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The Effect of Pilates Exercises on Antenatal Depression in Overweight Women

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Abstract

Background: Depression is a widespread mental health condition that negatively impacts various aspects of quality of life, with anxiety often exacerbating these effects. Maternal depression during pregnancy is linked to several adverse outcomes, including preterm birth, low birth weight, small for gestational age, stillbirth, and maternal health issues such as perinatal complications, a higher likelihood of operative deliveries, and postpartum depression. To mitigate these risks, it is essential to screen, monitor, and manage depression carefully, considering the balance of risks and benefits. While antidepressants are a common treatment for antenatal depression, their use is generally avoided due to potential risks to the fetus, making alternatives like psychotherapy and exercise more favorable. There is a recognized relationship between obesity and depression, with each condition increasing the risk of the other.

Aim of Study: This study aims to explore the impact of Pilates exercises on antenatal depression in overweight women.

Material and Methods: Forty overweight multiparous pregnant women diagnosed with depression from week 20 till week 32 of the pregnancy. Their body mass index did not exceed 30Kg/m^2 at the beginning of the pregnancy. The women's score on the Edinburgh post-natal depression scale was above 12, indicating a probable depressive disorder. The design of this study is an experimental randomized control trial. Group A (control group): It consisted of 20 overweight pregnant women who took their vitamins and any medication prescribed by their Gynecologist without performing any type of exercise. Group B (treatment group): It contained 20 overweight pregnant women who took the same medications and vitamins as Group A and the Pilates exercise program for pregnant women. The Pilates program was applied from week 20 till week 32. Measurements of BMI were taken using a standard weight-height scale, and depressive symptoms were evaluated using the EPDS at baseline and after treatment for both groups A & B.

Results: Post-intervention EPDS scores in Group B decreased significantly by 75.82% (p<0.001), whereas Group A's scores remained statistically unchanged (p>0.05). At baseline, both groups had similar EPDS scores (p>0.05), but post-treatment comparisons showed significantly lower scores in Group B relative to Group A (p>0.001).

Conclusion: It can be concluded that Pilates exercises during pregnancy are effective in the treatment of antepartum depression, according to this study.

Key Words: *Pilates exercise – Antenatal depression – Overweight women.*

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Introduction

DEPRESSION represents the leading psychiatric disorder in the general population, with women facing double the prevalence seen in men and a notably higher risk during their reproductive years **[1].**

Antenatal depression impacts 20.7% of pregnancies, with 15% of cases classified as major. As gestation progresses, rates rise from 7.4% to 12.8%, underscoring the urgent need for alternative therapies that align with maternal preferences and safeguard fetal well-being **[2,3].**

Maternal depression in the antenatal period correlates with various adverse outcomes, including increased risks of preterm labor, restricted fetal growth, stillbirth, and low birth weight infants. Mothers face higher rates of medical issues, such as childbirth-related complications, surgical interventions during childbirth, and postnatal depression. Effective screening, monitoring, and management of depression during pregnancy, with careful consideration of risks and benefits, is crucial to minimize these negative consequences **[4].**

The interventions used for treating antenatal depression include pharmacological and non-pharmacological treatment, where pharmacological

treatment, which includes antidepressants, is not preferred due to the risk of fetal complications, including congenital anomalies and growth restriction, as well as maternal side effects such as dry mouth, nausea, vomiting, constipation, and drowsiness,so alternatives such as psychotherapy and exercise are often recommended to mitigate depressive and anxious symptoms **[5].**

The Pilates method, conceived by German innovator Joseph Hubertus Pilates in the early 1900s, represents a comprehensive mind-body exercise strategy. It targets core stability, muscular strength, flexibility, and posture while emphasizing controlled breathing. Exercises may be performed on mats or using specific apparatus. This system, initially called "contrology," adheres to six core tenets: concentration, control, centering, flow, precision, and breathing **[6-9].**

The Pilates method offers numerous health benefits, including enhanced respiratory function, increased muscle strength (particularly in trunk-stabilizing musculature), improved flexibility, spinal mobility, posture, coordination, proprioception, balance, and motor control. Due to the unique physiological changes experienced by pregnant women, Pilates can significantly benefit their health within their physical and psychological constraints. By promoting life quality and wellness, Pilates can help expectant mothers better adapt to the changes that occur throughout each week of pregnancy **[10].**

Pilates has been associated with positive effects on mental health, including improvements in depression and overall mood, attributed to increased serotonin levels. The practice also shows promise in reducing body measurements and enhancing emotional, psychological, and social well-being amongwomen with obesity **[11,12].**

Although some studies were done on the impact of Pilates exercises on depression in several conditions, such as elderly, post-menopausal syndrome, hypothyroidism, and breast cancer patients, the impact of Pilates on antenatal depression remains understudied **[8,13,14,15].**

The aim of this study was to investigate the effect of Pilates exercises on antenatal depression in overweight women.

