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**Research Article**

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# Assessment of Anxiety and Depression in the Perioperative Period in Women of Reproductive Age During Regional Anesthesia

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**INTRODUCTION** Perioperative cognitive impairment occurs in both pregnant and non-pregnant women. Prediction, early detection and effective treatment of these disorders are important for the well-being of women and their offspring.

**AIM OF STUDY** To evaluate the effect of anesthesia and surgery on the level of anxiety, depression, short-term memory, and concentration in pregnant and non-pregnant women.

**MATERIAL AND METHODS** The observational prospective study included 120 patients who were divided into two equal groups — pregnant (n=60) and non-pregnant (n=60) women. A comparative analysis of testing psychosomatic reactions and cognitive functions using the MoCa test, Benton and Wechsler tests, self-assessment questionnaire, Hospital Anxiety and Depression Scale (HADS) was carried out. The relative risk and odds ratio of developing anxiety and depression were calculated.

**RESULTS** Anxiety indicators in pregnant women before surgery reached subclinical values of 7.5 (8.4; 6.6), and in non-pregnant women – the norm: 6.5 (7.3; 5.7) (p<0.001); results of depression in pregnant women after surgery were 7.3 (8.5; 6.1), in non-pregnant women — the norm: 6.3 (7; 5.5) (p<0.001). The odds of developing short-term memory impairment in pregnant women before surgery was 3.1 times higher than in non-pregnant women, odds ratio 3.1 (95% CI [1.3–7.4]). In the pregnant group, short-term memory scores before surgery were 5 (5.8; 4.2), and after surgery they decreased to 3.8 (4.7; 2.9) (p<0.001). There was a decrease in concentration of attention in pregnant women: before surgery 6.2 (6.8; 5.6), and after surgery — 5 (5.8; 4.2) (p<0.001). The relative risk (RR) of developing depression in pregnant women after surgery was 6.1 times RR=6.1 (95% CI 2.4; 15.8), sensitivity Se (%)=0.9, specificity Sp (%)=0.5. The relative risk (RR) of developing short-term memory impairment after surgery was 1.1 times RR=1.1 (95% CI 1; 1.2), sensitivity Se (%)=0.5, specificity Sp (%)=0, 8. The relative risk (RR) of developing problems with concentration after surgery was 8.3 times RR=8.3 (95% CI 3.9; 18.3), sensitivity Se (%)=0.8, specificity Sp (%)=0.7.

**CONCLUSIONS** The results obtained allow us to conclude that before surgery, pregnant women experience a subclinical version of anxiety, against the background of which the chances of developing problems with short-term memory and concentration increase. After surgery, pregnant women experience a subclinical version of depression, along with it there is also impairment of intelligence, short-term memory and concentration. The initial impairment of memory and attention requires the selection of anesthesia in a group of pregnant women.

**Keywords:** pregnancy, anxiety, depression

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CI – confidence interval
HADS – Hospital Anxiety and Depression Scale
OR – odds ratio
RR – relative risk
Se – sensitivity
Sp – specificity
SRH – self-rated health questionnaire

## INTRODUCTION

Cognitive disorders in women of reproductive age that occur in the postoperative period include depression, anxiety, and postpartum psychosis, which can manifest as bipolar disorder [1, 2]. Postpartum depression is often combined with anxiety disorders and is a psychopathological condition associated with pregnancy. There is evidence that depression during pregnancy negatively affects the development of the child's nervous system [2, 3].

Risk factors for developing postoperative depression include a history of depression, anxiety, or bipolar disorder, as well as psychosocial factors such as ongoing family conflict, poor social support, and ongoing stressful life events. Early symptoms of depression, anxiety and mania can be detected through screening during pregnancy and the postpartum period [3, 4].

In a study by S. Nakić Radoš (2018), statistical data indicated a high level of anxiety during pregnancy, which occurred in 35% of patients. In the early postpartum period, anxiety was detected in 20%, and 6 weeks after birth – in 17% of patients. Anxiety symptoms overlapped with those of paranoid personality disorder, indicating that screening for postpartum cognitive dysfunction should include both depression and anxiety [4].

