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Original Article

Effect of Regular Exercise Assessed by Pedometer on Pregnancy Outcomes and Maternal Mental Health

Serap Simavlı [1], *Emel Kiyak Caglayan [2], Deniz Ulas [3], Aydın Kosus [3], Nermin Kosus [3], İkbal Kaygusuz [4]

1. *Department of Obstetrics and Gynecology, Yuzyıl Hospital, İstanbul, Turkey*
2. *Tekirdag Namık Kemal University, Facuty of Medicine, Department of Obstetrics and Gynecology, Tekirdağ, Turkey*
3. *Obstetrics and Gynecology, Private Practise, Ankara, Turkey*
4. *Department of Obstetrics and Gynecology, Medikal Park Hospital, Ankara, Turkey*

***Corresponding Author:** Email: drekiyak@gmail.com

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Abstract

Background: We sought to analyze the impact of physical activity and exercise ability, measured with a pedometer, on obstetric and neonatal outcomes.

Methods: Women who engaged, Türkiye in exercise for 30 minutes or longer during pregnancy were classified as the exercise group, whereas those who did not exercise were classified as the control group. The exercise capacity of women was evaluated by a 6-minute walking test utilizing a step counter, and its correlation with pregnancy outcomes was established. Postpartum anxiety levels and satisfaction were evaluated on the first and eighth days postpartum.

Results: The exercise group exhibited a significantly increased step count and length, alongside a reduced incidence of pregnancy problems ($P < .05$). The duration of labor, initial breastfeeding time, and neonatal intensive care unit (NICU) requirements were significantly reduced in the exercise group ($P < .05$). A notable disparity was detected between the two groups for anxiety levels and satisfaction and postpartum depression ($P < .05$).

Conclusion: Regular physical activity throughout gestation positively influences pregnancy outcomes and maternal well-being, without inducing difficulties for either the mother or the infant.

Keywords: Exercise; Pregnancy; Neonatal; Depression; Maternal health

Introduction

Historically, pregnant women have been perceived as susceptible and counseled to limit their activities. Exercise has potential advantages for both the mother and the fetus (1). Engaging in physical activity is safe during pregnancy. After consulting a healthcare practitioner, the American College of Obstetrics and Gynecology (ACOG) advises that all healthy pregnant women engage in regular exercise (2). Extensive scientific research has demonstrated that, for healthy pregnant women, moderate-intensity exercise is both safe and advantageous for both the women and the fetüs(3).

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The exercise recommendations continue to adhere to the existing guidelines for moderate-intensity, low-impact aerobic activity, stipulating 30 minutes per session and a minimum of 150 minutes per week (4). Childbirth is a pivotal occurrence in a woman's life, and its outcome can have both immediate and enduring consequences. Negative delivery experiences can adversely impact postpartum mental conditions (5). During childbirth, particularly for primiparas, women encounter increased pain and anxiety, which can adversely affect both moms and newborns. Enhanced aerobic exercise or resistance training has been shown to significantly reduce depressed symptoms. Individuals with depression generally exhibit lower levels of physical activity compared to those without the condition (6). Physical activity has been associated with a decrease in anxiety and depression symptoms (7).

A sedentary lifestyle during pregnancy may lead to the onset of various illnesses, including hypertension, preeclampsia, maternal and childhood obesity, gestational diabetes mellitus (GDM), and dyspnea (8). Excessive gestational weight gain during pregnancy has been associated with negative outcomes, including hypertension, elevated birth weight, cesarean delivery and obesity in both mothers and their offspring (9). We aimed to investigate the hypothesis that regular exercise during pregnancy can reduce pregnancy complications such as GDM, preeclampsia, birth complications. We examined the correlation between exercise ability, assessed using the 6-minute walk test, and the incidence of unfavorable pregnancy outcomes, labor results, and postpartum maternal mental health.

Materıals and Methods

Overall, 151 primiparous women, at 36 weeks of gestational age, who visited to Bolu Izzet Baysal Hospital (Bolu/ Türkiye), Obstetrics and Gynecology Department for antenatal care, were solicited to participate in a trial examining the impact of exercise on maternal and newborn outcomes.

The research received approval from the local Ethics Committee (date/number:2011/127 - Turgut Ozal University, Ankara, Turkey) and adhered to the Helsinki Declaration, including its latest modifications and Good Clinical Practice recommendations. Eligible patients were apprised of the study design and provided informed permission prior to participation.