Material and Methods

Study design:

This research employed a randomized controlled trial design. Prior to commencement, the study received ethical approval from the institutional review board of Cairo University's Faculty of Physical Therapy (approval number: P.T.REC/012/002384). The study adhered to the ethical guidelines outlined in the Declaration of Helsinki for human research.

Participants:

Forty overweight, multiparous pregnant women were diagnosed with depression from week 20 till week 32 of the pregnancy. The study kept going from September 2021 till March 2023 for a year and a half. They were selected from Kasr Aleiny University Hospital, where their age ranged from 20 to 30 years. Their body mass index was 30kg/m^2 or below at the beginning of the pregnancy. They live a sedentary lifestyle where they are not engaged in any exercise before. The women's score on the Edinburgh post-natal depression scale was above 12, indicating a probable depressive disorder **[16]**. The study excluded women with various chronic medical conditions, including psychiatric and cardiovascular diseases, as well as those at risk for preterm labor. Additional exclusion criteria encompassed primigravidas, patients with a history of recurrent miscarriages, polyhydramnios, oligohydramnios, persistent bleeding beyond the first trimester, uncontrolled thyroid disorders, placenta previa, cervical incompetence, infertility, diabetes, and hypertension.

Eligibility:

50 pregnant participants were evaluated in this study; 3 opted out of the treatment program, and 7 were enrolled but did not finish it. Therefore, 40 women were randomly assigned to the study, completed it, and had their data examined.

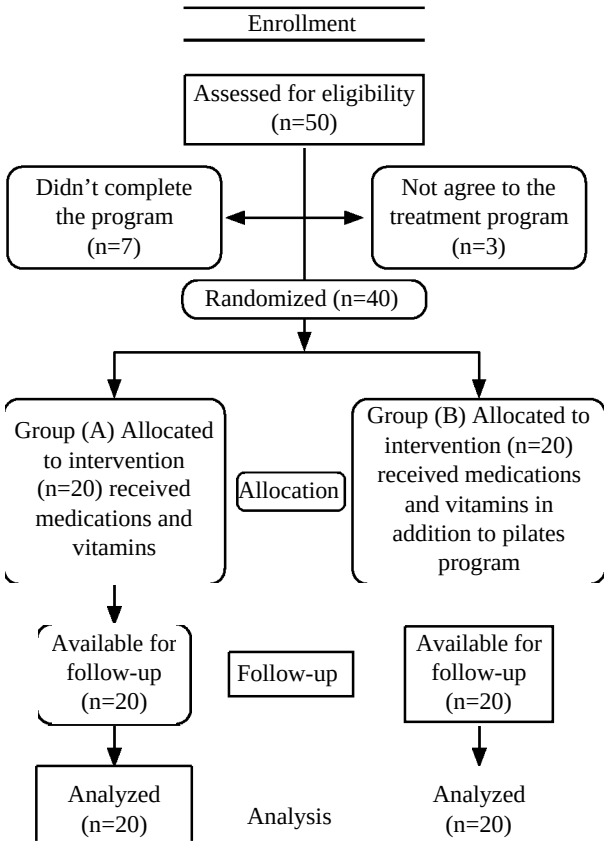

Fig. (1): CONSORT flow chart for patients in the study.

All women were partitioned into two equal groups (A&B):

Group A (control group): It consisted of 20 overweight pregnant women who took their vitamins and any medication prescribed by their Gynecologist without performing any type of exercise.

Group B (treatment group): It contained 20 overweight pregnant women who took the same medications and vitamins asGroup A and the Pilates exercise program for pregnant women. The Pilates program was applied from week 20 till week 32, three times per week, where each session duration takes 45 minutes. Moreover, each Pilates movement includes from 5 to 10 repetitions. Only five sessions are done under observation, while the other sessions were done as a home program, where there is a written guidance book for help during home program.

Methods:

The Pilates program for pregnant women:

The treatment protocol is divided into three phases the warm up exercises, the exercise and the cool down phase **[17]**:

The warm up phase:

1- Wall slide
2- Rib cage closure in wall slide
3- Seated zigzags
4- Side reach

The exercise phase:

1- Pelvic rocking
2- Side lying circles
3- Arm opening
4- Tennis ball rising:
5- Pilates squat

The cool down phase:

1- Seated scapular squeeze.
2- Ankle circles.
3- Rest position.
4- Breathing exercise.

