Taiwanese Journal of Obstetrics & Gynecology 57 (2018) 18–22

Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Original Article

Physical activities (exercises or choreses) during pregnancy and mode of delivery in nulliparous women: A prospective cohort study

Abdolhalim Rajabi [a, b], Najmeh Maharlouei [c], Abbas Rezaianzadeh [d], Kamran B. Lankarani [c], Firooz Esmaeilzadeh [e], Ali Gholami [f], Kamyar Mansori [g, h, *]

[a] Department of Community Medicine, School of Medicine, Golestan University of Medical Sciences, Gorgan, Iran
[b] Department of Epidemiology, School of Health, Iran University of Medical Sciences, Tehran, Iran
[c] Health Policy Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
[d] Research Center for Health Sciences, Epidemiology Department, Shiraz University of Medical Sciences, Shiraz, Iran
[e] Department of Public Health, School of Nursing and Midwifery, Maragheh University of Medical Sciences, Maragheh, Iran
[f] Department of Epidemiology, School of Health, Iran University of Medical Sciences, Tehran, Iran
[g] Social Development & Health Promotion Research Center, Gonabad University of Medical Sciences, Gonabad, Iran
[h] Department of Epidemiology, School of Public Health, Iran University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Article history:
Accepted 3 August 2017

Keywords:
Physical activity
Caesarean section
Pregnancy
Cohort study
Iran

ABSTRACT

Objective: The aim of this study was to investigate changes in physical activities during pregnancy and the relationship between physical activity and unplanned caesarean sections (CSs).
Materials and methods: A cohort study design was carried out. A cohort of 2029 pregnant women was established when they received prenatal care at 18–22 weeks of gestation in a medical center in southwest Iran. Participants were asked to recall their levels of physical activity during pre-pregnancy. The data were processed using Statistics/Data Analysis. To compare activities the chi-square was used to identify significant differences between the groups. A multiple logistic regressian was used to identify the association between activities and delivery mode as well as controlling potential confounding variables. In the analyses, the level of significance was set at $P < 0.05$.
Results: In total, 2029 pregnant women participated in the study, among which 1334 (65.84%) underwent CSs and 692 (34.16%) underwent NVDs. The study indicated the odds ratio of CS was 0.68 (95% CI: 0.47–0.97) for a pregnant woman who increased her level of activity during pregnancy compared to pre-pregnancy.
Conclusion: The results of this study showed that regular and standard physical activities during pregnancy can reduce the risk of caesarean section in pregnant women. These findings can be important in convincing health care providers to prescribe regular and standard physical activities for pregnant women during pregnancy.

Introduction

Pregnancy is a unique and special experience and its appropriate management promotes the physical and mental health of pregnant women. There are few events in life that may have such considerable physical, emotional and social effects on lives of the woman and her family [1]. During pregnancy, physical and mental aspects of women undergo a series of changes in both visible and invisible ways. Lack of a correct understanding may have unpleasant side impacts on physical and mental health. For instance, one of the common misbeliefs regarding pregnancy is that physical activities and performing exercise during pregnancy are problematic and that rest is the best option. Even in developed societies until 1985, recommending pregnant women to have rest was common among health care providers [2]. Unlike this erroneous belief, it should be noted that if scientific principles regarding exercise prescription be respected, performing exercise during pregnancy will be very valuable. The purpose of doing exercise during pregnancy is to maintain and promote physical fitness not increasing athletic abilities [3].

* Corresponding author. Social Development & Health Promotion Research Center, Gonabad University of Medical Sciences, Gonabad, Iran.
E-mail address: kamyarmansori@yahoo.com (K. Mansori).

https://doi.org/10.1016/j.tjog.2017.12.003

Physical fitness allows the pregnant woman to carry out the variety of daily activities with more vitality; as a result, the risk of diseases caused by physical inactivity are reduced [4]. Recently, according to the recommendations of the American College of Obstetricians and Gynecologists (ACOG), a large number of women have embarked on conducting exercise during pregnancy [5]. Evidence has shown that exercise has beneficial effects, even on those pregnant women who were sedentary before pregnancy [6]. Exercise is one of the best ways to reduce the adverse effects of pregnancy. It, in labor and delivery process, reduces pain and intensity and meanwhile improves heart and lung functions [7–10]. Also, through post-delivery exercise, the person returns more quickly to her pre-pregnancy shape, increasing her capabilities regarding the activities related to neonatal care [11].