Regardless of the changes that occur, during pregnancy women often report increased forgetfulness and absent-mindedness. Pregnancy is a critical period for a woman's central nervous system, as it is an exceptional stage in her life when she is massively exposed to significant hormonal fluctuations. The sex hormones estrogen and progesterone may perform a protective function, preparing the woman's brain for motherhood, when all attention should be focused on the needs of the child [5]. Thus, studying the level of anxiety and depression and assessing such components of cognitive function as memory and attention in the perioperative period are very important for motherhood and childhood.

**Aim:** To evaluate the effects of anesthesia and surgery on levels of anxiety, depression, short-term memory and attention in pregnant and non-pregnant women.

## MATERIAL AND METHODS

The observational prospective study was based on examination and treatment data of patients admitted for planned surgical treatment at the Obstetrics and Gynecology Clinic of the S. M. Kirov Military Medical Academy and the D.O. Ott Research Institute of Obstetrics, Gynecology and Reproductology.

A total of 120 patients participated in the study. The criteria for inclusion in the research were as follows: age from 18 to 49 years, planned surgical interventions, including surgical delivery in pregnant women, the American Society of Anesthesiologists (ASA) class I–III physical status, and patient consent. Non-inclusion criteria were as follows: a history of traumatic brain injury and (or) mental disorders, pregnancy with preeclampsia.

During the preoperative examination, the features of anesthesia for operations and the specifics of perioperative management were explained to all the patients. Each patient was given a testing card, after reading which the patients signed a voluntary informed consent to participate in the study.

The patients were divided into two groups. The first group included pregnant patients (n=60), the second one included non-pregnant patients (with gynecological pathology) - also 60 people. Statistically significant differences among the patients in weight, as well as in laboratory parameters (levels of hemoglobin, red blood cells, white blood cells) were due to pregnancy and within the reference values (Table 1).

*Table 1*

**Distribution of patients by somatic status, Me (Q1; Q3)**

| Parameter | Group 1 (n=60) | Group 2 (n=60) | p (Mann–Whitney U-test) |
|---|---|---|---|
| Weight | 86.2 (86.9; 85.5) | 67.6 (68.4; 66.8) | <0.001 |
| Height | 166 (166.8; 165.2) | 164.4 (165; 163) | 0.563 |
| Age | 34.6 (35.3; 33.9) | 31.6 (32; 31) | 0.003 |
| Red blood cell level | 3.2 (3.8; 2.6) | 4.5 (5.2; 3.8) | 0.002 |
| Hemoglobin level | 116.6 (119; 114.2) | 128.9 (131; 127) | 0.004 |
| White blood cell level | 8.8 (9.2; 8.4) | 6.6 (6.9; 6.3) | <0.001 |

In the group of pregnant women, delivery was performed by caesarean section under spinal anesthesia. In the group of non-pregnant patients, various surgical interventions were carried out, depending on the existing pathology, also under spinal anesthesia (Table 2).

*Table 2*
**Distribution of patients by type of surgery and anesthesia**

| | | Group 1 (n=60) | Group 2 (n=60) |
|---|---|---|---|
| Surgery | Caesarean section | 60 | |
| | Genital Plastic Surgery | – | 24 |
| | Bartholin cyst enucleation | – | 16 |
| | Cervical excision | – | 20 |
| Type of anesthesia | Spinal anesthesia | 60 | 60 |

To assess memory and attention on the eve of the proposed surgical intervention, testing was carried out according to a formalized examination chart, which included 5 tests to assess cognitive functions (MoCa test, Benton test, Wechsler test, self-rated health (SRH) questionnaire, Hospital Anxiety and Depression Scale). Subsequently, a similar examination was carried out on the 3rd day after anesthesia and surgery.

Using the Montreal Cognitive Assessment (MoCA) test, various aspects of cognitive activity were assessed: memory, "frontal" functions, speech function (naming animals), visuospatial praxis (cube, clock). The sensitivity of the MoCa test is high enough to detect moderate cognitive impairment, amounting to 26 points. For the patients, this testing method was presented on a separate sheet of paper in the form of a table, which had to be filled out together with the doctor during the testing.

