

## ORIGINAL ARTICLE

# Barriers and Preferences to Antenatal Exercise among Pregnant Women in Kuala Selangor

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## ABSTRACT

**Introduction:** Physical activity during pregnancy offers numerous benefits for maternal and fetal health. However, the level of physical exercise is low among pregnant women worldwide. Physical inactivity and sedentary lifestyles among pregnant women significantly increase maternal health problems. This study aimed to determine the barriers and preferences to practice antenatal exercise (ANE) among women during pregnancy. **Materials and methods:** It was a cross-sectional study that included 553 pregnant women who attended antenatal follow-up at the government's primary health clinics in Kuala Selangor. Data were collected from December 2021 to March 2022. A self-administered questionnaire was used that included socio-demographic information, barriers, and preferences to practice ANE. The collected data were analyzed using SPSS version 27. **Results:** The findings of this study showed that lack of information (n=346), tiredness (n=323), and lack of time (n=272) were three common barriers. Most participants preferred healthcare providers to provide ANE information and advice and a short video of antenatal exercise as the mode of delivery. Majority of them chose that exercise may ease labour (43.8%) as their main reason for exercising and preferred individual online exercise (45.4%) during pandemic era whereas physical group exercise (61.3%) during non-pandemic era. **Conclusion:** It is advised that an intervention be used to overcome each barrier found. To encourage pregnant women to be more active throughout pregnancy, healthcare professionals should receive training and be given the authority to serve as change agents.

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the existing antenatal care guideline, physical exercise intervention is not conducted in most primary health care settings.

## INTRODUCTION

Anatomical, physiological, and emotional changes take place throughout pregnancy. Thus, pregnancy-related physical activity (PA) encourages physical fitness. Physical activity is any skeletal muscle-produced motion of the body that involves the use of energy. Meanwhile, exercise is one of the kinds of PA that entails repetitive, scheduled, and regulated bodily action to enhance physical fitness, a crucial component of a healthy lifestyle (1). Based on the manual of antenatal exercise (ANE) developed by Ministry of Health Malaysia (MOH), pregnant women are encouraged to start exercise at 16-week gestation and above (2). In Malaysia, healthcare providers, particularly nurses, promote ANE to pregnant women as they have frequent contact during regular antenatal check-ups (3). While ANE are encouraged in

Regular PA during pregnancy benefits the mother and the developing fetus (4). For example, PA helps reduce the risk of gestational diabetes, gestational weight retention, and preeclampsia (5). Active pregnant women also have lower rates of preterm labour (6) and reduced rates of miscarriage and caesarean section (7). PA can also reduce postpartum depression (8,9). Additionally, PA throughout pregnancy can improve postnatal health and lower the child's risk of contracting chronic diseases including obesity, diabetes, and CVD (10). Unfortunately, most pregnant women adhere to PA recommendations only loosely throughout pregnancy, and many continue to be inactive both during and after pregnancy, despite the advantages and the introduction of guidelines for encouraging PA (11).

The American College of Obstetricians and Gynecologists (ACOG) recommends moderate-intensity

PA for women experiencing a healthy pregnancy for at least 150 minutes per week (12). However, a previous study among pregnant women in the United States of America (USA) revealed that only 23% to 29% engaged in sufficient PA during pregnancy (13). Similarly, 16.4% in Saudi Arabia reported that women were not doing any exercise during pregnancy (14). In Malaysia, a recent study reported 64.5% physical inactivity among pregnant women in Seremban (15) and 38.3% physical inactivity among early pregnancy women in Kuala Lumpur (16).

Pregnancy is an ideal time to adopt and maintain healthy lifestyle habits due to the mother's concern for the fetus's health (17). However, women face many barriers to PA during pregnancy, and these barriers are multi-faceted. The commonly reported barriers to PA are tiredness, pregnancy symptoms and discomfort (18,19); lack of strength or fatigue (19,20), lack of time (18–20), lack of motivation (17,21), lack of social support (21,22), and concern about the safety of the baby and the mother (17,23). In addition, cultural and religious beliefs (24,25), children, work, and family duties or obligations (26,27) are cited as limiting factors for PA during pregnancy. Limited accessibility to facilities and resources (21) and bad weather conditions (20,21) are environmental factors considered restraints to PA. These barriers significantly impact how much PA participation is limited, and more research is required to identify the problems and suggest solutions.

