

Methods of preventing postpartum depression. The role of physical activity, mobile applications and psychosocial interventions

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Summary

Aim. The purpose of this narrative review is to collect and analyze research on selected methods of preventing postpartum depression.

Material and method. The literature review for this work was carried out in the scientific database PubMed. The analysis and further description were developed based on the PRISMA protocol. Only English-language research published between 2018 and 2023 was included.

Results. Research has not definitively proved a correlation between physical activity and preventing postpartum depression. The effective strategies that may reduce the risk of postpartum depression include mindfulness meditation, providing pregnant women with social support and professional medical care, as well as participating in educational programs during pregnancy. Additionally, internet programs and mobile apps based on cognitive-behavioral therapy can be an effective form of psychological support for pregnant women.

Conclusions. There are a few effective strategies that may reduce the risk of postpartum depression. The research has shown that the key is to provide women with holistic and multidisciplinary care, as well as identifying groups at highest risk of postpartum depression, in order to offer them professional support as quickly as possible.

Key words: postpartum depression, prevention of postpartum depression

Introduction

According to the World Health Organization (WHO), globally, 10% of pregnant women and 13% of women after childbirth experience mental disorders, particularly depression [1]. Currently, depending on the severity and intensity of symptoms, four common forms of postpartum mood disorders are distinguished: baby blues, pure

postpartum depression, postpartum depression which can occur in the context of pre-existing affective disorders, and postpartum psychosis [2]. Symptoms of postpartum depression are often similar to those observed in a typical depressive episode [3]. Nevertheless, there are specific characteristics that can be distinguished as unique to this period. These include a lack of interest in the newborn, difficulties in caring for the infant, negative feelings towards the child, and a sense of incompetence, often accompanied by guilt [4]. Literature indicates multifaceted determinants of postpartum depression, where socio-economic factors (e.g., lack of social support), psychological factors related to pregnancy (e.g., unwanted pregnancy), past mental disorders (e.g., recurrent depressive disorders), specific personality traits, and others play a role in its etiopathogenesis [2]. Formerly, postpartum depression was not a phenomenon of interest to researchers; however, over the past two decades, the quantity of scientific publications on this topic has significantly increased [5].

According to the ICD-10, the diagnosis of postpartum depression is most commonly made in cases of mental disorders related to childbirth, beginning within six weeks of delivery [6]. In this classification, postpartum depression is coded as F53.0 – mild mental and behavioral disorders associated with the puerperium, not elsewhere classified: postnatal depression, postpartum depression [2]. If a recurrent depressive episode occurs in association with childbirth or if depressive symptoms are severe, the codes from the F33 and F32 groups apply. In the DSM-5 classification, postpartum depression is defined as major depressive disorder occurring during pregnancy or within four weeks of delivery [7]. According to the latest ICD-11 classification, mental and behavioral disorders related to pregnancy, childbirth, and the puerperium include changes in mental state occurring up to six weeks after delivery. However, in this case, it may be necessary to use multiple diagnoses if symptoms meet diagnostic criteria for another disorder. Therefore, if there is a recurrence or exacerbation of pre-existing mood disorders during pregnancy, delivery, or the postpartum period, the situation should be described with two codes: one indicating another depressive episode in recurrent disorders and another emphasizing that it occurred in relation to childbirth [8].

It is worth mentioning that most clinicians consider depressive symptoms appearing within 12 months after delivery to be an episode of depression related to childbirth. In practice, when diagnosing depressive disorders in young mothers, a range of biological and psychological factors, individual medical history, and psychiatric disorders in the medical records are taken into account to establish a specific nosological entity and tailor appropriate comprehensive treatment.

The diagnosis of postpartum depression is made based on a psychiatric evaluation. Clinicians commonly use self-assessment scales to help assess the severity of symptoms, such as the Edinburgh Postnatal Depression Scale (EPDS) [9] and the Beck Depression Inventory (BDI) [10]. However, it is important to note that these are screening questionnaires, and their value is limited; the results may not necessarily align with a psychiatric diagnosis.

