Tyuvina N.A., Voronina E.O., Balabanova V.V., Goncharova E.M.
Department of Psychiatry and Narcology, I.M. Sechenov First Moscow State Medical University (Sechenov University), Ministry of Health of Russia, Moscow, Russia
11, Rossolimo St., Build. 9, Moscow 119021

The relationship and interaction of menstrual and generative function and depressive disorders in women

Objective: *to study of the individual aspects of the relationship and interaction of menstrual and generative function and depressive disorders in women.*

Patients and methods. *120 women aged 18–65 years with recurrent depressive disorder (RDD) who had experienced at least two depressive episodes (a study group) and 120 mentally healthy women of the same age (a control group) were clinically examined using a specially designed map with subsequent statistical processing of the findings.*

Results and discussion. *In 71.7% of women, depression manifests itself during hormonal rearrangement periods (puberty, postpartum, and menopause). 65.0% of women with RDD have premenstrual syndrome (PMS), the pattern of which shows depressive symptoms. Depression affects menstrual function: the later onset and irregularity of menstruation, the earlier restoration of menstrual function after childbirth, and the earlier onset of premenopause, which has an adverse impact on generative function (a reduction in the number of pregnancies, births, and babies). Depression, the onset of which is observed during puberty, exerts the most malignant effect on menstrual and generative function. Overall, depressive patients are less socially and family-friendly than healthy women. Menstrual and generative function and adaptation minimally suffer in women with postmenopausal depression.*

Conclusion. *The onset of depressive disorders is associated with the hormonal rearrangement periods. The presence of depressive symptoms in the pattern of PMS is a prognostic sign of future depression or indicates partial remission. At the same time, menstrual function is impaired in women suffering from RDD, which along with psychic manifestations of depression (a decrease in sexual drive and contacts, as well as anesthesia of feelings, etc.) leads to infertility.*

Keywords: *recurrent depressive disorder; depression in women; menstrual and generative function; puberty; postpartum; menopause; premenstrual syndrome.*

Contact: *Nina Arkadyevna Tyuvina;* ***natuvina@yandex.ru***

For reference: *Tyuvina NA, Voronina EO, Balabanova VV, Goncharova EM. The relationship and interaction of menstrual and generative function and depressive disorders in women. Nevrologiya, neiropsikhiatriya, psikhosomatika = Neurology, neuropsychiatry, psychosomatics. 2018;10(2):45–51.*
DOI: *10.14412/2074-2711-2018-2-45-51*

Depression is one of the most common disorders. At the same time, the proportion of women among all patients with depressive disorders is 72% [1]. Women suffer from depression 2 times more often than men, and the risk of depression in women is higher than that in men since adolescence [2]. For many years it is believed that such sensitivity of women to depression is associated with the effect of ovarian hormones [3].

However, the interrelation and mutual influence of the mental state of a woman and menstrual function are very ambiguous. On the one hand, in the pubertal period, with the appearance of menstruation, in the body of a woman begin to occur cyclical processes, caused by neuroendocrine regulation, which contribute to the emergence of mood fluctuations associated with the menstrual cycle, and on the other hand, the onset of depressive disorders affects the menstrual function [4]. The influence of periods of hormonal adjustment in the life of a woman on her emotional state is being actively studied. There are a number of studies that testify to the influence of periods of hormonal adjustment in women, as like as of the menstrual cycle phases on the onset and course of mental disorders, primarily depressive [5, 6, 7, 8, 9, 10, 11, 12, 13, 14].]. Thus, we can assume the dependence of the development of depression in women on the level of ovarian hormones. So the results of the study by K.Cheslack-Postava et al. show a lower incidence of major depressive disorder in women taking oral contraceptives. The authors conclude that estrogen is protective against the development of depression and that the risk of latter increases with decreasing estrogen level [15].

