The features of psychological status of pregnant women with an allogeneic fetus

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The objective: to establish the peculiarities of the psychological status of pregnant women with an allogeneic fetus.

Materials and methods. The psychological status of 120 pregnant women, who were divided into two groups, was assessed. I group included 80 patients after in vitro fertilization (IVF) programs with the formation of an allogeneic fetus, II group (control one) included 40 pregnant women after IVF with the woman's own oocytes.

The psychological state of pregnant women was assessed using the Spielberger-Hanin questionnaire, the Holmes and Rahe stress event scale, the assessment of well-being, activity and mood, the Edinburgh Postnatal Depression Scale, and the SF-36 quality of life questionnaire.

Results. A high level of reactive anxiety was significantly more often determined in pregnant women with an allogeneic fetus compared to the pregnant women in the control group (32.50 % and 12.50 %, respectively), as well as uncertain indicators according to the Edinburgh Postnatal Depression Scale (72.50 % and 52.50 %, respectively).

During the evaluation of the quality of life in patients of the I group, significantly lower indicators of role-emotional functioning (41.13±5.29 points), social functioning (72.76±4.88 points), as well as role-physical functioning (35.12±7.22 points) and vitality (38±7.11 points) than in the examined women of the II group (62.43±5.45, 84.4±5.02, 46.89±6.51 and 59.56±9.78 points, respectively) were established. The indicators of well-being and mood were also significantly lower in the I group (3.88±1.40 and 4.21±1.27 points, respectively) compared to the II group (4.83±1.55 and 5.13±1.49 points, respectively).

Conclusions. The psychological status of pregnant women with an allogeneic fetus is characterized by the presence of statistically significant deviations not only compared to the control group, but also to the normative indicators provided by standardized survey methods. This indicates the necessity for further study of the relationship between these factors and the frequency of complications during pregnancy, childbirth and the postpartum period, as well as the condition of newborns in these women and possible ways of correcting the psychological status to reduce the frequency of obstetric and perinatal complications.

Keywords: assisted reproductive technologies, in vitro fertilization, allogeneic fetus, surrogate (substitute) motherhood, psychological status, state anxiety, trait anxiety, quality of life, postpartum depression, Edinburgh Postnatal Depression Scale.

Особливості психологічного статусу вагітних з алогенним плодом
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Мета дослідження: встановлення особливостей психологічного статусу вагітних із алогенним плодом.

Матеріали та методи. Проведено оцінювання психологічного статусу 120 вагітних, які були розподілені на дві групи. До I групи увійшли 80 пацієнток, залучених до програм екстракорпорального запліднення (ЕКЗ) з формуванням алогенного плода, до II групи (контрольна) – 40 вагітних, яким виконали ЕКЗ із використанням власних ооцитів жінки. Психологічний стан вагітних оцінювали за допомогою опитувальника Спілбергера–Ханіна, шкали стресових подій Холмса–Раге, оцінювання самопочуття, активності та настрою, Единбурської шкали післяпологової депресії, опитувальника якості життя SF-36.

Результати. Серед вагітних із алогенним плодом достовірно частіше реєстрували високий рівень реактивної тривожності порівняно з вагітними контрольної групи (32,50 % та 12,50 % відповідно), а також сумнівні показники за Единбурською шкалою післяпологової депресії (72,50 % та 52,50 % відповідно).

У ході оцінювання якості життя у пацієнток I групи встановлено достовірно нижчі показники рольового емоційного функціонування (41,13±5,29 бала), соціального функціонування (72,76±4,88 бала), а також рольового фізичного функціонування (35,12±7,22 бала) та життєвої активності (38±7,11 бала), ніж в обстежених жінок II групи (62,43±5,45, 84,4±5,02, 46,89±6,51 та 59,56±9,78 бала відповідно). Показники самопочуття та настрою також були достовірно нижчими у I групі (3,88±1,40 та 4,21±1,27 бала відповідно) порівняно з II групою (4,83±1,55 та 5,13±1,49 бала відповідно).

Висновки. Психологічний статус вагітних із алогенним плодом характеризується наявністю статистично значущих відхилень не лише порівняно з контрольною групою, а й з нормативними показниками, передбаченими стандартизованими методиками опитування. Це свідчить про необхідність подальшого вивчення взаємозв'язку між даними факторами та частотою ускладнень перебігу вагітності, пологів та післяпологового періоду, а також стану новонароджених у цих жінок та можливих шляхів корекції психологічного статусу для зниження частоти акушерських та перинатальних ускладнень.