The Hospital Anxiety and Depression Scale (HADS) was used to screen for and assess the severity of depression and anxiety. A clear framework for answering questions and filling out the scale was established for the patients (about 20–30 minutes). When interpreting the data, the total indicator for each subscale (anxiety and depression) was taken into account, with 3 ranges of values being distinguished: 0–7 points – normal, 8–10 points – subclinically expressed anxiety/depression, 11 points and above – clinically expressed anxiety/depression.

The self-rated health (SRH) questionnaire was used to study subjective well-being and identify the presence of somatic complaints. The examination was carried out using special forms, when the patient was offered 7 pairs of polar statements characterizing a certain condition with an assessment of the severity of each.

The Benton test was used to identify and evaluate attention deficit disorder, mainly visual short-term memory through the reproduction (sketching) of figures that are presented as standards for a certain strictly fixed time. Numbers less than 5 indicate a low level of attention. The set of geometrically relatively abstract figures contains 10 series. Memory and attention were studied using the Wechsler test (subtest - repetition of number series). In this task, part 1 (forward counting) is aimed at determining the volume of short-term memory, part 2 (counting backwards) is aimed at determining the degree of concentration. The need for such a detailed analysis is due to the fact that in the absence of concentration, even a good memory can seem weak. The number of figures in the last correctly reproduced row during direct counting is an indicator of the volume of short-term memory. The number of figures correctly named when counting backwards is an indicator of concentration. The volume of short-term memory is 5-9 points (mean value - 7), and attention - 3-7 points (mean value - 5). A short-term memory indicator of less than three points when counting forward and backward usually indicates organic brain disorder.

Data analysis was performed using SPSS 26 for Windows (Statistical Package for Social Science, SPSS Inc. Chicago IL, USA). Variables were examined using analytical methods (Mann–Whitney U test, Wilcoxon signed-rank test) to determine whether they were normally distributed. The description of quantitative data that did not follow a normal distribution was presented in the form of the median and the 25th and 75th percentiles - Me (Q1; Q3). Analyzes were conducted to describe and summarize the distributions of the variables. A description of the frequencies in the sample under study is presented

with a mandatory indication of the given characteristic of the sample (n (%)). Differences were considered statistically significant at p<0.05. The sensitivity (Se) and specificity (Sp) of the testing were evaluated based on the assessment of risk and odds indicators. The confidence interval (CI) for the proportion was calculated using the uCALC calculator. The confidence level was determined to be more than 95% (less than 0.05).

## RESEARCH RESULTS

During surgical interventions and anesthesia in both groups, there were neither complications nor critical incidents that could affect the results of the study.

The results of the research showed the presence of statistically significant differences in anxiety, depression, impairment of short-term memory and attention in the groups of pregnant and non-pregnant patients.

Depression scores before surgery in both groups did not exceed normal values. In pregnant women, the severity of depression according to the HADS questionnaire was statistically significantly higher compared to that in non-pregnant women (p<0.001). The severity of anxiety in pregnant women reached subclinical values of 7.5 (8.4; 6.6) and was also statistically significantly higher than in non-pregnant women 6.5 (7.3; 5.7) (p <0.001) (Table 3). The parameters of somatic status in the group of pregnant women indicated satisfactory well-being of the patients. It should be noted that in the group of non-pregnant patients, self-rated health indicators on the SRH scale statistically significantly differed from the group of patients with pregnancy (Table 4). Short-term memory indicators in pregnant women according to the Wechsler test were lower and amounted to 5.7 (6.5; 4.9) compared to non-pregnant patients – 6.3 (7.1; 5.5). A decrease in concentration of attention in pregnant women according to the Benton test was observed even before surgery, and was 6.2 (6.8; 5.6) compared to non-pregnant women - 6.8 (7.5; 6.1), without statistically significant differences. The Montreal Cognitive Assessment (MoCA) test results were low in both groups and amounted to 24.4 (25.2; 23.6) in the pregnant group, and 25.4 (26.3; 24.3) in the non-pregnant group, without statistically significant differences (Table 4).

