UDC 618

FAVORABLE LIFESTYLE BEHAVIORS AS REVERSE RISK FACTORS AND TREATMENT FOR POSTPARTUM DEPRESSION

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Abstracts

Background. Lifestyle behaviors such as sleep, sedentary behavior, physical activity (PA) or exercise, and diet may influence risk for postpartum depression (PPD) or serve as treatment options for those diagnosed with PPD. The purpose of this review was to summarize existing research about four key lifestyle behaviors (sleep, sedentary behavior, PA and exercise, and diet) and their potential influence on PPD. ***Methods.*** Studies that were published in English after 2000 were drawn from the PubMed database. Observational studies, systematic reviews, meta- analyses, and randomized, controlled trials that enrolled >50 participants were considered for inclusion. ***Results.*** Quality sleep and PA or exercise during pregnancy and the postpartum period may reduce PPD risk or help improve PPD symptoms. Data regarding the utility of intervening on diet patterns or specific nutrients for lessening PPD risk or serving as PPD treatment are inconsistent. Evidence for vitamin D supplementation is extensive, while evidence supporting other vitamins, nutrients, and minerals remains inconclusive. Research linking sedentary behavior and PPD is extremely limited. ***Conclusion.*** Sleep quality and PA or exercise may reduce the risk of PPD or mitigate its symptoms. Further high- quality research studies examining the relationship between sedentary behavior and PPD risk are necessary. Healthy lifestyle behaviors, alone or in conjunction with other evidence-based strategies recommended by healthcare providers, may serve as effective preventive measures and treatments for PPD in the pregnancy and postpartum periods.

Key words: physical activity, sedentary behavior, nutrition, sleep.

Ебігейл Брансон, Марні К. Маклін, Жасмін Паркер-Браун, Джеймі Вітні, Еббі Лейн. Здоровий спосіб життя як фактор запобігання розвитку післяпологової депресії та її профілактики. ***Актуальність теми.*** Спосіб та умови життя людини – тривалість та якість сну, рухова активність, занять фізичними вправами й спортом, незбалансоване харчування можуть ставати ризиком виникнення післяпологової депресії (ППД) або слугувати профілактикою для жінок, у яких діагностовано ППД. ***Мета дослідження*** полягала в обґрунтуванні чотирьох ключових способів життя людини (сну, малорухливості, фізичної активності (ФА) і харчування) та їх потенційного впливу на ППД. ***Методи дослідження.*** Дані, опубліковані англійською мовою, узяті з бази даних PubMed. У роботі використано методи спостереження, систематичні огляди, методи статистичного аналізу, такі як мета-аналіз та рандомізоване контрольоване дослідження, у якому взяло участь понад 50 людей. ***Результати дослідження.*** Здоровий сон, фізична активність і заняття спортом під час вагітності та в післяпологовий період жінки можуть зменшити ризик виникнення ППД або покращити її симптоми. Дані щодо користі дієти або введення дієтичних добавок до раціонів харчування жінки з метою зниження ризику виникнення або подолання ППД є суперечливим фактом. Доказів щодо необхідності вживання вітаміну D багато, тоді як доказів, що підтверджують користь від уживання інших вітамінів, мінералів і дієтичних добавок залишаються непереконливими. Також недостатньо уваги приділено науковим дослідженням, які аналізують вплив малорухливого способу життя на ризик виникнення ППД. ***Висновки.*** Здоровий сон та дозована фізична активність можуть зменшити ризик виникнення або зменшення симптомів ППД. Необхідні подальші дослідження, які б

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дали можливість проаналізувати зв'язок між малорухливим способом життя та ризиком виникнення ППД. Здоровий спосіб життя в поєднанні з іншими медичними стратегіями, ефективність яких підтверджена результатами досліджень, є заходами профілактики ППД як під час вагітності, так і в післяпологовий період.

Ключові слова: післяпологова депресія, фізична активність, малорухливий спосіб життя, харчування, сон.

Introduction. Pregnancy is associated with many physical, financial, emotional, social, and psychological changes for persons giving birth [1; 12; 40]. Mood disruptions during the perinatal period are common and have been observed for many years [21]. In about 12 % of postpartum people, mood symptoms are more severe and persist after the first few weeks after delivery [3; 21]. PPD is a major depressive disorder and is characterized by symptoms such as low self-esteem, fatigue, depressed mood, lack of interest in normal activities, loss of appetite, trouble sleeping, trouble concentrating, and feelings of hostility towards infants [33]. Although the exact etiology of PPD is not completely understood and is likely multifactorial, studies have identified multiple risk factors that can predispose people to postpartum depression, including unfavorable lifestyle behaviors [38].

Some lifestyle behaviors, including sleep, sedentary behavior, physical activity, and diet, were associated with PPD in previous studies [38]. but the strength of these associations has been inconsistent. Fewer studies have described the effects of intervening on lifestyle behaviors to reduce PPD risk or severity. The purpose of this narrative review was to synthesize the literature that has examined the relationship of four key modifiable lifestyle behaviors to PPD. Observational and interventional studies were included. The following sections provide summaries, sample characteristics, and risk estimates reported in the literature, with an emphasis on interventions employed in randomized, controlled trials (RCTs) that included >50 individuals. We included the findings from recent systematic reviews related to each lifestyle behavior. The overarching goal was to help healthcare providers and pregnant and postpartum people understand the potential benefits of improving sleep and dietary patterns, reducing sedentary time, and increasing physical activity (PA) or exercise for reducing PPD incidence or severity.