The inclusion criteria were: women aged 18 to 35 years, primiparous at 37–41 weeks of gestation, carrying a singleton fetus with cephalic presentation with normal birth weight, and anticipated to undergo normal spontaneous vaginal delivery. Excluded criteria were: maternal hypertension, cardiac, renal diseases, corticosteroid use, cervical incompetence, prior tocolytic treatments from the onset of pregnancy to the interview date, any form of bleeding during pregnancy, postdates, multiple gestations, elective cesarean sections, use of analgesic, antipsychotic, hearing impairments, inability to comprehend the visual analog scale (VAS), Postpartum Depression Scale (EPDS), intrauterine fetal demise, fetal anomalies.

During personal interviews, the women were inquired about the average number of times per week they engaged in exercise for 30 minutes or more beyond their typical activities during pregnancy. For analysis, activity status was classified into the exercise group and the control group. The exercise group comprises pregnant women who engage in aerobic exercise for 30-45 minutes at least once a week and no more than four times a week, alongside their usual routine activities. The control group comprises pregnant women who engage in no exercise and just perform their usual daily activities. Information regarding age, height, initial maternal weight, step count, and step length was documented on a data sheet. The exercise capacity of women was evaluated using a 6-minute walking test with a step counter (digital Omron HJ-112 pedometer) for each participant at 36 weeks of gestation. The patients' typical stride length was subsequently assessed. The patient affixed the pedometer to the belt and maintained its use during ambulation. The step counter documented the quantity of steps taken by the wearer during the 6-minute interval.

Postpartum maternal health was assessed utilizing the VAS for anxiety (VAS-A), the VAS for satisfaction (VAS-S), and EPDS for postpartum depression. Data on depression were gathered prior to the operation to compare baseline prenatal depression rates between the groups.

Anxiety assessments: The initial outcome measure was the anxiety level during the 0-24 hours postpartum interval. Anxiety levels were evaluated utilizing a 0–10 cm horizontal VAS, where 0 signifies the absence/ minimal of anxiety, and 10 denotes extreme/highest level of anxiety. A blinded medical staff member requested that patients indicate their anxiety levels to mitigate potential reluctance in reporting anxiety scores. All patients were instructed to evaluate their anxiety at four specific time intervals (2, 8, 12, and 24 hours).

Satisfaction rate: The final outcome metric was satisfaction with childbirth. Satisfaction rates were evaluated utilizing a 0 – 10 cm VAS. All patients received instruction on the VAS prior to the trial and were requested to indicate their satisfaction levels (0 = completely unhappy, 10 = entirely satisfied) at 2, 8, 12, and 24 hours postpartum.

The rate of postpartum depression: EPDS is a prevalent self-report tool utilized for screening depression in both postnatal and antenatal phases. A 10-item EPDS was developed to detect depressive symptoms in postpartum women (10). The scale is user-friendly and does not necessitate specialized knowledge for scoring and validation within the Turkish population (11,12). The scale focuses on the cognitive and affective traits of depression and has been validated for use both during pregnancy and postpartum. Scores of Z10 and Z13 on the scale signify moderate depressed symptoms and probable major depression, respectively; however, the scale cannot establish a diagnosis of depression. Depression rates were assessed at three distinct intervals: 36 weeks of gestation, the first day postpartum prior to discharge, and the eighth day postpartum,employing the EPDS. Upon the patient's admission for labor, the final maternal weight, gestational weight gain, gestational week, initial cervical dilation, cervical effacement, and maternal hemodynamic parameters, including systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and pregnancy complications, were documented. The maternal pulse was palpated and counted for 60 seconds, and blood pressure was recorded in the right arm at heart level using a sphygmomanometer. The initial stage of labor is characterized by the period from the diagnosis of labor (indicated by regular contractions and progressive cervical dilation) to complete cervical dilation. This includes the latent phase, which lasts until cervical dilation reaches 6 cm, and the active phase, during which cervical dilation progresses from 6 to 10 cm. The second stage of labor encompasses the period from complete dilatation to delivery. The third stage of labor encompasses the period from delivery to the complete separation of the placenta. The duration of labor stages and neonatal and labor outcomes were documented and compared among groups.

Statistical Analysis

The power analysis indicated that 45 patients per group were required to achieve 80% power, with an alpha error of 0.05, beta error of 0.20, and an effect size of 0.60. Twenty patients were incorporated into each group to account for any potential missing data due to various causes.