Ключові слова: допоміжні репродуктивні технології, екстракорпоральне запліднення, алогенний плід, сурогатне (замінне) материнство, психологічний статус, реактивна (ситуативна) тривожність, особистісна тривожність, якість життя, післяпологова депресія, Единбурська шкала післяпологової депресії.

In accordance with the definition approved by the WHO Constitution, health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity [1]. Therefore, it is clear that the support of the government and various non-governmental organizations for preventive measures aimed at preserving mental health should contribute to their widespread implementation over the years. At the same time, work with a specialist in the field of mental health in the circumstances of obstetric and gynecological care is not carried out actively enough, although in the health care systems of many countries, including Ukraine, it is de jure enshrined in regulatory documents that provide clinical guidance for both ways of medical care – outpatient and inpatient [2, 3].

The priority of this field of healthcare is determined by the results of numerous studies that highlight the presence of changes in the mental status of a pregnant women and its influence on the obstetric and perinatal outcomes rate [4–6]. In particular, scientists talk about pregnancy as a psychological phenomenon, taking as an example not only frequent mood changes ranging from exhaustion to exaltation, or mixed anxiety-depressive disorders, but also generally defining pregnancy as a highly emotional state that acts as a stressor in itself [7].

It is obvious that during pregnancy resulting from in vitro fertilization (IVF), the patient will face a significantly greater amount of stressors, which may include, for instance, invasive manipulations and the increased overall number of medical interventions. A group of researchers from Germany has shown that patients undergoing IVF treatment have higher levels of anxiety compared to the average population [8].

In general, a number of scientists note the deterioration of the quality of life indicator of patients diagnosed with infertility in comparison with other women of reproductive age [9, 10]. Also, a group of Polish researchers report the negative impact of the factor of extending the duration of infertility treatment on the quality of life of patients [11].

Generally, higher levels of anxiety and depression are observed in patients after failure of ART treatment in comparison with successful treatment cycles [12]. In particular, a significant increase in state anxiety and depression scores were registered from 22 weeks of gestation to 15 days after delivery in patients who received multiple unsuccessful IVF/ICSI cycles compared to women who became pregnant as a result of the first cycle of IVF and those who had only one unsuccessful IVF treatment cycle previously [13].

In addition, both partners of the couple with the history of recurrent pregnancy loss have high risks for developing depression and anxiety [14].

Current data show that deterioration of psychological status indicators is associated with increased rates of various obstetric and perinatal complications [15]. For example, women with a high level of perceived stress were less likely to achieve livebirth [16].

But it is worth adding that in a number of studies it is also noted that the indicators of the psychological status of patients, which characterize the level of anxiety, self-esteem, satisfaction with life and depression scales, right before the start of the IVF protocol were close to normal levels. It may be associated with significant expectations of women from these methods of infertility treatment [17]. In particular, rates of anxiety obtained during the infertility treatment with the help of IVF were relatively lower in comparison with such assessments before the start of the cycle [18].

An important aspect is that many women undergoing infertility treatment in IVF programs report high levels of social support and emotional well-being [16].

Also, in one of the studies a low level of depression and anxiety in patients who became pregnant as a result of IVF with donor oocyte was observed [19]. Scientists believe that it can be explained by the dominant desire of the patients to experience pregnancy and childbirth despite the complete allogeneity of the fetus [20].

However, with regard to another category of patients with an allogeneic fetus – surrogate mothers, the available studies are mainly focused on the assessment of their psychological status in direct connection with the necessity to relinquish the newborn, and therefore are mainly based on the results of examinations carried out in the postpartum period [21]. At the same time, the relatively high frequency of obstetric and perinatal complications in women undergoing careful selection based on the data of somatic and reproductive anamnesis and the results of clinical and laboratory examinations before the enrollment in surrogacy programs requires the additional research into the pathogenesis of the development of these conditions.

The American Society for Reproductive Medicine postulates that gestational carriers (surrogate mothers) should undergo psychological evaluation before, and access to counseling during and after participation in the program [22].