There are many complications with pregnancy, one of the most important of which is cesarean section. Caesarean section is a major surgery that involves incising abdominal skin, the muscles under it and uterine lining. A Caesarean section is often performed when virginal delivery would put the baby's or mother's life or health at risk [12]. Given that cesarean section has always been one of the complications of pregnancy, medical experts trying with their utmost efforts to reduce the incidence of C-sections; however, the trend of this complication is so on the rise that in 2012 about 23 million C-sections were carried out globally [13,14]. In Iran, according to official statistics, the rate of cesarean is estimated to be about 35 percent; that is, three times as many as the global rate [15]. In some Iranian hospitals, this figure has reached up to 80 percent. According to unofficial statistics, Iran is the record holder of caesarean section in the world. Based on the abovementioned statistics, 75 percent of cesarean sections in Iran were not necessary [15].

The high rate of the caesarean section in the country may be due to cultural, economic, professional and physical factors. In the cultural dimension, the problem roots in the misbeliefs that are in favor of cesarean section (such as considering it to be a modern or scientific method that reduces complications for both mothers and infants) and against vaginal delivery. Financially, the hospitals and specialists are the main beneficiaries of performing cesarean. When it comes to professional factors resulting in high rate of cesarean, lack of attention to training and preparing pregnant women and low quality of services for carrying out natural delivery are of the main importance. Finally, regarding the physical factors of the large number of cesarean sections in Iran, lack of proper education and practice in terms of diet, nutrition and exercise makes mothers feel they do not have the stamina for vaginal delivery [17]. Probably doing exercise during pregnancy is an optimal intervention for promoting the physical and mental health of women both across and after pregnancy [18]. However, the effect of physical activity during pregnancy on the type of delivery is still controversial and published studies on physical activity during pregnancy are insufficient.

Therefore, considering the abovementioned issues and the uncertainty there is about the effects of physical activity on the mode of delivery and the vaginal delivery priority in health care and also given that no study has been done in this area in Iran, this study was designed and conducted to investigate changes in physical activity during pregnancy compared to pre-pregnancy and their effects on the mode of delivery.

Methods

This study used a prospective cohort design. The data were collected, from September 2012 to February 2013, during appointments for routine ultrasound examinations at 18–22 weeks of gestation in a prenatal clinic in a medical center situated in southwestern Iran by random sampling, that is explained in detail in another study [19]. 2029 pregnant women were enrolled at the time of receiving prenatal care at 18–22 weeks of gestation.

The selection criteria were first time pregnant women who: [1] were aged over 14 years [2], had a singleton fetus [3], had no medical-surgical or obstetric complications [4], could speak Persian and [5] agreed to participate in the study. The exclusion criterion was having planned to undergo a CS in advance.

The study was approved by the Human Research Review Board of Shiraz University of Medical Sciences. ID Research: No. 2013-6597, 20.12.2013. Each mother provided written informed consent before she was allowed to participate. A cohort of 2029 pregnant women was established. After obtaining a permit from the University, a trained health practitioner at the prenatal clinic explained the purpose of the study to the women and obtained their consents. Then, the study subjects were asked to fill out some questionnaires which are explained in detail in another study [19]. Women who were at 18–22 weeks of gestation were asked to recall their levels of physical activity before pregnancy with the question of “in general, comparing to before pregnancy, how much your activities (exercise or chores) have changed during pregnancy?” and the answers were classified into the three classes of “Decreased”, “Not changed”, “increased”.

