Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: xyz

DEPRESSION, PHYSICAL ACTIVITY, AND PREECLAMPSIA: UNRAVELING THE MATERNAL HEALTH CONNECTION

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Abstract:
The two main symptoms of preeclampsia, a potentially lethal pregnancy illness, are hypertension and organ failure. Depression and physical activity are significant factors in the pathophysiology of preeclampsia. The PMC Hospital Nawabshah hosted this cross-sectional observational study to examine the complex link between depression, physical activity, and the risk of preeclampsia during pregnancy. In total, 275 pregnant women participated in the study. The Edinburgh Postnatal Depression Scale (EPDS) was used to measure depression levels during each trimester of pregnancy, and the Pregnancy Physical Activity Questionnaire (PPAQ) was used to measure physical activity during pregnancy. Preeclampsia and depression were found to be significantly correlated in the study, meaning that pregnant women who had depression were more likely to Preeclampsia risk was found to be lowered by physical exercise, especially at moderate to intense levels (P-value = 0.01). The study emphasizes how complex preeclampsia development is and how crucial it is to address psychological and lifestyle issues in addition to physiological reasons while providing prenatal care. To reduce the occurrence of preeclampsia, healthcare practitioners should use a comprehensive strategy that includes encouraging physical activity and being diligent in diagnosing and addressing depression in pregnant women.

Keywords: depression, physical activity, preeclampsia, pregnancy, mental health

Introduction

Pregnancy, a transformative and complex phase in a woman's life, is marked by significant physiological, psychological, and emotional changes. While most pregnancies progress without complications, certain conditions can pose significant risks to both maternal and fetal health. Among these, preeclampsia, characterized by hypertension and organ dysfunction after 20 weeks of gestation, affects approximately 2-8% of pregnancies globally and stands as a major contributor to maternal morbidity and mortality (Girchenko, P. et al., 2022; Abazarnejad, T 2019). Depression is yet another grave concern. It is a prevalent mental disease that, particularly when it happens during pregnancy, can have far-reaching consequences (Cramer, E. et al., 2022).

Pregnancy-related depression, a prevalent and occasionally crippling mental health issue, calls for further attention. Understanding the effects of depression is crucial because up to 20% of pregnant women may suffer it (Lackovic, M. et al., 2023; Lin, D., & Chen, Y., 2022). According to research by Bennett et al. (2019), depression during pregnancy is a common issue that affects women from a variety of backgrounds and is sometimes misinterpreted. It is essential to comprehend the scope of this issue to address any potential effects on maternal health.

Empirical studies such as the one conducted by Huppertz (2018) have demonstrated the criticality of identifying preeclampsia risk factors in order to improve outcomes for both the mother and the fetus. Smith et al., (2020) looked at psychological variables like stress and depression that might lead to the onset of preeclampsia. Based on their findings, mental health should be considered in preeclampsia research. Preeclampsia risk may be influenced by the physiological and psychological effects of depression, according to studies (Bisson, C. et al., 2023; Yuan, M., et al., 2022). Further research is required to fully comprehend this relationship and determine whether physical activity has a moderating effect.

Exercise is a well-known modifiable lifestyle factor that may reduce pregnancy complications and improve maternal health (Gascoigne, E. L. et al., 2023; Raguema, N. et al., 2020). Frequent exercise can enhance mood, lower stress levels, and improve general wellbeing. It may also postpone the onset of preeclampsia by improving cardiovascular health and lowering blood pressure (DiPietro, L. et al., 2019; Brown, W. J. et al., 2022). Further research is required to completely understand the connection between depression, exercise, and preeclampsia. The Owe et al. (2016) study could be included to emphasize the importance of physical activity during pregnancy. It demonstrates how physical activity can improve mothers' mental health and may even reduce their risk of depression and its associated conditions, like preeclampsia. The model highlights the intricate interactions between biological, psychological, and social factors in the development of preeclampsia, according to Roberts et al. (2017). By comprehending how these variables fit into this framework, the mechanisms underlying the correlation between depression, physical activity, and preeclampsia can be clarified.

