

Exercise among pregnant females in maternity and children hospital in Jeddah, Saudi Arabia, 2019: Prevalence and barriers

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ABSTRACT

Objectives: To estimate the prevalence and explore factors of adequate physical activity among pregnant women in maternal care. **Materials and Methods:** A cross-sectional study conducted in healthy pregnant women visiting the antenatal clinics of the Maternity & Children's Hospital, Jeddah, Saudi Arabia. A structured questionnaire was administered face to face to collect the following: 1) sociodemographic and obstetrical data; 2) the Arabic version of the Pregnancy Physical Activity Questionnaire (PPAQ) developed by Lisa Chasan-Taber; and 3) barriers to exercise. The PPAQ enabled calculating average weekly energy expenditures in various activities, in metabolic equivalent (MET-h/week) and determining two levels of physical activity (active versus inactive). **Results:** Two hundred and five pregnant women were included: 49.3% were multiparous (gravida >2) and 55.6% declared exercising before pregnancy. The median overall energy expenditure was 108.0 MET-h/week, and household/caregiving activities accounted for the most important share (median = 45.7 MET-h/week), followed by transportation (12.6 MET-h/week). Of the total, 45.9% met the WHO criteria of adequate physical activity. There was no statistically significant difference between physically active and inactive participants across demographic factors. The most common barriers to being active were lack of energy, fatigue, or drowsiness (70.2%), lack of education by doctors (68.3%), and inconvenient weather (62.0%). **Conclusion:** Women in Saudi Arabia have decline in physical activity during pregnancy, and less than 50% maintain a level of exercise that enables beneficial effects on their overall health and pregnancy outcome. Health authorities and decision makers should consider implementing a national strategy and guidelines for the promotion of physical activity during pregnancy.

Keywords: Exercise, physical activity, pregnancy, Saudi Arabia

Introduction

Formerly, pregnant women were commonly advised against physical exercise, owing to concerns about health. However, recent evidence showed multiple benefits of regular physical activity during pregnancy for both the mother and the fetus.^[1-7]

Several recommendations promote regular, moderate-intensity exercise as an integrative component of maternal preventive care, providing guidance on prescription and eventual contraindications.^[8-11] However, due to persisting misconceptions and lack of knowledge or support, majority pregnant women tend to have sedentary lifestyle especially in the third trimester.^[2,12-16]

This study assessed the levels of adequate physical activity among Saudi pregnant women and explored related physical, social, and cognitive barriers.

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Materials and Methods

Design and population

A cross-sectional study was conducted in all pregnant females visiting the Maternity & Children's Hospital (MCH), Jeddah, Saudi Arabia, from 1st June 2019 to 31st August 2019. Pregnant females were at any gestational age during the study period and having a naturally conceived fetus, with no history of more than one miscarriage.

Women were excluded if they had any: chronic systemic disease, such as cardiorespiratory diseases, diabetes mellitus, hypertension requiring medications, chronic renal disease; an inflammatory joint disease or long-term and/or repetitive musculoskeletal problem that would limit daily physical activity; and inability to write and read well enough to record physical activity. Exclusion criteria expanded to women having pregnancy-specific conditions or complications that constitute specific contraindications to exercise such as heart or lung diseases, cervical insufficiency or cerclage, twin or higher pregnancy, placenta previa after 26 weeks of pregnancy, preterm labor or ruptured membranes during pregnancy, preeclampsia or pregnancy-induced hypertension, and severe anemia.

Sample size

The estimated number of pregnant females visiting the antenatal clinic at MCH during the study period was 500. The sample size was calculated to detect an unknown proportion of women with adequate physical activity, with 80% statistical power, 5% type I, and 95% confidence interval. The calculated sample size ($N = 218$) was increased by 10% to compensate for eventual incomplete participations, which resulted in a target sample size of $N = 240$.