Meanwhile, numerous studies to explore direct correlations between the level of hormones and mood gave conflicting results. A number of long-term studies have not revealed links between psychiatric changes and level of female sex hormones [16, 17], and currently there is no unambiguous evidence proving a link between the circulating levels of estradiol or FSH and depression [18]. Thus, S.Romans et al. found no significant correlation between the ovarian hormones level, the menstrual cycle phase and mood in women with premenstrual syndrome [19]. The results of this issue also disproved the assumption that the level of steroids in women with premenstrual tension goes beyond the norm [16, 20]. So, the cause of mood fluctuations, apparently, is not the overall level of hormones, but individual changes in their indices. Perhaps the formation of depression is associated not so much with the absolute level of estrogen as with its fluctuations [21]. Although depressive disorders in women occur during significant hormonal changes for the female organism (pubertal,

premenstrual syndrome, pregnancy and the puerperium, perimenopause) [5, 8, 9, 10, 11, 12, 13, 14], mood fluctuations may not be associated directly with the influence of sex hormones, but with the regulatory effect of stress-controlling hormones, including epinephrine hormones. Cortisol, produced by activating the hypothalamic-pituitary-adrenal system, as well as in response to stress, can trigger subsequent biochemical reactions that affect mood. Thus, in patients with major depressive disorder, increased cortisol production for stress is often noted, indicating a dysregulation of the response of the hypothalamic-pituitary-adrenal system. Weiss et al. suggested that women more often than men have a dysregulation of the response in the hypothalamic-pituitary-adrenal system, because they are more prone to experiencing traumatic events, which probably causes the development of depression as a reaction to stress [22]. In addition, the hypothalamic-pituitary-adrenal system plays a regulating role in the ovaries function [23].

In addition, along with neuroendocrine regulation a great role is played by psychosocial factors. Several studies have found a higher correlation between mood disorders and psychosocial factors [19]; however, as more logical, endogenous depression accepted to result from genetic predisposition under trigger conditions of neurohormonal restructuring, and provocative psychosocial factors [4].

In spite of the fact that E. Kraepelin (1898) and R. Kraft-Ebing (1897) already wrote about the violations of menstrual function in depression and menstrual psychosis, the interrelation and mutual influence of the woman's mental state and menstrual-generative function remain poorly understood. In girls with affective fluctuations, menstruation becomes established at a later date (15–17 years) than in the population, and from the outset may be irregular. In severe depression, menstruation may disappear throughout the entire period of the attack [1]. According to different data, premenstrual syndrome occurs in the population in 30–70%, and in women with mental disorders its frequency ranges from 70 to 100%. In maniacal-depressive psychosis, PMS occurs in 86% of cases [24]. However, there is almost no issues on the study of individual quantitative indicators of menstrual and generative function in women with depression in comparison with the population of the mentally healthy, although this has not only medical but also great social significance.

Objectives. Studying of different aspects of interrelation and mutual influence of menstrual-generative function and depressive disorders in women.

Patients and methods. The study had been running since 2014 until 2017 in out- and in-patient regime in S.S. Korsakov Psychiatric Hospital of I.M. Sechenov First Moscow State Medical University. 120 women aged 18 to 65 years with recurrent depressive disorder (F 33. ICD-10) were examined by clinical and catamnestic methods. Women with a first or a single episode of depression, pregnant women, as well as suffering from decompensated somatic and neurological diseases were not included. A special survey had been elaborated. The MADRS scale was used to measure the severity of depression.

In the main group of depressed patients the age was 45.0 [32.5; 54,0] years (minimum 18 years, maximum 65 years); the duration of the disease was 8.0 [4.0, 16.0] years; patients all together passed through 4.0 [3.0, 6.0] depressive episodes. The maximal duration of depressive episodes was 5.0 [4.0, 7.0] months, the minimal – 2.0 [2.0, 3.0] months; the average duration of episodes was 3.5 [2.5, 5.0] months. The duration of remission: maximal was 54.0 [48.0, 84.0] months, minimal – 6.0 [6.0, 12.0] months, in average – 33.0 [24.0, 45.0] months. The severity of depression was 27.0 [26.0, 28.0] points by the MADRS scale.

As a comparison group, 120 mentally healthy women aged 18 to 65, in average 42.5 [36.0; 52,0] years, by mediane (Me), were examined. Statistical processing of the study results was carried out using the Statistica for Windows 6.0 software (StatSoft Inc.). Qualitative features were described in absolute and relative (%) indicators.