This study recognizes the complex interrelationships among depression, physical activity, and preeclampsia risk and investigates the ways in which these variables interact to impact the health of the mother and the developing fetus. Although more research is needed to fully understand the connection between depression, physical activity levels, and the incidence of preeclampsia during pregnancy, some indications are starting to emerge. Our research is expected to aid in the creation of evidence-based practices and treatments targeted at improving the health and outcomes of expectant mothers and their fetuses. By offering fresh perspectives on the connection between depression, exercise, and preeclampsia, we hope to enhance the care of expectant patients and better prepare them for the amazing journey that is parenthood.

Methodology

This study observed at the relationship between depression, physical activity, and preeclampsia during pregnancy using a cross-sectional observational design to investigate the relationships between these variables and their potential effects on mother's health. The trial, which took place at the PMC Hospital Nawabshah from January 2022 to July 2023, involved 275 pregnant women. Each participant gave informed consent before beginning the trial. The inclusion criteria included pregnant women who agreed to a diagnosis of preeclampsia and who showed appropriate communication. Participants were excluded if they had pre-existing hypertension, significant medical conditions, or contraindications for physical activity during pregnancy.

Demographic characteristics of the participants, including gestational age and a family history of depression, were collected through a structured questionnaire. Depression levels were assessed using the Edinburgh Postnatal Depression Scale (EPDS) during each trimester, a standardized questionnaire designed to measure the presence and severity of depressive symptoms during pregnancy.Physical activity patterns were assessed using the Pregnancy Physical Activity Questionnaire (PPAQ), a validated questionnaire categorizing physical activity into sedentary, light, moderate, and vigorous levels. Participants reported their activity levels for each trimester. Diagnosis of preeclampsia was

based on clinical assessments of hypertension (systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg) confirmed by healthcare professionals. Ethical approval for the study was obtained from the Ethical Review Committee of PUMHSW, with adherence to ethical principles, privacy, confidentiality, and relevant ethical guidelines and regulations ensured.
Preeclampsia, physical activity, and depression were examined statistically using chi-square testing. A significant threshold of $p < 0.05$ was established. Data analysis was done using statistical programs (SPSS).

Results and discussion

The tables offer significant insights into the associations among the research participants' preeclampsia incidence, depression, physical activity, and gestational age. the study participants' demographics, such as their gestational age, if they are depressed, and whether their family has a history of depression. Remarkably, 38.91% of participants (n=107) had a family history of depression, but the bulk of participants (n=186) were in the first and third trimesters and around 67.64% of participants received a diagnosis of depression. The rate of moderate depression was highest in the second trimester (32.39%).

Table 1: Demographic Characteristics of Participants

Characteristic		Numbers (n)	Percentage (%)
Gestational Age	1st trimester	112	40.73
	2nd trimester	71	25.82
	3rd trimester	92	33.45
Depression diagnosis		186	67.64
Family history of depression		107	38.91

The depression levels of the subjects are distributed across the trimesters in Table 2. The proportion of participants with normal depression levels was highest in the first trimester, while the findings of this study shed light on the intricate relationship between depression, physical activity, and the risk of preeclampsia during pregnancy. Understanding the links between these variables and how they affect pregnant women and their foetuses is essential to improving treatment linked to pregnancy. Remarkably, depression affects up to 20% of expecting mothers, making it a common worry for pregnant women (Bennett et al., 2019). Its presence during pregnancy has serious repercussions, endangering the growing foetus as well as the mental health of the mothers. The study's findings highlight the significant correlation ($p < 0.001$) between depression and preeclampsia, suggesting that pregnant women with depression may be more susceptible to this dangerous condition.