Initially, continuous variables were examined graphically for the normality of their statistical distribution with the Shapiro-Wilk test. The median (minimum-maximum) was employed for continuous variables, while counts and percentages were utilized for categorical variables in nonparametric variables. In parametric variables mean ± standart deviation were used. The baseline characteristics and outcome measures of the two groups were assessed using the Mann–Whitney test for continuous data and the chi-square test for categorical variable comparison. In cases where expected frequencies were lesss than 5, Fisher's exact test was used. Spearman's rank correlation was employed to identify the association between walking metrics and prenatal-neonatal outcomes. The threshold for statistical significance was established at $P < 0.05$. Sta-

tistical analysis was conducted using SPSS version 16.0 software (SPSS Inc., Chicago, IL, USA).

Results

While 151 pregnant women participated in the study (exercise group=85, control group=66), only 119 were incorporated into the analysis. A total of 32 women withdrew from the study for the following reasons: failure to notify researchers upon admission to the maternity unit for labor (n=9), cervical dilation exceeding 3 cm (n=8), labor occurring before 37 weeks of gestation (n=6), or after 41 weeks of gestation (n=9). Seventy-five women were allocated to the exercise group, whereas 44 were designated to the control group.

The demographic attributes of the study cohorts are delineated Table 1. The exercise and control groups shown comparability regarding maternal age, gravidity, parity, gestational age, and pre-pregnancy maternal weight ($P > 0.05$). The exercise group exhibited a significantly greater number of steps and step length compared to the control group ($P < 0.05$). The exercise group had decreased gestational weight growth, blood pressure, and heart rate ($P< 0.001$) (Table 1).

Table 1: Demographic characteristics of groups

Variable	Exercise group (n=75)	Control group (n=44)	*P*
Maternal age	24.8 ± 4.9	24.4 ± 4.1	0.989
Gravidity	1(1-3)	1(1-3)	0.283
Parity	1(0-2)	1(1-2)	0.791
Gestational age (week)	38.4 ± 0.9	38.5 ± 0.9	0.750
First maternal weight (kg)	56.6 ± 5.2	57.6 ± 6.4	0.322
Last maternal weight (kg)	69.4 ± 5.9	75.1 ± 6.5	<0.001
Maternal weight gain (kg)	13.9 ± 3.2	17.5 ± 5.2	<0.001
Heart rate	71.6 ± 5.4	81.4 ± 6.6	<0.001
SBP (mmHg)	97.3 ± 6.8	103.0 ± 8.5	<0.001
DBP (mmHg)	62.4 ± 4.9	65.4 ± 14.3	<0.001
Number of step (n/6m)	485(198-754)	359(180-754)	0.034
Step lenght (cm)	32(7-54)	28(24-54)	0.007

Abbreviations: SBP; systolic blood pressure, DBP; diastolic blood pressure

Upon comparison of the groups for pregnancy problems, the incidence of GDM and polyhydramnios was significantly elevated in the control group ($P= 0.006$ and $P< 0.001$, respectively). The incidence of other pregnancy-related problems showed no significant difference ($P > 0.05$) (Table 2). Dietary plans were established for individuals with GDM under the guidance of a dietician, and both fasting and postprandial blood glucose levels were assessed. The limited sample size may render our subgroup analyses, such as those concerning GDM rates, insufficiently powered. Cervical dilatation occurred more frequently in the exercise group compared to the control group, and the duration of both the first and second stages of labor was reduced in the exercise group ($P< 0.05$). The exercise group had marginally shorter durations in the latent and third stages; however, the difference was not statistically significant ($P>0.05$) (Table 2).

Table 2: The effect of exercise on pregnancy complications and labor parameters

Variable	Exercise group (n=75, %)	Control group (n=44, %)	*P*
GDM	0 (0.0)	5 (11.4)	0.006
Oligohydroamnios	5 (6.7)	3 (6.8)	1.000
Polihydroamnios	0 (0.0)	11 (25.0)	<0.001
IUGR	3 (4.5)	2 (4.0)	0.886
Cervical efasman	60(40-80)	60(40-80)	0.814
Cervical dilation (cm)	3(2-4)	2(1-4)	0.008
Duration of first stage	290(160-630)	350(180-660)	0.001
Duration of latent phase	147.5840-420)	150(40-440)	0.069
Duration of active phase	140(60-330)	190(60-330)	0.040
Duration of second stage	35(15-65)	40(15-65)	0.025
Duration of third stage	10(5-30)	12.5(5-20)	0.335