Psychological goal: Pilates exercises led to a significant enhancement in mindfulness, characterized by a present-focused and non-judgmental approach to processing information. This increase in mindfulness partially mediated the relationship between Pilates and various psychological outcomes, such as self-efficacy, mood, perceived stress, and sleep quality **[18]**.

Outcome measures:

BMI assessment:

Before the study began, the weight and height of each participant were measured in light clothing and without shoes, and the BMI was calculated using this equation:

$$BMI = Weight/Height\ (kg/m^2)$$ **[19]**

Edinburgh postnatal depression scale (EPDS):

The EPDS represents the predominant screening instrument for identifying postpartum depression (PPD), utilized in a majority of clinical settings. Women were prompted to reflect on their feelings during the past week using this 10-item assessment. Responses were scored on a scale of 0 to 3 for each question, yielding anoverall score ranging from 0 to 30, and the process typically took approximately five minutes to complete. In many parts of the UK, health visitors routinely administer the EPDS to women 6–8 weeks postpartum. Scores of 12/13 are indicative of 'probable depression', whereas scores of 9/10 suggest 'possible depression'. Nevertheless, the EPDS serves solely as a screening tool, and a diagnosis should be confirmed by a qualified healthcare professional. Scores of 9/10 and 12/13 also signify potential for mild and severe depression, respectively. The EPDS has undergone translation and validation in several languages besides English. Additionally, the EPDS is validated for screening antepartum depression (APD) in expectant mothers, with a cut-off score of 14/15 for 'probable depression'. Currently, there is no universally accepted 'gold standard' research tool for diagnosing PPD or APD.

Data analysis yielded three classifications: scores below 10 signify "No Depression," scores of 10 to 12 represent "Borderline Depression," and scores of 13 or more indicate "Depression" **[16]**.

Statistical analysis:

Subject characteristics were compared between groups using descriptive statistics and unpaired *t*-tests. The Shapiro-Wilk test assessed data normality, while Levene's test ensured group homogeneity. EPDS mean values were compared between groups A and B using unpaired *t*-tests. Within-group pre- and post-treatment comparisons employed paired *t*-tests. Statistical significance was set at $p<0.05$. Analyses were performed using SPSS version 25 for Windows (IBM SPSS, Chicago, IL, USA).

Results

Participant characteristics:

Participant characteristics for both groups are summarized in Table (1), revealing no significant between-group differences in mean age, weight, height, or BMI ($p>0.05$).

Effect of treatment on EPDS:

- *Within-group comparison:*

Group B exhibited a significant reduction in EPDS scores after treatment compared to before treatment ($p<0.001$), with a 75.82% decrease. In contrast, Group A showed no significant change in EPDS scores from before to after treatment ($p>0.05$). (Table 2, Fig. 1).

- Between groups comparison:

Pre-treatment EPDS scores showed an insignificant difference between the groups (p>0.05). However, following treatment, Group B demonstrated a significant decrease in EPDS scores relative to Group A (p>0.001). (Table 2, Fig. 1).

Table (1): Basic characteristics of participants.

	Group A Mean ± SD	Group B Mean ± SD	MD	*t*-value	*p*-value
Age (years)	27.5±2.13	27.65±2.51	–0.15	–0.97	0.33
Weight (kg)	71±5.75	70.85±5.58	0.15	–0.17	0.86
Height (cm)	160.5±5.17	159.85±5.23	0.65	0.55	0.58
BMI (kg/m^2)	27.48±1.17	27.65±1.14	-0.17	–0.68	0.49

SD : Standard deviation.
MD: Mean difference.
p-value: Probability value.

Table (2): Mean EPDS pre and post treatment of groups A&B.

EPDS	Group A Mean ± SD	Group B Mean ± SD	MD	*t*-value	*p*-value
Pre treatment	19.15±3	19.85±3.58	0.7	–0.67	0.5
Post treatment	19.65±2.97	4.8±1.43	14.85	20.08	0.001
MD	–0.5	15.05			
Percentage of change	–2.61	75.82			
t-value	–1.81	22.71			
	p=0.08	p=0.001			

SD : Standard deviation.
MD: Mean difference.
p-value: Probability value.