Nowadays, the active investigation of the characteristics of psychological status creates prerequisites for further research into possible ways of its correction. In particular, in one of the studies of recent years, a 7-week daily at-home meditation and mindfulness program combined with group sessions leaded to significant decrease in the perceived stress index in the involved patients in comparison with those who underwent standard algorithm for the management of patients with recurrent pregnancy loss [23].

It is obvious that the conditions for conducting psychocorrective measures during pregnancy and the indicators of their effectiveness will differ, so it is difficult to extrapolate the data of studies similar to the abovementioned ones on pregnant women. However, a number of publications describe pilot randomized controlled studies focused on the possibility of correcting the psychological status under the circumstances of antenatal care [24, 25]. The results demonstrate a decrease in the rates of pregnancy-related anxiety in patients [26].

Obviously, the reason for the lack of large-scale studies on the possibility of correcting the psychological state of surrogate mothers is connected with extremely limited data on possible features of the psychological state of these women during pregnancy with an allogeneic fetus.

The objective: of the study is to establish the features of the psychological status of pregnant women with an allogeneic fetus.

MATERIALS AND METHODS

We examined 120 patients that underwent inpatient treatment on the basis of Kyiv Regional Perinatal Center. They were divided into two groups: I (main) group – 80 pregnant women with allogeneic fetus, who underwent IVF procedure with foreign oocytes, II (control) group – 40 pregnant women, who underwent IVF procedure with the use of their own oocytes.

Including criteria were: the patient's consent to participation in the study, age 18 – 40 years, pregnancy achieved by IVF with foreign oocytes in surrogacy program (ultrasound verification of pregnancy, number of embryos in the uterus ≤2) – for the main group, in the control group – pregnancy as a result of IVF program with the use of their own oocytes (ultrasound verification of pregnancy, number of embryos in the uterus ≤2), absence of severe extragenital pathology, absence of psychiatric disorders, absence of acute infections, reassuring fetal state on the beginning of investigation, antenatal monitoring and labour at Kyiv Regional Perinatal Center.

Excluding criteria were: patient's refusal to participation in the study, age under 18 or over 40 years, presence of severe extragenital pathology, presence of psychiatric disorders, acute infections, nonreassuring fetal state or presence of fetal pathology with poor prognosis at the beginning of investigation.

The basis for assessing the psychological status of pregnant women was the analysis of data obtained from the interview and questionnaires, which pregnant women filled out individually according to the unified written instructions: Spielberger's State-Trait Anxiety Inventory (Khanin's adaptation), Holmes – Rahe Stress Inventory, well-being, activity and mood inventory, Edinburgh postnatal depression scale, SF-36 (Short Form-36) Health Survey (SF-36).

Spielberger's State-Trait Anxiety Inventory is widely used by researchers to assess levels of state and trait anxiety [27, 28]. It is suggested that the indicator of trait anxiety is determined by individual characteristics and reflects a person's constant traits in various everyday situations, while state anxiety denotes the subject's state at the time of the action of a threatening factor, which causes a specific degree of fear, nervousness and discomfort [29]. This questionnaire makes it possible to evaluate each of the components of anxiety diversely and to divide patients according to the corresponding levels, in particular, an indicator of up to 30 points corresponds to a low level of anxiety, 31–45 points – to an average level, and 46 points and more corresponds to a high level of anxiety [30].

The Holmes – Rahe Stress Inventory includes 43 significant events for which the above-mentioned scientists have established a certain score [31]. The latter reflects the degree of significance, or the stressogenicity of the event. The number of points depending on the general list of events that happened in the respondent's life during the last year is added up, and an assessment of the risk of stress-induced health problems is made. It is supposed that the score of 150 points means a 50% probability to develop a so-called "stress disease", while a score of 300 points means 90% of such probability [32].

Well-being, activity and mood inventory has been also used by scientists to assess the psychological status of pregnant women [27]. This inventory provides a differentiated evaluation of the above-mentioned conditions according to a scale with a maximum value of seven points. At the same time, a score above 4 points is considered as an indicator of a favorable state of the respondent, and less than 4 points – of an unfavorable one.

