



DOI: 10.5505/anoljfm.2021.08860

Anatol J Family Med 2021;4(3):207–212

# The Association of Exercise during Pregnancy with Maternal and Infant Health

Hilal Türker, Basri Furkan Dağcıoğlu

Department of Family Medicine, Ankara Yıldırım Beyazıt University Faculty of Medicine, Ankara, Turkey

## ABSTRACT

**Objectives:** This study was aimed to examine exercise status during pregnancy and the related factors.

**Methods:** Women who applied to the Gynecology and Obstetrics clinic between January-February 2017 for birth or examination were enrolled in this study. The patients, who were divided into two groups as exercised and not exercised during pregnancy, were questioned by face-to-face interview method for various parameters related to exercise.

**Results:** A total of 171 participants were evaluated, including 127 (74.3%) pregnant women in their last trimester and 44 (25.7%) puerperant women in the postpartum period. One hundred fourteen (67.1%) of the participants reported that they exercised during pregnancy, whereas 56 (32.9%) stated that they never exercised. Of the participants who exercised during pregnancy, 28 (24.6%) were doing moderate-paced walking or equivalent exercise at least three to four times a week, while 86 (75.4%) were doing less than two times a week. It was observed that those who regularly exercised before pregnancy were more frequent to exercise during their pregnancy, and edema formation was less in those who exercised during pregnancy (OR=1.751, 95%CI=1.220-2.514, p=0.002 and OR=2.457, 95%CI=1.143-5.291, p=0.021, respectively).

**Conclusion:** Exercise during pregnancy seems to be associated with some physical findings of the mothers. Therefore, it may be beneficial for pregnant to receive counseling on the benefits and possible risks of exercise in family medicine.

**Keywords:** Exercise, physical activity, pregnancy, infant health



Please cite this article as:  
Türker H, Dağcıoğlu BF. The Association of Exercise during Pregnancy with Maternal and Infant Health. Anatol J Family Med 2021;4(3):207–212.

### Address for correspondence:

Dr. Basri Furkan Dağcıoğlu.  
Department of Family  
Medicine, Ankara Yıldırım  
Beyazıt University Faculty of  
Medicine, Ankara, Turkey

Phone: +90 505 777 60 63

E-mail: bfurkan@gmail.com

Received Date: 31.12.2020

Accepted Date: 18.05.2021

Published online: 29.12.2021

©Copyright 2021 by Anatolian  
Journal of Family Medicine -  
Available online at  
www.anatoljfm.org

OPEN ACCESS



This work is licensed under a Creative  
Commons Attribution-NonCommer-  
cial 4.0 International License.

## INTRODUCTION

The first known source that mentions the effect of exercise during pregnancy belongs to Aristotle, who lived in 300 BC, and mentions that difficult births are often caused by a sedentary lifestyle.<sup>[1]</sup> Exercise allows the regulation of muscle activity to be used in birth, reduction of birth complications, cesarean rate, and analgesic use.<sup>[2]</sup> Besides, exercise has been shown to shorten labor time, reduce the need for obstetric interventions, and provide a faster recovery process.

In the guide "Exercise during pregnancy and the postpartum period: Committee on Obstetric Practice" published by the American College of Obstetricians and Gynecologists in 2002, it has been emphasized that exercising during pregnancy is beneficial for most women, even if exercise can bring minimal risks due to physiological and anatomical changes during pregnancy.<sup>[3]</sup>

There is an increase in cardiac output by 50%, blood volume by 45%, and heart rate is 15 beats per minute faster than the resting rate during pregnancy.<sup>[4]</sup> Although it is thought that the blood flow to the uteroplacental unit decreases due to the increase in blood flow to the muscles during exercise, because of compensatory mechanisms such as maternal hematocrit and tissue oxygenation increase, fetal oxygenation is not impaired, and the risk of hypoxia is reduced.<sup>[5]</sup> However, there may be a risk of fetal hypoxemia in intense exercises.<sup>[6]</sup> In addition, insulin sensitivity decreases during pregnancy, and catecholamine levels are noted to increase.<sup>[7]</sup> Therefore, in order to prevent hypoglycemia, it is recommended that pregnant women get enough calories during exercise and keep the exercise duration under 45 minutes.