Research Materials and Methods. The narrative review was based on a search conducted by four independent researchers (AB, JPB, MKM, AL). Articles published in English after 2000 were obtained through literature searches using PubMed. Search terms included "postpartum depression OR anxiety" AND "sleep," "sedentary behavior," "diet OR nutrition," and "exercise OR physical activity." Observational and interventional studies were included that evaluated lifestyle behaviors as preventative measures or treatments for PPD in pregnant or postpartum people. All articles included were reviewed and confirmed by the first author (AB) for relevance. While exercise and physical activity are often used interchangeably, this paper will define physical activity (PA) as any bodily movement that results in energy expenditure. Exercise will be defined as a subset of PA that is structured, repetitive, and aimed at maintaining or improving physical fitness [4].

Research Results.

Sleep during pregnancy

Several studies investigated the potential influence of sleep on PPD. Pietikäinen et al. (2021) [28] examined associations of insomnia symptoms across pregnancy on postnatal depression symptoms in participants in the Finnish Birth Cohort Study. Participants were assessed at 14 (T1), 24 (T2), and 34 weeks (T3) of gestation as well as 3 months postpartum using the Edinburgh Postnatal Depression Scale (EPDS) for depressive symptoms. Insomnia symptoms in both early and late pregnancy were associated with symptoms of PPD. Sleep latency of ≥20 minutes during pregnancy was related to depression symptoms at T1 (adjusted odds ratio [AOR] 1,87, 95 % CI 1,29–2,71) and T3 (AOR 1,73, 95 % CI 1,18–2,55), and insufficient sleep during late pregnancy was related to depression symptoms at T1 (AOR 1,86, 95 % CI 1,13–3,06), T2 (AOR 1,99, 95 % CI 1,21–3,28), and T3 (AOR 2,76, 95 % CI 1,73–4,40). Similarly, Yun et al. (2021) [42] monitored sleep patterns pre- pregnancy, at 12-, 24- and 36-weeks gestation, and 4–5 weeks postpartum and found that insufficient sleep at 36 weeks of gestation exhibited a strong association with PPD (OR 1,79, 95 % CI 1,40–2,27). Sleep latency of ≥20 minutes in early pregnancy and insufficient sleep in late pregnancy provided the best explanations for depressive symptoms [29]. Findings from a prospective, longitudinal study conducted in China were similar; although prenatal psychological distress and perceived stress were the strongest predictors of PPD, the association between subjective poor sleep quality and PPD persisted after adjustment for psychological distress and perceived stress (OR 2,4, 95 % CI = 1,1–5,6, P = 0,044) [43]. Yun et al. (2021) [41] suggested that PPD mitigation techniques include screening and counseling at around 36 weeks and after delivery.

Sleep in the postpartum period

Khadka et al. (2020) [14] conducted a cross-sectional study of patterns of sleep quality and PPD in Nepalese women between 2- and 12-months postpartum and found that 28 % reported poor sleep quality and 18,7 % experienced PPD. Poor sleep quality in the postpartum period was associated with PPD (OR: 3,20 (95 % CI: 1,34 to 7,61)). The components of poor sleep patterns that were strongly associated with PPD included sleep quality, sleep latency, sleep medications, and daytime. Risk factors for poor sleep quality included working mother, male infant, home delivery, maternal or infant medical complications post-delivery, and history of mental illness. A longitudinal study of 116 pregnant people assessed at 6 time points during pregnancy and after delivery [24] also explored sleep quality. Poor sleepers had worse Patient Health Questionnaire scores, EPDS scores, and Overall Anxiety Severity and Impairment Scale scores at 6 months postpartum. Although prenatal mood was strongly correlated with PPD scores, poor sleep quality also influenced postpartum mood.

Physical activity for prevention of PPD

Nakamura et al. (2019) conducted a systematic review and meta-analysis of PA during pregnancy and PPD [22]. They identified 21 studies that investigated the effectiveness of any type of PA on depressive symptoms within the first year postpartum, without the use of other interventions or treatments. Participants were diagnosed or screened for PPD using a validated tool such as the EPDS or the judgment of a healthcare professional. Those who were physically active during pregnancy had significantly lower PPD scores when compared to those who were inactive throughout pregnancy (Overall standardized mean difference [SMD]= -0,22 [95 % CI – 0,42 to −0,01], p = 0,04; I2 = 86,4 %). PA during pregnancy was related to lower risk of PPD symptoms, although future studies are necessary to elucidate the role of PA in the perinatal period.