An analysis of the correspondence between the distribution of the characteristic values for the characteristics of the normal distribution was carried out using the Kolmogorov–Smirnov method. As the most of the quantitative signs did not correspond to the laws of normal distribution, they were described in terms of the median (Me) and quartiles (Me [25%, 75%]). Nonparametric methods were used to estimate the statistical significance of the differences between groups: when comparing two independent groups by quantitative indicators The Mann–Whitney method

Table 1. *Socio-demographic characteristics*

Characteristics	Women with depression (main group) n=120	Mentally healthy women (control group) n=120	p
Education:			
Primary school	4 (3,3)	0 (0,0)	
Secondary school	1 (0,8)	0 (0,0)	
College	41 (34,2)	36 (30,0)	0,160
High incomplete	6 (5,0)	10 (8,3)	
High	68 (56,7)	74 (61,7)	
Marital State:			
Divorsed	26 (21,7)	8 (6,7)	0,002*
Widow	9 (7,5)	7 (5,8)	0,796
Married	60 (50,0)	86 (71,7)	<0,001*
Single	25 (20,8)	19 (15,8)	0,404
Work			:
Dismissed because of illness	41 (35,0)	0 (0)	<0,001*
Working	44 (37,0)	80 (66,7)	<0,001*
Unoccupied	60 (50,4)	21 (17,5)	<0,001*
Retired	15 (12,6)	19 (15,8)	0,579

p * – statistically significant

Table 2. *Characteristics of the menstrual function*

Characteristics	Women with depression (main group) n=120	Mentally healthy women (control group) n=120	p
Menarche age	14,0 [13,0; 14,0]	13,0 [12,0; 14,0]	<0,001*
Menstruation was not established immediately	22 (18,3)	25 (20,8)	0,626
Duration of menstruation (days)	5,0 [4,0; 5,0]	5,0 [5,0; 6,0]	<0,001*
Duration of menstrual cycle (days)	28,0 [28,0; 28,0]	28,0 [28,0; 30,0]	0,177
Intensity of menstrual flow:			
abundant	44 (36,7)	44 (36,7)	
moderate	74 (61,7)	72 (60,0)	0,707
meager	2 (1,7)	4 (3,3)	
Soreness of menstruation	54 (45,0)	45 (37,5)	0,238
Psychic perception of menarche:			
adequate	109 (90,8)	119 (99,2)	0,012*
fright, fear	8 (6,7)	1 (0,8)	(0,041* – fright)
rejoicing	3 (2,5)	0 (0,0)	
Regularity of menstruation:	61 (51,3)	109 (90,8)	<0,001*
Change in the menstrual cycle:			
after marriage	1 (1,0)	0 (0,00)	0,483
after childbirth	8 (8,7)	17 (16,4)	0,109

p * – statistically significant

was used; more than two independent groups – the Kraskel–Wallis method. When comparing independent groups by qualitative indicators, the χ^2-method, if necessary – the Fisher two-sided exact method, were applied.

The confidence level was assumed to be sufficient for p <0.05; in the case of multiple comparisons, the Bonferroni correction was used, in which case p was defined as p=0.05 / n, where n is the number of pairwise comparisons on the same data set.

Results and discussion. Comparative analysis of socio-demographic indicators in the main and control groups showed that there were significantly more divorced women in the main group, while significantly more married in the control group, i.e. women with depression had lower marital adaptation. The majority of women in the main group did not work, meanwhile in the control group working women dominated, despite the same level of education in the both groups. 35% of women with RDD had been dismissed from their work because of insanity that indicated their worse social adaptation (Table 1).

It was established that the menstrual-generative function in the groups of patients and mentally healthy women significantly differs by a number of parameters (Table 2, 3).