The data were processed using the Statistics/Data Analysis (STATA.12 College Station, Texas USA). Descriptive statistics includes the frequency, percentage and frequency distribution of variables. The baseline characteristics of the two groups were compared using the chi-square test and t-test. To compare activities (exercise or chores) during pregnancy and pre-pregnancy, and to identify significant differences between the groups, the chi-square was employed. A multiple logistic regression was used to identify the association between activities (exercise or chores) during pregnancy and pre-pregnancy and delivery mode as well as controlling potential confounding variables. Goodness-of-fit (Nagelkerke R2) is the proportion of heterogeneity of mode of delivery explained by the independent variables in the model. Its value ranges from 0 to 1 and is directly related to the explanatory power of the model. The significance level was set at $P < 0.2$ for univariate analyses and $P < 0.05$ for multiple analyses.

Results

Formation of the study cohort is shown in Fig. 1. Women with Multiparas and a non-live fetus were excluded.

In total, 2029 pregnant women participated in the study, among which 1334 (65.84%) underwent CSs and 692 (34.16%) underwent NVDs. Most of the participants (89.26%) were aged between 19 and 34 years; more than seven-tenths of the mothers had an educational level of 9–12 years or above; the majority (87.88%) of participants had not worked outside home; the mean birth weight for the study participants' infants was 3107.01 (SD = 514.4333, range = 50–7600 g). The average gestational age was 38.74 weeks. More than half (55.92%) of the participants had decreased exercises or chores during pregnancy.

There were no significant differences in the type of pregnancy, history of abortion and stillbirth, birth height and head circumstance, between participants who underwent CSs and those who underwent NVDs (Table 1).

Activities (exercises or chores) during pregnancy, compared to pre-pregnancy, influences the birth pattern

Logistic regression was used to analyze the characteristics of activities (exercises or chores) during pregnancy, compared to pre-pregnancy, in women who underwent CSs. Those independent

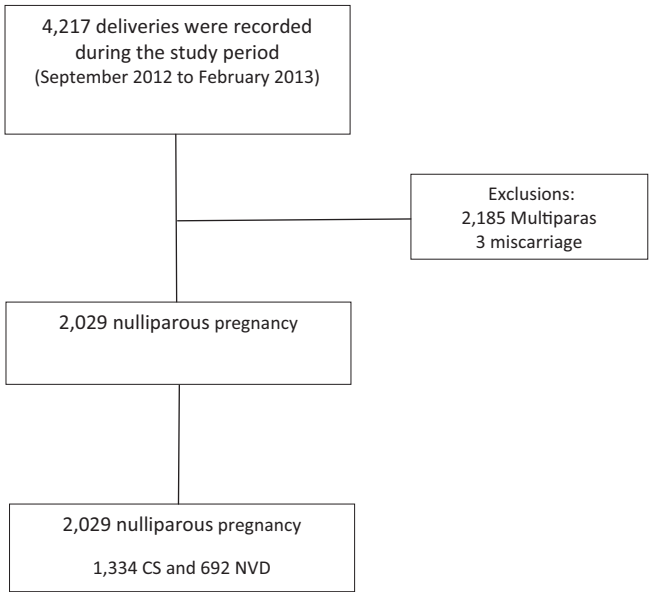

Fig. 1. Number of nulliparous pregnancies throughout the study period after exclusions.

variables included in the model and were significant in the univariate analysis, were: location of receiving health care services, maternal age (years), age of marriage, mother's level of education, Socio-economic level, gestational age, occupation, birth weight (g) and the activities (exercises or chores) changed during pregnancy. The results indicated that the odds ratio (OR) of a CS was 0.68 (95% CI: 0.47–0.97) for a pregnant woman increased her level of activity (exercises or chores) during pregnancy compared to pre-pregnancy (Table 2).