The MCH has four antenatal clinics per day, with an estimation of 30–40 patients per clinic. During the period of data collection, the researchers used a systematic random sampling technique to recruit participants from each antenatal clinic. Patients were numbered according to their arrival time daily and the first patient was randomly selected among the first 10 patients using a 1-to-10 random numbers generated by a Microsoft Excel program. If the selected patient was not eligible, another random generation was executed. When eligibility of the first patient was verified, every third eligible and consenting woman was included until a cumulative daily number of 20 effective participations in the 4 clinics reached.

Data collection

A semistructured questionnaire divided into four sections was used. Section 1 collected sociodemographic and baseline clinical data. Section 2 verified eligibility by exploring exclusion criteria. Section 3 included a modified Arabic version of the Pregnancy Physical Activity Questionnaire (PPAQ) developed by Lisa Chasan-Taber, a validated version used for the assessment and measurement of physical activity levels during

pregnancy in Arabic speaking populations.^[17,18] The modified version included 27 items, each assessing the average daily time spent on a given activity, during the current trimester. The 27 activities were grouped into four types: household/caregiving (10 items); occupational (5 items); sports/exercise (9 items); and transportation (3 items). Time spent on each activity was measured in six levels: 1) none or absent; 2) <0.5 h; 3) 0.5–1 h; 4) 1–2 h; 5) 2–3 h; and 6) 3 + h. Section 4 explored eventual obstacles to physical activity or complaints affecting the physical performance among a predefined list of 22 items, such as fatigue, anxiousness and fear for the fetus, inconvenient weather, lack of transportation, and lack of motivations; a three-level, Likert-type agreement scale was used providing the following options: I agree, neutral, and do not agree.

Selected women were approached by the investigators and assessed for eligibility and their consent was sought in a written consent form. Further to consent receipt, a face-to-face interview was held for data collection. Each participant was interviewed in a private location within the clinic.

Computing energy expenditure and defining study outcomes

The number of hours spent in each activity was multiplied by the respective activity intensity, to estimate the average daily energy expenditure (MET-hours per day) attributable to the given activity. Activity intensity was determined from the compendium of physical activities.^[19]

The primary study outcome was the overall daily energy expenditure, in MET-hours per day, which was calculated for each participant as the sum of the average daily energy expenditures of all the 27 activities. According to their overall daily energy expenditure, participants were divided into two groups: physically active versus physically inactive, using two different cutoffs as defined by the WHO's^[20] updated ACOG guidelines.^[11]

Statistical methods

The data were analyzed using the Statistical Package for Social Sciences, version 21 for Windows (IBM SPSS, Inc., Chicago, IL, USA). The reliability of the modified version of the PPAQ questionnaire was tested by measuring the Cronbach's alpha coefficient, which was found to be 0.773, indicating the reliability of the tool in the studied population. Measures of central tendency and dispersion were used to describe the numerical data. Pearson's Chi-square test was used to identify the association between the level of physical activity and the nominal and ordinal predictors. Independent *t*-test and One-Way ANOVA were used to compare two means and more, respectively. Factor analysis was used to assess the structure of the domains and to evaluate the construct validity of the 22-item subscale related to barriers to physical activity. Correlations between the items were computed, with analysis of Bartlett's test of sphericity and Kaiser–Meyer–Olkin (KMO) index, followed by principal component analysis (PCA). A *P* value <0.05 was considered for the statistical significance.

Ethical clearance

The study protocol was ethically reviewed and approved by the Joint Program of Family Medicine and the Administration of Training and Research in Jeddah, IRB registration number (H-02-J-002). All data were collected anonymously and processed and stored with confidentiality.

Results

Description of the study participants

Demographic characteristics of the study population are presented in Table 1. Of the 205 participants, more than half of them (52.2%) were in the age group 27–35 years and had a bachelor's or higher degree (56.1%). Regarding obstetric characteristics Table 2, majority (61.5%) were in the third trimester, one-third had history of abortion (34.6%), almost half were gravida 3 or greater (49.3%), and 55.6% were exercising before the current pregnancy.