In sick women, menstruation occurs significantly later than in healthy women, and the duration of menstruation itself is less. The timing of the establishment of regular menstruation (established immediately or not immediately), the duration of the menstrual cycle, the soreness of menstruation and the intensity of menstrual flow did not differ significantly. Sick and healthy women differently perceive the first menstruation, which indicates the readiness of a female organism to perform a childbearing function. In women with depressive disorders, the appearance of menstruation significantly more often causes an inadequate emotional reaction like fear, fright or, on the contrary, joy and delight, unlike healthy ones. Healthy women have a significantly more regular menstrual cycle, and in depression, menstruation becomes irregular or even disappears completely during the period of a severe attack. All this testifies to the fact that the normally flowing menstruation is an indicator of the physical and mental health of a woman.

The age of sexual activity onset in patients and healthy women is not significantly different. However, in terms of regularity and satisfaction with sexual activity, the groups had significant differences (p <0.001). 78.0% and 70.3% of healthy women respectively have a regular sex and are satisfied with it, while only 49.6% of women with depression run regular sex life and only 37.8% are satisfied with it.

Groups of patients and healthy women significantly differed in a number of characteristics of generative function: healthy women differed for the better for the presence and number of pregnancies and births per woman. Accordingly, the number of children in healthy women is greater than that of patients, despite the fact that they make abortions reliably more often. On the other hand, miscarriages are significantly more frequent in women in the main group, although the toxicosis of the first and of the second half of pregnancy are significantly lower in them than in healthy ones. As for gynecological diseases and surgery operations, including crippling (hysterectomy, hyster- and ovariectomy, ovariectomy), there were no significant differences between the groups. After childbirth women in the main group later restore their menstrual function, that is probably associated

Table 3. *Characteristic of generative function and PMS*

Characteristics	Women with depression (main group) n=120	Mentally healthy women (control group) n=120	p
Pregnancy	91 (75,8)	103 (85,8)	0,049*
Number of pregnancies	1,0 [1,0; 3,0]	2,0 [1,0; 3,0]	0,013*
Childbirth	88 (77,9)	102 (95,3)	<0,001*
Number of births	1,0 [1,0; 2,0]	2,0 [1,0; 2,0]	<0,001*
Abortion	35 (31,00)	49 (46,2)	0,020*
Number of abortions	0,0 [0,0; 1,0]	0,0 [0,0; 1,0]	0,085
Miscarriages	10 (8,9)	3 (2,8)	0,048*
Toxicosis: of the first half of pregnancy of the 2nd half of pregnancy	 33 (37,1) 6 (6,7)	 52 (51,0) 17 (16,7)	 0,049* 0,036*
Restoration of menses after birth (months)	3,0 [2,0; 3,0]	6,0 [3,0; 9,0]	<0,001*
Amount of children	1,0 [0,0; 2,0]	1,5 [1,0; 2,0]	0,001*
Gynecological diseases	56 (50,0)	45 (42,5)	0,264
Gynecological operations	38 (31,7)	32 (26,7)	0,394
Gynecological operations, crippling	18 (15,0)	13 (10,8)	0,336
PMS (availability)	78 (65,0)	68 (56,7)	0,186
The emergence of PMS (for how many daysbefore menstruation)	3,0 [3,0; 5,0]	4,5 [2,0; 7,0]	0,214
Disappearance of PMS (on which day of the cycle)	1,0 [1,0; 2,0]	2,0 [1,0; 3,0]	0,041*
PMS duration (days)	5,0 [4,0; 7,0]	6,5 [4,0; 9,0]	0,034*
Vegetative-vascular manifestations of PMS	26 (33,3)	28 (41,2)	0,327
Metabolic-endocrine manifestations of PMS	23 (29,5)	25 (36,8)	0,350
Psychiatric manifestations of PMS	72 (92,3)	62 (91,2)	0,803
Treatment of PMS	5 (6,4)	12 (17,7)	0,035*
Worsening of the condition during ovulation	3 (2,5)	15 (12,5)	0,003*

p * – statistically significant

with a longer period of breastfeeding. Thus, the generative function also is negatively affected in women in the main group, and women with predisposition to depression are less able to perform their reproductive function.

PMS has been reviled in the group of patients with higher incidence than in healthy women, but the difference does not reach the level of reliability. The duration of PMS in healthy women is significantly greater: the symptoms of PMS appear earlier and disappear later, unlike in the group of patients. A significantly greater number of healthy women try to relief PMS, using analgesics and antispasmodics. Women in the main group have subjective experience of ovulation in 2.3% compared with healthy women (12.5%), probably because of fewer ovulatory cycles in women who suffer from depression.