We also estimated the results of Edinburgh Postnatal Depression Scale that was created in the 80s of the last century and is currently actively used by doctors in various parts of the world both at the stage of antenatal care and in the postpartum period [33, 34]. The proportion of women whose score result exceeded the threshold of 9 recommended by the authors of the questionnaire was determined, as well as the number of patients with an ambiguous result (5-9 points) [34]. This scale includes anxiety symptoms that are characteristic of perinatal mood disorders, but excludes constitutional symptoms of depression, such as changes in sleep patterns, which may be common in pregnancy and the postpartum period [35].

As an integral indicator that reflects various aspects of the patient's physical, mental, social, economic and emotional state, the concept of quality of life was taken. Its quantitative and qualitative assessment was performed using the SF-36 Health Survey questionnaire, which is fully adapted and widely used in Ukraine in various biomedical studies. [36–38]. The questionnaire consists of 11 items, which include 36 questions. During the analysis, they are combined into 8 scales and 2 integral indicators. Thus, it is possible to evaluate: vitality, physical functioning, bodily pain, general health perceptions, role-physical functioning, role-emotional functioning, social functioning, mental health or emotional wellbeing, as well as two integral indicators – physical and mental components of health. The obtained results are displayed by the score within the range from 0 to 100 points, where 100 corresponds to "full health" [39].

The study was performed in accordance with the principles of the Declaration of Helsinki, as well as in compliance with the relevant legislative norms and requirements for conducting clinical/biomedical research. The research protocol was approved by the Local Ethics Committee of the institution where it was conducted. Informed consents of the women were obtained.

Statistical analysis of the obtained data was performed in the "SPSS Statistics" software environment. Using the methods of descriptive statistics, the main indicators characterizing the quantitative variables were determined. Categorical variables were described as the absolute number of cases in the group and the corresponding percentage – n (%). The assessment of differences between independent samples for quantitative variables was carried out by parametric and non-parametric methods depending on the type of the distribution (Independent Sample T-Test, Mann-Whitney U test), and the Pearson's chi-squared test (χ^2), Fisher's exact test for categorical variables were used. Differences at $p<0.05$ were considered statistically significant. The graphical display of the results was carried out using the tools of the software package «Microsoft Office».

RESULTS

Our findings show that the average age of the patients of the main group was 31,65±2,92 years [95% CI: 31,00–32,30], of the control group – 32,05±2,34 years [95% CI: 31,30–32,79], p>0,05. Also, the groups had an age structure (Table 1) that did not significantly differ from each other. At the same time, a significant proportion of women of the age of 30 years or older was found in both groups – 64 (80%) and 35 (87,5%) of women in groups I and II, respectively.

A comprehensive assessment of the patients' socio-demographic factors was carried out with help of surveys and questionnaires. We also focused on the marital status of women since it is generally acknowledged that there is an influence of the support of the spouse on the risk of developing anxiety during pregnancy [40]. We found out that among the women of the group I, only 42 (52,5%) of the patients were in a registered marriage, which is significantly lower than the similar indicator for the control group (31 women – 77,5%), p<0,01 (Figure 1).

Patients were also asked to assess their own financial situation. Despite the subjectivity, we believe it is appropriate to evaluate this indicator, as it reflects the patient's satisfaction with her own life and, accordingly, determines certain aspects of her quality of life, which will be further evaluated by a standardized questionnaire. Thus, less than half of women in the main group – 36 (45%), and 23 (57,5%) of patients from the control group consider their financial situation subjectively satisfactory, the difference is not statistically significant (p>0,05).

We analyzed the levels of state and trait anxiety according to Spielberger's State-Trait Anxiety Inventory. The number and the percentage of patients of both groups with certain level of state and trait anxiety according to the generally accepted ranges are displayed in table 2.

As it is shown in table 2, in both groups, the medium level of trait anxiety was found in almost 2/3 of the patients. This level of anxiety is recognized as optimal, because it provides an adequate reaction and adaptation to stressogenic factors. Along with that, in the main group

Table 1

Age structure of groups of study, n (%)

Age	Group I, n=80		Group II, n=40	
	n	%	n	%
Younger than 30 years	16	20	5	12,5
30–34 years	50	62,5	29	72,5
35 years and older	14	17,5	6	15

there is a considerable proportion of patients with a low level of trait anxiety (18 women – 22,5) compared to 6 (15%) patients of the control group), which may indicate a lack of critical assessment of one's own condition and the environment, which may result in an insufficiently effective reaction to the stimulus.