Exercises during pregnancy have been found to be beneficial for maternal health, especially for continuity of muscle tone, sleep patterns, appetite, gas problems, and swelling in the feet. In addition, exercise and a balanced diet can result in appropriate weight gain during pregnancy, thus reducing the risk of gestational diabetes and long-term obesity.<sup>[6]</sup> Moderate exercises during pregnancy can have positive effects on birth weight. Fetal heart rate may increase 10–30 bpm during exercise. This increase returns to normal in a short time (5–20 minutes) after exercise and does not cause any harm to the fetus.<sup>[8]</sup> Fetal body temperature is approximately 1°C higher than maternal temperature, and fetal temperature can increase due to the increase in the mother's temperature during exercise; however, it has been determined to be harmless during and after maximum exercise.<sup>[9]</sup>

The ideal starting time for those who did not exercise before pregnancy is the second trimester, and the exercise program should be conducted three times a week for 15 minutes.<sup>[10]</sup> Exercise frequency and duration should be gradually increased to 30 minutes, four days a week. Studies have shown that mild and moderate exercise is beneficial, allowing pregnant women to be healthy, and does not cause any harm to the baby.<sup>[3,11]</sup> Moderate-intensity exercise is defined as the exercise level where the heart rate can reach a maximum of 140 beats/minute while the person can speak comfortably. The ideal application targets the heart rate of 60–70% of the value obtained using the 220-age formula.<sup>[1]</sup>

In primary care medicine, which is vital in pregnancy follow-ups, it will be beneficial to question pregnant women's exercise levels and make correct recommendations. Therefore, this study was aimed to examine exercise and the related factors during pregnancy.

## METHOD

This cross-sectional study included women who applied to the Gynecology and Obstetrics Clinic of Ankara Atatürk Training and Research Hospital for birth or examination between January and February 2017. The women who were aged between 18-40 years, who were in their last trimester (28 weeks and above according to the last menstrual period) and puerperant women in their postpartum period (including the 40th postpartum day) were included in the study. No participant refused to participate in the study. Thus, the whole of the targeted study population was reached.

Participants were divided into two groups as exercising and non-exercising during pregnancy, and a data collection form asking them about various parameters related to maternal and infant health were utilized. All of the women, who were interviewed during pregnancy, were followed up afterward through the hospital system, and their birth information was accessed and recorded on the data collection form.

The questionnaire form used in this study consisted of two parts. The first part consisted of 30 questions common to both groups participating in the study, asking about their sociodemographic data, chronic diseases, anthropomorphic data, and the course of pregnancy. The second part consisted of two questionnaires applied separately to pregnant women in the last trimester and postpartum period. In this part, the participants were asked questions about their pregnancy or delivery in accordance with their situation. Parameters that may be related to maternal and infant health were obtained from participants' health records. A structured questionnaire was applied to the participants via face-to-face interview.

Individuals diagnosed with high-risk pregnancies were excluded from this study.

The recorded data were analyzed using the Statistical Package for the Social Sciences (SPSS) v.21.0 program. Frequency, percentage, mean, standard deviation, median, interquartile range (IQR), were used for descriptive statistical data. Chi-square test and adjusted residual method were preferred for the comparison of groups. The Student t-test was used for comparing normally distributed groups, and the Mann Whitney-U test was used for comparing not normally distributed groups. The logistic regression analysis with the enter method is used for significant parameters. A p-value of less than 0.05 was considered statistically significant.

## RESULTS

A total of 171 participants, of which 127 (74.3%) pregnant women were in their last trimester and 44 (25.7%) puerperant women in their postpartum period were evaluated. The mean age was  $29.6 \pm 5.0$  years, the mean body mass index (BMI) before pregnancy was  $24.8 \pm 4.7$  kg/m<sup>2</sup> and the mean gestational week of the participants was  $35.8 \pm 2.8$  weeks. Besides, the mean gestational week of the participants on birth was  $39.2 \pm 1.1$  weeks and the mean baby weight was  $3354.0 \pm 447.0$  grams.

While 114 (67.1%) of the participants stated that they exercised during their pregnancy, 56 (32.9%) stated that they never exercised during their pregnancy. Of the participants who exercised during their pregnancy, 28 (24.6%) were doing moderate-paced walking or equivalent exercise at least three to four times a week, while 86 (75.4%) were doing less than two times a week. Pregnancy-related features among pregnant women according to exercise status are summarized in Table 1.