Exercise practise preferences and barriers must be understood in order to create effective solutions. Unfortunately, limited information is available on antenatal exercise among pregnant women in Malaysia (3). Therefore, the purpose of this study was to identify the factors that prevent pregnant women in Kuala Selangor from exercising and their preferences for doing so.

## MATERIALS AND METHODS

A cross-sectional study was conducted among 553 women who received antenatal care at seven government health clinics in Kuala Selangor. Kuala Selangor is a district in Selangor on the west coast of peninsular Malaysia. It is a sub-urban and developing district with an increasing number of populations of child-bearing age. As a result, it has the potential for higher birth rates, based on the Household income and basic amenities survey in Selangor, 2019 (28). Participants for this study were recruited from December 2021 to March 2022. The inclusion criteria were Malaysian pregnant women aged 18 – 49 years, able to read and understand Malay language. Pregnant women diagnosed with medical or obstetric complications resulting in ambulatory

disabilities and serious psychological conditions were excluded.

In this study, an estimated 1500 newly pregnant women in Kuala Selangor district were proportionately stratified allocated to each primary health facility. Based on the anticipated average number of registered expectant women per month in 2021, the expected number of pregnant women present at each primary health clinic at the time of data collection was determined. Based on the percentage of prenatal women who were registered in 2021, the number of selected respondents was calculated.

Subsequently, systematic random sampling was used to choose the respondents. The sampling interval of selected respondents was calculated by dividing the estimated number of new antenatal women (N) during data collection by the estimated number of sample sizes in each clinic (n). On the day of data collection, every second pregnant mother met the inclusion criteria were included until the required sample size was reached.

Face-to-face interviews were used to gather information using a self-administered questionnaire with three sections: socio-demographic, barriers, and preferences for exercising. The barriers questionnaire was adapted from previous studies conducted among Nigerian (29) and American pregnant women (30) and then, modified to suit Malaysian culture. Meanwhile, questionnaire on preferences for exercise was self-developed based on systematic review (21) and previous cross-sectional studies in exercise during pregnancy (19,30). To better comprehend the target community, the questionnaire was written in Malay. Before the actual data collection period, the questionnaire underwent pre-testing.

All data are analyzed using SPSS version 27. Socio-demographic data, barriers, and preferences were analyzed through descriptive analysis in frequencies and percentages. Finally, the results were presented using tables and text accordingly.

## Ethical Clearance

We obtained approval from the Medical Research and Ethics Committee (MREC) registered under NMRR-21-1518-60816.

## RESULTS

A total of 571 women were approached, and 553 gave written informed consent and completed the questionnaire. Respondents ranged in age from 18 to 49 years, with a mean age of 29.85 years and a standard deviation (SD) of 5.09 years. Socio-demographic data and maternal characteristics are summarized in Table I.