Energy expenditure findings

Table 3 depicts the descriptive analysis of total energy expenditure measured in MET-h/week as recommended by the PPAQ developers, as well as its distributions across intensity levels and exercise type. The minimum, median, and the maximum of energy expenditure for total activity were 6, 108.0, and 340 MET-h/week, respectively. The highest mean and median energy expenditure were obtained for light activities (68.2 and 63.7 MET-h/week respectively), whereas the lowest were obtained from vigorous activities (1.1 and 0.0, respectively). With regards to the type of physical activity, the highest energy expenditure was recorded in household/caregiving activity (mean = 56.0, median = 45.7) followed by transportation (mean = 18.5, median = 12.6 MET-h/week respectively). Thus, household/caregiving activities were the activities that contributed most in total energy expenditure, standing for approximately 56%, followed by transportation (18.5%), and occupation (15.7%); while sport/exercise contributed 2.8% of total energy expenditure.

Levels of physical activity

The percentage of physically active pregnant females according to the ACOG and WHO guidelines was 45.9% and 40%, respectively. There was no statistically significant difference between physically active and inactive participants across demographic factors, namely age group ($P = 0.114$), nationality ($P = 0.772$), educational level ($P = 0.672$), monthly income ($P = 0.501$), and professional status ($P = 0.827$) (results not presented in tables or figures).

Perceived barriers to physical activity

Figure 1 shows the ascending percentage of participants who declared being impacted by each of the 22 predefined barriers to physical activity. The most commonly mentioned barriers to being active were lack of energy, fatigue, or drowsiness (70.2%), lack of education by doctor (68.3%), and inconvenient weather (62.0%). Further barriers related to lack of knowledge

Table 1: Demographics characteristics of the participants

Variables	Description (n=205) n (%)
Age	
18-26 years	47 (22.9)
27-35 years	107 (52.2)
36 or more	51 (24.9)
Nationality	
Saudi	173 (84.4)
Non-Saudi	32 (15.6)
Education	
Less than secondary	26 (12.7)
Secondary	64 (31.2)
Bachelor degree	112 (54.6)
Postgraduate	3 (1.5)
Job	
Employed	171 (83.4)
Unemployed	25 (12.2)
Student	9 (4.4)
Average monthly income	
<3000 SR	18 (8.8)
3000-5000 SR	64 (31.2)
5001-10,000	93 (45.4)
10,001-20,000	24 (11.7)
>20,000	6 (2.9)

Table 2: Obstetric characteristics of the participants

Variables	Description (n=205) n (%)
Number of pregnancies	
2 or less	104 (50.7)
>2	101 (49.3)
Abortion	
Yes	71 (34.6)
No	134 (65.4)
Number of children	
2 or less	143 (69.8)
>2	62 (30.2)
Have children	
Yes	135 (65.9)
No	70 (34.1)
Trimester	
First trimester	20 (9.8)
Second trimester	59 (28.8)
Third trimester	126 (61.5)
Illness preventing exercise	
Yes	23 (11.2)
No	182 (88.8)
Exercise before pregnancy	
Yes	114 (55.6)
No	91 (44.4)

and misconceptions about physical activity frequently reported included: concerns about pregnancy complications (52.2%) notably fear of injury (51.2%), or about the child's health (50.7%).

Validity and domain definition of the barriers' subscale

Assessment of suitability of data for factor analysis showed many correlation coefficients greater than 0.3, a significant Bartlett's

Table 3: Energy expenditure measured in MET-h/week according to total activity, intensity level, and type of activity

Activity	Mean	Min	Max	Percentile		
				25 th	50 th (median)	75 th
Total activity	111.5	5.9	339.9	72.4	108.0	148.1
Intensity						
Sedentary	18.3	0.0	42.0	3.5	14.0	42.0
Light	68.2	2.3	223.0	37.1	63.7	89.8
Moderate	25.3	0.0	146.8	5.9	15.8	33.8
Vigorous	1.1	0.0	36.0	0.0	0.0	0.0
Type						
Household/caregiving	56.0	1.7	198.1	27.1	45.7	80.2
Occupational	15.7	0.0	298.2	0.0	0.0	2.8
Sport/exercise	3.1	0.0	44.9	0.0	0.9	4.4
Transportation	18.5	0.0	91.0	4.9	12.6	29.5

test of sphericity (<0.05), and KMO index was 0.728, which is greater than 0.6, the suggested value as the minimum value for good factor analysis.