Also, among the patients of the main group, there is a significantly higher proportion of women with a high level of state anxiety – 32,5% (26 women) compared to 12,5% (5 patients) in the control group. Accordingly, the proportion of patients with low and medium levels of state anxiety is lower, but there was no statistically significant difference with the corresponding indicators of women in the control group. This may prove the statement that the patients of the main group have a pronounced stress reaction, which can act as a background for the development of various complications during pregnancy, childbirth and the postpartum period.

Similarly, the level of psychosocial stress was evaluated according to the The Holmes – Rahe Stress Inventory. It was established that more than half of the patients of both groups presented medium level of psychosocial stress (Table 3). However, there was no statistically significant difference between both groups.

The results of assessment of Edinburgh Postnatal Depression Scale scores are shown in Figure 2. It was established that there is a statistically significant difference in the number of patients with a questionable ambigu-
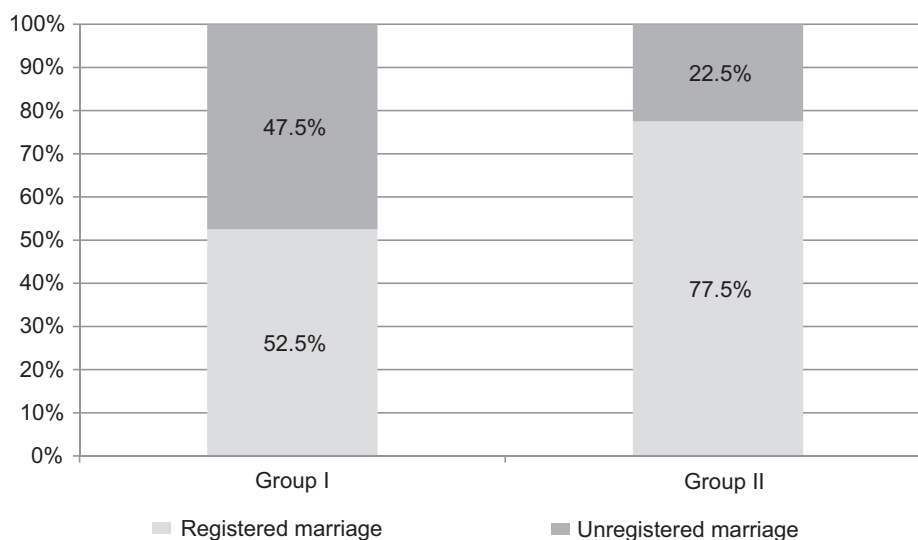

Fig. 1. Marital status of the patients (%)

Distribution of the patients by levels of trait and state anxiety, n (%)

Anxiety level	Trait anxiety		State anxiety	
	Group I, n=80	Group II, n=40	Group I, n=80	Group II, n=40
Low	18 (22,50%)	6 (15,00%)	9 (11,25%)	7 (17,50%)
Medium	49 (61,25%)	26 (65,00%)	45 (56,25%)	28 (70,00%)
High	13 (16,25%)	8 (20,00%)	26 (32,50%)*	5 (12,50%)*

Note. * – Statistically significant difference (p<0,05).

ous test result in the range of 5-9 points, as stated in the Standards of medical care "Normal pregnancy" approved by the Order of the Ministry of Health of Ukraine dated August 9, 2022 No. 1437 [41].

At the same time, every fifth patient (15 women – 18,8%) of the main group received a result of more than 9 points, which requires further examination for the detection of depressive disorders, while in the control group there were less than 10% of such women (3 patients) (however, the difference is not statistically significant, p>0,05). It should be mentioned that none of the patients in both groups had a score equal to or higher than 13 points, and no positive answer was received to question №10 regarding the woman's desire to harm herself.

The results of the assessment of well-being, activity and mood were obtained in both studied groups and are shown in Figure 3. None of the indicators of the main group reached the optimal level of 5,0–5,5 points. The low rates of the well-being scale scores in the patients of group I are observed (3,88±1,40 points [95% CI: 3,56–4,19]), and the difference with such indicator of the control group (4,83±1,55 points [95% CI: 4,33–5,32] respectively) is statistically significant (p<0,01). The activity level is also below 4 points ((3,55±1,28 points [95% CI: 3,26–3,84]), which means unfavorable state of the patients, but it doesn't differ significantly from the control group scores (4,10±1,60 points [95% CI: 3,59–4,61]).