Discussion

Different studies have shown that physical activities during pregnancy have many benefits for maternal and fetal health; for instance, it can reduce the risk of preterm delivery, gestational diabetes, and possibly preeclampsia. However, few studies have examined the effect of physical activities during pregnancy on the type of delivery. The researchers stress the need for performing further investigations in this area. Therefore, the present study as a prospective cohort study was designed and implemented with the aim of comparing physical activities during pregnancy with pre-pregnancy, and their impacts on the type of delivery (natural or cesarean). The results of this study showed that physical activities of more than half of the women studied had been decreased during pregnancy compared to pre-pregnancy (55.92%), and there was a statistically significant difference between the two groups of women with vaginal delivery and caesarean section in terms of maternal healthcare location, marriage age, maternal education level, socioeconomic status, gestational age, mother's employment status, and infant's birth weight. The results also showed that after adjustment for the effects of confounding variables in the logistic

Table 1
Demographics and characteristics of the whole study population (n = 2029).

Variables	Total (N = 2029)[b] %	NVD* (n = 692) %	C/S* (n = 1334) %	P-value
Location of receiving health care services				
Private clinics	786 (38.74)	168 (24.28)	617 (46.25)	*<0.001***
Public clinics	1243 (61.26)	524 (75.72)	717 (53.75)	
Maternal age (years)				
<19 Years	167 (8.23)	82 (11.94)	85 (6.41)	*<0.001*
19-34 Years	1811 (89.26)	596 (86.75)	1212 (91.40)	
>34 Years	38 (1.87)	9 (1.31)	29 (2.19)	
Age of marriage				
<19 Years	530 (26.12)	213 (31.51)	316 (24.23)	*0.002*
19-34 Years	1441 (71.02)	459 (67.90)	980 (75.15)	
>34 Years	12 (0.59)	4 (0.59)	8 (0.61)	
Mother's level of education				
<8 Years	554 (27.43)	267 (38.86)	287 (21.58)	*<0.001*
9-12 Years	1040 (51.49)	324 (47.16)	714 (53.68)	
>12 Years	426 (21.09)	96 (13.97)	329 (24.74)	
Scio-economic Level				
Low level	443 (22.17)	172 (25.33)	270 (20.52)	*0.01*
Moderate level	1511 (75.63)	498 (73.34)	1011 (76.82)	
High level	44 (2.20)	9 (1.33)	35 (2.66)	
Gestational age	38.74 ± 2.69	39.28 ± 3.25	38.41 ± 1.84	<0.001***
Type of pregnancy				
Wanted	1855 (91.79)	630 (91.30)	1222 (92.02)	*0.58*
Unwanted	166 (8.21)	60 (8.70)	106 (7.98)	
Occupation				
Not working outside home	1769 (87.88)	640 (93.16)	1127 (85.19)	<0.001
Working outside home	244 (12.12)	47 (6.84)	196 (14.81)	
History of Abortion and stillbirth				
Yes	30 (1.48)	8 (1.16)	22 (1.65)	*0.38*
No	1993 (98.52)	682 (98.84)	1308 (98.35)	
Birth weight (g)[a]	3107.01 ± 514.43	3142.05 ± 457.88	3093.55 ± 527.92	*0.04*
Birth Height[a]	50.00 ± 4.58	50.29 ± 4.77	49.83 ± 4.29	*0.06*
Head circumstance	35.28 ± 5.36	35.41 ± 6.63	35.08 ± 3.80	*0.27*
Changing activities (exercises or chores) during pregnancy compared to before pregnancy				
Decreased	1110 (55.92)	348 (51.79)	759 (57.94)	*0.002*
Not Changed	676 (34.06)	236 (35.12)	440 (33.59)	
Increased	199 (10.03)	88 (13.10)	111 (8.47)	

*NVD, Normal Vaginal Delivery; CS, caesarean section. ** Chi square test, *** Two sample independent *t*-test.
Italic indicates significant level was P < 0.05.
[a] Values are presented as mean ± SD.
[b] In some subgroups of the data we've been system missing.

Table 2
Multiple logistic regression model by Backward Wald variable selection for explaining effects of changing activities (exercises or chores) during pregnancy compared to before pregnancy on birth pattern.