Aim, material and method

The aim of this study is to present research on methods of preventing postpartum depression, published between 2018 and 2023 and indexed in the PubMed database. To illustrate the data analysis process, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [11] protocol was utilized. Data collection for this study was conducted between November and December 2023. Only articles published in English were considered. The time criteria encompassed publications between 2018 and 2023 to ensure the inclusion of the latest data on the review topic. Only randomized controlled trials were included, and the scope was narrowed to studies focusing on physical activity, mobile applications, home visitations, cognitive-behavioral therapy, and education. Studies were excluded if they lacked a control group or if the study group consisted of women experiencing violence or obesity.

A search of the PubMed database identified a total of 78 articles related to the prevention of postpartum depression. After verification and application of inclusion and exclusion criteria, 24 studies were ultimately included in the article. The selection process is depicted in Figure 1. For the purpose of organizing the data, studies were grouped according to the type of intervention, including physical activity [14, 17, 18,

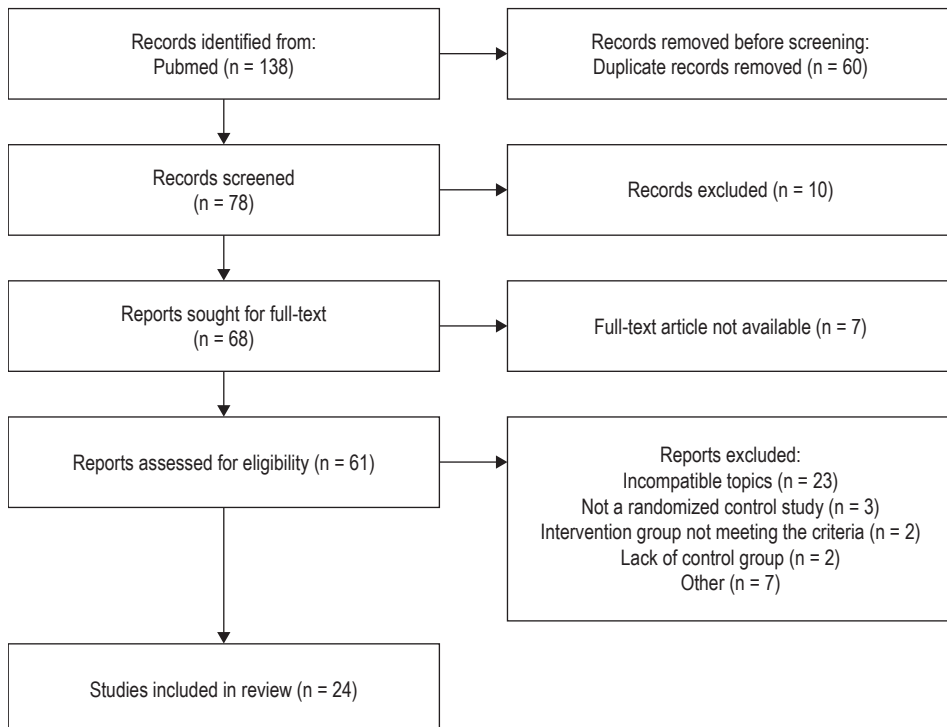


Figure 1. Flow diagram of studies used in review

20, 22, 23], mobile applications [27-29, 31, 32, 34-36], home visitations and cognitive-behavioral therapy [37, 38, 41-45], and education [47-49].

Discussion

Physical activity

According to WHO guidelines, physical activity brings significant health benefits. Physical exercise requires relatively low financial and time investment and additionally promotes weight loss, reduces symptoms of depression and anxiety, and has a positive impact on promoting a healthy lifestyle change. For pregnant and postpartum women, at least 150 minutes of moderate physical activity per week (including aerobic and muscle-strengthening exercises) is recommended [12]. While physical activity is recognized as an effective form of preventing depression in the general population [13], there is still insufficient data to determine whether such a relationship exists specifically for postpartum depression.

In the context of the discussed issue, it is valuable to refer to a study evaluating the relationship between physical exercise, telephone support, and the prevention of postpartum depression [14]. The study included women with a history of previous depressive episodes but excluded women suffering from depression at recruitment. A total of 450 women, on average 4.35 weeks postpartum, were assigned in a 1:1:1 ratio to one of three groups: (1) exercise group – aimed at increasing self-efficacy in engaging in physical activity and motivating postpartum women to exercise; (2) telephone support group – providing advice on sleep hygiene, nutrition, stress reduction, and time management; (3) standard postpartum care group. The effectiveness of the study was assessed using measures including the SCID (Structured Clinical Interview for DSM Disorders) [15], EPDS (Edinburgh Postnatal Depression Scale), and PSS-14 (14-item Perceived Stress Scale) [16] at three time points: baseline, immediately post-intervention, and three months later. The study results did not confirm a definitive relationship between physical exercise and the prevention of postpartum depression. However, a negative correlation was observed between physical exercise and the level of perceived stress in women at risk of postpartum depression.