CONTINUE

**Table I: Socio-demographic, maternal characteristics and medical problems of respondents**

Variables	Frequency	Percentage	Mean (sd)	Min-max
<b>Demographics</b> n=553				
<b>Age (years)</b>			29.85(5.09)	19-46
< 25	78	14.1		
25-35	361	65.3		
>35	114	20.6		
<b>Race</b>				
Malay	498	90.1		
Chinese	11	2.0		
Indian	41	7.4		
Others	3	0.5		
<b>Educational level</b>				
Primary	7	1.5		
Secondary	272	49.2		
Tertiary	274	49.5		
<b>Occupation</b>				
Unemployed	278	49.2		
Employed	275	49.73		
Student	6	1.1		
<b>Average monthly income</b>				
- respond	474	85.7		
- not respond	79	14.3		
< RM3000	246	15.9		
≥ RM 3000	126	26.58		
≥ RM 5000	87	18.35		
RM10000-15000	15	3.16		
<b>Parity</b>			0-7	
0 children	185	33.5		
1-2 children	253	45.8		
>3 children	115	20.8		
<b>Gravida</b>				
Primigravida	182	32.9		
Multigravida	347	62.7		
Grand multigravida	24	4.3		
<b>Gestational period</b>				
1st trimester	72	13		
2nd trimester	174	31.5		
3rd trimester	307	55.5		
<b>Medical problem / condition</b>				
None	342	61.8		
Twin pregnancy	6	1.1		
HPT	3	0.5		
HPT in pregnancy	11	2.0		
Type I DM	19	3.4		
Gestational DM	129	23.3		
Heart problem	3	0.5		
Thyroid	3	0.5		
Asthma	25	4.5		
Others	12	2.2		
<b>PA pre-pregnancy</b>				
Yes	302	54.6		
No	251	45.4		
<b>Advice on PA from healthcare providers</b>				
Yes	303	54.8		
No	250	45.2		

Table II shows the barriers that hinder pregnant women from exercising. Among ten common barriers listed in the questionnaire, the three highest barriers chosen by the participants were lack of information (n=346), tiredness (n=323), and lack of time (n=272). Meanwhile, lack of family support, not being interested in exercise, and family not being advised to exercise were the lowest choice of barriers.

**Table II: Barriers to exercise during pregnancy**

Barriers	Frequency	Percentage
Lack of information	346	62.6
Tiredness	323	58.4
Lack of time	272	49.25
Feel uncomfortable	209	37.8
No suitable equipment	204	36.9
Harmful to fetus	170	30.7
No suitable facilities	122	22.1
Lack of family support	58	10.5
Not interested	41	7.4
Family advice not to exercise	25	4.5

\*denotes multiple answers

In terms of participant preferences for participating in exercise during pregnancy, three hundred sixty (65.1%) participants preferred health care providers to be the medium to deliver information regarding antenatal exercise compared to the advertisement via television at the primary health clinics (9.7%) or poster (15.2%) as depicted in Table III.

**Table III: Preferences to practice exercise during pregnancy**

Variables	Frequency	Percentage
<b>Demographics</b> n=553		
<b>Q1- Medium to deliver information on antenatal exercise</b>		
HCP	360	65.1
Health TV at PHC	109	19.7
Poster	84	15.2
<b>Q2- Mode of delivery antenatal exercise</b>		
Short video	28	5.1
Article/illustration	34	6.1
Individual exercise	121	21.9
Group exercise	370	66.9
<b>Q3- Duration of exercise/session</b>		
10-20 minutes	377	68.2
20-30 minutes	161	29.1
30-40 minutes	15	2.7
<b>Q4- Motivation</b>		
Thinking of self & baby's health	238	43
Eases labor	242	43.8
Increase stamina	59	10.7
Support from spouse	10	1.8
Socializing	4	0.7
<b>Q5-Best method of exercise during the pandemic</b>		
F2F individual	96	17.4
F2F group	45	8.1
Individual online	251	45.4
Online group	159	28.8

**Table III: Preferences to practice exercise during pregnancy**

Variables	Frequency	Percentage
<b>Demographics</b>		
n=553		
<b>Q6-Best method of exercise during the non-pandemic</b>		
F2F individual	106	19.2
F2F group	339	61.3
Individual online	70	12.7
Online group	38	6.9

HCP-healthcare providers; \*PHC-primary health clinic; \*F2F-face to-to-face

Regarding type of delivery mode, 370 (66.9%) of participants preferred a short video of the antenatal exercise, 21.9% chose group exercise, 6.1% favoured individual exercise, and 28 (5.2%) participants preferred an article/illustration about antenatal exercise. The majority of participants (68.2%) chosen at least 10-20 minutes per session as a duration to practice exercise.

The majority of participants chose that exercise may ease labour (43.8%) as their primary reason for exercising, with consideration for one’s own and the health of the unborn child (43%) as their secondary reason. They also selected that exercise can boost stamina (43%). Only 1.8% of respondents chose their spouse’s support, and 0.7% said that exercising for social purposes motivated them to exercise.