Variables	Wald	Sig	OR	95% CI for OR	
				Lower	Upper
Changing Activities					
Decreased	0.03	0.97	1.00	0.80	1.25
Not Changed	–	–	1.Ref	–	–
Increased	−2.09	0.03	**0.68**	0.47	0.97
Location of receiving health care services					
Private clinics	5.81	<0.001	2.01	1.58	2.54
Public clinics	–	–	1.Ref	–	–
Maternal age (years)					
<19 Years	–	–	1.Ref	–	–
19-34 Years	1.72	0.08	1.43	0.95	2.16
>34 Years	1.99	0.04	3.30	1.01	10.78
Mother's level of education					
<8 Years	–	–	1.Ref	–	–
9-12 Years	3.38	0.001	1.53	1.19	1.97
>12 Years	3.53	<0.001	1.90	1.33	2.71
Gestational age[a]	−7.65	<0.001	0.70	0.64	0.77
Nagelkerke R2	0.153				

Bold indicates significant level was P < 0.05.
[a] Continuous variable.

regression models, the following variables were identified as the most important factors influencing the prediction of the type of delivery: physical activities during pregnancy, maternal healthcare location, marriage age, maternal education level and gestational age. In this study, we found an inverse relationship between physical activities during pregnancy and the type of delivery (OR: 0.68 (95% CI: 0.47–0.97)). Since the main objective of this study was to evaluate the effect of physical activities during pregnancy on the type of delivery, the researchers mainly focused on this issue in the discussion and conclusion sections.

The results of the present study showed that physical activities of more than half of the women studied had decreased during pregnancy compared to pre-pregnancy, and this was consistent with the results of other similar studies conducted on pregnant women [20–24]. In a study by Yi-Li Kio in Taiwan with the aim of studying the influence of physical activities during pregnancy on the type of delivery, the results showed that 31% of the women had decreased their physical activities during pregnancy compared to pre-pregnancy [20]. Several studies have shown that physical activities, especially participation in sports and exercises, had been reduced within the first 20 weeks of pregnancy compared to pre-pregnancy. In fact, mothers instinctively reduce the intensity of their activities during pregnancy, but this should not cause them to avoid physical activities and sport participation. Performing physical activities during pregnancy would maintain women's fitness, and pregnant women need to do at least 30 min of physical activities every day [17,25,26].

In the present study, performing physical activities during pregnancy was considered to be an important factor in predicting the type of delivery, since fewer caesarean were reported among the women with higher physical activities during pregnancy (OR: 0.68, 95% CI: 0.47–0.97). This finding was consistent with the results of the studies conducted in this area. In a study by Timothy J et al. with the aim of examining the relationship between physical activities and the type of delivery in America, after adjustment of confounding variables, the odds ratio of cesarean section among women who were not physically active was 4.5 times more than those who did physical activities (OR: 2.48, 95% CI: 1.23–16.23)) [24]. Furthermore, Zeanah and Schlosser showed that vaginal delivery occurred significantly more among women who were physically active [27].

A systematic review and meta-analysis done by Domenjoz I to investigate the impact of physical activities and the type of delivery in 16 randomized clinical trials (RCT) with 3359 participants implied that the risk of cesarean section for the women with physical activities was significantly lower (RR: 0.85, 95% CI: 0.73–0.99) [28]. Also, another meta-analysis study in 2015 showed that performing physical activities during pregnancy increases the chance of normal delivery. However, the researchers stressed the need for further research in this filed [29]. Emilie Nor Nielsen and at al. in a multicenter cohort study published in Danish indicated that increasing levels of physical activity reduces odds of caesarean considerably and also women with a low activity level, in comparison with moderately active women, were 28% more likely to experience different complications of delivery [30]. Conducting exercise during pregnancy is aimed at maintaining or increasing physical fitness. Physical fitness allows pregnant women to do a variety of daily activities with more vitality. Hence, the risk of physical ailments caused by physical inactivity might decrease [3,31]. Evidence shows that exercise during pregnancy has positive effects, even for women who had been sedentary before pregnancy. Exercise is one of the perfect ways to reduce the adverse effects of pregnancy including insomnia, Spinal Column pain in the back, waist and hips, constipation, urinary incontinence, high blood pressure, gestational diabetes and anxiety. Exercise reduces pain even in the delivery process and improves lung function [7–10,32–35].