Similar conclusions arise from another study involving 639 women between 16 and 20 weeks of pregnancy, without contraindications to exercise [17]. They were randomly assigned in a 1:2 ratio to either the intervention group or the control group. Participants in the intervention group took part in a 16-week exercise program supervised by researchers, involving aerobic and resistance training, conducted in 60-minute sessions three times a week. Depression symptoms were assessed using the EPDS three months after childbirth. Similar to other studies, the results here also did not show significantly lower severity of postpartum depression symptoms in the intervention group compared to the control group; however, it should be emphasized that only 40.4% of participants in the intervention group attended at least 70% of the planned training sessions and thus met the research protocol requirements.

In a study conducted at the Department of Obstetrics at Copenhagen University Hospital, 282 pregnant women with a history of depression and/or anxiety requiring treatment within the last 10 years or who had used antidepressant medication before or during pregnancy were enrolled [18]. The women were randomly assigned to either a group ($n = 143$) participating in supervised physical exercises twice a week for 12 weeks or a control group (standard care, $n = 139$). Mental well-being was assessed after the intervention and again 8 weeks after childbirth using the WHO-5 (Five Well-Being Index) scale [19]. The results showed that supervised physical exercises did not significantly improve the mental well-being of participants between weeks 29 and 34 of pregnancy; however, women in the intervention group achieved a higher mean WHO-5 score 8 weeks after childbirth compared to women in the control group. The authors noted that participants' mental well-being may have been influenced not only by physical activity but also by the experience of mutual support.

Researchers in Granada [20] adopted a different strategy compared to the previously discussed studies. They enrolled 62 mothers between 3 and 9 months postpartum who had a history of low physical activity levels and experienced significant depressive symptoms into a 12-week intervention. Participants ($n = 32$) received free exercise equipment for home use, along with support via a mobile application and access to an online forum, while the control group ($n = 30$) received standard postpartum care. Mental health assessments were conducted using the EPDS at baseline and at 4, 8, and 12 weeks into the intervention, as well as the Generalized Anxiety Disorder Questionnaire (GAD-7) [21] at baseline and at the end of the 12-week study period. Outcome measurements using these scales did not show significant differences between the intervention and control groups. The results suggest that providing exercise equipment stimulates postpartum women to engage in regular physical activity, enabling them to incorporate exercise into their daily routine despite various limitations such as childcare responsibilities or adverse weather conditions. While most women expressed positive feelings about using exercise equipment at home, some reported difficulties in adapting to this new activity. The studies did not confirm a connection between physical activity and the severity of depressive symptoms. Further research and exploration of effective strategies are needed to sustain positive changes over time.

In another study investigating the relationship between physical activity and reduction in the severity of postpartum depression symptoms, participants in the intervention group also followed a Mediterranean dietary pattern [22]. The exercise program consisted of 60-minute sessions, three times per week, starting from the 17th week of pregnancy until delivery, involving a total of 85 women, with 45 individuals in the intervention group and 39 in the control group. The severity of postpartum depression symptoms was assessed using the EPDS questionnaire at the beginning of the intervention and 6 weeks after childbirth, with results showing no statistically significant differences between the control group and the exercise group. However, the analysis revealed that higher fruit consumption, lower red meat consumption, and better adherence to medical recommendations were associated with lower levels of

postpartum depression, suggesting that besides physical activity, other factors such as diet and compliance with medical advice may influence the reduction of postpartum depression symptoms.

In the context of the discussed topic, it is worth referring to a 2018 study [23], which presents different results compared to those previously discussed. Healthy women below 16 weeks of pregnancy were allocated to two groups: an intervention group ($n = 70$) and a control group ($n = 54$). The intervention group participated in a 60-minute exercise program three days a week throughout the entire pregnancy. The risk of developing depression was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) [24] at the beginning of the study, at the 38th week of pregnancy, and at 6 weeks postpartum. The analysis results showed that at the beginning of the study, there were no significant differences in the percentage of women with depression between the groups; however, at the 38th week of pregnancy and 6 weeks postpartum, a lower percentage of women with depression was observed in the intervention group compared to the control group. The per-protocol analysis confirmed the significance of these differences. A positive correlation was observed between participation in the physical exercise program and a reduction in the incidence of depression in late pregnancy and postpartum.