Distribution of the patients by levels of psychosocial stress (Holmes – Rahe Stress Inventory), n (%)

Level of psychosocial stress	Group I (n=80)		Group II (n=40)	
	n	%	n	%
Low	24	30,00	11	27,50
Medium	45	56,25	23	57,50
High	11	13,75	6	15,00

Note. * – Statistically significant difference (p<0,05).

There was a statistically significant difference in mood scale rates between the patients of main and control group (p=0,001). However, the scores of both groups were more than 4 points (4,21±1,27 points [95% CI: 3,93–4,50] in main group and 5,13±1,49 points [95% ДІ 4,65–5,60] in control group), which indicates generally favorable state of the patients according to this parameter.

The assessment of the SF-36 Health Survey questionnaire results revealed significantly lower scores of role-emotional functioning, social functioning, as well as role-physical functioning and vitality in the patients of the main group (Table 4). The levels of physical functioning and mental health were also lower, but did not reach the criteria of statistical significance.

Our findings show a significantly higher proportion of patients with a high level of state anxiety among pregnant
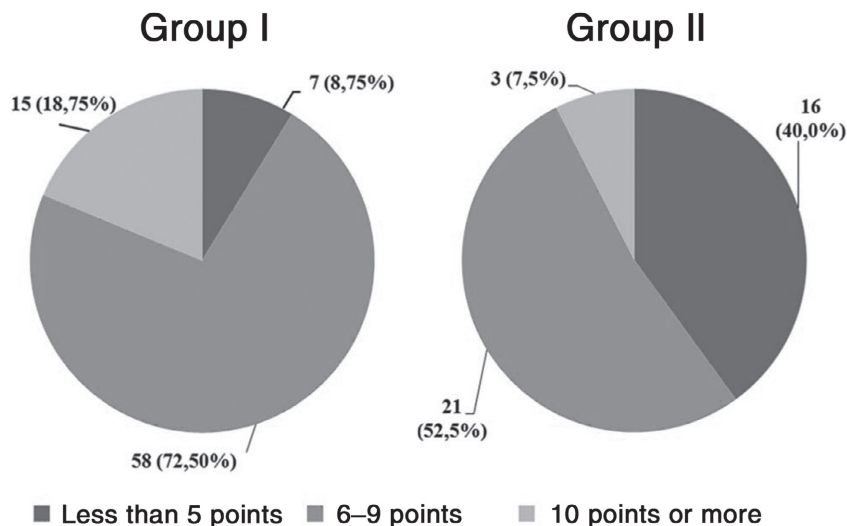

Group I

7 (8,75%)
15 (18,75%)
58 (72,50%)

Group II

3 (7,5%)
16 (40,0%)
21 (52,5%)

■ Less than 5 points ■ 6–9 points ■ 10 points or more

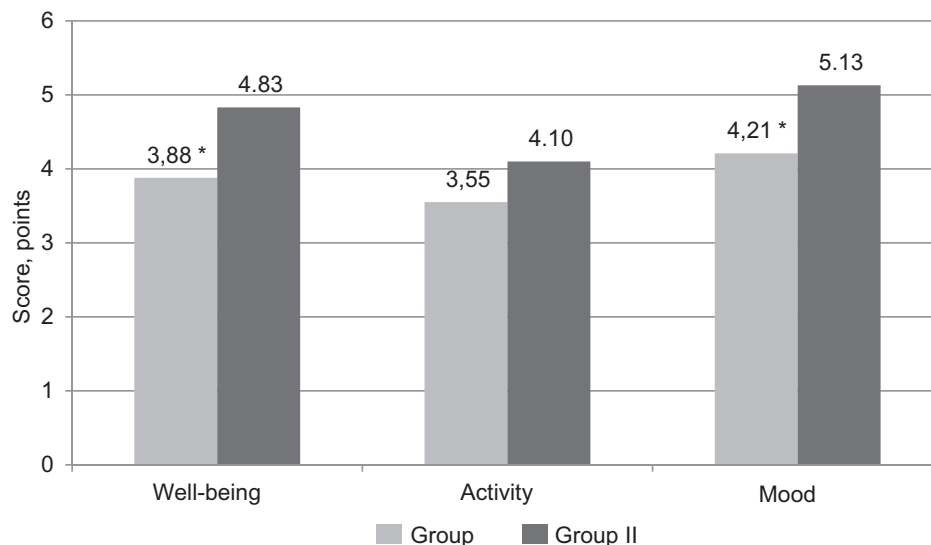**Fig. 2. Distribution of the patients according to Edinburgh Postnatal Depression Scale score, N (%)**