Abdominal muscles together with the diaphragm and pelvic floor muscles increase the intra-abdominal pressure for disposal activities (cough as well as urine and feces and vomit). That is why strengthening these muscles by doing physical activities may probably have a significant role in facilitating delivery. On the other hand, in many women, inguinal ligaments and muscles as well as those of the hip and lower extremities, especially the thigh and back leg adductors, have been shortened due to a sedentary life and this might cause paralysis of the posterior pelvis and the childbirth may be faced with problems [36].

It seems that stretching the thigh and back leg adductors and resistance exercises of abdominal and pelvic floor muscles help these women to more easily turn to and keep their natural delivery positions. Therefore, on the one hand, standard exercises for pregnant women can make them more prepared physically and mentally, and on the other hand, prepare them to turn to natural delivery positions. Since pregnant women may not turn to natural delivery positions by doing normal daily activities and the only way to make this type of adjustment is through exercise. Educating pregnant women and helping them develop correct exercise habits can increase the chance of natural delivery and avoid caesarean section [24,36].

Conclusion

The results of this study showed that standard physical activity during pregnancy can reduce the risk of caesarean in pregnant women. Therefore, It is recommended that medical professionals prescribe regular and standard physical activities for pregnant women during pregnancy and motivating them to preform exercise.

Conflicts of interest

The authors declare no conflict of interest regarding publication of this article.

References

[1] Bahadoran B, Abbasi F, Yousefi A, Kargarfard M. Evaluating the effect of exercise on the postpartum quality of life. Iran J Nurs Midwifery Res 2008;12(1).