When pregnancy-related factors were evaluated by regression analysis, the absence of edema during pregnancy and pre-pregnancy exercise habits were found to be significant ( $p=0.021$  and  $p=0.002$ ). The factors associated with exercise during pregnancy are summarized in Table 2.

## DISCUSSION

In our study, in which the relationship between exercise status during pregnancy and mother and infant health was examined, it was observed that exercise during pregnancy was particularly associated with the absence of edema and exercise habits before pregnancy. Besides, approximately two-thirds of the participants stated that they exercised during their pregnancy. In the physical activity guideline for pregnant women published in Canada in 2019, it is recommended that all pregnant women with no contraindications should exercise for 150 minutes per week.<sup>[12]</sup> In a study conducted in the United States in 2004, the rate of exercising in pregnant women was 65.6%, while the same rate was 73.1% in non-pregnant women.<sup>[13]</sup> In the study conducted by Balsak et al. on 526 pregnant women living in the Aegean Region in 2007, the rate of those who exercised during pregnancy was found to be 40.1%, but in this study, it was stated that the low rate of exercising during pregnancy was due to the fact that pregnant women did not consider walking as an exercise.<sup>[14]</sup> In the Turkey Nutrition and Health Survey (TNHS-2010) study conducted under the leadership of the Turkish Ministry of Health in 2010, it was found that the exercise ratio is 76.5% in women and 70.4% in pregnant women.<sup>[15]</sup> Among the 145 pregnant women whose

physical activity status was examined in the same study, it was revealed that only 43 pregnant women exercised, of which 11.6% of them exercised one to two times a week and 17.9% exercised at least three to four times a week, and the most preferred exercise type was walking.<sup>[15]</sup> Although the exercise rates found in our study are similar to the results determined in the United States, it is striking that the exercise rates in the TNHS-2010 study were deemed to be very low. This may be because the participants were at any period of pregnancy in TNHS-2010; thus, the participants at the beginning of their pregnancy may not have started exercise yet, making the rates seem low. However, in our study, different sets of questions were asked to pregnant women who are in their last trimester and to participants in the postpartum period.

It has been reported in the literature that women who exercise regularly continue to exercise during pregnancy.<sup>[16]</sup> However, in a large-scale study suggesting a regression in exercise behavior during pregnancy, it was observed that the rate of regular exercise, which was 55% before pregnancy, decreased to 42% during pregnancy.<sup>[17]</sup> In our study, determining the relationship between pre-pregnancy exercise and exercise behavior during pregnancy again emphasizes the importance of converting exercise into a lifestyle rather than just a temporary attempt. It is known that exercise has an important contribution to the prevention of varicose veins caused by the compression of the uterus on the pelvic vessels in the last trimester.<sup>[18]</sup> In our study, it was found that pregnant women who exercise had fewer complaints of edema. Accordingly, it can be said that exercise is an essential factor in terms of preventing edema in pregnancy, and it would be beneficial to recommend regular exercise to pregnant women with lower extremity edema.

Stretch marks, one of the most common conditions during pregnancy, are often an aesthetic problem that cannot be treated effectively.<sup>[19]</sup> Although the role of exercise in this issue has not been clearly revealed in previous literature, some studies report that there is no significant relationship between exercise and stretch mark development. In our study, it is an interesting result that more stretch marks were observed in women who do exercise during their pregnancy. It seems that more comprehensive studies investigating the effects of genetic factors and nutrition are needed to reveal the clinical significance of this situation.