The majority of participants (45.4%) preferred individual online exercise, followed by 159 (28.8%) who liked online group exercise, individual physical exercise (17.4%), and physical group exercise as their preferred antenatal exercise delivery modality during the pandemic timeframe (8.2%). When it came to antenatal exercise delivery during the non-pandemic era, 339 (61.3%) of the participants selected physical group exercise, whereas 106 (19.2%) preferred individual exercise, 12.7% preferred individual online exercise, and 6.9% preferred online group exercise.

**DISCUSSION**

The current study examined pregnant women in Kuala Selangor’s desires for exercise during pregnancy as well as its barriers. This was the first study to examine the preferences and challenges associated with exercising while pregnant in health clinic settings. The obstacles preventing pregnant women from being physically active during pregnancy should be addressed and a suitable intervention can be created to encourage antenatal exercise among pregnant women, particularly in Malaysia.

The results of the present study showed that, despite receiving PA recommendations from medical professionals during pregnancy, the biggest obstacle preventing women from engaging in antenatal exercise was a lack of knowledge about exercise. The outcome conflicts with a qualitative study done in South Africa (31) that found that women were given

insufficient information and little advice from healthcare professionals. The study also found that women were discouraged from engaging in antenatal physical activity by inadequate and conflicting information about physical activity and exercise.

A similar lack of information about exercising when pregnant and a lack of exercise counselling from doctors and midwives were found in a study of PA barriers in Iranian women. Contrarily, pregnancy was viewed as a social barrier to PA (32). However, it is important for healthcare professionals to give correct information on the advantages and importance of PA during pregnancy. Given that pregnant women may ask about their maternal health or receive contradicting information from family members or others, this role is very crucial.

The participants in the current study acknowledged that fatigue prevented them from exercising. Lack of time is yet another barrier that prevents PA from being initiated or exercised. These two obstacles were widely mentioned as obstacles to PA during pregnancy in the literature (19–21). According to a South African study, weariness from job and household duties was a major impediment to people’s engagement in PA (19,20,23,33). An earlier study indicated that prenatal exercise and PA are impacted by physiological changes (19). The results showed that the initial obstacle in trimester one to trimester three was a lack of energy/tiredness, which was consistent with the study of reasons and barriers across trimesters in pregnant women in the USA (30).

Insufficient family support, such as not encouraging family members to exercise, was another barrier highlighted by the women in this study that prevents women from engaging in PA during pregnancy. In particular, a prior study showed how a lack of family support was strongly connected with more major barriers to PA during pregnancy (21). In fact, a study on the patterns of PA among pregnant women in Poland discovered that due to a variety of responsibilities, including child care, working from home, and employment, women have little opportunities to engage in PA during pregnancy (34). Consequently, the intervention may be customised to incorporate partners and family members as a significant motivation for PA (35).

The vast majority of participants favoured using medical professionals to deliver prenatal exercise. Women were more likely to participate in and maintain their PA levels when they received PA advice or counselling from healthcare experts (36). In terms of motivation, participants worked out to shorten labour and consider the health of the unborn child and themselves. The results are consistent with the earlier study that found pregnant women who were healthier were more likely to exercise (30). The majority of participants preferred 10- to 20-minute sessions of physical group exercise. With a minimum of 20 minutes per session, these preferences

satisfy the ACOG standard for healthy pregnant women for at least 150 minutes per week.

This research had several limitations. The first one has to do with how the study was set up. In contrast to a qualitative study where participants had the opportunity to express their ideas freely, a quantitative survey has fewer options for answers, making it difficult to comment on the origin of the restrictions. Second, the participants' backgrounds may have had an impact on the study's findings, which may have varied in terms of participant socio-demographics, maternal traits, and educational background. Thirdly, because the answer is self-reported, it's possible gave a false or incomplete response. In addition, since the questionnaire is a subjective individual assessment, the issue of dishonesty between respondents may arise, leading to reporting bias.