PCA showed that the data recommend extracting three components or domains. The first domain of barriers comprised concerns about pregnancy outcomes and mother health. This domain was dominant, as lack of energy, fatigue, or drowsiness ranked first in term of frequency reported by 144 (70.2%) pregnant women agreed that it constitutes a barrier to physical activity. The second and third most frequent barriers in this domain were breathlessness and concern about pregnancy complications, which were reported by 59.6% and 53% women, respectively. The second domain included physical barriers, in which lack of facilities was the main barrier reported by 41.1%, followed by lack of companion with whom to practice (38.6%) and lack of social support (33.3%).

The third domain was represented by intrinsic and environmental barriers, in which the most commonly reported barrier was lack of medical advice about exercise during pregnancy (69%), followed by inconvenient weather (62.3%) and low motivation (44.1%).

Discussion

The present study estimated the levels of and barriers to physical activity among pregnant women and showed that $<46\%$ have adequate levels of activity, with no significant variability across age groups, educational level or other sociodemographic factors. However, 55.6% declared performing physical activity before pregnancy, which indicate decline in exercise during pregnancy and shift toward more sedentary lifestyle. On the other hand, approximately 89% of the participants declared having not received any recommendations about physical activity, emphasizing the role of physicians and healthcare providers in patient education.

Over the last decades, the issue of physical exercise during pregnancy and the recommended volume has been a subject of

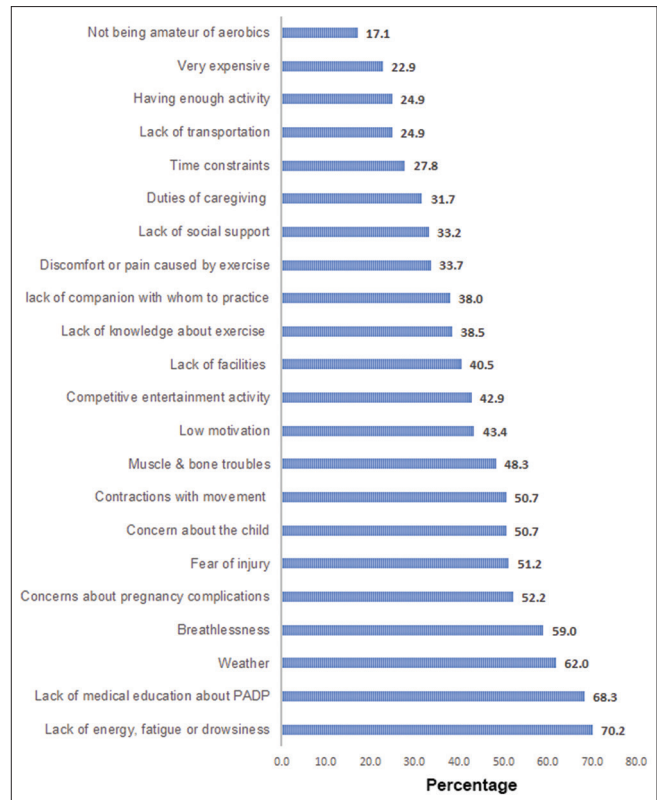


Figure 1: Barriers to physical activity among pregnant women. Bars represent the percentage of participants who declared that the given item constitutes an effective barrier to practicing exercise

debate. According to the 2002 ACOG guidelines, ≥ 30 min/day of exercise on most days per week are recommended,^[21] whereas the updated ACOG guidelines advised performing exercise for ≥ 20 min on most days per week.^[9] Nevertheless, the trend is consistent in encouraging exercise and physical activity among pregnant women with the growing evidence regarding its benefits on physical and mental health of the women and on pregnancy outcome.^[22]