Internet programs and mobile applications

According to a study conducted by the National Media Institute in Poland, 75.8% of Poles use smartphones [25]. With the advancement of technology, researchers are increasingly opting to utilize modern technologies, including mobile and internet-based interventions, to improve the therapeutic process for patients. These innovative methods offer key advantages such as easy accessibility and low operating costs.

Cognitive-behavioral therapy (CBT) is widely recognized as an effective form of therapy [26]. Many mobile applications aimed at preventing postpartum depression are based on CBT principles, and one such application is CareMom [27]. In a study evaluating its effectiveness, 112 women participated. The experimental group ($n = 57$) used the CareMom app, while the control group ($n = 55$) did not have access to it. Symptoms of depression and anxiety were assessed weekly for four weeks using the EPDS and the GAD-7. Participants were required to complete daily tasks within the app, and over 90% of them successfully completed these tasks. Some tasks included video materials and checkpoint questions based on CBT methods, focusing on postpartum depression topics. Additionally, the app allowed participants to record their daily mood and engage in reflective analysis of related events and thoughts. Once a day, they could rate their overall mood on a scale ranging from “very good” to “very bad”. After 4 weeks of intervention, it was found that the group using the CareMom app achieved a significantly lower EPDS score compared to the control group, while the results of the GAD-7 questionnaire did not differ significantly between the groups. According to the authors’ conclusions of the cited study, these results provide preliminary evidence for

the effectiveness of the CareMom app, which is based on CBT principles, in reducing postpartum depression symptoms in women shortly after childbirth.

It is worth noting that another study also confirms the hypothesis of the effectiveness of internet interventions based on CBT principles – in this case, it is the “Be a Mom” program, specifically designed to prevent persistent postpartum depression (PPD) symptoms [28]. Eligible women ($n = 194$) presenting risk factors for PPD and/or early PPD symptoms were randomly assigned to either the “Be a Mom” program ($n = 98$) or the control group ($n = 96$). Participants from both groups completed baseline assessment (T1) and post-intervention assessment (T2), which included the use of the EPDS scale among other measures. A significant Time x Group interaction effect was found for both depressive and anxiety symptoms, with women in the intervention group showing a greater reduction in symptom severity from T1 to T2. Unlike the CareMom app discussed earlier, only 41.8% of women completed the “Be a Mom” program in this study; however, the majority (71.4%) expressed willingness to use the program again if needed. These results confirmed the previously described negative correlation between the use of online CBT-based interventions — in this case, the “Be a Mom” program — and the severity of depressive symptoms as measured by the EPDS scale.

Another study highlighted in the literature focused on evaluating the effectiveness of internet-based cognitive-behavioral therapy (iCBT) in preventing major depressive episodes (MDE), but unlike the studies discussed earlier, it did not yield equally satisfactory results [29]. The therapeutic program, involving 5,017 women (iCBT, $n = 2,509$; control, $n = 2,508$) between the 16th and 20th week of pregnancy who had no prior history of major depressive episodes, consisted of six sessions, each lasting 5 to 10 minutes each. Symptoms of depression were monitored using the Composite International Diagnostic Interview (CIDI) questionnaire [30] at the 32nd week of pregnancy and 3 months postpartum. Additionally, the EPDS questionnaire was used at the beginning of the intervention, at the 32nd week of pregnancy, and one week and 3 months postpartum. The iCBT program did not result in the expected reduction in the occurrence of major depressive episodes or postpartum depression. It was found that iCBT therapy may be effective in preventing postpartum depression only in women who had previously experienced subthreshold depressive symptoms. Researchers point out several potential reasons for the failure of this intervention, such as the short duration of the therapeutic program, which may have been insufficient to achieve a significant preventive effect, and the rare occurrence of major depressive episodes, which likely influenced the difficulty in detecting intervention effects.

