Facilities (parks, gyms) too hard to get to	982.00	-2.03	0.04*	297.00	-1.88	0.06	2361.50	-2.75	0.01*
It's too hard to stick to a routine	821.00	-3.01	< 0.01**	459.00	-1.50	0.13	2185.00	-3.29	<0.01**
No one to do physical activities with	472.00	-5.25	< 0.01**	247.50	-2.59	0.01**	1422.50	-5.76	<0.01**
I worry about my safety	1206.50	-0.70	0.49	291.00	-1.95	0.05*	2748.00	-1.58	0.11
I would have to get someone to get my children	1146.00	-0.91	0.36	231.00	-2.85	< 0.01**	2505.50	-2.21	0.03*
I'm too old	1219.00	-0.67	0.50	336.00	-1.60	0.10	2840.50	-1.51	0.13
I get bored quickly	893.50	-2.63	0.01**	270.00	-2.26	0.02*	2140.00	-3.49	<0.01**
There are other things I'd rather do during my free time	495.00	-5.37	< 0.01**	222.00	-3.19	< 0.01**	1401.40	-6.17	<0.01**
Others discourage me from being physically active	1068.00	-1.55	0.12	279.50	-2.15	0.03*	2470.00	-2.47	0.01**
I have too many household chores to do	817.00	-3.11	< 0.01**	293.50	-1.91	0.06	2102.00	-3.57	<0.01**
Physical activity is uncomfortable for me	756.00	-3.62	< 0.01**	259.00	-2.47	0.01**	1927.50	-4.27	<0.01**
I'm too out of shape to start	1196.50	-0.78	0.44	283.00	-2.17	0.03*	2680.50	-1.88	0.06
I feel I am too overweight to be physically active	1156.50	-1.02	0.31	284.50	-2.10	0.04*	2592.50	-2.13	0.03*
I don't know how to be physically active	885.00	-2.70	0.01**	211.50	-3.16	< 0.01**	1985.00	-4.01	<0.01**
I don't like to sweat	828.50	-3.11	< 0.01**	308.00	-1.71	0.09	2164.50	-3.45	<0.01**
I don't like feeling out of breath	790.50	-3.25	< 0.01**	305.00	-1.75	0.08	2096.00	-3.58	<0.01**
I don't like other people to see me being physically active	943.00	-2.43	0.02*	353.00	-1.10	0.27	2450.50	-2.61	0.01**
Physical activity takes too much effort	590.50	-4.50	< 0.01**	220.00	-3.00	< 0.01**	1524.50	-5.43	<0.01**

* significant at $p \leq 0.05$ ** significant at $p \leq 0.01$

Table 3. Differences of perceived incentives among pregnant and non-pregnant mothers.

Incentives to exercise	Non-Pregnant participants N = 121; exercising = 28, non-exercising = 93)			Currently Pregnant Participants (N = 69; exercising = 16, non-exercising = 53)			Total participants (N = 190; exercising = 44, non-exercising 146)		
	U	Z	p	U	Z	p	U	Z	p
I could call a toll-free number to get advice from an expert	981.50	-2.10	0.04*	331.50	-1.39	0.17	2456.50	-2.51	0.01**
I could get a free pamphlet on how to do it	1228.00	-0.39	0.70	289.50	-2.00	0.05*	2746.00	-1.46	0.14
I could get a free or low-cost gym membership	1399.50	0.62	0.53	516.00	1.35	0.18	3614.50	1.30	0.19
My health insurance company rewards me with lower premiums	1169.50	-0.77	0.44	432.50	0.13	0.90	3012.50	-0.58	0.56
I had an extra hour of free time during the day	1253.00	-0.33	0.74	392.00	0.63	0.63	3032.00	-0.60	0.55
Someone agreed to support me/check me on my progress	1237.00	-0.42	0.68	387.50	-0.54	0.59	2991.00	-0.72	0.47
I could get someone to watch my children	1283.50	-0.13	0.90	289.00	-1.96	0.05*	2805.50	-0.13	0.18
My employer offered a free gym membership	1635.00	2.13	0.03*	511.00	1.27	0.20	3964.50	2.43	0.02*
My employer allowed time for it	1376.50	0.48	0.63	383.00	-0.60	0.55	3219.00	0.02	0.98
My employer paid me to be more physically active	1315.50	0.09	0.93	400.50	-0.35	0.73	3153.50	-0.19	0.85
I thought it would get my children to be more physically active	1383.50	0.52	0.61	372.50	-0.76	0.45	3201.50	-0.03	0.97
I had someone to go with	659.00	-4.11	<0.01**	328.00	-1.44	0.15	1963.50	-4.07	<0.01**
Whenever I was physically active, I would earn points towards free things like magazines, clothes and travel	893.00	-2.58	0.01**	313.50	-1.61	0.11	2253.50	-3.07	<0.01**