In the present study, the prevalence of physical activity was assessed according to two different guidelines, including the WHO guidelines, and the updated ACOG guidelines, showing adequate physical activity among only 40% and 46% of the participants, respectively. The two guidelines are concordant indicating that majority of healthy pregnant women in the participating center have below-optimal level of physical activity. By further investigation on the levels of physical activity, the majority of pregnant women were found to be in the light level with a mean of 68.2 MET/h per week, whereas 25.3% were in the moderate level and a minority had vigorous activity (1.1%).

A study conducted at King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia showed that more than half of pregnant women (65.3%) were not exercising, which is in agreement with our findings.^[23] Another study from Al Qassim region showed that 42% of pregnant women were adequately practicing exercise during their pregnancy, which is quite similar to our findings, and

propensity to exercise was significantly greater among women aged ≤ 30 years, multiparous ones, and those perceiving exercise as necessary. Additionally, the same study showed that women who rated their own health status as excellent had adequate exercise with an odds ratio of 2.5 with reference to those who rated their own health status as being fair or poor.^[15] In Riyadh city, approximately 42% of pregnant women reported high levels of awareness and practice physical activity, which were comparable to our study and concordant with the previous study. Furthermore, authors reported significant association of the level of awareness and practice with higher parity, educational level, and socioeconomic rank.^[16] These local figures consistently indicate that 4 out of 10 women in Saudi Arabia would maintain adequate physical exercise practice during pregnancy indicating relatively low level of exercise practice among Saudi females despite a palpable gain in the physical exercise and sports culture within the Saudi society.

A study conducted in China in 1179 pregnant women revealed lower levels of adequate practice in physical exercise during pregnancy, as 92.6% of the participants were classified as not meeting the ACOG guidelines.^[24] Results were not enthusiastic in the Western countries. For example, a study from the USA reported lower prevalence of physical activity (32.8%) compared to our findings.^[25] An Irish study showed that only 21.5% of healthy pregnant females met the current recommendations for exercises per the ACOG and Royal College of Obstetricians and Gynaecologists guidelines, and 11.7% reported no physical activity at all.^[23] Similar observations are reported in the developing countries. A study from Ethiopia revealed that 79.3% of participants were classified as sedentary,^[26] comparable to our study findings.

Although these observations showed low prevalence of physical activity among pregnant women reflecting a universal negative attitude toward exercise during pregnancy, they do not exclude variances in the barriers and common beliefs across the countries and cultures. In the present study, we investigated the barriers to physical activity commonly reported by pregnant women in western Saudi Arabia. The most frequently reported barriers related to concerns about the general health or pregnancy outcomes included complaints of fatigue and lack of energy, breathlessness, or fear of injury or contractions with movement, besides other unspecific concerns about the fetus, all reported by up to 70% of the participants. Besides, lack of knowledge about physical activity and sports and lack of medical advice regarding exercise during pregnancy were also commonly reported as barriers to practice physical exercise among participants. On the other hand, intrinsic and environmental barriers, such as unaffordability of the activities, and lack of transportation had a minor contribution. These findings are somewhat concordant with literature. Locally, the previously mentioned study from Riyadh highlighted complaints of fatigue, inaccessibility to exercise facilities, and unawareness as the most commonly reported barriers to exercise, while inaccessibility to facilities was significantly associated with lower level of practice.^[16]

Internationally, a study that involved 1535 pregnant women demonstrated that 85% of them reported interpersonal barriers to physical activity, and two-third of them were related to health.^[27] The greatest barriers reported in another study included nausea and fatigue, and lack of time.^[28] A systematic review of 49 articles indicated lack of time, fatigue, and discomfort as the most common intrapersonal barriers to physical activity.^[29]

Limitations

The present study was conducted in one hospital, which may hinder the generalizability of the results. However, MCH is the largest hospital providing maternal care in Jeddah, and all pregnant women have open access for treatment regardless of nationality, area of residence, or ability to pay for service as the hospital provides free services.