There are contradictory results in the literature regarding the birth weight of women who exercise. In a study conducted on 250 healthy pregnant women in Iran, no statistically significant difference was found between the exercising and non-exercising pregnant groups in terms of infant

**Table 1.** Pregnancy-related features among pregnant women according to exercise status

	Exercise status during pregnancy		p
	Present	Absent	
Age of mothers (years) (n=170)	28.9±5.2	28.4±6.1	0.624*
Gestational week (weeks) (n=102)	39.3±1.2	38.9±1.1	0.411*
BMI (kg/m <sup>2</sup> )(n=169)	25.1 [7.3]	23.9 [5.1]	0.887 <sup>†</sup>
Baby's birth weight (g) (n=100)	3357.5 [649.0]	3270.0 [540.0]	0.892 <sup>†</sup>
Having chronic disease (n=170)			
Yes	45 (67.2)	22 (32.8)	0.981 <sup>‡</sup>
No	68 (67.0)	34 (33.0)	
Working status (n=170)			
Housewife	94 (69.1)	42 (30.9)	0.253 <sup>‡</sup>
Working	20 (58.8)	14 (41.2)	
Planning status of pregnancy (n=168)			
Planned	88 (66.2)	45 (33.8)	0.788 <sup>‡</sup>
Unplanned	24 (68.6)	11 (31.4)	
Information about pregnancy exercises (n=169)			
Yes	61 (77.2)	18 (22.8)	0.007 <sup>‡</sup>
No	52 (57.8)	38 (42.2)	
Pre-pregnancy exercise habits (n=169)			
Never or rarely	68 (58.1)	49 (41.9)	<0.001 <sup>‡</sup>
Regularly	45 (86.5)	7 (13.5)	
Gestational diabetes mellitus (n=170)			
Present	13 (61.9)	8 (38.1)	0.591 <sup>‡</sup>
Absent	101 (67.8)	48 (32.2)	
Hypertension/Pre-eclampsia (n=170)			
Present	12 (80.0)	3 (20.0)	0.264 <sup>‡</sup>
Absent	102 (65.8)	53 (34.2)	
Presence of stretch marks during pregnancy (n=170)			
Present	59 (74.7)	20 (25.3)	0.049 <sup>‡</sup>
Absent	55 (60.4)	36 (39.6)	
Delivery type (n=102)			
Vaginal delivery	33 (70.2)	14 (29.8)	0.625 <sup>‡</sup>
Cesarean	41 (74.5)	14 (25.5)	
Edema in pregnancy (n=170)			
Yes	62 (59.6)	42 (40.4)	0.010 <sup>‡</sup>
No	52 (78.8)	14 (21.2)	
Sleep quality during pregnancy (n=170)			
Increased or not changed	50 (65.8)	26 (34.2)	0.752 <sup>‡</sup>
Decreased	64 (68.1)	30 (31.9)	
Neonatal intensive care need (n=101)			
Yes	9 (69.2)	4 (30.8)	0.793 <sup>‡</sup>
No	64 (72.7)	24 (27.3)	
Urinary incontinence (n=165)			
Never or rarely	104 (68.0)	49 (32.0)	0.614 <sup>‡</sup>
Frequent or continuous	9 (75.0)	3 (25.0)	

**Table 1.** CONT.

	Exercise status during pregnancy		p
	Present	Absent	
Constipation (n=168)			
Never or rarely	94 (66.2)	48 (33.8)	0.492 <sup>‡</sup>
Frequent or continuous	19 (73.1)	7 (26.9)	
Back pain during pregnancy (n=169)			
Never or rarely	58 (70.7)	24 (29.3)	0.300 <sup>‡</sup>
Frequent or continuous	55 (63.2)	32 (36.8)	

BMI: Body mass index.  
Data are presented as mean±standard deviation, median [IQR] and n (%).  
\*Student T-test, †Mann Whitney-U test, ‡Chi-square test.

**Table 2.** The factors associated with exercise during pregnancy

	B	SE	p	OR	95% CI	
					Lower	Upper
Presence of stretch marks during pregnancy	0.600	0.370	0.105	1.822	0.883	3.760
Absence of edema during pregnancy	0.899	0.390	0.021	2.457	1.143	5.291
Information about pregnancy exercises	0.586	0.376	0.119	1.797	0.860	3.754
Pre-pregnancy exercise habits	0.035	0.184	0.002	1.751	1.220	2.514

CI: Confidence interval; OR: Odds ratio; SE: Standard error.  
Logistic regression analysis.

birth weight, which is consistent with our findings.<sup>[20]</sup> Although the literature suggests that women who exercise moderately during pregnancy give birth to babies with a birth weight of up to 500 grams lower than those who do not exercise, meta-analyses concluded that there is no significant relationship between the mother's exercising and the birth weight of the baby.<sup>[21]</sup>