The odds ratio (OR) showed that, according to the SRH scale, the number of somatic disorders and complaints of poor health in pregnant women was 6.7 times higher than in non-pregnant women - OR 6.7 (95% CI [2.4–18.7]). The chance of developing short-term memory impairment in pregnant women was 3.1 times higher than in non-pregnant women – OR 3.1 (95% CI [1.3–7.4]), and the likelihood of developing attention impairment in pregnant women was 3.2 times higher than in non-pregnant women - OR 3.2 (95% CI [1.5–6.5]). Surgery and anesthesia in the groups of pregnant and non-pregnant patients had a different impact on the severity of cognitive dysfunction, depression, attention and well-being of the patients.

In the group of non-pregnant patients, depression increased after surgery, but did not reach the level of clinical manifestations, remaining within the reference values (Table 3). Anxiety indicators, as well as depression indicators, fluctuated within the reference values. The somatic status after surgery was without significant changes (good subjective well-being) (Table 3).

In the group of pregnant patients, depression after surgery increased statistically significantly (p<0.001), and reached subclinical values of 7.3 (8.5; 6.1). They had a decrease in short-term memory indicators - 5 (5.8; 4.2) before surgery compared to 3.5 (4; 3) after surgery (p<0.001), and concentration indicators - 6.2 (6.8; 5.6) before surgery compared to 5 (5.8, 4.2) after surgery (p<0.001), possibly associated with postpartum depression. The relative risk (RR) of developing depression after surgery increased by 6.1 times and amounted to 6.1 (95% CI [2.4–15.8] (sensitivity Se (%)=0.9, specificity Sp (%)= 0.5). The relative risk of short-term memory impairment after surgery increased by 1.1 times, being equal to 1.1 (95% CI [1–1.2]) (sensitivity Se (%)=0.5, specificity Sp (%)=0 ,8); and concentration impairment – by 8.3 times: 8.3 (95% CI [3.9–18.3]) (sensitivity Se (%)=0.8, specificity Sp (%)=0.7).

*Table 3*

**Pre- and post-operative testing results of pregnant and non-pregnant patients**

| Tests indicators | Group 1 (n=60) | | Group 2 (n=60) | |
|---|---|---|---|---|
| | Before surgery | After surgery | Before surgery | After surgery |
| MoCa test | 24.4 (25.2; 23.6) | 24.6 (25.4; 23.8) | 25.4 (26.3; 24.3) | 25.6 (26.27; 24.53) |
| SRH | 5.5 (6.2; 4.8) | 5.4 (6.2; 4.6) | 6.2 (6.9; 5.5) | 6.6 (7.3; 5.9) |
| Anxiety | 7.5 (8.4; 6.6) | 5.2 (6.1; 4.3) | 6.5(7.3; 5.7) | 5.4(6.1; 4.7) |
| Depression | 4.9 (5.7; 4.1) | 7.3 (8.5; 6.1) | 4 (4.7; 4) | 6.3 (7; 5.5) |
| Repeating numbers in direct order | 5.7 (6.5; 4.9) | 5.65 (6.51; 4.79) | 6.3 (7.1; 5.5) | 6.1 (6.9; 5.3) |
| Repeating numbers in reverse order | 5 (5.8; 4.2) | 3.8 (4; 3) | 6.5 (7.3; 5.7) | 4.5 (5.2; 3.8) |
| Benton test | 6.2 (6.8; 5.6) | 5 (5.8; 4.2) | 6.8 (7.5; 6.1) | 5 (5.7; 4.3) |