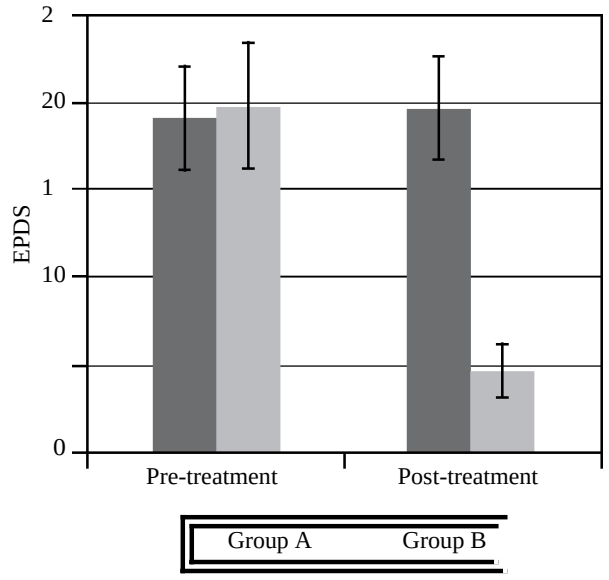

Fig. (1): Mean EPDS pre and post treatment of groups A & B.

Discussion

Pregnancy is characterized by its complexity and uniqueness in a woman's lifecycle. The associated changes are comprehensive, impacting biological functions, psychological states, and social relationships. Alterations in mental state can manifest throughout the entire gestational journey, extending into the postnatal phase *[20]*.

Pregnancy-related depression affects approximately 1 in 5 women *[21]*.

Researchreveals that unmanaged depression and stress in pregnant women may result in unfavorable birth outcomes and developmental issues in children. Additionally, research indicates that prenatal exposure to antidepressant drugs could have similar detrimental effects on birth outcomes and child development *[22]*.

Pregnant women with previous children had elevated depression and anxiety scores compared to first-time mothers *[23]*.

A bidirectional relationship was observed between obesity and depression, with each condition increasing the risk of the other *[24]*.

The aim of this study was to investigate the effect of Pilates exercises on antenatal depression in overweight women.

This study found a significant decrease in EPDS scores in the treatment group compared to the control group post-treatment.

Our results align with those of a prior study *[25]*, where participants were divided into two cohorts: a Pilates group engaging in supervised hour-long sessions twice weekly for 12 weeks, and a control group practicing relaxation and breathing exercises at home. Significant reductions in depression were noted in the Pilates group, whereas the control group's depression levels remained unchanged.

The findings indicated that Pilates exercises over a 12-week period in the postpartum phase could enhance functional ability, reduce depression, and improve sleep quality among postpartum women.

Also, the present study's result agrees with *[26]* that postmenopausal women who adhered tothe Pilates protocol for 12 weeks experienced significant improvements in quality of sleep, anxious feelings, depressive symptoms, and fatigue.

In a study *[27]*, researchers explored how Pilates and walking influenced quality of life (QoL), anxiety, and depression levels in individuals suffering from overweight and obesity. Sixty-three participants were randomly assigned to control, Pilates, or walking groups. Both the Pilates and walking groups adhered to a schedule of three hour-long sessions per weekover an eight-week period. Assessments

of QoL, state anxiety, trait anxiety, and depression were conducted before and after the training period. The findings indicated that both Pilates and walking had positive effects on QoL, depression, and anxiety levels. This suggests that Pilates may offer a beneficial option formanaging mood disturbances in individuals with weight-related issues.

A study **[28]** examined the efficacy of performing Pilates exercises for 8 weekson depression in postmenopausal women aged 55-65. Forty depressed women were randomly assigned to intervention and control groups. The intervention group performed thrice-weekly, hour-long Pilates sessions for 8 weeks, while the control group remained sedentary. Depression levels, measured using Beck's Depression Inventory pre- and post-intervention, were significantly improved in the Pilates group compared to baseline and controls. The researchers concluded that Pilates could serve as a valuable complementary treatment for depressedwomen post-menopause.

Ameta-analysis conducted by **[29]** found that Pilates has a positive effect on mental health outcomes, with a significant population effect size supporting its benefits.

All of these studies are supported by **[11]** who highlighted the favorable impacts of Pilates on women's mental health through increased serotonin levels and reduced depression severity.

Researchers in a study by **[1]** conducted a meta-analysis to identify the optimal exercise program for reducing antenatal depression, concluding that exercise-based interventions yield substantial benefits.

Conversely, a meta-analysis by **[30]** highlighted limitations in existing research on exercise and antenatal depression. The analysis found that studies were primarily low to moderate in quality, with small sample sizes, considerable inconsistency, and broad confidence intervals, precluding definitive conclusions about the preventive effects of exercise on antenatal depression.