Several RCTs have demonstrated the preventive effects of PA on PPD. Vargas- Terrones et al. (2019) [40] recruited 124 women to participate in an exercise intervention study throughout their pregnancy. The intervention, which began at 12–16 weeks gestation and continued through the end of the third trimester, included three, 60-minute exercise sessions per week in a fitness room in a hospital. A smaller percentage of women in the intervention group experienced depression, compared to the control group, at 38 weeks' gestation (18,6 % vs 35,6 %) and 6 weeks postpartum (14,5 % vs 29,8 %) in the per-protocol analysis. In the intention-to-treat analysis, the percentage of people with depression was lower in the exercise group at 38 weeks gestation after multiple imputation analysis (18,6 % vs 34,4 %). Similarly, Norman et al. (2010) [23] examined the effects of an 8-week "Mother and Baby" (M&B) program on the psychological well-being of new mothers. Participants were randomly assigned to either the M&B program that consisted of a weekly, 1-hour mother and baby group exercise session, or an education only (EO) program. The program began at 6 to 10 weeks postpartum and lasted for 8 weeks. The M&B group experienced a significant decrease in the proportion of high/unfavorable EPDS scores from baseline (16 % scoring 13 or higher) to immediately post intervention (11 % scoring 13 or higher), the EO group showed no significant differences from baseline to post-intervention. Research suggests that the benefits of exercise may be particularly effective for those who do not exercise regularly prior to pregnancy. A subgroup analysis of a 12-week exercise intervention found that participants assigned to the intervention who did not exercise regularly prior to pregnancy had lower rates of EPDS scores of ≥10 compared to a control group (OR: 0,20; 95 % CI 0,0–0,9) [31].

Studies have also explored alternatives to face-to-face exercise. Lewis et al. (2021) [18] conducted an RCT among a sample of women at risk for PPD to examine the effects of telephone-based exercise and wellness programs. Participants had self- reported history of depression and reported less than 60 minutes of exercise per week. At 6 months, symptoms of depression in the wellness group were significantly lower than in the usual care group (b= − 1,00, SE=0,46, *p*=0,03), and perceived stress was significantly lower in the exercise group compared to both the usual care (b= −2,00, SE=0,98, *p*=0,04) and wellness groups (b= − 2,20, SE=1,11, p=0,04).

Physical activity as a treatment for PPD

A systematic review and meta-analysis by Pritchett et al. (2017) [29] described associations of aerobic exercise and PPD symptoms. Thirteen studies were included, involving a total of 1734 participants who were ≤1 year postpartum and had existing depressive symptoms. Three subgroup analyses were used to determine variations in the effectiveness of exercise in reducing PPD symptoms in relation to (i.) participant characteristics, (ii.) the presence of co-interventions and (iii.) the context of the exercise. Exercise had a significant reductive effect on depressive symptoms (SMD -0,44; 95 % CI = -0,75 to 0,12). Exercise reduced depressive symptoms in populations with depression (SMD –0,32; 95 % CI = –0,63 to –0,00), as well as in the general postpartum population (SMD -0,57, 95 % CI = –1,12 to –0,02). Although exercise-only interventions did not appear to have a significant effect in reducing PPD, studies that involved exercise with other elements found significant reductions in PPD symptoms (SMD –0,35, 95 % CI = –0,66 to –0,04). Finally, both group exercise (SMD difference –1,10, 95 % CI = –1,99 to –0,21) and personal choice of exercise (SMD –0,20, 95 % CI = –0,33 to –0,06) had significant, favorable effects on depressive symptoms.

Several studies have explored the effects of home-based and independent exercise on the treatment of PPD. Özkan et. al. (2020) conducted an RCT with 65 postpartum women in Turkey in which participants were assigned to either the experimental independent exercise group or a control group one month after delivery [26]. The exercise intervention was 4 weeks in duration with progressively increasing exercise intensity. After the intervention, EPDS scores were significantly lower in the experimental ($7{,}29 \pm 1{,}67$) versus control group ($12{,}54 \pm 2{,}65$). Two studies explored home-based exercise programs. In a study conducted by Dritsa et. al. (2008), participants were randomly allocated into a 12-week aerobic exercise intervention group or a control group [6]. Compared to the control group, participants in the exercise group had a greater reduction in physical fatigue post-treatment (mean change of -4,07 units) and at 3 months post-treatment (mean change of -4,24 units). Reductions in mental fatigue were seen in participants in the exercise group who reported lower physical fatigue at baseline. A similar RCT conducted by Daley et al. (2015) included women who gave birth in the past 6 months and were experiencing a major depressive episode [5]. Participants were assigned to usual care or a 6-month progressive, home-based exercise intervention in conjunction with usual care. Participants in the intervention group had a -2,04-point change in EPDS score compared to the control group, when adjusting for baseline scores, that was statistically significant after adjustment for potential confounders. Furthermore, the proportion of those who recovered from PPD, defined as an EPDS <13, was higher among the intervention group compared to the control group at 6 months post- randomization (46,5 % vs 23,8 %). Heh et al. (2008) also found reductions in EPDS scores in a RCT that investigated a 3-month exercise support group in those who had given birth 4 weeks prior [12]. Both the control and experimental groups experienced significant reductions in EPDS scores from baseline ($p<0{,}001$), with those in the experimental group experiencing a significantly greater reduction in EPDS score compared to those in the control group ($p=0{,}01$). Greater than 80 % of participants who were assigned to the intervention reported that the exercise support program was useful, as it helped them understand and cope with their emotional status.