Table 2: Trimester-wise distribution of participants regarding depression

Gestational Age	Depression									
	Normal		Mild		Moderate		Clinical borderline		Sever	
	n	%age	n	%age	n	%age	n	%age	n	%age
1st trimester	51	45.54	32	28.57	16	14.29	12	10.71	1	0.89
2nd trimester	21	29.58	23	32.39	15	21.13	09	12.68	03	4.22
3rd trimester	17	18.48	21	22.83	19	20.65	22	23.91	13	14.13

Trimester-wise distribution of participants' physical activity and its association with preeclampsia is shown in table 3. Notably, during the 2nd trimester, sedentary activity was the most common, with 83.10% (n=59) of participants engaging in it.
There are several different processes behind the association between preeclampsia and depression. Physiological changes, such as altered immune system performance and elevated stress hormone levels, are frequently linked to depression (Smith & Pell, 2020). These changes might encourage the onset of hypertension, which is a hallmark of preeclampsia. A poor diet, insufficient exercise, and inadequate prenatal care are just a few of the unhealthy lifestyle decisions that can result from

depression and increase the risk of preeclampsia (Huppertz, 2018). Therefore, it becomes essential to understand the significance of diagnosing and treating depression during pregnancy in order to reduce the risk of preeclampsia and the negative effects associated with it. Previous research by Smith et al. (2020) has demonstrated the important role stress and mental health play in the development of preeclampsia. This understanding is furthered by the current study, which focuses on depression and its relationship to preeclampsia.

Table 3: Trimester-wise distribution of participants regarding physical activity

Gestational Age	Physical activities							
	Sedentary		Light		Moderate		Vigorous	
	n	%age	n	%age	n	%age	n	%age
1st trimester	79	70.54	32	28.57	1	0.89	00	00
2nd trimester	59	83.10	11	15.49	1	1,41	00	00
3rd trimester	64	69.56	26	28.26	2	2.17	00	00

Table 4 delves into the association of preeclampsia with both depression and physical activity. It highlights that preeclampsia is significantly associated with depression (P value = 0.00) and physical activity (P value = 0.01). The data suggests that there may be a correlation between these factors and the occurrence of preeclampsia among pregnant participants in the study. Moreover, research has shown that exercising during pregnancy provides several health benefits, including elevated mood, decreased stress, and enhanced cardiovascular well-being. The results of the study corroborate the theory that exercise, particularly moderate-to-intense exercise, reduces the risk of preeclampsia in pregnancy (p = 0.01). Exercise can reduce the risk of preeclampsia by strengthening cardiovascular function, lowering hypertension, and improving general well-being (Owe et al., 2016).

Table 4: Association of depression and physical activity with preeclampsia

Gestational Age	Depression										
	Normal		Mild		Moderate		Clinical borderline		Sever		P value
	n	%age	n	%age	n	%age	n	%age	n	%age	
Preeclampsia	58	36.71	34	21.52	29	18.35	22	13.93	15	9.49	0.00
Gestational Age	Physical activities										
	Sedentary		Light		Moderate		Vigorous				P value
	n	%age	n	%age	n	%age	n	%age			
Preeclampsia	103	71.03	41	28.28	1	0.69	00	00			0.01

The complex interplay between depression and physical activity concerning preeclampsia is a central theme of this study. While depression is associated with an increased risk of preeclampsia, engaging in physical activity may serve as a mitigating factor. The study by Owe et al. (2016) underscores the positive impact of exercise on maternal mental health, which may potentially reduce the risk of depression. Hence, physical activity emerges as a modifiable factor that holds promise in breaking the link between depression and preeclampsia. This study adds to the understanding of the multifaceted nature of preeclampsia development, emphasizing the importance of addressing not only the physiological aspects but also the psychological and lifestyle factors. Roberts et al. (2017) have emphasized the complexity of preeclampsia, and the findings of this study align with this perspective. The intricate interplay of biological, psychological, and social factors in the development of preeclampsia underscores the need for a comprehensive approach to prenatal care.

Conclusion

In conclusion, this study uncovers a substantial association between depression, physical activity, and the risk of preeclampsia during pregnancy. Depressive symptoms are found to be associated with an increased risk of preeclampsia, possibly due to physiological changes and suboptimal lifestyle choices. Conversely, engaging in moderate to vigorous physical activity seems to reduce the risk of preeclampsia, offering a promising avenue for risk reduction.

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