Given the robustness of the data (553 respondents), it is possible to extrapolate the findings of this study to all pregnant women in the Kuala Selangor region. Future research involving different locales is necessary to make sure that these results can be applied to all pregnant women in Malaysia. This is the only study that we are aware of that particularly examines the preferences and barriers to exercise among pregnant women in primary health clinic settings. Future research in urban and rural populations can provide a more comprehensive picture of the variables limiting women's antenatal PA. Instead of generalising results, a qualitative investigation is required to learn more about a topic.

## CONCLUSION

Overall, the study's findings indicate that the three main obstacles to antenatal exercise among pregnant women in Kuala Selangor were a lack of knowledge, exhaustion, and time. Additionally, it demonstrated that one of the crucial interpersonal barriers to address is a lack of information. Therefore, healthcare practitioners (gynaecologists, midwives, nurses, physiotherapists, and other community workers) should increase their understanding of prenatal exercise by providing better counselling and health education.

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## REFERENCES

1. ACSM. Benefits and Risks Associated with Physical Activity. In: ACSM's Guidelines For Exercise Testing and Prescription [Internet]. 2014. p. 1–20. Available from: [www.acsm.org](http://www.acsm.org)
2. Ministry of Health. Manual senaman di klinik kesihatan [Internet]. Vol. 15. 2014. Available from: [https://hq.moh.gov.my/bpkk/images/3.Penerbitan/2.Orang\\_Awam/6.Kesihatan\\_Ibu/PDF/3.GARIS\\_PANDUAN/25\\_manual\\_senaman\\_antenatal\\_postnatal\\_di\\_klinik\\_kesihatan.pdf](https://hq.moh.gov.my/bpkk/images/3.Penerbitan/2.Orang_Awam/6.Kesihatan_Ibu/PDF/3.GARIS_PANDUAN/25_manual_senaman_antenatal_postnatal_di_klinik_kesihatan.pdf)
3. Nor Azura I, Azlina I, Rosnani Z, Norhayati MN. Effectiveness of an Antenatal-Exercise Counseling Module on Knowledge and Self-Efficacy of Nurses in Northeast Peninsular Malaysia: A Quasi-Experimental Study. *Malaysian J Med Sci* [Internet]. 2020 Jun 30;27(3):84–92. Available from: <https://doi.org/10.21315/mjms2020.27.3.9>
4. Mottola MF, Davenport MH, Ruchat S, Davies GA, Poitras V, Gray C, et al. No. 367-2019 Canadian Guideline for Physical Activity throughout Pregnancy. *J Obstet Gynaecol Canada* [Internet]. 2018 Nov;40(11):1528–37. Available from: <https://doi.org/10.1136/bjsports-2018-100056>
5. Mottola MF. Physical activity and maternal obesity: cardiovascular adaptations, exercise recommendations, and pregnancy outcomes. *Nutr Rev* [Internet]. 2013 Oct;71:S31–6. Available from: <https://doi.org/10.1111/nure.12064>
6. Melzer K, Schutz Y, Boulvain M, Kayser B. Physical Activity and Pregnancy. *Sport Med* [Internet]. 2010 Jun;40(6):493–507. Available from: <http://link.springer.com/10.2165/11532290-000000000-00000>
7. Barakat R, Perales M, Garatachea N, Ruiz JR, Lucia A. Exercise during pregnancy. A narrative review asking: what do we know? *Br J Sports Med* [Internet]. 2015 Nov;49(21):1377–81. Available from: <https://doi.org/10.1136/bjsports-2015-094756>
8. Nascimento SL, Surita FG, Godoy AC, Kasawara KT, Morais SS. Physical Activity Patterns and Factors Related to Exercise during Pregnancy: A Cross Sectional Study. Croy A, editor. *PLoS One* [Internet]. 2015 Jun 17;10(6):e0128953. Available from: <https://doi.org/10.1371/journal.pone.0128953>
9. Padmapriya N, Bernard JY, Liang S, Loy SL, Shen Z, Kwek K, et al. Association of physical activity and sedentary behavior with depression and anxiety symptoms during pregnancy in a multiethnic cohort of Asian women. *Arch Womens Ment Health* [Internet]. 2016 Dec 23;19(6):1119–28. Available from: <https://doi.org/10.1007/s00737-016-0664-y>
10. Davenport MH. Exercise during pregnancy. *ACSMs Health Fit J* [Internet]. 2020 Sep;24(5):10–7. Available from: <https://doi.org/10.1249/FIT.0000000000000602>
11. Pearce EE, Evenson KR, Downs DS, Steckler A. Strategies to Promote Physical Activity During Pregnancy. *Am J Lifestyle Med* [Internet]. 2013 Jan 4;7(1):38–50. Available from: <https://doi.org/10.1177/1559827612446416>
12. ACOG Opinion. Physical Activity and