Sedentary behavior

As pregnant people reportedly spend more than 50 % of their time in sedentary behavior (SED) (i.e., any non-sleeping activity performed in a reclining or seated position with low energy expenditure), describing the relation of SED to PPD is relevant [8; 28]. Van der Waerden et al. (2019) described relationships between domain-specific activity behaviors during pregnancy and PPD using data from two French birth cohorts [38]. Participants among the cohorts completed questionnaires regarding SED during either the first or third trimester of pregnancy, and the EPDS scale was used to measure occurrence of PPD symptoms within the first year following birth. The study found an inverse relationship between time spent on household and caregiving and leisure-time SED in the third trimester and the odds of developing PPD.

Additional studies have quantified SED in pregnancy as associated with adverse pregnancy outcomes (APOs) and other maternal health outcomes. Barone Gibbs et al. (2021) described longitudinal patterns of SED throughout the three trimesters of pregnancy with the use of gold-standard activity monitoring [2]. Participants spent approximately 2/3 of the day in SED and approximately 1/4 of the day standing. Being in the highest SED trajectory (~11 hr/day in each trimester) was associated with higher odds of APOs [2], which are themselves risk factors for PPD [11]. Although these studies did not evaluate a direct link between SED and PPD, past research has shown a direct association between the development of APOs, such as gestational hypertension, preeclampsia, pre-term birth, and caesarean sections, and PPD [11; 20]. Associations between SED and PPD may be mediated or moderated by the presence of APOs, though this hypothesis needs to be formally tested.

Diet patterns and PPD risk

Fallah et. al (2020) conducted a systematic review that included 14 studies that evaluated associations between vitamin D deficiencies and PPD, anxiety, and sleep disorders [7]. Of these studies, 9 reported that deficiencies in vitamin D were directly associated with PPD. Lower levels of prenatal 25(OH)D were associated with PPD, and women with PPD symptoms were more likely to have low levels of vitamin D. PPD was most prevalent in women with lower vitamin D serum levels at delivery. The authors concluded that sufficient vitamin D during pregnancy has a protective effect on PPD. Tan et al. (2021) reported similar findings in a dose response analysis that showed a non-linear negative association of vitamin D with the risk of maternal depression (nonlinear P=0,001), demonstrating that high blood 25(OH)D, most prominently in the range of 90–110 nmol/l, has a protective effect against maternal depression [35]. Subgroup analyses showed that this association existed regardless of seasons, although the risk for maternal depression was more prominent in the summer than in other seasons.

Research into a fuller panel of nutrients suggests that multivitamin supplementation may have a greater effect on reducing the risk and severity of PPD when compared to calcium and vitamin D supplementation [32]. Selenium supplementation may have a protective effect on PPD at 12 weeks postpartum [32], with some studies finding significant associations of low selenium intake and risk of PPD [30]. However, other studies have found no evidence that selenium prevents PPD [17]. Sparling and colleagues found in this study that higher risk of depression may be associated with higher intake of calcium, plant iron, potassium, and dietary and supplementary folate [32]. Other studies had conflicting results, such as the finding that pregnant people who had higher consumption of many nutrients such as total calcium, plant calcium, plant iron, potassium, total folate, and dietary folate may report less severe symptoms of depression [15]. Additionally, a later study by Starling et al found evidence that high folate levels during the antenatal period were inversely linked to PPD (Gould et al., 2022), while iron deficiency was sometimes associated with higher risk of PPD [21]. Previous studies on specific nutrients found that intake of B vitamins does not appear to have a strong association with the risk of PPD, with a few studies finding weak evidence of any association between the two [32]. One study demonstrated that lower levels of zinc consumption may increase the risk of antenatal depression [32]. However, this study did not find any evidence for a link between zinc and PPD, and a separate study found only a weak association [10]. Data regarding DHA and fish oil during pregnancy were conflicting [17; 36]. Some evidence suggested that consuming too many n-6 and n-3 PUFAs may increase the prevalence of depressive symptoms [32]. Additionally, higher intakes of total fat and saturated fats may be risk factors for PPD [32].

Sparling et al. (2017) conducted a systematic review summarizing the influences of different dietary components on prenatal and postpartum depression [32]. Studies were sorted into four different categories: adherence to dietary patterns, full panel of essential nutrients, specific nutrients, and intake of fish or polyunsaturated fatty acids (PUFAs) [32]. Among these groups, 22 studies showed protective effects for PPD. Evidence of dietary patterns showed that consuming and adhering to a healthy diet rather than a western-style diet had a protective effect against PPD at 8–10 weeks postpartum. In addition, adherence to a healthy diet versus the common Brazilian diet could influence EPDS score. Moreover, the authors found that protection against PPD was associated with low frequency of fast-food consumption, high Dietary Quality Index scores in pregnancy, and high adherence to the US national dietary guidelines. Despite several studies showing strong evidence, other studies have not demonstrated an association between an unhealthy diet and PPD. Other potentially beneficial diets include the Mediterranean Diet and the Traditional Indian Confinement Diet. Flor-Alemany et al. (2022) found that greater adherence to the Mediterranean Diet was associated with lower PPD, and that optimal diet adherence during pregnancy resulted in a 72 % reduced risk for PPD [9]. The cohort Growing Up in Singapore Towards Healthy Outcomes Study demonstrated that adherence to the Traditional Indian Confinement Diet was associated with fewer PPD symptoms and a lower likelihood of probable PPD [36]. Overall, the evidence informing this review was inconclusive, indicating a need for longitudinal studies with better measures of dietary intake and depressive symptoms [32].