Abbreviations: GDM; gestational diabetes mellitus, IUGR; intra-uterine growth restriction

Despite a higher rate of spontaneous vaginal delivery in the exercise group, the difference was not statistically significant ($P > 0.05$). The first breastfeeding time, neonatal intensive care unit (NICU) requirements, and length of NICU stay were reduced in the exercise group compared to the control group ($P< 0.05$). The Apgar score exhibited no significant difference between women who engaged in exercise and those who did not throughout pregnancy ($P>0.05$) (Table 3).

Table 3: The effect of exercise on birth and neonatal outcomes

Variable	Exercise group (n=75)	Control group (n=44)	*P*
NSVD	72 (96%)	40 (90.9%)	0.421
C/S	3 (4%)	4 (9.1%)	
Vacuum	5 (11.4)	5 (6.7)	0.496
Birth weight (gram)	3185 ± 406	3322 ± 368	0.112
Episiotomy	71 (94.7%)	40 (90.9%)	0.466
Length of episiotomy (cm)	5.9 ± 1.7	5.8 ± 1.9	0.869
Lacerations	16 (21.3%)	19 (51.9%)	0.060
1st degree lacerations	11 (14.7%)	13 (27.9%)	
2nd degree lacerations	5 (6.6%)	6 (14%)	
First bresfeeding (min)	20 (5-60)	25(10-60)	0.017
APGAR 1st min	10(9-10)	10(9-10)	0.700
Admission of NICU	18 (24%)	20 (45.5%)	0.024
NICU time (day)	0.43 ± 0.86	0.70 ± 0.96	0.027

Abbreviations: NSVD; normal spontaneous vaginal delivery, C/S;caeseraen section, NICU; neonatal intensive care unit

A moderate negative link existed between step length and the duration of the active phase, second stage, and third stage of labor, as well as NICU stay. A moderate positive link exists among step length, cervical dilatation, and Apgar scores ($P < 0.05$). A moderate inverse connection was identified between step count and cervical effacement score. A significant negative connection was identified between step count and the duration of the first, second, and third stages of labor (all $P < 0.05$). A favorable connection existed between the Apgar score and both step length and step count (both $P < 0.05$). No associations were identified among the other factors ($P>0.05$) (Table 4).

Table 4: Correlation analysis between walking parameters and prenatal - neonatal outcomes

	Step lenght		Step count	
Variables	Rho(95% CI)	*P*	Rho(95% CI)	*P*
Birth weight	0.016(-0.17,0.2)	0.866	0.121(-0.07,0.30)	0.189
Maternal weight gain	-0.179(-0.35,0.01)	0.051	0.041(-0.15,0.23)	0.619
Cervical efasman	-0.073(-0.26,0.11)	0.428	-0.373(-0.52,-0.20)	<0.001
Cervical dilatation	0.059(-0.13,0.24)	0.525	0.411(0.25,0.55)	<0.001
First stage of labor	-0.116(-0.30,0.07)	0.209	-0.598(-0.71,-0.47)	<0.001
Latent phase	0.086(-0.13,0.24)	0.353	-0.168(-0.35,0.01)	0.069
Active phase	-0.230(-0.40,-0.05)	0.012	-0.694(-0.78,-0.58)	<0.001
Second stage of labor	-0.441(-0.56,-0.26)	<0.001	-0.516(-0.62,-0.34)	<0.001
Third stage of labor	-0.374(-0.51,-0.18)	<0.001	-0.724(-0.78,-0.59)	<0.001
Lenghty of episiotomy	-0.060(-0.24,-0.13)	0.517	-0.058(-0.24,0.13)	0.532
First breastfeeding	-0.125(-0.30,0.06)	0.176	-0.117(-0.30,0.07)	0.207
APGAR 1st min	-0.295(-0.46,-0.12)	0.001	0.210(-0.38,-0.03)	0.022
NICU time	-0.231(-0.40,-0.05)	0.011	-0.163(-0.34,0.02)	0.077

Abbreviations: NICU; neonatal intencive care unit

The exercise group exhibited markedly better satisfaction levels compared to the control group after eight, 12, and 24 hours postpartum (all *P*<0.05) (Table 5). The anxiety levels of mothers in the exercise group were significantly lower than those in the control group at both 12-hour and 24-hour periods (*P*< 0.001) (Table 5).