* significant at $p \leq 0.05$ ** significant at $p \leq 0.01$

Mothers who are pregnant and non-pregnant reported different incentives for exercising. One example is that having social support who watch the children while mothers exercise is essential in the pregnant subgroups but not non-pregnant sub-groups. On the contrary, in the non-pregnant subgroup having the employer offer free gym membership is more important than having someone to take care of the children. Table 3 provides detailed differences in perceived incentives to exercise.

DISCUSSION

The current study investigates if pregnant and postpartum mothers are sufficiently active as recommended. Our analysis revealed that currently expecting and recently giving birth mothers were prone to be inactive. Our data showed that less than a quarter of the participants reported regularly exercising, regardless of their pregnancy status. The percentage of active mothers is even lower than the reported percentage of active Indonesian adults [43] or active women in Southeast Asian region [42]. The higher proportion of non-exercising mothers resembles the finding in prior studies. A more

significant proportion of postpartum mothers reported being inactive or rarely engaged in light to moderate intensity exercise at 12-months post-labor [19,67].

Pregnant and postpartum mothers are encouraged to engage in 30 minutes of light aerobic exercise at least five days a week [7,8]. This recommendation is equal to 500 (150 x 3.3 MET for walking) - 600 (150 x 4 MET for moderate activity) MET minutes per week [56,58]. However, we found that the participating mothers were below the recommended physical activity guidelines for postpartum mothers. Participants in our study had a median of 160 MET minutes per week (interquartile: 48-546). The non-pregnant participants had a higher median of 168 MET minutes per week (interquartile 46-588) than pregnant mothers (Median = 120 MET minutes per week, interquartile: 48-396). Our finding is similar to prior studies, which found that mothers' physical activity fell below recommended guidelines [11,21,40,55–58].

Our findings also showed that the number of children in the household does not impact the physical activity level. Mothers who have one child do not have different MET minutes, GLTEQ scores, and sitting times than mothers who have more than one child in their household. In the pregnant subgroup, mothers who expect their firstborn reported more physical activity (i.e., higher GLTEQ score) than those expecting the second or third child. However, there are no significant MET minutes and total sitting time between the two. Our findings contradict previous studies that suggest the number of children in the household negatively impacts mothers' physical activity [40,54]. The inconsistent association between the number of children in the family with mothers' physical activity warrants further investigation.

Future studies should consider other factors such as the availability and involvement of extended family or external help in childcare and household responsibilities. As recent research suggests, the availability of external support with house chores and childcare could facilitate Asian mothers' physical activity, offsetting the overload related to having more children at home [39].

Our findings also showed that pregnant and non-pregnant mothers spent a relatively similar number of sitting times. Expecting mothers had a median of 300 minutes (interquartile: 120-420) sitting time per day, only slightly higher than non-pregnant mothers (median: 270 minutes, interquartile: 120-420). That means that mothers spend between 4.5 and 5 hours per day in sedentary activity (i.e., sitting). This number is lower than a past study which found that women could spend up to 7 hours per day sitting [17]. However, it still shows that our participants spend a more considerable amount of time sitting compared to being physically active.

The time spent sitting with the participating mothers might be related to their employment status. As more than half of the participants are working on either full-time or part-time arrangements, the high number of time sitting throughout the day may be related to the changing nature of occupational work. Studies have shown that recent advances in technologies have impacted in more sedentary nature in an occupational setting [54,68,69].

In our study, mothers spend considerably higher sitting time than active time (regardless of pregnancy and exercise status) may illustrate an often-overlooked misconception about active lifestyles. It is often assumed that being active simultaneously increases physical activity level and decrease sedentary behavior [70,71]. Our data indicated that sedentary behavior has a distinct pattern not associated with physical activity levels. Our data is in line with a recent meta-analysis investigating the effects of an intervention on physical activity and sedentary behavior [70]. According to this study, intervention in physical activity could lead to a reduction in sedentary time, but the result is less consistent than the change in physical activity level. As a result, future studies might better target sedentary behavior and investigate viable replacements and not solely focus on increasing physical activity.