One of the critical reasons that impair the quality of life of pregnant women in the last trimester is the presence of urinary incontinence. In Turkey, 16.4% to 49.7% of women are reported to have symptoms of urinary incontinence.<sup>[22]</sup> Studies show that this rate is 40% in pregnant women.<sup>[23]</sup> In our study, it was observed that approximately one-third of pregnant women had complained of urinary incontinence. On the other hand, in a 2016 consensus statement, it was stated that there was no significant difference in terms of urinary and fecal incontinence between pregnant women who exercise and those who do not.<sup>[24]</sup> Similarly, in our study, no significant relationship was determined between exercising status and urinary incontinence; further, there was no association between pre-pregnancy BMI and the presence of incontinence.

There were some limitations in our study. Since our study was conducted in a single center and a short period, the generalizability of the data obtained remains unclear. In our study, exercise and its effects were investigated based on the statements of pregnant women. This situation reduces the level of reliability of the information obtained. However, it is seen that the same method is preferred in some large-scale studies on this subject.<sup>[15]</sup> Also, the fact that the participants included in the study are pregnant women in the third trimester and mothers who have just given birth can be seen as another limitation. However, it can be thought that this situation may provide more reliable data compared to the information obtained from individuals who are just at the beginning of pregnancy.

## CONCLUSION

In this study, it can be inferred that doing exercise during pregnancy was most significantly associated with doing regular exercise even before pregnancy and having knowledge about exercise during pregnancy. Besides, edema development in the legs was significantly less in pregnant women who exercise; however, stretch marks

were more common. In our study, it was seen that exercising during pregnancy had no significant relationship with the mother's employment status, whether the pregnancy was planned or not, the presence of gestational diabetes mellitus, the presence of hypertension/preeclampsia, the type of delivery, the sleep quality of the pregnant woman, the need for neonatal intensive care unit, the presence of urinary incontinence, constipation, and low back pain. In primary care, which is deemed vital in pregnancy follow-up, it will be beneficial to encourage pregnant women to engage in physical activity and provide consultancy on the benefits/risks of exercise during pregnancy.

### Disclosures

**Peer-review:** Externally peer-reviewed.

**Conflict of interest:** The authors declare no conflict of interest.

**Funding:** No financial support was received for this research

**Ethics Committee Approval:** This study was conducted with the approval of the Ankara Yıldırım Beyazıt University, Faculty of Medicine Clinical Research Ethics Committee (Approval date: Dec 21, 2016 and Approval number: 291). All individuals who met the study criteria were informed about the study, and their consent was obtained.

**Authorship Contributions:** Concept – H.T.; Design – B.F.D.; Supervision – B.F.D.; Materials – H.T., B.F.D.; Data collection &/ or processing – H.T.; Analysis and/or interpretation – B.F.D.; Literature search – H.T.; Writing – B.F.D.; Critical review – H.T., B.F.D.