Mobile medical services encompass not only therapeutic elements but also enable remote consultations with various specialists. An example of such an approach is the mHealth program, which provided participants with the opportunity for free consultations with gynecologists, obstetricians, pediatricians, and midwives via a website from 6:00 PM to 10:00 PM on weekdays, both during pregnancy and after childbirth [31]. The study was conducted on a sample of 734 pregnant women (mHealth, $n = 365$; control, $n = 369$). The analysis examined the risk of severe postpartum depression

symptoms, assessed based on an EPDS score ≥ 9 , as well as a sense of self-efficacy, loneliness, and perceived limitations in accessing healthcare (such as the number of clinic visits and use of ambulance services). It was found that women in the mHealth group, three months after childbirth, had a lower risk of experiencing severe postpartum depression symptoms compared to the control group and exhibited higher self-efficacy, less loneliness, and experienced fewer limitations in accessing healthcare.

The PIP program was created to provide psychological support to mothers during the perinatal period through phone calls and SMS messages [32]. The study included 138 mothers at risk of postpartum depression, with 69 assigned to the intervention group and 69 to the control group. Prior to the intervention, 20 volunteers were trained by a psychiatrist in social support skills to assist mothers participating in the program. The intervention lasted four weeks and involved weekly interactions in which mothers in the intervention group communicated with peer volunteers via phone calls or SMS messages, alongside standard postnatal care. The control group received only standard postnatal care. The study assessed the severity of postnatal depression (PND) symptoms, postnatal anxiety (PNA), feelings of loneliness, and perceived social support using the EPDS, with data collected immediately after childbirth and at one and three months postpartum. The results showed a statistically significant difference in EPDS scores between the intervention group and the control group at three months postpartum. The PIP program, based on this technology, effectively reduced the risk of postpartum depression in young mothers, while also showing a positive correlation with reduced postnatal anxiety and loneliness, and increased perceived social support.

According to some scientific reports, mindfulness meditation practice can be an effective intervention in treating mental disorders [33]. Modern technologies enable the integration of such techniques into mobile applications and internet-based programs, attracting the attention of researchers. One study [34] focused on 75 pregnant adult women who were experiencing increased levels of stress during the perinatal period. The women, with a mean age of 30.6 years and an average gestational age of 18.8 weeks, were randomly assigned to two groups. The first group ($n = 38$) participated in a program called “Thriving in Pregnancy – Cultivating the Four Immeasurables”, consisting of eight weekly mindfulness practice sessions tailored to the needs of pregnant women. The control group ($n = 37$) received an online perinatal education program. The severity of postnatal depression symptoms was assessed using the EPDS at various stages: baseline, post-intervention, in the 37th week of pregnancy, and between the 4th and 6th weeks postpartum. Moreover, data on postpartum recovery, newborn health, and the positive impact of the intervention on maternal mental health were also collected. The results in the experimental group were lower on the EPDS compared to the control group, both post-intervention and postpartum. A negative correlation was observed between participation in this program and the severity of depressive symptoms during the studied time period. Therefore, it appears that the mindfulness-based intervention (MBI) program may be an acceptable and effective method for reducing depressive symptoms throughout pregnancy and the postpartum period.

Another study examined the effectiveness of an electronic mindfulness-based intervention (eMBI) involving 460 women (intervention group, $n = 230$; control group, $n = 230$) between the 29th and 36th week of pregnancy [35]. Participants received access to a specially designed eMBI platform, which included an 8-week program of 45-minute sessions consisting of psychological and obstetric education, mindfulness training, and elements of cognitive-behavioral therapy. The women were followed up for five months postpartum. Mental health status was assessed using various diagnostic tools, including the EPDS. Questionnaires were administered every two weeks from the 28th to the 36th week of pregnancy, and then again at one and five months postpartum. As opposed to the previous study, the use of the eMBI program was not associated with an overall reduction in the severity of depressive symptoms. However, a significant correlation was observed between participation in the eMBI program and a reduction in anxiety symptoms related to pregnancy and childbirth in the intervention group.