Note: ACC — self-assessment questionnaire

*Table 4*

**Indicators of statistically significant differences in pregnant and non-pregnant women before and after surgery**

| Tests indicators | Pregnant group | Non-pregnant group | Comparison between pregnant and non-pregnant | |
|---|---|---|---|---|
| | Comparison before and after surgery | Comparison before and after surgery | Before surgery | After surgery |
| MoCa test | *Z*=-1.955 *p*=0.051 | *Z*=-2.352 *p*=0.019 | *U*=1587.0 *Z*=-0.078 *p*=0.938 | ***U*=810.0 *Z*=-4.641 *p*<0.0015** |
| SRH | *Z*=-1.426 *p*=0.154 | ***Z*=-4.049 *p*<0.002** | ***U*=815.0 *Z*=-4.715 *p*<0.001** | ***U*=448.5 *Z*=-6.841 *p*<0.0014** |
| Anxiety | *Z*=-0.944 *p*=0.345 | ***Z*=-4.999 *p*<0.0034** | ***U*=899.0 *Z*=-4.057 *p*<0.002** | *U*=1245.5 *Z*=-2.179 *p*=0.029 |
| Depression | ***Z*=-7.330 *p*<0.002** | ***Z*=-5.464 *p*<0.0025** | ***U*=702.0 *Z*=-5.337 *p*<0.0013** | ***U*=980.5 *Z*=-3.587 *p*<0.003** |
| Repeating numbers in direct order | *Z*=-0.547 *p*=0.584 | *Z*=-0.990 *p*=0.322 | ***U*=1030.0 *Z*=-3.387 *p*<0.001** | *U*=1144.5 *Z*=-2.694 *p*=0.007 |
| Repeating numbers in reverse order | ***Z*=-4.492 *p*<0.001** | *Z*=-0.758 *p*=0.449 | ***U*=1136.0 *Z*=-2.815 *p*=0.005** | ***U*=601.5 *Z*=-5.908 *p*<0.001** |
| Benton test | ***Z*=-4.091 *p*<0.001** | *Z*=-1.767 *p*=0.077 | *U*=1308.5 *Z*=-1.838 *p*=0.066 | ***U*=981.0 *Z*=-3.526 *p*<0.004** |

Note: ACC — self-assessment questionnaire

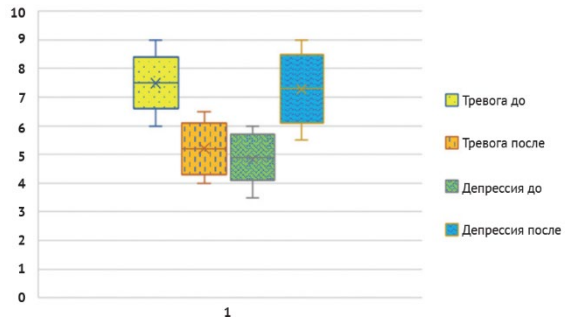


Figure. Results of anxiety and depression in pregnant women before and after regional anesthesia

The study showed that cognitive dysfunction at all stages of the research occurred in both groups; and in pregnant women after surgery, MoCa test scores were statistically significantly (p<0.001) lower than in non-pregnant women (Table 3). Indicators of somatic status on the SRH scale were satisfactory: in pregnant women - 5.4 (6.2; 4.6) and corresponded to good health, and in non-pregnant women - 6.6 (7.3; 5.9). The presence of statistically significant differences (p<0.001) (Table 4) allowed us to state that pregnant women feel worse compared to non-pregnant women. The severity of anxiety was within the reference values, however, statistically significant differences were identified between the groups (p<0.001). Parameters of depression in pregnant women indicated the presence of its subclinical form - 7.3 (8.5; 6.1), while in non-pregnant women they were within the normal range - 6.3 (7.1; 5.5) (p <0.001). Short-term memory indicators in pregnant women were

significantly reduced after surgery – 3.5 (4; 3), compared with the same indicator in non-pregnant women - 4.5 (5.2; 3.8) (p <0.041, statistically significant). The concentration of attention in pregnant and non-pregnant women was worse after surgery; no differences were found between the groups.

An assessment of the risks of developing cognitive dysfunction, depression, decreased concentration, and deterioration of well-being showed that the risk of developing cognitive impairment in pregnant women is 3.8 times higher than in non-pregnant women - OR 3.8 (95% CI [1.4–10.4]). According to the SRH scale, the chance of developing poor health in pregnant women was 5.2 times higher than in non-pregnant women - OR=5.2 (95% CI [3.2–3.4]), and the chance of developing depression was 2.4 times higher — OR=2.4 (95% CI [1.1–5.2]). The odds ratio for impaired concentration in pregnant women was 7.9 times higher than in non-pregnant women - OR = 7.9 (95% CI [3.1–20]).