Diet as PPD treatment

A systematic review of 21 studies evaluated the effect of vitamin D on antenatal and postpartum depression [10]. The RCTs included in this review reported decreased EPDS scores in participants who supplemented with vitamin D.

However, the sample sizes were small and the intervention periods were short, and the overall relationships were weak. Furthermore, analysis of the observational studies showed conflicting results, with only some reporting associations between vitamin D and PPD, while others reported no association. Evidence from the RCTs and observational studies was deemed insufficient for determining the effects of vitamin D in PPD due to the conflicting results of the observational studies and limitations of the RCTs. Thus, future studies should include improved measures for depression, standardization of seasons, and adjustments for demographic factors. Future studies could target those with low vitamin D status.

The role of polyunsaturated fatty acids in perinatal depression was explored in a systematic review and meta-analysis conducted by Lin et al. (2017) Levels of EPA, DHA, arachidonic acid, total n-3, total n-6, and n-6/n-3 ratio were compared between those with and without PPD [19]. In the studies reviewed, participants with PPD had significantly lower levels of DHA and total n-3, as well as a significantly higher n- 6/n-3 ratio

[20]. However, the studies showed no changes in the levels of EPA, arachidonic acid, or total n-6. Analysis of cross-sectional studies found that EPA levels were lower in those with PPD, while levels of DHA, arachidonic acid, total n-3, total n-6, and n-6/n-3 ratios showed no differences [20]. Moderate heterogeneity between studies was found between DHA and n-6/n-3 ratios. Furthermore, studies with levels of DHA, total n-6, and n-6/n-3 ratio levels were found to have some publication bias. PPD was associated with lower levels of n-3 PUFAs and higher n-6/n-3 ratios. The authors suggested that clinical trials are needed to test the therapeutic effects of n-3 PUFAs in PPD.

Other diet factors that may play a role in the treatment of PPD include selenium supplementation, which has been shown in some studies to decrease EPDS scores [10] and depression symptoms [6]. Additionally, a moderate relationship between high body mass index (BMI) and symptoms of depression has been reported. At 4 and 14 months postpartum, eating attitudes and BMI may be significant predictors for PPD [15]. Due to design flaws or caveats of the studies reviewed, the evidence for a role of dietary patterns on PPD was inconclusive. However, some evidence suggests that healthy and varied diets offer protective effects against PPD [15]. These and other authors in a variety of geographical locations suggested a role for improving diet as an adjuvant for PPD treatment, but overall associations were not consistent.

Discussion

Sleep

Several studies reported an association between poor subjective sleep and higher risk of PPD, both during pregnancy and during the postpartum period. Poor sleep quality, greater sleep disturbances, sleep latency, perceived stress and psychological distress, and insufficient sleep during pregnancy contribute to or are related to risk for PPD and/or identify those at risk for PPD [28; 41; 42]. Poor sleep quality during late pregnancy seemed to have the strongest link with PPD [28; 41; 42]. The association between poor sleep quality in late pregnancy and PPD appears to be independent of psychological distress and perceived stress [42]. Investigations of sleep quality in the postpartum period drew similar conclusions [14; 24]. Limitations of the literature include almost exclusive use of self-report, with few studies utilizing polysomnography. Actigraphic (objective) sleep measures were not associated with depressive symptoms [17].

Research regarding the utility of intervening to improve sleep quantity or quality to combat PPD is limited to nonexistent. Data strongly suggest that postpartum people should obtain adequate sleep to help alleviate PPD, but getting sleep with a new baby can be challenging. Leistikow et al. (2022) presents some possible solutions anchored on changing the message to new postpartum people to focus on self-care rather than self-sacrifice to make time for more sleep [17].

Physical activity

Several studies and meta-analyses concluded that exercise and PA may reduce the risk of developing PPD. Exercising 5 days per week for at least 30 minutes at moderate to vigorous intensity during the early postpartum period has been shown to reduce and prevent high perceived stress among those at risk for PPD [18]. Engaging in low impact exercise at least 2 times a week for 50 minutes per day has shown to be effective in weight control and management of depressive symptoms [16]. Benefits of exercise for PPD prevention may be particularly important in those who routinely partake in less than 60 minutes of exercise per week or did not exercise at all prior to pregnancy [17; 31]. Exercise in the postpartum is effective as a treatment for PPD in participants with depression [29]. This effect has been observed in prior research in different modalities, with reductions in depression severity observed in early postpartum [26], mid postpartum [5] and later postpartum [6]. Reduction in the severity of PPD has been demonstrated among those engaging in exercise or PA of different intensities, including light, moderate, and moderate to vigorous intensity exercise for at least 5 days a week, along with some degree of exercise education [26].