Following further analysis of research on mobile interventions, it is significant to introduce the study on the effectiveness of a program called “Mamma Mia.” [36]. The study included 1,342 pregnant women who were randomly assigned to either the “Mamma Mia” intervention group ($n = 678$) or the control group ($n = 664$). The intervention consisted of three stages: (1) 11 sessions starting in the second trimester of pregnancy; (2) 3 sessions per week for 6 weeks, beginning when the baby was 2–3 weeks old; (3) 10 sessions over the following 18 weeks. The study used a tunnel model, guiding participants through the program step-by-step using e-mail and interactive websites featuring text, images, recorded audio files, and user input data. Each session lasted approximately 10 minutes and had to be completed before the next session could be accessed. Data were collected at 21–25 weeks and 37 weeks of pregnancy, and at 6 weeks, 3 months, and 6 months postpartum. Participants in the intervention group showed lower levels of depressive symptoms (assessed using the EPDS) compared to the control group. These results suggest a significant association between the “Mamma Mia” intervention and a reduced risk of postpartum depression.

Psychosocial interventions

Research carried out by teams worldwide focuses on various intervention strategies aimed at identifying the most effective methods of preventing postpartum depression. These approaches include individual and group cognitive-behavioral therapy, mindfulness training, home visits, and psychiatric care.

In a 2020 study, the effectiveness of a childbirth preparation program incorporating mindfulness training elements was evaluated [37]. The program, known as Mind in Labor (MIL), was compared to treatment as usual (TAU). The main goal was to assess whether prenatal mindfulness training could alleviate distress in pregnant women during the perinatal period, and whether the degree of benefit depended on initial levels of risk for depressive and anxiety symptoms, as well as protective factors

such as mindfulness. Thirty women in their third trimester participated in the study and were randomized into the MIL group ($n = 15$) or the TAU group ($n = 15$). Before the intervention, and at one week, six weeks, and one year postpartum, their distress levels, including perceived stress, anxiety, and depressive symptoms, were assessed using various scales, including the Center for Epidemiologic Studies Depression Scale (CES-D) [24]. The results showed a greater decrease in distress levels (from the preintervention period to 12 months postpartum) in women participating in the MIL program compared to the TAU group. Therefore, this study provides preliminary evidence for the mental health benefits of a mindfulness-based childbirth preparation program compared to standard care.

Mindfulness training was also the subject of another research program [38]. One hundred and four women between the 13th and 28th weeks of pregnancy were enrolled in the study and then randomly assigned to either the experimental group ($n = 52$) or the control group ($n = 52$). Ultimately, 74 women completed the study, including 39 in the experimental group and 35 in the control group. The program consisted of a series of eight 3-hour sessions held once a week, as well as one day of 7-hour silent meditation. Participants' psychological states were assessed at the beginning of the study (after obtaining informed consent) and 3 months postpartum using the 10-item Perceived Stress Scale (PSS-10) [39], the EPDS, and Five Facet Mindfulness Questionnaire (FFMQ) [40]. Significant differences in perceived stress and the severity of depressive symptoms were observed in both groups during the intervention period. The outcomes were significantly better in the experimental group compared to the control group 3 months postpartum. A strong association was observed between the implementation of the research program and reductions in depressive symptom severity and perceived stress, as measured by the assessment tools.

The conclusions from these studies suggest that mindfulness training may be a promising intervention in preventing postpartum depression and may yield long-term health benefits for women during the perinatal period.

Another study compared the effectiveness of three different interventions: couples-based cognitive-behavioral therapy (CBT) ($n = 134$), individually delivered CBT for women ($n = 124$), and standard perinatal care, which was used as the control group ($n = 130$) [41]. The CBT intervention consisted of a 3-hour group session before childbirth and two 30-minute telephone sessions after delivery. Depressive symptoms were assessed using the EPDS at the beginning of the study (during pregnancy), and at 6 weeks, 6 months, and 12 months postpartum. The results of the study showed a significant improvement in the severity of depressive symptoms at 6 weeks postpartum among mothers who participated in the couples-based CBT intervention compared to mothers in the individual CBT and control groups. Additionally, the percentage of mothers with postpartum depression (EPDS score ≥ 10) was significantly lower at 6 weeks postpartum in the group where couples participated in the CBT intervention compared to the control group. The study showed that couple-based CBT intervention is associated with a lower incidence of postpartum

depression in the early postpartum period compared to individual CBT intervention and standard perinatal care.