Conclusion

Women in MCH, Jeddah, Saudi Arabia, have decline physical activity during pregnancy. Only 40% to 46% maintain an average daily physical activity meeting the recommended energy expenditure that enables beneficial effects on their overall health and pregnancy outcome. The most common barriers to exercise are represented by concerns about pregnancy outcome and general health, which are represented by minor complaints and nourished by misconceptions about adverse effects of exercise on the mother's or child's health. Other important barriers include lack of medical education, social support, and motivation, indicating poor sports and exercise culture among the Saudi women. Further environmental barriers such as inconvenient weather and lack of appropriate facilities and transportation means are to be highlighted.

Physicians and health providers should be trained for and involved in active counseling regarding physical exercise and provide relevant advice regarding the frequency, intensity, and type of activities to be recommended to their patients, as well as to implement specific measures or precautions and to screen for eventual temporary or permanent contraindications to exercise.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Key messages

Overall, there seems to be a poor sports and exercise culture among the Saudi women.

- Pregnancy is associated with significant decline in physical activity among Saudi women.
- Minor physical complaints represent the most common barriers to exercise, which indicates the relevance of

counseling women during antenatal care to significantly improve the levels of exercise.

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Conflicts of interest

There are no conflicts of interest.

References

- Silva-Jose C, Diaz-Blanco Á, Barakat R, Coterón J, Refoyo I. Physical activity during pregnancy is associated with a lower number of perineal tears. *Transl Sports Med.* 2021;4:38-45.
- Santo EC, Forbes PW, Oken E, Belfort MB. Determinants of physical activity frequency and provider advice during pregnancy. *BMC Pregnancy Childbirth* 2017;17:286.
- Koleilat M, Vargas N, Kodjebacheva GD. Perceived barriers to and suggested interventions for physical activity during pregnancy among participants of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in Southern California. *BMC Pregnancy Childbirth* 2021;21:1-9.
- Tobias DK, Zhang C, van Dam RM, Bowers K, Hu FB. Physical activity before and during pregnancy and risk of gestational diabetes mellitus: A meta-analysis. *Diabetes Care* 2011;34:223-9.
- Perales M, Santos-Lozano A, Sanchis-Gomar F, Luaces M, Pareja-Galeano H, Garatachea N, *et al.* Maternal cardiac adaptations to a physical exercise program during pregnancy. *Med Sci Sports Exerc* 2016;48:896-906.
- Barakat R, Refoyo I, Coterón J, Franco E. Exercise during pregnancy has a preventative effect on excessive maternal weight gain and gestational diabetes. A randomized controlled trial. *Braz J Phys Ther* 2019;23:148-55.
- Shen WC, Chen CH. Effects of non-supervised aerobic exercise on sleep quality and maternal-fetal attachment in pregnant women: A randomized controlled trial. *Complement Ther Med* 2021;57:102671.
- Mottola MF, Davenport MH, Ruchat SM, Davies GA, Poitras V, Gray C, *et al.* No. 367-2019 Canadian guideline for physical activity throughout pregnancy. *J Obstet Gynaecol Can* 2018;40:1528-37.
- American College of Obstetricians and Gynecologists. ACOG committee opinion No. 650: Physical activity and exercise during pregnancy and the postpartum period. *Obstet Gynecol* 2015;126:e135-42.