## DISCUSSION OF THE RESULTS

The main result of the study was the identification of statistically significant differences in anxiety, depression, changes in short-term memory and concentration at different stages of the perioperative period in pregnant and non-pregnant patients. Some modern studies [6, 7] show that women during pregnancy are at increased risk of developing neuropsychiatric disorders. However, in the majority (77%) of cases, neuropsychiatric disorders of pregnant women remain unrecognized [8]. A number of studies examined the priority of emotional factors in the development of pregnancy complications [9–12]. The present work revealed a decline in memory and attention against the background of depression and anxiety. Anxiety and anxiety-depressive disorder, according to other research, are the most common emotional disabilities encountered during gestation [10, 11]. R.L. McDonald (1968) believes that anxiety, noted by pregnant women themselves, is the main factor that makes it possible to draw the line between women with a normal physiological pregnancy and a complicated one [13].

The postpartum period is considered a period of increased risk for the manifestation of depression or psychosis. According to some authors, from 50 to 80% of women experience “postpartum sadness” lasting from 2 weeks [14] to 1 month [15], and represented by mild depressive symptoms such as emotional lability, tearfulness, anxiety and sleep disturbances. During the first month after childbirth, 10 to 22% of women experience depression of varying severity, and 0.1–0.2% experience severe postpartum depression, which may be resistant to psychopharmacotherapy [16, 17]. It was suggested that this incidence of depressive disorders in the postpartum period is due to a sharp drop in estrogen levels, that plays a trigger role in the development of depression [17, 18]. Women with a history of depression are especially sensitive to the destabilizing influence of sex hormones on emotions [19].

Depression during pregnancy negatively affects both the mother and the fetus. If a pregnant woman suffers from depression, this can lead to decreased appetite and insufficient weight gain, alcohol and substance abuse, poor nutrition, lack of medical supervision and adequate prenatal care [20–22]. The risk of developing preeclampsia and premature birth, having a baby weighing less than 2500 g and reduced gestational age, and postpartum depression also increases [23–25]. Children born to mothers whose pregnancies were associated with depression had a subsequent increased risk of developmental delays, and emotional and behavioral disorders [26–28].

The results of our study and data from the analyzed literature indicate that the chance of developing depression in pregnant women is higher compared to non-pregnant women; against this background, indicators of short-term memory, concentration and intelligence decreased after surgery.

## CONCLUSIONS

1. Cognitive dysfunction was identified in all the patients before surgery according to the Montreal Cognitive Assessment (MoCA) test. MoCA test showed an initial decrease in both groups, while the severity of dysfunction in pregnant women was statistically higher: 24.4 (25.2; 23.6) points versus 25.4 (26.3; 24.3) points in non-pregnant women (p=0.0038). After surgery, statistical differences also persisted - cognitive dysfunction was higher in pregnant women.

2. The pregnant and non-pregnant groups differed in the severity of anxiety and depression at baseline. The severity of anxiety in pregnant women reached subclinical values of 7.5 (8.4; 6.6), and was statistically higher before surgery than in non-pregnant women 6.5 (7.3; 5.7) ($p<0.001$). After surgery, anxiety scores in both groups decreased to normal values, and there were no statistical differences when comparing pregnant and non-pregnant women. The level of depression before surgery in both groups was within the reference values, but the severity of depression in pregnant women was higher. After surgery, the severity of depression increased in both groups ($p<0.001$).

3. The indicators of short-term memory capacity in pregnant women according to the results of the Wechsler test did not show statistical differences either before or after surgery. Attention levels in pregnant women decreased after surgery from 5 (5.8; 4.2) to 3.5 (4; 3) ($p<0.001$), while in non-pregnant women there were no statistical differences. Indicators of visual memory in pregnant women decreased from 6.2 (6.8; 5.6) to 5 (5.8; 4.2) ($p<0.0071$) according to the Benton test, and had statistical differences; and when comparing this indicator between the groups of pregnant and non-pregnant women, there were no statistical differences.