### REFERENCES

- Akbayrak T, Kaya S. Gebelik ve egzersiz. Ankara: Sağlık Bakanlığı Temel Sağlık Hizmetleri Genel Müdürlüğü Beslenme ve Fiziksel Aktivite Daire Başkanlığı; 2008. Available at: [http://www.xn-ukurayrasm-n6ae87g.com/Makaleler/Gebelik\\_ve\\_Egzersiz/Gebelik%20ve%20Egzersiz.pdf](http://www.xn-ukurayrasm-n6ae87g.com/Makaleler/Gebelik_ve_Egzersiz/Gebelik%20ve%20Egzersiz.pdf). Accessed Oct 5, 2021.
- Türkiye fiziksel aktivite rehberi. Ankara: T.C. Sağlık Bakanlığı Türkiye Halk Sağlığı Kurumu Obezite, Diyabet ve Metabolik Hastalıklar Daire Başkanlığı; 2014. Available at: [https://hsgm.saglik.gov.tr/depo/birimler/saglikli-beslenme-hareketli-hayat-db/Fiziksel\\_Aktivite\\_Rehberi/Turkiye\\_Fiziksel\\_Aktivite\\_Rehberi.pdf](https://hsgm.saglik.gov.tr/depo/birimler/saglikli-beslenme-hareketli-hayat-db/Fiziksel_Aktivite_Rehberi/Turkiye_Fiziksel_Aktivite_Rehberi.pdf). Accessed Oct 5, 2021.
- Committee on Obstetric Practice. ACOG committee opinion. Exercise during pregnancy and the postpartum period. Number 267, January 2002. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 2002;77(1):79–81.
- Clapp JF, Capeless EL. Neonatal morphometrics after endurance exercise during pregnancy. *AJOG* 1990;163(6):1805–11.
- Clapp JF. The course of labor after endurance exercise during pregnancy. *AJOG* 1990;163(6):1799–805.
- Api O, Ünal O, Şen C. Gebelikte beslenme, kilo alımı ve egzersiz. *Perinatoloji Dergisi* 2005;13(2):71–9.
- Pivarnik JM. Maternal exercise during pregnancy. *Sports Med* 1994;18(4):215–7.
- Polden M, Mantle J. *Physiotherapy in obstetrics and gynaecology*. Oxford: Elsevier Health Sciences; 1990.
- Larsson L, Lindqvist PG. Low-impact exercise during pregnancy—a study of safety. *Acta Obstet Gynecol Scand* 2005;84(1):34–8.
- Taşçı Duran E, Atay E, İmer B. Gebelikte egzersiz uygulamaları: neden? nasıl?. *Spor Sağlık ve Tıp Bilimleri Dergisi* 2013;3(6):63–74.
- American College of Sports Medicine. *Guidelines for exercise testing and prescription*. Philadelphia: Williams & Wilkins; 1991.
- Mottola MF, Davenport MH, Ruchat SM, Davies GA, Poitras VJ, Gray CE, et al. 2019 Canadian guideline for physical activity throughout pregnancy. *Br J Sports Med* 2018;52(21):1339–46.
- Evenson KR, Savitz DA, Huston SL. Leisure-time physical activity among pregnant women in the US. *Paediatr Perinat Epidemiol* 2004;18(6):400–7.
- Balsak D, Yildirim Y, Avcı ME, Töz E, Gültekin E, Kayhan K, et al. Ege bölgesinde yaşayan gebe kadınların gebelik egzersizleri hakkındaki bilgi ve davranışlarının incelenmesi. *Trakya Univ Tıp Fak Derg* 2007;24(3):200–4.
- TC Sağlık Bakanlığı. Türkiye beslenme ve sağlık araştırması 2010: Beslenme durumu ve alışkanlıklarının değerlendirilmesi sonuç raporu. Ankara: Sağlık Bakanlığı Sağlık Araştırmaları Genel Müdürlüğü; 2014.
- Kutlu M, Şimşek M, Kaya N, Özekci Ü. Hamilelik süresince egzersizin pozitif ve negatif boyutları. *JCOG* 1996;6(4):290–5.
- Zhang J, Savitz DA. Exercise during pregnancy among US women. *Ann Epidemiol* 1996;6(1):53–9.
- Wadsworth P. The Benefits of Exercise in Pregnancy. *JNP* 2007;3(5):333–9.
- Elsaie ML, Baumann LS, Elsaie LT. Striae distensae (stretch marks) and different modalities of therapy: an update. *Dermatol Surg* 2009;35(4):563–73.
- Ghods Z, Asltoghiri M. Maternal exercise during pregnancy and neonatal outcomes in Iran. *Procedia Soc Behav Sci* 2012;46:2877–81.
- Pivarnik JM. Potential effects of maternal physical activity on birth weight: brief review. *Med Sci Sports Exerc* 1998;30(3):400–6.
- Karakuş A, Yanikkerem E. Postpartum dönemde inkontinans ve yaşam kalitesi: son 10 yıllık çalışmalar. *CBU-SBED* 2015;2(3):54–9.
- Diñç A. Prevalence of Urinary Incontinence During pregnancy and associated risk factors. *Low Urin Tract Symptoms* 2018;10(3):303–307.
- Bo K, Artal R, Barakat R, Brown W, Dooley M, Evenson KR, et al. Exercise and pregnancy in recreational and elite athletes: 2016 evidence summary from the IOC expert group meeting, Lausanne. Part 2—the effect of exercise on the fetus, labour and birth. *Br J Sports Med* 2016;50(21):1297–305.