In research on postpartum depression, particular attention is often drawn to the fact that young mothers, especially those who lack social support, constitute a significant risk group for developing depression. In response, the MFPSS (Midwife-Family Provided Social Support) program was designed and analyzed in a subsequent study [42]. Within this program, social support was provided by midwives and family members in the third month after childbirth. Forty-two adolescent mothers were randomly assigned either to a 4-week MFPSS program ($n = 21$), which also included routine care, or to a control group ($n = 21$) that received only standard perinatal care. Postpartum depression symptoms were measured using the EPDS at the beginning and after the intervention, as well as at follow-up 6 weeks and 3 months postpartum. Data analysis showed that after the intervention, the mean EPDS scores and the frequency and severity of postpartum depression symptoms in the intervention group were significantly lower compared to the control group during post-intervention observations and at 6 weeks and 3 months postpartum. Psychosocial support interventions, including support from midwives and family members, proved to be more effective in preventing postpartum depression in adolescent mothers compared to standard perinatal care, and the preventive effect persisted for up to 3 months after childbirth.

From the available literature, it is evident that postpartum depression often affects women with low socioeconomic status. In this context, the effectiveness of a new intervention, Mothers and Babies (MB), was assessed [43]. This intervention involved conducting individual sessions with mothers by volunteers trained in MB therapy, who visited the participants at their homes. The intervention program consisted of 12 sessions: the first two served as an introduction, the next nine covered three modules related to key methods of cognitive-behavioral therapy, and the final session focused on summarizing and applying the techniques learned in daily life. The study involved 120 pregnant women (MB, $n = 54$; control, $n = 66$) who did not experience symptoms of severe depression. Mental health status was assessed using the BDI, GAD-7, and PSS-10 scales. The results showed that in the intervention group, levels of depressive symptoms decreased between baseline and the third month postpartum, with a further reduction observed at six months postpartum. A similar pattern was observed for anxiety symptoms, with significant differences in the severity of depressive symptoms between the start of the intervention and six months postpartum, but no changes between baseline and the third month postpartum. In the control group, levels of depression symptoms remained the same at baseline and at six months postpartum. The use of the MB method positively influenced the reduction of depressive symptoms in women from the prenatal period to six months postpartum; however, it did not significantly reduce the perceived stress levels among participants.

The next intervention focused on providing participants with multidisciplinary healthcare [44]. The aim was to assess the program's effects on improving postpartum mental health in women and raising the standard of care for women and their children

during the perinatal period. Out of the 349 women enrolled in the study, 210 were assigned to the intervention group and 139 to the control group. The intervention program included a wide range of perinatal services, including consultations with specialists from various fields, enabling continuous, professional support to participants during pregnancy and the postpartum period. Women's mental health status was assessed using the EPDS questionnaire three months after childbirth, and the total score significantly differed between the intervention and control groups. Additionally, the number of women using the services of community nurses, participating in motherhood seminars, and receiving home visits from community nurses was significantly higher in the intervention group. A positive correlation was observed between the number of healthcare services provided by community nurses and the improvement of parameters assessed in the EPDS questionnaire. Therefore, it was concluded that an increased number of healthcare services provided by community nurses is associated with a significant improvement in maternal mental health in the postpartum period.

In the aim of searching for effective methods to reduce postpartum depression symptoms, it is worth to consider the findings of a study evaluating group intervention conducted by lay health workers [45]. In this study, 214 participants were assigned to three different groups: the active intervention group (group 1, $n = 69$); the positive control group (group 2, $n = 75$); and negative control group (group 3, $n = 70$). The program involved three-day group sessions led by volunteers, three times a day for 45–60 minutes, focusing on various aspects of women's experiences and functioning depending on the group. Group 1 discussed topics related to postpartum depression risk factors, common concerns of women during the perinatal period, coping strategies, and the importance of interpersonal relationships. Sessions in the positive control group focused on childbirth, breastfeeding, vaccinations, child development, and nutritional and hygiene needs. The negative control group received standard perinatal care. Evaluation of participants' mental state was mainly based on the Clinical Interview Schedule-Revised (CIS-R) [46]. The data were collected at three time points: at the beginning of the intervention, and at 6 and 12 weeks postpartum. The study found that the active intervention group showed a 30% decrease in incidence of postpartum depression compared to the control groups. However, it is important to note that this difference did not reach statistical significance.

Various forms of support, such as social support programs, cognitive-behavioral interventions, integrated healthcare services, home visitations, and group interventions, may be helpful in alleviating symptoms of postpartum depression. However, further research is needed to more precisely determine the effectiveness of each intervention and their optimal application in clinical practice.