- Evenson KR, Barakat R, Brown WJ, Dargent-Molina P, Haruna M, Mikkelsen EM, *et al.* Guidelines for physical activity during pregnancy: Comparisons from around the world. *Am J Lifestyle Med* 2014;8:102-21.
- Artal R, O'toole M. Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period. *Br J Sports Med* 2003;37:6-12.
- Melzer K, Schutz Y, Boulvain M, Kayser B. Physical activity and pregnancy. *Sports Med* 2010;40:493-507.
- Dashti S, Joseph HL, Esfehiani AJ, Tin Su T, Abdul Latiff L, Esfehiani RJ. Perceived barriers to physical activity among Iranian women. *World Appl Sci J* 2014;32:422-8.
- Justine M, Azizan A, Hassan V, Salleh Z, Manaf H. Barriers to participation in physical activity and exercise among middle-aged and elderly individuals. *Singapore Med J* 2013;54:581-6.
- Alaglan AA, Almousa RF, Alomirini AA, Alabdularazaq ES, Alkheder RS, Alzaben KA, *et al.* Saudi women's physical activity habits during pregnancy. *Womens Health (Lond)* 2020;16:1745506520952045. doi: 10.1177/1745506520952045.
- Al-Youbi GM, Elsaid T. Knowledge, attitude, and practices on exercise among pregnant females attending Al-Wazarat Health Center, Riyadh, Saudi Arabia. *J Family Med Prim Care* 2020;9:3905-15.
- Chasan-Taber Li, Schmidt MD, Roberts De, Hosmer D, Markenson G, Freedson PS. Development and validation of a pregnancy physical activity questionnaire. *Med Sci Sports Exerc* 2004;36:1750-60.
- Papazian T, El Osta N, Hout H, Chammas DE, El Helou N, Younes H, *et al.* Pregnancy physical activity questionnaire (PPAQ): Translation and cross-cultural adaptation of an Arabic version. *PLoS One* 2020;15:e0230420.
- Ekenga CC, Parks CG, Wilson LE, Sandler DP. Leisure-time physical activity in relation to occupational physical activity among women. *Prev Med* 2015;74:93-6.
- WHO. Global Physical Activity Questionnaire (GPAQ). 2010;1-3. Cited on 2021 Jan 18. Available from: https://www.who.int/ncds/surveillance/steps/GPAQ_EN.pdf.
- ACOG Committee Obstetric Practice. ACOG Committee opinion. Number 267, January 2002: Exercise during pregnancy and the postpartum period. *Obstet Gynecol* 2002;99:171-3.
- Barakat R, Franco E, Perales M, Lopez C, Mottola MF. Exercise during pregnancy is associated with a shorter duration of labor. A randomized clinical trial. *Eur J Obstet Gynecol Reprod Biol* 2018;224:33-40.
- World Health Organization. WHO guidelines on physical activity and sedentary behavior. WHO. 2020. Cited on 2021 Jan 18. Available from: <https://www.who.int/publications/i/item/9789240015128>.
- Yin, Y., Huang, Y., Liu, X. and Luo, B., 2019. Assessment of physical activity status among pregnant women in southwestern China. *Frontiers of Nursing*, 6(2), pp.135-141.
- Dumith SC, Domingues MR, Mendoza-Sassi RA, Cesar JA. Physical activity during pregnancy and its association with maternal and child health indicators. *Rev Saude Publica* 2012;46:327-33.
- Hailemariam TT, Gebregiorgis YS, Gebremeskel BF, Haile TG, Spitznagle TM. Physical activity and associated factors among pregnant women in Ethiopia: Facility-based cross-sectional study. *BMC Pregnancy Childbirth* 2020;20:92.
- Evenson KR, Moos MK, Carrier K, Siega-Riz AM. Perceived barriers to physical activity among pregnant women. *Matern Child Health J* 2009;13:364-75.
- Sytsma TT, Zimmerman KP, Manning JB, Jenkins SM, Nelson NC, Clark MM, *et al.* Perceived barriers to exercise in the first trimester of pregnancy. *J Perinat Educ* 2018;27:198-206.
- Harrison AL, Taylor NF, Shields N, Frawley HC. Attitudes, barriers and enablers to physical activity in pregnant women: A systematic review. *J Physiother* 2018;64:24-32.