[2] Pruett MD, Caputo JL. Exercise guidelines for pregnant and postpartum women. Strength Condit J 2011;33(3):100–3.
[3] 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(1):6–12.
[4] Gauer R, O'Connor F. How to write an exercise prescription. Education 2013;50(18):60–8.
[5] Olson D, Sikka RS, Hayman J, Novak M, Stavig C. Exercise in pregnancy. Curr Sports Med Rep 2009;8(3):147–53.
[6] Kagan KO, Kuhn U. Sport und Schwangerschaft [Exercise and Pregnancy]. Herz 2004;29(4):426.
[7] Arena B, Maffulli N. Exercise in pregnancy: how safe is it? Sports Med Arthrosc Rev 2002;10(1):15–22.
[8] Gau M-L, Chang C-Y, Tian S-H, Lin K-C. Effects of birth ball exercise on pain and self-efficacy during childbirth: a randomised controlled trial in Taiwan. Midwifery 2011;27(6):e293–300.
[9] Szymanski LM, Satin AJ. Exercise during pregnancy: fetal responses to current public health guidelines. Obstet Gynecol 2012;119(3):603.
[10] Tella B, Sokunbi O, Akinlami O, Afolabi B. Effects of aerobic exercises on the level of insomnia and fatigue in pregnant women. Internet J Gynecol Obstet 2011;15(1).
[11] Mottola MF, McLaughlin R. Exercise and pregnancy: Canadian guidelines for health care professionals. Wellspring. Alberta Centre for Active Living 2011;22(4):1–4.
[12] Finger C. Caesarean section rates skyrocket in Brazil. Lancet 2003;362(9384):628.
[13] MacDorman MF, Menacker F, Declercq E. Cesarean birth in the United States: epidemiology, trends, and outcomes. Clin Perinatol 2008;35(2):293–307.
[14] Molina G, Weiser TG, Lipsitz SR, Esquivel MM, Uribe-Leitz T, Azad T, et al. Relationship between cesarean delivery rate and maternal and neonatal mortality. J Am Med Assoc 2015;314(21):2263–70.
[15] Vahid Dastjerdi M. Ndications and outcomes and complications of cesarean section in Arash hospital in Tehran (Iran). J Sch Med Tehran Univ Med Sci 1998;56(1):42–5.
[17] Fell DB, Joseph K, Armson BA, Dodds L. The impact of pregnancy on physical activity level. Matern Child Health J 2009;13(5):597–603.
[18] Yeo SA. Exercise guidelines for pregnant women. J Nurs Scholarsh 2008;26(4):265–9.
[19] Rajabi A, Maharlouei N, Rezaianzadeh A, Rajaeefard A, Keshavarzi S, Lankarani KB, et al. Non-medical factors affecting antenatal preferences for delivery route and actual delivery mode of women in southwestern Iran. J Matern Fetal Neonatal Med 2016:1–7.
[20] Ko Y-L, Chen C-P, Lin P-C. Physical activities during pregnancy and type of delivery in nulliparae. Eur J Sport Sci 2016;16(3):374–80.
[21] Hojjati S. Relationship between daily physical activity during last month of pregnancy and pregnancy outcome. Iran Red Crescent Med J 2011;2011(1, Jan):15–20.
[22] Tsai M, Huang C, Kuo W, Wu H, Lee M. Physical activity, sleep quality and unplanned cesarean section in pregnant women. J Nurs Health Sci 2010;6(1):13–23.
[23] Borodulin K, Evenson KR, Wen F, Herring AH, Benson A. Physical activity patterns during pregnancy. Med Sci Sports Exerc 2008;40(11):1901.
[24] Bungum TJ, Peaslee DL, Jackson AW, Perez MA. Exercise during pregnancy and type of delivery in nulliparae. J Obstet Gynecol Neonatal Nurs 2000;29(3):258–64.
[25] Artal R. Exercise and pregnancy. Clin Sports Med 1992;11(2):363–77.
[26] Hegaard HK, Pedersen BK, Bruun Nielsen B, Damm P. Leisure time physical activity during pregnancy and impact on gestational diabetes mellitus, pre-eclampsia, preterm delivery and birth weight: a review. Acta Obstet Gynecol Scand 2007;86(11):1290–6.
[27] Zeanah M, Schlosser SP. Adherence to ACOG guidelines on exercise during pregnancy: effect on pregnancy outcome. J Obstet Gynecol Neonatal Nurs 1993;22(4):329–35.
[28] Domenjoz I, Kayser B, Boulvain M. Effect of physical activity during pregnancy on mode of delivery. Am J Obstet Gynecol 2014;211(4):401. e1-. e11.
[29] Poyatos-León R, García-Hermoso A, Sanabria-Martínez G, Álvarez-Bueno C, Sánchez-López M, Martínez-Vizcaíno V. Effects of exercise during pregnancy on mode of delivery: a meta-analysis. Acta Obstet Gynecol Scand 2015;94(10):1039–47.
[30] Nielsen EN, Andersen PK, Hegaard HK, Juhl M. Mode of delivery according to Leisure time physical activity before and during pregnancy: a multicenter cohort study of low-risk women. J pregnancy 2017;2017.
[31] Al-Shamli A. The impact of the Omani physical education curriculum on physical fitness. Curr Res J Soc Sci 2010;2(4):220–5.
[32] Bahadoran P, Pouya F, Zolaktaf V, Taebi M. The effect of stretching exercise and walking on changes of blood pressure in nulliparous women. Iran J Nurs Midwifery Res 2015;20(2):205.
[33] Duckitt K. Exercise during pregnancy: Eat for one, exercise for two. BMJ: Br Med J. 2011;343(7834):1129.
[34] Stafne S, Salvesen K, Romundstad P, Torjusen I, Mørkved S. Does regular exercise including pelvic floor muscle training prevent urinary and anal incontinence during pregnancy? A randomised controlled trial. BJOG An Int J Obstet Gynaecol 2012;119(10):1270–80.
[35] Stafne SN, Salvesen KÅ, Romundstad PR, Stuge B, Mørkved S. Does regular exercise during pregnancy influence lumbopelvic pain? A randomized controlled trial. Acta Obstet Gynecol Scand 2012;91(5):552–9.
[36] Kramer MS, McDonald SW. Aerobic exercise for women during pregnancy. The Cochrane Library; 2006.