This study has two main limitations. First, psycho-cultural issues that exercising during pregnancy can lead to miscarriage. Second, the lack of follow-up in the postnatal period restricts our understanding of long-term outcomes.

Conclusion:

It can be concluded that according to this study, Pilates exercises effectively treat antenatal depression and can serve as an additional component in intervention programs.

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Conflicts of interest:

There are no conflicts of interest.

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تأثير تمرينات البيلاتيس على اكتئاب الحمل لدى النساء اللاتى تعانين من زيادة الوزن

الخلفية: يعد الاكتئاب حالة شائعة من حالات الصحة العقلية تؤثر سلبًا على جوانب مختلفة من جودة الحياة، وغالبًا ما يؤدى القلق إلى تفاقم هذه التأثيرات. يرتبط اكتئاب الأمهات أثناء الحمل بالعديد من النتائج السلبية، بما فى ذلك الولادة المبكرة، وانخفاض وزن المواليد، وصغر حجم الجنين بالنسبة لعمره الحملى، وولادة الجنين ميتًا، ومشاكل صحية للأم مثل مضاعفات ما حول الولادة، وزيادة احتمالية الولادة القيصرية، واكتئاب ما بعد الولادة. وللتخفيف من هذه المخاطر، من الضرورى فحص الاكتئاب ومراقبته وإدارته بعناية مع مراعاة توازن المخاطر والفوائد. بينما تعتبر مضادات الاكتئاب علاجًا شائعًا للاكتئاب أثناء الحمل، إلا أن استخدامها يُتجنب عمومًا بسبب المخاطر المحتملة على الجنين، مما يجعل البدائل مثل العلاج النفسى والتمارين الرياضية أكثر تفضيلًا. وهناك علاقة معروفة بين السمنة والاكتئاب، حيث يزيد كل منهما من خطر الإصابة بالآخر. يهدف هذا البحث إلى استكشاف تأثير تمارين البيلاتس على الاكتئاب أثناء الحمل لدى النساء ذوات الوزن الزائد.

الطرق: شملت الدراسة أربعين امرأة حامل متعددى الحمل يعانون من السمنة تم تشخيصهن بالاكتئاب من الأسبوع ٢٠ حتى الأسبوع ٣٢ من الحمل. لم يتجاوز مؤشر كتلة الجسم لديهن ٣٠ كجم/متر مربع فى بداية الحمل. كانت درجات النساء على مقياس إيدنبيرج للاكتئاب بعد الولادة أعلى من ١٢، مما يشير إلى احتمال وجود اضطراب اكتئابى. تصميم هذه الدراسة هو تجربة عشوائية محكومة. المجموعة (ا) (مجموعة التحكم): تكونت من ٢٠ امرأة حامل تعانى من زيادة الوزن تناولن الفيتامينات وأى أدوية وصفها الطبيب النسائى دون أداء أى نوع من التمارين الرياضية. المجموعة (ب (مجموعة العلاج): تضمنت ٢٠ امرأة حامل يعانون من زيادة الوزن تناولن نفس الأدوية والفيتامينات التى تناولتها المجموعة (ا) بالإضافة إلى برنامج تمارين البيلاتس للنساء الحوامل. تم تطبيق برنامج البيلاتس من الأسبوع ٢٠ حتى الأسبوع ٣٢. تم قياس مؤشر كتلة الجسم باستخدام مقياس الوزن–الطول القياسى، وتم تقييم أعراض الاكتئاب باستخدام مقياس إيدنبيرج للاكتئاب قبل العلاج وبعده لكل من المجموعتين ا وب.

النتائج: انخفضت درجات مقياس إيدنبيرج للاكتئاب بشكل كبير فى المجموعة بنسبة ٧٥,٨٢٪ ($p < ٠,٠٠١$) بعد التدخل، بينما ظلت درجات المجموعة (ا) دون تغيير إحصائيًا ($p > ٠,٠٥$). كانت درجات المجموعتين متشابهة عند القياس الأولى ($p > ٠,٠٥$)، لكن المقارنات بعد العلاج أظهرت انخفاضًا ملحوظًا فى الدرجات فى المجموعة بمقارنةً بالمجموعة (ا) ($p < ٠,٠٠١$).

الخلاصة: يمكن الاستنتاج أن تمارين البيلاتس أثناء الحمل فعالة فى علاج الاكتئاب أثناء الحمل، وفقًا لهذه الدراسة.