- Exercise During Pregnancy and the Postpartum Period. *Obstet Gynecol* [Internet]. 2020 Apr;135(4):e178–88. Available from: <https://doi.org/10.1097/AOG.0000000000003773>
13. Hesketh KR, Evenson KR. Prevalence of U.S. Pregnant Women Meeting 2015 ACOG Physical Activity Guidelines. *Am J Prev Med* [Internet]. 2016;51(3):e87–9. Available from: <https://doi.org/10.1016/j.amepre.2016.05.023>
  14. Al-Youbi G, Elsaid T. Knowledge, attitude, and practices on exercise among pregnant females attending Al-Wazarat Health Center, Riyadh, Saudi Arabia. *J Fam Med Prim Care* [Internet]. 2020;9(8):3905. Available from: [https://doi.org/10.4103/jfmpc.jfmpc\\_276\\_20](https://doi.org/10.4103/jfmpc.jfmpc_276_20)
  15. Yusrina N, Yusof M, Afiah N, Zulkefli M, Minhat HS, Ahmad N. Predictors of Physical Inactivity Among Antenatal Women : A Systematic Review. *Mal J Med Health Sci*. 2020; 16(4): 317-324,
  16. Syed Nor SF, Idris IB, Md Isa Z. Physical inactivity in early pregnancy and the determinants in an urban city setting of Kuala Lumpur, Malaysia. *BMC Public Health* [Internet]. 2022;22(1):1–12. Available from: <https://doi.org/10.1186/s12889-022-12513-5>
  17. KoleilatM, VargasN, VanTwistV, KodjebachevaGD. 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* [Internet]. 2021 Dec 21;21(1):69. Available from: <https://doi.org/10.1186/s12884-021-03553-7>
  18. Watson ED, Norris SA, Draper CE, Jones RA, van Poppel MNM, Micklesfield LK. “Just because you’re pregnant, doesn’t mean you’re sick!” A qualitative study of beliefs regarding physical activity in black South African women. *BMC Pregnancy Childbirth* [Internet]. 2016 Dec 19;16(1):174. Available from: <https://doi.org/10.1186/s12884-016-0963-3>
  19. 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* [Internet]. 2018 Oct 1;27(4):198–206. Available from: <https://doi.org/10.1891/1058-1243.27.4.198>
  20. 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(1):41-54. <https://doi.org/10.1007/s10865-015-9672-z>
  21. Harrison AL, Taylor NF, Shields N, Frawley HC. Attitudes, barriers and enablers to physical activity in pregnant women: a systematic review. *J Physiother* [Internet]. 2018 Jan;64(1):24–32. Available from: <https://doi.org/10.1016/j.jphys.2017.11.012>
  22. Ekelin M, Langeland Iversen M, Grønboek Backhausen M, Hegaard HK. Not now but later – a qualitative study of non-exercising pregnant women’s views and experiences of exercise. *BMC Pregnancy Childbirth* [Internet]. 2018 Dec 11;18(1):399. Available from: <https://doi.org/10.1186/s12884-018-2035-3>
  23. Haakstad LAH, Vistad I, Sagedal LR, Lohne-Seiler H, Torstveit MK. How does a lifestyle intervention during pregnancy influence perceived barriers to leisure-time physical activity? The Norwegian fit for delivery study, a randomized controlled trial. *BMC Pregnancy Childbirth* [Internet]. 2018 Dec 3;18(1):127. Available from: <https://doi.org/10.1186/s12884-018-1771-8>
  24. Petronilla OC, Moris AE, Justina OA, Omelogo NJ, Okwudili JD, Anthonia EU, et al. Antenatal Exercise Practices: Associated Factors and Correlation with Antenatal Quality of Life. *J Appl Life Sci Int* [Internet]. 2018 Oct 4;18(4):1–9. Available from: <https://doi.org/10.9734/JALSI/2018/43947>