Those implementing a PA or exercise strategy to mitigate PPD risk should consider a multi-component approach, including social, educational, and coaching elements. Face-to-face and group-based programs and programs incorporating parent-baby bonding time have also been effective in reducing the risk of PPD and increasing general well-being of new mothers [23]. Telephone- based exercise education may increase the effectiveness of and adherence to at-home exercise, ultimately aiding in prevention of PPD [18]. Telephone-based health and wellness sessions can be helpful during early postpartum on their own, separate from engaging in exercise, and could reduce and prevent symptoms of depression [18]. Face-to-face educational support on exercise, diet, and psychological health has also demonstrated effectiveness (Vargas-Terrones et al., 2019) but may be more difficult to implement [39]. Written educational material can benefit subjective well-being [23].

Sedentary behavior

The literature regarding direct relationships between SED and PPD is limited. However, observational studies showed that greater leisure-time SED, such as caregiving and household activities, during the last trimester of pregnancy appears to be a risk factor for the development of PPD [37]. Furthermore, greater SED during pregnancy was associated with APOs [2]. The relationship described previously between APOs and increased PPD risk suggests that SED may also contribute to PPD risk, though this hypothesis should be systematically investigated. No literature regarding the utility of manipulating SED for prevention or treatment of PPD was identified.

Diet

The relationship between diet and PPD is still largely inconclusive, with many conflicting findings requiring further research. Several studies have shown that adherence to a "healthy" diet during pregnancy has a protective effect against PPD. However, dietary patterns unfavorable to PPD have been identified, including high consumption of fast food [32] and oily fish and offal (Khan et al., 2020), as well as strictly vegetarian diets [15]. High BMI has also been associated with PPD in some research [15]. A focus on health guidelines may be helpful for reducing risk of PPD or for reducing the severity of PPD [25].

Vitamins have been studied more extensively than dietary patterns in the PPD literature. Perhaps the vitamin most studied in this area is vitamin D, which has been shown to have a protective effect against PPD in observational studies. However, it remains unknown if low vitamin D levels are a risk factor for PPD/prenatal depression, or a consequence of PPD [35]. Evidence of vitamin D as a treatment for PPD is contradictory, with some research showing vitamin D supplementation in conjunction with calcium to be effective for reducing the severity of existing PPD symptoms [7] and other studies finding no connections [10]. Evidence for other nutrients, vitamins, and minerals is inconclusive, with several instances of insufficient and contradictory evidence.

Conclusions

The evidence presented in this narrative review suggests that lifestyle behaviors may be important for preventing and treating PPD. The qualitatively strongest evidence supports the use of perinatal exercise and promotion of high-quality sleep to improve PPD risk and symptoms (Figure 1). Significant knowledge gaps remain. Interventions designed to establish a regular exercise routine during pregnancy and the post-partum period and increase adherence to exercise and PA should be tested. Future research should test for associations of perinatal SED and PPD and evaluate potential effect mediators, such as adverse pregnancy outcomes or social determinants of health. Interventions to improve perinatal sleep quality should be developed and tested. The role for improvement in lifestyle behaviors as an adjuvant for pharmacotherapy for reducing PPD severity should be described.

Central Illustration

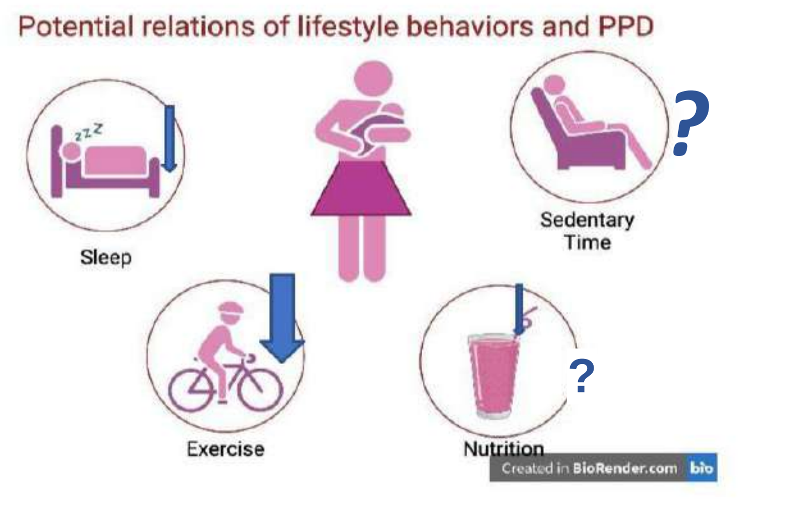

Figure 1. *Relation of Favorable Levels of Behaviors with PPD Risk or Severity. Strength of Association is Indicated by Size and Boldness of*