PMS in women of both groups equally comprised a constellation of vegetative, vascular, metabolic, endocrine and mental symptoms. However, if in healthy women mental disorders in PMS were presented by asthenic, dysphoric or hysterical symptoms, then in patients – by symptoms of depression, that will be shown to have a prognostic significance in the course of the disease.

In general, in the group of women with RDD, menopause developed earlier (at 50 years [46.0, 52.0]) compared with healthy women (at 52.0 years [50.0, 53.0]), although the difference did

Table 4. *Features of the reproductive function and PMS, depending on the period of depression debut*

Characteristics	Depression debuted in the period of				
	non-associated with hormonal adjustment 0	pubertal 1	post-partum 2	pre-menopause 3	pos-tmenopause 4
Age of sexual activity onset	19,0 [18,0; 21,0]	18,0 [16,0; 19,0]	18,0 [18,0; 20,0]	18,0 [18,0; 18,0]	18,0 [18,0; 20,0]
Menstrual irregularities	11 (32,4)	21 (53,9)	6 (40,0)	5 (35,7)	2 (11,1)
Satisfaction with sex life	12 (35,3)	7 (18,4)	7 (46,7)	8 (57,1)	11 (61,1)
Pregnancy	27 (79,4)	19 (48,7)	15 (100,0)	12 (85,7)	18 (100,0)
Number of pregnancy	2,0 [1,0; 3,0]	0,0 [0,0; 2,0]	2,0 [1,0; 4,0]	2,0 [1,0; 4,0]	2,0 [1,0; 3,0]
Childbirth	27 (79,4)	17 (53,1)	15 (100,0)	11 (78,6)	18 (100,0)
Number of childbirth	1,0 [1,0; 2,0]	1,0 [0,0; 1,0]	1,0 [1,0; 2,0]	2,0 [1,0; 2,0]	2,0 [1,0; 2,0]
Number of children	1,0 [1,0; 2,0]	0,0 [0,0; 1,0]	1,0 [1,0; 2,0]	2,0 [1,0; 2,0]	1,5 [1,0; 2,0]
PMS	21 (61,8)	32 (82,1)	10 (66,7)	8 (57,1)	7 (38,9)
Age of PMS manifestation	20,0 [18,0; 24,0]	17,5 [16,0; 19,5]	16,0 [15,0; 23,0]	25,0 [19,0; 32,5]	25,0 [16,0; 30,0]
PMS duration before menses (days)	4,0 [3,0; 5,0]	3,0 [3,0; 5,0]	3,5 [3,0; 5,0]	2,5 [2,0; 3,0]	3,0 [3,0; 3,0]
PMS duration (days)	5,0 [4,0; 8,0]	5,5 [4,0; 7,0]	5,0 [4,0; 6,0]	4,0 [3,0; 5,0]	4,0 [4,0; 5,0]

not reach the degree of reliability. However, signs of premenopause in the group of patients appear from 48.0 [45.0, 50.0] years, in the control group – from 50.0 [48.0, 52.0] years, p = 0.035 *. The duration of premenopause is significantly (p = 0.037) more in women with depression (2.0 [1.0, 4.0] years) than in healthy women (1.0 [1.0, 3.0] year), as like as vegetative and vascular manifestations of premenopause (including hot flashes and sweating) have been found more often (p = 0.015) in the main group (86.7%) than in the control group (61.5%).

To compare the individual indicators of menstrual and reproductive function in terms of their prognostic value, all women with RDD were divided into 5 groups, depending on the debut or manifestation of the disorder.

Group 0 – debut of depression is not associated with periods of hormonal adjustment (n = 34, 28.3%).

Group 1 – depression debuted during pubertal period (n = 39, 32.5%).