  25. Chasan-Taber L. Physical Activity and Dietary Behaviors Associated With Weight Gain and Impaired Glucose Tolerance Among Pregnant Latinas. *Adv Nutr* [Internet]. 2012 Jan;3(1):108–18. Available from: <https://doi.org/10.3945/an.111.001214>
  26. Bauer C, Graf C, Platschek AM, Strøder HK, Ferrari N. Reasons, Motivational Factors, and Perceived Personal Barriers to Engagement in Physical Activity During Pregnancy Vary Within the BMI Classes: The Prenatal Prevention Project Germany. *J Phys Act Heal* [Internet]. 2018 Mar;15(3):204–11. Available from: <https://journals.humankinetics.com/doi/10.1123/jpah.2016-0563>
  27. Sujindra E, Bupathy A, Suganya A, Praveena R. Knowledge, attitude, and practice of exercise during pregnancy among antenatal mothers. *Int J Educ Psychol Res* [Internet]. 2015;1(3):234. Available from: <https://doi.org/10.4103/2395-2296.158347>
  28. Department of Statistic Malaysia. Statistic of States. Population Quick Info DOSM. 2020; 1–7. [https://www.dosm.gov.my/v1/uploads/files/6\\_Newsletter/Newsletter1752020/DOSM\\_DOSM.SELANGOR\\_1.2020\\_Siri\\_93.pdf](https://www.dosm.gov.my/v1/uploads/files/6_Newsletter/Newsletter1752020/DOSM_DOSM.SELANGOR_1.2020_Siri_93.pdf)
  29. Janakiraman B, Gebreyesus T, Yihunie M, Genet MG. Knowledge, attitude, and practice of antenatal exercises among pregnant women in Ethiopia: A cross-sectional study. *PLoS One* [Internet]. 2021;16(2):1–15. Available from: <https://doi.org/10.1371/journal.pone.0247533>
  30. White E, Pfeifer K, Holzman C, Pivarnik J. Motives for and barriers to exercising across trimesters of pregnancy in health club members. *Hum Mov* [Internet]. 2020;21(3):21–30. Available from: <https://doi.org/10.5114/hm.2020.91342>
  31. Okafor UB, Goon D Ter. Uncovering Barriers to Prenatal Physical Activity and Exercise Among South African Pregnant Women: A Cross-Sectional, Mixed-Method Analysis. *Front Public*

- Heal. 2022;10(April):1–10.<https://doi.org/10.3389/fpubh.2022.697386>
32. 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* [Internet]. 2022;22(1):1–11. Available from: <https://doi.org/10.1186/s12884-022-05124-w>
  33. 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* [Internet]. 2020 Jul 23; Available from: <https://doi.org/10.1111/mcn.13068>
  34. Walasik I, Kwiatkowska K, Kosińska Kaczyńska K, Szymusik I. Physical Activity Patterns among 9000 Pregnant Women in Poland: A Cross-Sectional Study. *Int J Environ Res Public Health* [Internet]. 2020 Mar 9;17(5):1771. Available from: <https://doi.org/10.3390/ijerph17051771>
  35. Petrov Fieril K, Fagevik Olsén M, Glantz A, Larsson M. Experiences of Exercise During Pregnancy Among Women Who Perform Regular Resistance Training: A Qualitative Study. *Phys Ther* [Internet]. 2014 Aug 1;94(8):1135–43. Available from: <https://doi.org/10.2522/ptj.20120432>
  36. Coll CVN, 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* [Internet]. 2017 Jan;20(1):17–25. Available from: <https://doi.org/10.1016/j.jsams.2016.06.007>