References

1. Affonso, D. D., Liu-Chiang, C. Y., & Mayberry, L. J. (1999). Worry: conceptual dimensions and relevance to childbearing women. *Health Care for Women International*, 20(3), 227–236 (in English).
2. Barone Gibbs, B., Jones, M. A., Jakicic, J. M. [et al.] (2021). Objectively measured sedentary behavior and physical activity across 3 trimesters of pregnancy: The monitoring movement and health study. *Journal of Physical Activity & Health*, 18(3), 254–261 (in English).
3. Beck, C. T. (2006). Postpartum depression: It isn't just the blues. *The American Journal of Nursing*, 106(5), 40–51 (in English).
4. Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, 100(2), 126–131 (in English).
5. Daley, A. J., Blamey, R. V., Jolly, K. [et al.] (2015). Pragmatic randomized controlled trial to evaluate the effectiveness of a facilitated exercise intervention as a treatment for postnatal depression: The PAM-PeRS trial. *Psychological Medicine*, 45, 2413–2425 (in English).
6. Dritsa, M., Da Costa, D., Dupuis, G., Lowensteyn, I., & Khalifé, S. (2008). Effects of a home-based exercise intervention on fatigue in postpartum depressed women: Results of a randomized controlled trial. *Annals of Behavioral Medicine*, 35(2), 179–187 (in English).
7. Fallah, M., Askari, G., Asemi, Z. (2020). Is vitamin D status associated with depression, anxiety and sleep quality in pregnancy: A systematic review. *Advanced Biomedical Research*, 9 (in English).
8. Fazzi, C., Saunders, D. H., Linton, K., Norman, J. E., & Reynolds, R. M. (2017). Sedentary behaviours during pregnancy: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1) (in English).
9. Flor-Alemany, M., Migueles, J. H., Alemany-Arrebola, I., Aparicio, V. A., Baena-García, L. (2022). Exercise, Mediterranean diet adherence or both during pregnancy to prevent postpartum depression – GESTAFIT trial secondary analyses. *International Journal of Environmental Research and Public Health*, 19, 144–50 (in English).
10. Gould, J. F., Gibson, R. A., Green, T. J., & Makrides, M. (2022). A systematic review of vitamin d during pregnancy and postnatally and symptoms of depression in the antenatal and postpartum period from randomized controlled trials and observational studies. *Nutrients*, 14(11), 2300 (in English).
11. Guintivano, J., Manuck, T., & Meltzer-Brody, S. (2018). Predictors of postpartum depression: A comprehensive review of the last decade of evidence. *Clinical Obstetrics and Gynecology*, 61(3), 591–603 (in English).
12. Halman, L. J., Oakley, D., & Lederman, R. (1995). Adaptation to pregnancy and motherhood among subfecund and fecund primiparous women. *Maternal- Child Nursing Journal*, 23(3), 90–100 (in English).
13. Heh, S. S., Huang, L. H., Ho, S. M., Fu, Y. Y., Wang, L. L. (208). Effectiveness of an exercise support program in reducing the severity of postnatal depression in Taiwanese women. *Birth*, 35, 60–65 (in English).
14. Khadka, R., Hong, S. A., & Chang, Y. S. (2020). Prevalence and determinants of poor sleep quality and depression among postpartum women: A community- based study in Ramechhap district, Nepal. *International Health*, 12(2), 125–131 (in English).
15. Khan, R., Waqas, A., Bilal, A., Mustehsan, Z. H., Omar, J., & Rahman, A. (2020). Association of Maternal depression with diet: A systematic review. *Asian Journal of Psychiatry*, 52, 102098 (in English).
16. Kim, H.-B., Hyun, A.-H. (2022). Psychological and biochemical effects of an online Pilates intervention in pregnant women during COVID-19: A randomized pilot study. *International Journal of Environmental Research and Public Health*. 19, 109–31 (in English).
17. Leistikow, N., Baller, E. B., Bradshaw, P. J. [et al.] (2022). Prescribing sleep: An overlooked treatment for postpartum depression. *Biological Psychiatry*. 92, e13-e15 (in English).
18. Lewis, B. A., Schuver, K., Dunsiger, S. [et al.] (2021). Randomized trial examining the effect of exercise and wellness interventions on preventing postpartum depression and perceived stress. *BMC Pregnancy and Childbirth*, 21, 1–11 (in English).
19. Lin, P. Y., Chang, C. H., Chong, M. F., Chen, H., & Su, K. P. (2017). Polyunsaturated fatty acids in perinatal depression: A systematic review and meta-analysis. *Biological Psychiatry*, 82(8), 560–569 (in English).
20. Meltzer-Brody, S., Maegbaek, M. L., Medland, S. E. [et al.] (2017). Obstetrical, pregnancy and socio-economic predictors for new-onset severe postpartum psychiatric disorders in primiparous women. *Psychological Medicine*, 47, 1427–1441 (in English).
21. Mughal, S., Azhar, Y., Siddiqui, W. (2018) Postpartum depression (in English).
22. Nakamura, A., van der Waerden, J., Melchior, M., Bolze, C., El-Khoury, F., & Pryor, L. (2019). Physical activity during pregnancy and postpartum depression: Systematic review and meta-analysis. *Journal of Affective Disorders*, 246, 29–41 (in English).
23. Norman, E., Sherburn, M., Osborne, R. H., & Galea, M. P. (2010). An exercise and education program improves well-being of new mothers: A randomized controlled trial. *Physical Therapy*, 90(3), 348–355 (in English).
24. Okun, M. L., Mancuso, R. A., Hobel, C. J., Schetter, C. D., & Coussons-Read, M. (2018). Poor sleep quality increases symptoms of depression and anxiety in postpartum women. *Journal of Behavioral Medicine*, 41(5), 703–710 (in English).