Table 5: Effect of exercise on the postpartum anxiety and saticfaction score

Variables	Exercise group (n=75)	Control group (n=44)	*P*
VAS-A (2. h)	9(7-10)	10(9-10)	0.232
VAS-A (8. h)	9(6-10)	9(6-10)	0.106
VAS-A (12. h)	6(4-10)	9(6-10)	0.041
VAS-A (24. h)	6(0-10)	9(8-10)	0.019
VAS-S (2. h)	9(6-10)	8(6-10)	0.106
VAS-S (8. h)	10(7-10)	8(5-10)	0.019
VAS-S (12. h)	10(7-10)	9(6-10)	0.044
VAS-S (24. h)	9(7-10)	7(6-10)	0.035
Antenatal Depression			
Mean (SD) score	8.03 ± 2.73	8.41 ± 2.54	0.32
EPDS ≥ 10	19 (25.3%)	13 (29.5%)	0.53
EPDS ≥ 13	9 (12%)	6 (13.6%)	0.78
Postnatal depression second day			
Mean (SD) score	7.31 ± 2.35	8.27 ± 2.76	0.03
No (%) depressed (score≥10)	12 (16%)	14 (31.8%)	0.03
No (%) depressed (score≥13)	4 (5.3%)	8 (18.2%)	0.03
Postnatal depression eighty day			
Mean (SD) score	7.16 ± 2.15	8.61 ± 2.87	0.001
No (%) depressed (score≥10)	10 (13.3%)	16 (36.4%)	0.01
No (%) depressed (score≥13)	4 (5.3%)	8 (18.2%)	0.02

Abrevations;VAS-A;Visual Analog scala-Anxiety, VAS-S; Visual Analog scala-Satisfaction, EPDS; Edinburgh Postpartum Depression Scale, h;hours

The prevalence of prenatal moderate depression (EPDS > 10) was 25.3% in the exercise group and 29.5% in the control group (*P*= 0.53). The incidences of prenatal significant depression (EPDS score ≥13) were 12% and 13.6%, respectively (*P*= 0.78). The incidence of both moderate and serious postpartum depression were considerably reduced in the exercise group compared to the control group on both day one and day eight postpartum (both $P < 0.05$) (Table 6). Psychological consultation was offered to individuals with postpartum depression.

Table 6: Antenatal and Postnatal Edinburgh Postnatal Depression Score

Variables	Exercise group (n=75)	Control group (n=44)	*P*
Antenatal Depression			
Mean (SD) score	8.03 ± 2.73	8.41 ± 2.54	.32
EPDS ≥ 10	19 (25.3%)	13 (29.5%)	.53
EPDS ≥ 13	9 (12%)	6 (13.6%)	.78
Postnatal depression second day			
Mean (SD) score	7.31 ± 2.35	8.27 ± 2.76	.03
No (%) depressed (score≥10)	12 (16%)	14 (31.8%)	.03
No (%) depressed (score≥13)	4 (5.3%)	8 (18.2%)	.03
Postnatal depression eighty day			
Mean (SD) score	7.16 ± 2.15	8.61 ± 2.87	.001
No (%) depressed (score≥10)	10 (13.3%)	16 (36.4%)	.01
No (%) depressed (score≥13)	4 (5.3%)	8 (18.2%)	.02

Abrevations: EPDS; Edinburgh Postpartum Depression Scale.

Discussion

This study proved the advantageous benefits of exercise on maternal weight gain, mother hemodynamics, fetal-neonatal markers, labor outcomes, and postpartum maternal mental health. Consistent exercise during labor reduced maternal weight gain and pregnancy complications, such as GDM, polyhydramnios, shortened labor duration, expedited initial breastfeeding, NICU admissions, enhanced maternal hemodynamics, and lowered anxiety and early postpartum depression rates.

Limited research exists about the impact of physical activity on birth outcomes, and the findings are incongruous. Certain researches indicate a positive correlation between exercise and birth outcomes, whilst others observe either a negative correlation or no correlation at all (13-15). Women who were inactive throughout pregnancy had a twofold increased chance of delivering a very low birth weight infant compared to their active counterparts (14). Engaging in physical activity may diminish the likelihood of delivering an infant with low birth weight. Campbell and Mottola indicated that an excessive frequency of structured exercise elevates the probability of low birth weight outcomes (13). Among the group that exercised two or fewer times per week, the group that exercised three to four times per week, and the group that exercised more than five times per week, the incidence of low birth weight infants was greatest in the group that engaged in vigorous activity.