Further analysis showed that the non-exercising and exercising mothers differed in their reported perceived barriers and incentives to exercise. The non-exercising mothers reported higher agreement that they felt more obstacles to regularly exercising than the regularly exercising mothers. However, the reported perceived barriers are different in the pregnant and non-pregnant subgroups. Lack of energy, worry about safety, concern about childcare, and discouragement from the surroundings are unique perceived barriers in the pregnant subgroups. In the non-pregnant participants, limited access, difficulty sticking to a routine, household chores, and the discomfort from

exercising could explain the differences between exercising and non-exercising mothers. There are also perceived barriers consistent across the groups. These include feeling tired due to family responsibilities, lack of companionship, boredom, exercise is not the preferred activity for leisure, and the perception that exercising took much effort.

Our finding supports the conclusion from two previous systematic reviews that mothers regularly reported numerous hurdles to exercise [24,25]. However, prior studies show that a prominent role as a child caregiver and domestic responsibilities lead to a lack of energy and time to be the main barriers to regularly exercising [27,30–33,37,62]. Participants in the current study had more varied reasons why they exercise (or do not exercise).

Participants in our study reported that they prefer to do other things in their leisure time than exercising. The preference to do other things than exercise might indicate a lack of motivation to exercise. Prior research suggested that motivation is a significant predictor of exercise behavior in mothers [33,72]. Researchers suggested that the lack of motivation to exercise might associate with the failure to see the benefits of exercising to the mothers' overall health [31,36,73]. As all participants reported they have fair or reasonable health, they do not feel the importance of regularly exercising. Related to the issue of motivation, perhaps using an external bonus system might overcome the problem. As our study showed, providing a bonus for exercising (e.g., earning points toward gifts) might help motivate mothers to engage in regular exercise.

Another significant barrier was the perception that exercising takes too much effort. Mothers also expressed a lack of knowledge of how to exercise that is proper to their condition (i.e., pregnant or lactating). This perception might insinuate the lack of self-efficacy to stay active. Studies implied that mothers who had the belief they were unable to exercise adjusted to their condition (pregnant or postpartum) were more likely to be inactive [34,63]. Providing free access to experts (e.g., through a toll-free number) that can help advise mothers to exercise could counteract the lack of efficacy to exercise for the mothers.

The presence or absence of exercising partners is of importance. Social support, especially from the spouse, was a significant factor determining mothers' exercise [29,30,32,34,35]. Our study seemed to support the importance of social support. The response indicated that the absence of an exercising partner is a solid debilitating factor for exercising, both in the pregnant and non-pregnant participants. On the flip side, the presence of an exercise partner was rated as a substantial facilitating factor for mothers to exercise, especially for the non-pregnant mothers.

The current study has a few limitations. The small sample of the participants in the study prevents the generalizability of the finding. Our participants are mostly university graduates who participated in online research through a convenience sampling technique. This sample might reflect the high socioeconomic mothers in Indonesia rather than pregnant and postpartum Indonesian mothers in general. Another limitation of the current study stems from the cell's unequal size, especially for those who regularly exercise. The unequal sample size might lead to a more heterogeneous covariance, which inflates the type I error [74]. Another limitation of the current study is that it relied exclusively on self-report susceptibility measures to social desirability. The use of a cross-sectional design in the present study also prevents us from inferring the causality of the perceived barriers and incentives to exercising behavior of postpartum mothers.

CONCLUSION

Despite the limitation, the current study showed that pregnant and postpartum mothers were insufficiently active and spent more time sitting than doing moderate physical activity or walking. The study also showed that mothers reported many barriers to exercise, namely reason to exercise, perceived efficacy to exercise, and the lack of social support. In the overall landscape of mothers' physical activity, the finding shows the importance of understanding mothers' perceived barriers to help them increase their activity level and reduce sedentary behavior.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee, Faculty of Psychology, Eötvös Loránd University, and the Atma Jaya Catholic University of Indonesia. All procedures followed were following the Helsinki Declaration of 1975, as revised in 2000. Written informed consent for participation was not required for this study following the national legislation and the institutional requirements.

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