25. Opie, R. S., Uldrich, A. C., Ball, K. (2020). Maternal postpartum diet and postpartum depression: A systematic review. *Maternal and Child Health Journal*, 24, 966–978 (in English).
26. Özkan, S. A., Kücükkelepce, D. S., Korkmaz, B., Yılmaz, G., Bozkurt, M. A. (2020). The effectiveness of an exercise intervention in reducing the severity of postpartum depression: A randomized controlled trial. *Perspectives in Psychiatric Care*, 56, 844–850 (in English).
27. Pate, R. R., O'Neill, J. R., & Lobelo, F. (2008). The evolving definition of "sedentary". *Exercise and Sport Sciences Reviews*, 36(4), 173–178 (in English).
28. Pietikäinen, J. T., Härkänen, T., Polo-Kantola, P. [et al.] (2021). Estimating the cumulative risk of postnatal depressive symptoms: The role of insomnia symptoms across pregnancy. *Social Psychiatry and Psychiatric Epidemiology*, 56(12), 225–2261 (in English).
29. Pritchett, R. V., Daley, A. J., & Jolly, K. (2017). Does aerobic exercise reduce postpartum depressive symptoms? A systematic review and meta-analysis. *British Journal of General Practice*, 67(663), e684–e691 (in English).
30. Sajjadi, S. S., Foshati, S., Haddadian-Khouzani, S., & Rouhani, M. H. (2022). The role of selenium in depression: A systematic review and meta-analysis of human observational and interventional studies. *Scientific Reports*, 12(1), 1045 (in English).
31. Songøygard, K. M., Stafne, S. N., Evensen, K. A. I., [et al.] (2012). Does exercise during pregnancy prevent postnatal depression? A randomized controlled trial. *Acta obstetricia et gynecologica Scandinavica*, 91, 62–67 (in English).
32. Sparling, T. M., Henschke, N., Nesbitt, R. C., & Gabrysch, S. (2017). The role of diet and nutritional supplementation in perinatal depression: A systematic review. *Maternal & Child Nutrition*, 13(1), 10.1111/mcn.12235 (in English).
33. Stewart, D. E., & Vigod, S. N. (2019). Postpartum depression: Pathophysiology, treatment, and emerging therapeutics. *Annual Review of Medicine*, 70, 183– 196 (in English).
34. Stremler, R., McMurray, J., Brennenstuhl, S. (2019). Self-reported sleep quality and actigraphic measures of sleep in new mothers and the relationship to postpartum depressive symptoms. *Behavioral Sleep Medicine* (in English).
35. Tan, Q., Liu, S., & Chen, D. (2021). Poor vitamin D status and the risk of maternal depression: A dose-response meta-analysis of observational studies. *Public Health Nutrition*, 24(8), 2161–2170 (in English).
36. Teo, C., Chia, A. R., Colega, M. T. [et al.] (2018). Prospective associations of maternal dietary patterns and postpartum mental health in a multi-ethnic Asian cohort: The growing up in Singapore towards healthy outcomes (GUSTO) study. *Nutrients*, 10(3), 299 (in English).
37. van Der Waerden, J., Nakamura, A., Pryor, L. [et al.] (2019). Group EMCCS. Domain-specific physical activity and sedentary behavior during pregnancy and postpartum depression risk in the French EDEN and ELFE cohorts. *Preventive Medicine*, 121, 33–39 (in English).
38. van Lee, L., Chia, A., Phua, D. [et al.] (2020). Multiple modifiable lifestyle factors and the risk of perinatal depression during pregnancy: Findings from the GUSTO cohort. *Comprehensive Psychiatry*, 103, 152–210 (in English).
39. Vargas-Terrones, M., Barakat, R., Santacruz, B. [et al.] (2019). Physical exercise programme during pregnancy decreases perinatal depression risk: A randomised controlled trial. *British Journal of Sports Medicine*, 53(6), 348–353 (in English).
40. Yali, A. M., & Lobel, M. (1999). Coping and distress in pregnancy: an investigation of medically high-risk women. *Journal of Psychosomatic Obstetrics and Gynaecology*, 20(1), 39–52 (in English).
41. Yun, B. S., Shim, S. H., Cho, H. Y. [et al.] (2021). The impacts of insufficient sleep and its change during pregnancy on postpartum depression: A prospective cohort study of Korean women. *International Journal of Gynaecology and Obstetrics*, 155(1), 125–131 (in English).
42. Zhou, H., Li, W., & Ren, Y. (2020). Poor sleep quality of third trimester exacerbates the risk of experiencing postnatal depression. *Psychology, Health & Medicine*, 25(2), 229–238 (in English).

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