Jahromi et al. assessed the correlation between daily physical activity and pregnancy outcomes (16). Research indicated that infants born to women who engaged in exercise prior to or during pregnancy exhibited a markedly greater birth weight compared to those from the non-exercise cohort. The APGAR score revealed no significant difference between pregnant women who

engaged in exercise and those who did not. The APGAR scores at one minute and birth weight were comparable between women who exercised throughout pregnancy and those who did not. A robust positive connection was identified between the walking parameters and Apgar scores.

Both et al. demonstrated that strenuous physical activities did not adversely affect birth outcomes, including birth weight, gestational age at delivery, preterm birth, and survival, whereas a sedentary lifestyle correlated with reduced birth weight (17). A 2017 systematic review and meta-analysis indicated that women who consistently participated in aerobic exercise (30–60 minutes, 2–7 times weekly) had a significantly reduced risk of gestational hypertension and cesarean delivery compared to their more inactive counterparts (18).

No harmful impacts of exercise on pregnancy or newborn outcomes were seen. Furthermore, we demonstrated that women who did not engage in physical activity throughout pregnancy experienced a higher incidence of unfavorable outcomes, including GDM and polyhydramnios. Engaging in physical activity has been shown to enhance insulin sensitivity in persons with GDM and to affect blood glucose, adiponectin, and leptin levels, thereby aiding in the regulation of glucose and insulin production. Moreover, between 70% to 85% of insulin-mediated glucose metabolism transpires in skeletal muscle. Resistance exercise induces contractions in skeletal muscle, prompting these cells to augment both glucose consumption and uptake, therefore improving the regulation of blood glucose levels (19,20).

Melzer et al.examined the impact of the advised duration of ≥30 minutes of moderate physical activity daily on pregnancy outcomes (21). The duration of the second stage of labor was reduced in active women compared to sedentary women (88 minutes vs. 146 minutes, respectively; P= 0.05). The proposed degree of physical activity may contribute to reducing the duration of the second stage of labor and the frequency of surgical delivery. Our findings align with these investigations.

Conflicting evidence exists concerning the efficacy of exercise in the prevention and treatment of postpartum depression and mental health issues. Childbirth induces anxiety, and it is well-documented that maternal anxiety correlates with less fulfilling childbirth experiences (22,23). Our data support the idea that contentment may rise with a reduction in worry. In our study, anxiety levels diminished, and contentment augmented in the exercise group.

Engaging in physical exercise throughout pregnancy and the postpartum period is correlated with a reduced likelihood of experiencing depressive symptoms, whereas sedentary habits are connected with an elevated risk of postnatal depressive symptoms (24). Carter et al. revealed in their comprehensive study that exercise effectively alleviates depressive symptoms in postpartum women (25). Poyatos-León et al. shown that exercise is an effective method to enhance psychological well-being and mitigate postpartum depression symptoms, both during gestation and post-delivery (26). Consistent physical activity is associated with improved mental health and general well-being. Qualitative study suggests that improved mood, self-assurance, and body image are supplementary advantages of physical exercise (27). Exercise is an effective method to enhance psychological well-being and mitigate postpartum depression symptoms during pregnancy and the postpartum phase. This study shown that early postpartum depressive symptoms were less prevalent following pregnancy when physical exercise was incorporated. Researchers have indicated that exercise programs may be most efficacious when employed as a specific preventive or therapeutic intervention for the postpartum population (28).

This study was limited to the evaluation of early postpartum depression exclusively. The impact of exercise on late postpartum depression was not assessed. Furthermore, exercise ability was evaluated by the use of pedometers and step length measurements. Enhanced investigations can be performed with accelerometers or heart rate monitors.

Conclusion

Consistent physical activity throughout gestation helps mitigate the risks of GDM, polyhydramnios, and early postpartum depression. Exercise is a straightforward and enjoyable non-pharmacological approach that can be professionally recommended for a healthy pregnancy and postpartum phase. Our research endorses the assertion that physical activity during gestation is a secure and efficacious method to enhance psychological health and mitigate symptoms of postpartum depression.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Declaration of Competing Interest

The authors declare that they have no interests

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