Education

Pregnant women experiencing antenatal depression constitute a high-risk group for both postpartum depression and breastfeeding failure. The study described below aimed to examine the correlation between psychoeducational interventions and lactation education with breastfeeding outcomes and postpartum depression [47]. Primiparas ($n = 182$) with an EPDS score of 9 or higher were randomized and assigned to the intervention group ($n = 91$) or the control group ($n = 91$). The intervention group participated in four educational sessions on perinatal depression treatment and breastfeeding, while the control group received standard care. Data analysis revealed significant differences between the control and intervention groups on the 3rd and 42nd days postpartum regarding the frequency of breastfeeding, initial breastfeeding experience, breastfeeding behaviors, and maternal self-efficacy. Additionally, statistically significant differences were found in EPDS scores between the groups over time, and women in the intervention group were more satisfied with the support provided by their partners and the care received in the first month postpartum. The results of this study suggest that combining lactation counseling with psychological support during pregnancy may be an effective and easily implementable method for preventing postpartum depression. Furthermore, this study underscores the need for identifying pregnant women at risk of perinatal depression and indicates that individualized mixed intervention during the prenatal period may reduce the risk of postpartum depression and contribute to better breastfeeding outcomes.

In another study, mothers watched an educational video on infant crying during the first week after childbirth in maternity wards [48]. The aim was to determine whether this intervention could reduce the severity of postpartum depression symptoms. The study was conducted in 47 hospitals or maternity clinics in Japan, of which 44 completed the study, yielding 2,601 responses (intervention group, $n = 1,040$; control group, $n = 1,561$) on a postpartum depression questionnaire (response rate: 55.1%). Postpartum depression was assessed using the EPDS questionnaire, which was given to participants after watching the video, and they were asked to return it one month after childbirth. In the intervention group, 142 mothers (13.7%) reported symptoms of postpartum depression compared to 250 mothers (16.0%) in the control group, indicating no significant differences in the frequency of postpartum depression between the groups. However, contrasting results were found for young mothers (<25 years old) – in this group, the analysis showed a 67.0% reduction in the frequency of postpartum depression. The study suggests that watching an educational video about infant crying during the first week after childbirth does not affect the level of postpartum depression in the general population but may be effective for young mothers under the age of 25.

Other researchers conducted an evaluation of the effectiveness of an educational program in preventing postpartum depression [49]. In this study, 130 women between the 30th and 35th week of pregnancy were randomly assigned to the intervention group

($n = 60$) and the control group ($n = 70$). The educational program was delivered in the form of five groups ($n = 12$), with sessions held once a week for four weeks, 60 to 90 minutes each. During the intervention, various topics were discussed, including anatomical and physiological changes in the woman's body, prenatal and postnatal care, mental health during pregnancy and postpartum, pregnancy and postpartum events, maternal emotions and thoughts, as well as postpartum issues and coping strategies. Participants in the control group received routine perinatal care. Data were collected before and after the intervention using the GHQ General Health Questionnaire (GHQ) [50] and the EPDS. The study results indicate that the implementation of the educational program is significantly associated with a reduction in the severity of depressive symptoms. Participants in the program showed significantly lower rates of depression compared to the control group. Educational sessions focusing on various aspects of pregnancy, childbirth, and mental health yielded beneficial results, reducing the risk of postpartum depression. These findings suggest that appropriate educational support during pregnancy may have a significant impact on maternal mental health after childbirth.

Various approaches, including psychoeducational interventions, social support, and educational programs, can be effective tools in preventing postpartum depression. However, it is essential to adjust these interventions to the individual needs and characteristics of the population to achieve the best outcomes.

Conclusions

In summary, although research has not yet provided definitive evidence of the relationship between physical activity and the prevention of postpartum depression, there is evidence suggesting that incorporating exercise into postpartum care may bring health benefits for mothers. Internet-based programs and mobile applications, mostly based on cognitive-behavioral therapy principles, represent a promising form of psychological support for pregnant women, eliminating barriers to accessing healthcare. Additional effective strategies that can significantly contribute to reduce the risk of postpartum depression include practicing mindfulness meditation, social support, professional medical support, and participation in educational programs during pregnancy.

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