Group 2 – depression debuted in the postpartum period (n = 15, 12.5%)

Group 3 – depression debuted in premenopause (n = 14, 11.7%)

Group 4 – depression debuted in postmenopause (n = 18, 15.0%)

To make perception convenient, the following notations in describing the groups were used: * p – statistically significant, ** p – statistical trend (significantly without taking into account the multiplicity of comparisons, does not reach a reliable level when applying the Bonferroni p crit value = 0.005)

When comparing the characteristics by groups, it was found that the age at which the sexual life began was the earliest in the group 1 compared with women in the group 0 (** p=0.007) and group 4 (** p = 0.024) and reached the level of statistical trend. At the same time, group 1 stands out of all other groups with the lowest level of sexual satisfaction, especially in comparison with groups 3 (p = 0.007) and 4 (p=0.006). Violations of the menstrual cycle were also significantly more frequent in women of group 1, and less often in group 4 (* p=0.002). Less than half of the women with the onset of depression in adolescence had pregnancies, compared with women in groups 2 and 4 (* p<0.001). By this characteristic groups 1 and 3 differ (** p=0.016) at the level of the statistical trend. The lowest number of pregnancies is also observed in women from the group 1 compared to other groups: from group 4 (* p<0.001), 0 and 2 – significant differences (* p=0.001), and from group 3 – at statistical level (** p=0.007). The presence of childbirths revealed that 100% of women in groups 2 and 4 gave birth in their lives and had children; the least of having given birth women (53.1%) and having had children were in group 1. Thus, groups 1 and 2 differ significantly (* p=0.001) and groups 1 and 4 (* p<0.001), and group 1 and the group 0 (** p=0.024) differ at the level of trend. Women of group 1 also had fewer births than other groups: for groups 1–4 (* p<0.001), for groups 1–0 (* p=0.005) and groups 1–2 (* p=0.001), for groups 1–3 (** p=0.006) and 0–4 (** p=0.048) the difference is a statistical trend. Accordingly, the fewest children again reliably have women of group 1 – for groups 0–1 * p= 0.001, groups 1–2 * p<0.001, for groups 1–3 * p=0.002 and 1–4 * p<0.001. In this way. the menstrual-generative function is most disturbed in the group of women with onset of the disease in adolescence, and least in women with postmenopausal manifestation of the disease.

The greatest number of women with PMS was found in group 1, and the lowest in group 4 (* p=0.001). The earliest age of

onset of PMS is observed in women with debut of depression after childbirth (group 2), which significantly differs from group 3 (p=0.033). Groups 1 and 3 also differ reliably (* p=0.003). The greatest duration of PMS is in women of group 1, the lowest in groups 3 and 4. At the level of the statistical trend, there are differences between groups 3 and 1 (** p=0.046) and in groups 3 and 0 (** p=0.023).

The results of the study confirmed the existing opinion that there is a clear interrelation and mutual influence between depression and menstrual-generative function (4.6, 19, 24). Based on the obtained data, it can be stated with a high degree of certainty that women with RDD has significantly more violations of the menstrual-generative function in comparison with mentally healthy ones, at the same frequency of gynecological pathology. In women with depression, menstruation is established at a later age, in half the cases is irregular (dysmenorrhea, amenorrhea), premenopause begins earlier and lasts longer, and is more severe than in the population of the mentally healthy. Until now, there is no unequivocal opinion on the underlying mechanisms of neurohormonal regulation of these processes [16]. As a consequence of the violation of menstrual function, the reproductive capacity of women with RDD also decreases: pregnancy and childbirth are less common, the numbers of pregnancies and childbirths (and respectively, children) per patient are two times as less. Abortions are more likely to be made in group of healthy women, and miscarriages are more common in depressed patients. Pregnancy is better tolerated by women with RDD, they are less likely to have toxicosis of the first and second half of pregnancy. However, in this study, the worse marital adaptation because of illness in these women affects the fertility function: only half of the women with depression are married, the rest are divorced, widowed or have never married; only about half of women have a regular sex life and only slightly more than 1/3 experience sexual satisfaction, which in turn can be explained by the clinical picture of endogenous depression (decreased mood, activity, communication, sexual desire, etc.).