Fig. 3. The average rates of well-being, activity and mood inventory
Note. * – Statistically significant difference (p<0,01).

women with an allogeneic fetus, which, according to the literature, is a reflection of the individual's reaction to a specific threatening situation. Obviously, the test does not allow to identify the specific stressor as the cause of patients' anxiety. Nevertheless, scientists note that this examination allows outlining the risk groups for carrying out appropriate preventive measures [42].

Also a significant proportion – one fourth of the patients of main group – was characterized by a low level of trait anxiety. According to sources, this condition is associated with an insufficient critical assessment of one's own condition and potentially threatening environmental factors [43].

A possible evidence of insufficient social support for pregnant women in the main group was also identified: a significant percentage of patients are in an unregistered marriage, which implies the presence of certain psychological and material risks for a pregnant woman who temporarily loses her ability to work. This position is supported by the data on higher rates of anxiety and depression in patients with recurrent pregnancy loss who are dissatisfied with their marriage [44].

The results of our study also reflect that widespread implementation of screening programs to detect both pre-existing depressive disorders and conditions that develop during the current pregnancy is of great importance [41]. A significant proportion of women with the ambiguous test result of Edinburgh Postnatal Depression Scale reveals the necessity of re-examination and, according to the recommendations of a number of researchers, diagnostic and therapeutic measures to prevent the development of a specific pathology [45].

A decrease in well-being, activity and mood scores also reflects the peculiarities of the psychological status of pregnant women with an allogeneic fetus and the presence of prerequisites for the development of more serious neuropsychological disorders and, in general, the deterioration of the patient's quality of life [27]. Actually, significantly lower scores for certain scales of the quality

of life questionnaire were found in patients of main group in comparison with the control group. In particular, significantly lower level of certain parameters of the physical (role-physical functioning and vitality) and mental (role-emotional functioning, social functioning) components of health were observed.

CONCLUSIONS

It was established that among pregnant women with an allogeneic fetus, the proportion of women with a high level of state anxiety is significantly higher. The assessment of the level of psychosocial stress did not show statistically significant differences between the patients of the main and control groups.

In the group of pregnant women with an allogeneic fetus, significantly lower levels of well-being and mood scores were also noted. Moreover, the indicator of the mood scale was in the range that corresponds to

Table 4

Assessment of Quality of life indicators according to SF-36 Health Survey questionnaire, M±m

Шкала	I група, n=80	II група, n=40
Фізичне функціонування	53,56±8,54	72,64±13,78
Рольове фізичне функціонування	35,12±7,22*	46,89±6,51
Інтенсивність болю	83,37±11,31	81,29±7,86
Загальний стан здоров'я	71,65±13,36	68,26±12,87
Соціальне функціонування	72,76±4,88***	84,4±5,02
Рольове емоційне функціонування	41,13±5,29***	62,43±5,45
Життєва активність	38±7,11**	59,56±9,78
Психічне здоров'я	68,76±9,24	73,14±11,17

Note. * – statistically significant difference (p<0,05);
** – statistically significant difference (p<0,01);
*** – statistically significant difference (p<0,001)

the unfavorable condition of the patient according to the regulations of the test. Similarly, the activity indicator also corresponded to an unfavorable condition, but no statistical difference with the control group was achieved.

In the main group, a significantly higher proportion of women with ambiguous result according to the Edinburgh postnatal depression scale was registered. The assessment of the quality of life of patients of the group I revealed sig-

nificantly lower scores of indicators of both physical and mental health: the level of role-emotional functioning, social functioning, as well as role-physical functioning and vitality.

The analysis of socio-demographic factors showed that among the pregnant women with allogeneic fetus the proportion of patients who are in a registered marriage is significantly lower.

Authors declare no conflict of interests.

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