## REFERENCES


1. O'Hara MW, Wisner KL. Perinatal mental illness: definition, description and aetiology. *Best Pract Res Clin Obstet Gynaecol.* 2014;28(1):3–12 PMID: 24140480 https://doi.org/10.1016/j.bpobgyn.2013.09/002
2. Vivencio V, Nardi B, Bellantuono C. Depression in pregnancy: focus on the safety of antidepressant drugs. Recenti Prog Med. 2018;109(9):432–442. PMID: 30303187 https://doi.org/10.1701/2990.29929
3. Parsons TD, Thompson E, Buckwalter DK, Bluestein BW, Stanczyk FZ, Buckwalter JG. Pregnancy history and cognition during and after pregnancy. *Int J Neurosci.* 2004;114(9):1099–1110. PMID: 15370176 https://doi.org/10.1080/00207450490475544
4. Nakić Radoš S, Tadinac M, Herman R. Anxiety during pregnancy and postpartum: course, predictors and comorbidity with postpartum depression. *Acta Clin Croat*. 2018;57(1):39–51. PMID: 30256010 https://doi.org/10.20471/acc.2017.56.04.05
5. Apter G, Devouche E, Gratier M. Perinatal mental health. *J Nerv Ment Dis*. 2011;199(8):575–577. PMID: 21814083 https://doi.org/10.1097/NMD.0b013e318225f2f4
6. Dobryakov IV. *Perinatal'naya psikhologiya*. Saint Petersburg: Piter Publ., 2010. (in Russ.)
7. Oates M. Perinatal psychiatric disorders: a leading cause of maternal morbidity and mortality. *Br Med Bull*. 2003:67:219–229. PMID: 14711766. https://doi.org/10.1093/bmb/ldg011
8. Spitzer RL, Williams JB, Kroenke K, Hornyak R, McMurray J. Validity and utility of the PRIME-MD patient health questionnaire in assessment of 3000 obstetric-gynecology study. *Am J Obstet Gynecol*. 2000;183(3):759–769. PMID: 10992206 https://doi.org/10.1067/mob.2000.106580
9. Khlomov KD, Enikolopov SN. Influence of Psycho-Emotional and Individual Characteristics on the Course of Pregnancy in Women with Threatened Miscarriage. *Siberian Journal of Psychology*. 2007;(26):148–153. (In Russ.).
10. Shmukler AB. Psikhozy beremennosti: obzor literatury. *Russian Journal of Human Reproduction*. 1995;(2):19–22.
11. Chung TK, Lau TK, Yip AS, Chiu HF, Lee DT. Antepartum depressive symptomatology is associated with adverse obstetric and neonatal outcomes. *Psychosom Med.* 2001;63(5):830–834. PMID: 11573032 https://doi.org/10.1097/00006842-200109000-00017
12. Dayan J, Creveuil C, Herlicoviez M, Herbel C, Baranger E, Savoye C, Thouin A. Role of anxiety and depression in the onset of spontaneous preterm labor. *Am J Epidemiol*. 2002;155(4):293–301. https://doi.org/10.1093/aje/155.4.293
13. McDonald RL. The role of emotional factors in obstetric complications: a review. *Psychosom Med.* 1968;30(2):222–237. PMID:4873519 https://doi.org/10.1097/00006842-196803000-00007
14. Ahokas A, Kaukoranta J, Wahlbeck K, Alto M. Estrogen deficiency in severe postpartum depression: successful treatment with sublingual physiologic 17 beta-estradiol: a preliminary study. *J Clin Psychiatry*. 2001;62(5):332–336. PMID:11411813 https://doi.org/10.4088/jsp.v62n0504
15. Payne JL. The role of estrogen in mood disorders in women. *Int Rev Psychiatry.* 2003;15(3):280–290. PMID:15276966 https://doi.org/10.1080/0954026031000136893
16. Sherwin BB. Estrogenic effects on the central nervous system: clinical aspects. In: Lindsay R, Dempster DW, Jordan VC. (eds.). *Estrogens and Antiestrogens: basic and clinical aspects*. Philadelpfia: Lippincott-Raven; 1997. p. 75–87.
17. Wieck A, Kumar R, Hirst AD, Marks MN, Campbell IC, Checkley SA. Increased sensitivity of dopamine receptors and recurrence of affective psychosis after child-birth. *BMJ*. 1991;303(6803):613–616. PMID: 1805821 https://doi.org/10.1136/bmj.303.6803.613
18. Deakin JF. Relevance of hormone CNS interactions to psychological changes in the puerperum. In: Kumar R, Brockington IF. (eds.). *Motherhood and Mental Illness: Causes and consequences*. London: Butterworth; 1989. p. 113–132.
19. Bloch M, Shmidt PJ, Danaceau M, Murphy J, Nieman L, Rubinow DR. Effects of gonadal steroids in women with a history of postpartum depression. *Am J Psychiatry.* 2000;157(6):924–930. PMID:10831472 https://doi.org/10.1176/appi.ajp.157.6.924
20. Bodnar LM, Wisner KL, Moses-Kolko E, Sit DK, Hanusa BH. Prepregnancy body mass index, gestational weight gain, and the likelihood of major depressive disorder during pregnancy. *J Clin Psychiatry*. 2009;70(9):1290–1296. PMID:19607761 https://doi.org/10.4088/JCP.08m04651
21. Flynn HA, Chermack ST, Chermack T. Prenatal alcohol use: the role of lifetime problems with alcohol, drugs, depression, and violence. *J Stud Alcohol Drugs*. 2008;69(4):500–509. PMID:18612565 https://doi.org/10.15288/jsad.2008.69.500
22. Kallen B, Olausson PO. Maternal use selective serotonin re-uptake inhibitors and persistent pulmonary hypertension of the newborn. *Pharmacoepidemiol Drug Safe.* 2008;17(8):801–806. PMID:18314924. https://doi.org/10.1002/pds.1570