According to the results of the study, in most women the onset of the disease is associated with periods of hormonal adjustment, which is consistent with the data available in the literature (1, 4, 8, 9, 10, 11, 12, 13, 14). The most unfavorable in terms of affecting the menstrual-generative function is depression that manifests in puberty. In this very subgroup the menstrual and generative function of women (the smallest number of pregnancies, childbirths, children) suffers most. The most favorable in this regard can be considered depression, which begins in postmenopausal period, because women have already realized their childbearing function at the time of debut of depression. It should also be pointed that PMS in women with depression, according to the study, is more common than in common female population, that confirms the earlier data [24]. However, PMS turned out to be most often observed in women depression manifested in the adolescent period and lasts longer and is more severe, that indicates a less benevolent course of the disease in general in this group of patients. Less often PMS was observed in women with a debut of depression in postmenopause, even less often than in a group of the mentally healthy, that also indicates a lesser degree of mutual influence of menstrual-generative function and depression in this group of patients.

Numerous studies in which the authors attempted to revile correlations between the level of ovarian hormones in a particular period of hormonal adjustment and depression are contradictive [16, 18, 17, 20]. Perhaps, for the development of depression not so much important the absolute levels of hormones are, but their individual changes in certain periods [21], as a result of the regulating influence of the hypothalamic-pituitary-adrenal system [23].

Thus, depression and menstrual-generative function in women are closely interrelated and have mutual influence. This has to be taken into account not only when assessing the mental and gynecological status of women, but also when prescribing therapy. Treatment of depression in these patients helps restore menstrual and reproductive function.

BIBLIOGRAPHY

1. Тювина НА. Депрессии у женщин. Москва: Сервье; 2006. 32 с. [Tyuvina NA. *Depressii u zhenshchin* [Depressions in Women]. Moscow: Serv'e; 2006. 32 p.].
2. Silverstein B, Edwards T, Gamma A, et al. The role played by depression associated with somatic symptomatology in accounting for the gender difference in the prevalence of depression. *Soc Psychiatry Psychiatr Epidemiol.* 2013 Feb;48(2):257–63. doi: 10.1007/s00127-012-0540-7. Epub 2012 Jul
3. Nolen-Hoekesma S. Gender differences in depression. *Current directions in psychological science.* 2001;10(5):173-6.
4. Тювина НА, Балабанова ВВ, Воронина ЕО. Гендерные особенности депрессивных расстройств у женщин. Неврология, нейропсихиатрия, психосоматика. 2015;7(2):75-8. [Tyuvina NA, Balabanova VV, Voronina EO. Gender features of depressive disorders in women. *Nevrologiya, neiropsikhiatriya, psikhosomatika = Neurology, Neuropsychiatry, Psychosomatics.* 2015;7(2):75-8. (In Russ.)]. doi: 10.14412/2074-2711-2015-2-75-79
5. Жиляева ТВ. Предменструальные расстройства настроения: этиология, патогенез, диагностика и лечение (обзор литературы). Проблемы репродукции. 2015;(4):76-85. [Zhilyaeva TV. Premenstrual mood disorders: etiology, pathogenesis, diagnosis and treatment (literature review). *Problemy reproduktsii.* 2015;(4):76-85. (In Russ.)].
6. Сметник ВП, Кулаков ВИ. Руководство по климактерию. Москва: МИА; 2001. 685 с. [Smetnik VP, Kulakov VI. *Rukovodstvo po klimakteriyu* [Guide to menopause]. Moscow: MIA; 2001. 685 p.].
7. Сметник ВП, Ткаченко НМ, Глезер ГА, Москаленко НП. Климактерический синдром. Москва: Медицина; 1988. 270 с. [Smetnik VP, Tkachenko NM, Glezer GA, Moskalenko NP. *Klimaktericheskii sindrom* [Climacteric syndrome]. Moscow: Meditsina; 1988. 270 p.].
8. Юренева СВ, Каменецкая ТЯ. Депрессивные расстройства у женщин в пери- и постменопаузе. Журнал гинекологии. 2007; 9(2):5-12. [Yureneva SV, Kamenetskaya TYa. Depressive disorders in women in peri- and postmenopausal women. *Zhurnal ginekologii.* 2007;9(2):5-12. (In Russ.)].
9. Bennett HA, Einarson A, Taddio A, et al. Prevalence of depression during pregnancy: systematic review. *Obstet Gynecol.* 2004 Apr;103(4): 698-709.
10. Bromberger JT, Kravitz HM, Chang YF, et al. Major depression during and after the menopausal transition: Study of Women's Health Across the Nation (SWAN). *Psychol Med.* 2011 Sep;41(9):1879-88. doi: 10.1017/S003329171100016X. Epub 2011 Feb 9.
11. Bromberger JT, Matthews KA, Schott LL, et al. Depressive symptoms during the menopausal transition: the Study of Women's Health Across the Nation (SWAN). *J Affect Disord.* 2007 Nov;103(1-3):267-72. Epub 2007 Feb 28.
12. Epperson C, Steiner M, Hartlage S, et al. Premenstrual dysphoric disorder: evidence for a new category for DSM-5. *Am J Psychiatry.* 2012 May;169(5):465-75.
13. Lee PJ, Liaw JJ, Chen CM. Concept Analysis of Postpartum Depression. *Hu Li Za Zhi.* 2015 Jun;62(3):66-71. doi: 10.6224/JN.62.3.66.
14. Ross L, Steiner M. A biopsychosocial approach to premenstrual dysphoric disorder. *Psychiatr Clin North Am.* 2003 Sep;26(3):529-46.
15. Cheslack-Postava K, Keyes KM, Lowe SR, et al. Oral contraceptive use and psychiatric disorders in a nationally representative sample of women. *Arch Womens Ment Health.* 2015 Feb; 18(1):103-11. doi: 10.1007/s00737-014-0453-4. Epub 2014 Aug 13.
16. Romans S, Kreindler D, Asllani E, et al. Mood and the menstrual cycle. *Psychother Psychosom.* 2013;82(1):53–60. doi: 10.1159/000339370. Epub 2012 Nov 6
17. Woods NF, Smith-Dijulio K, Percival DB, et al. Symptoms during the menopausal transition and and early postmenopause and their relation to endocrine levels over time: observations from the Seattle Midlife Women's Health Study. *J Womens Health (Larchmt).* 2007 Jun; 16(5):667-77.
18. Viviand-Taylor J, Hickey M. Menopause and depression: is there a link? *Maturitas.* 2014 Oct;79(2):142-6. doi: 10.1016/j.maturitas.2014.05.014. Epub 2014 Jun 2.
19. Romans S, Clarkson R, Einstein G, et al. Mood and the menstrual cycle: a review of prospective data studies. *Gend Med.* 2012 Oct; 9(5):361-84. doi: 10.1016/j.genm.2012.07.003.
20. Rubinow DR, Schmidt PJ. Gonadal steroid regulation of mood: the lessons of premenstrual syndrome. *Front Neuroendocrinol.* 2006 Jul; 27(2):210–6. Epub 2006 May 2.
21. Lokuge S, Frey BN, Foster JA, et al. Depression in women: windows of vulnerability and new insights into the link between estrogen and serotonin. *J Clin Psychiatry.* 2011 Nov; 72(11):e1563-9. doi: 10.4088/JCP.11com07089.
22. Weiss EL, Longhurst JG, Mazure CM. Childhood sexual abuse as a risk factor for depression in women: Psychosocial and neurobiological correlates. *Am J Psychiatry.* 1999 Jun; 156(6):816-28.
23. Young E, Korszun A. Women, stress, and depression: Sex differences in hypothalamic-pituitary-adrenal axis regulation. *J Gend Specif Med.* 1998 Sep;1(1):21-7.
24. Тювина НА. Клинические особенности предменструального синдрома при основных психических заболеваниях. Дисс. канд. мед. наук. Москва; 1983. 231 с. [Tyuvina NA. Clinical features of premenstrual syndrome with major mental illness. Diss. cand. med. sci. Moscow; 1983. 231 p.].

Received on 7.02.2018

Declaration about financial and other relationships

This is a non-funded investigation. The authors are fully responsible for submitting the final version of the manuscript for publication. The final version of the manuscript has been approved by all co-authors.