23. Cripe SM, Frederick IO, Qui C, Williams MA. Risk of preterm delivery and hypertensive disorders of pregnancy in relation to maternal co-morbid mood and migraine disorders during pregnancy. *Paediatr Perinat Epidemiol*. 2011;25(2):116–123. PMID:21281324. https://doi.org/10.1111/j.1365-3016.2010/01182.x
24. Li D, Liu L, Odouli R. Presence of depressive symptoms during early pregnancy and the risk of preterm delivery: a prospective cohort study. *Hum Reprod*. 2009;24(1):146–153. PMID:18948314. https://doi.org/10.1093/humper/den342
25. Grote NK, Bridge JA, Gavin AR, Melville JL, Iyengar S, Katon WJ. A Meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. *Arch Gen Psychiatry*. 2010;67(10):1012–1024. PMID:20921117. https://doi.org/10.1001/archgenpsychiatry.2010.111
26. Britton JR. Infant temperament and maternal anxiety and depressed mood in the early postpartum period. *Women Health*. 2011;51(1):55–71. PMID:21391161. https://doi.org/10.1080/03630242.2011.540741
27. Deave T, Heron J, Evans J, Emond A. The impact of maternal depression in pregnancy on early child development. *BJOG*. 2008;115(8):1043–1051. PMID: 18651886. https://doi.org/10.1111/j.1471-0528.2008.01752.x
28. Paulson JF, Keefe HA, Leiferman JA. Early parental depression and child language development. *J Child Psychol Psychiatry*. 2009;50(3):254–262. PMID:19175819. https://doi.org/10.1111 /j.1469-7610.2008.01973.x
29. Ovezov AM, Panteleeva MV, Knyazev AV, Lugovoy AV, Bragina SV. Cognitive dysfunction and general anesthesia: from pathogenesis to prevention and correction. *Neurology, Neuropsychiatry, Psychosomatics*. 2016;8(3):101–105. (In Russ.) https://doi.org/10.14412/2074-2711-2016-3-101-105

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