

# СИНО

ISSN: 2707-5265

## ЕВРАЗИЙСКИЙ НАУЧНО - МЕДИЦИНСКИЙ ЖУРНАЛ

Eurasian Scientific and Medical Journal «Sino»



**2024 #4**  
**ТОМ 5 #4**

# Евразийский научно-медицинский журнал «Сино»

Том 5, № 4, 2024

## Eurasian Scientific and Medical Journal «Sino»

Vol. 5, N 4, 2024

ISSN: 2707-5265

Журнал зарегистрирован Министерством культуры  
Республики Таджикистан  
Свидетельство о регистрации средства массовой информации  
№ 223/МЧ - 97 от 10.12.2021 г.

**Издание Ассоциации общественного здравоохранения Таджикистана**

Основан в 2019 г.  
Журнал выходит 1 раз в 3 месяца,  
периодичность – 4 номера в год

**Сайт журнала:**  
[www.eurasian-journal-sino.tj](http://www.eurasian-journal-sino.tj)

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**Адрес редакции журнала:**  
734018, Таджикистан, г.Душанбе, пр. С.Шерози, 16  
Статьи отправить по адресу: [sino-journal@mail.ru](mailto:sino-journal@mail.ru)

Журнал рассчитан на научных работников и преподавателей  
медицинских вузов, руководителей органов и учреждений  
здравоохранения и практических врачей

Журнал индексируется в Российском индексе  
научного цитирования (РИНЦ), Crossref, Science Index

**Евразийский научно-медицинский журнал «Сино» включён  
в Перечень ведущих рецензируемых научных изданий  
ВАК при Президенте Республики Таджикистан, рекомендованных для  
публикации основных научных результатов диссертаций на соискание  
учёных степеней доктора и кандидата наук**

ISSN: 2707-5265

The journal is registered by the Ministry of Culture  
of the Republic of Tajikistan  
The certificate of registration of mass media  
No. 223/MCH - 97 dated 10/12/2021

**Publication of the Public Health Association of Tajikistan**

Founded in 2019  
The magazine is published once every 3 months;  
frequency - 4 issues per year

**Journal website:**  
[www.eurasian-journal-sino.tj](http://www.eurasian-journal-sino.tj)

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734018, Tajikistan, Dushanbe, Ave. S.Sherozi, 16  
Articles should be sent to: [sino-journal@mail.ru](mailto:sino-journal@mail.ru)

The journal is designed for researchers and teachers of medical schools,  
heads of health agencies and institutions and practitioners

The journal is indexed in the Russian Science Citation Index (RSCI), Crossref,  
Science Index

**The Eurasian Scientific and Medical Journal "Sino" is included  
in the List of leading peer-reviewed scientific publications  
of the Higher Attestation Commission under the President of the Republic  
of Tajikistan, recommended for publication of the main scientific results of  
dissertations for the academic degrees of Doctor and Candidate of Sciences**

# The rapeutic approaches to abnormal vaginal discharge in women of reproductive age

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**Objective:** To improve the effectiveness of treatment and prevent recurrence of abnormal vaginal discharge in nonspecific vaginitis in women of reproductive age.

**Material and Methods:** 114 women aged 18-39 years with abnormal vaginal discharge and 31 healthy women were examined. The microbiocenosis of vaginal discharge and feces was studied. The SHK reaction was performed, succinate dehydrogenase and acid phosphatase of immunocompetent blood cells, interleukins IL-1 ( $\beta$ ), IL-4, IL-8, IL-10 were determined. The personal and situational anxiety, neuroticism and depression were studied.

**Results:** Main causes of abnormal vaginal discharge were bacterial vaginosis, aerobic vaginitis, vulvovaginal candidiasis and trichomoniasis. Disease was accompanied by disturbances in vaginal and intestinal microbiome. Disturbances in the activity of energy supply and hydrolysis enzymes in granulocytes and blood lymphocytes were found. The prevalence of pro-inflammatory interleukins was noted, which leads to a violation of the immune response and prolonged inflammatory process. The violation of the psychological state of patients was revealed.

**Conclusion:** Abnormal vaginal discharge is accompanied by a violation of vaginal and intestine biocenosis, metabolic disorders of immunocompetent cells, increase in serum interleukins, the prevalence of pro-inflammatory interleukins over anti-inflammatory, psychological disorders. After 3 months of therapy women with abnormal vaginal discharge had better results in the biocenosis and metabolic disorders, decrease in the levels of serum interleukins.

## Key words:

*abnormal vaginal discharge, treatment, microbiota, immunocompetent cells, interleukins, psychological state, quality of life*

## For citation:

*Reznichenko N.Yu., Reznichenko G.I., Odinaeva N.F., Yemchenko Ya.O., Tavarova N.M. The rapeutic approaches to abnormal vaginal discharge in women of reproductive age. Eurasian Scientific and Medical Journal "Sino". 2024; 5(4): 21-36. <https://doi.org/10.54538/2707-5265-2024-5-4-21-36>*

DOI: 10.54538/2707-5265-2024-5-4-21-36

# Терапевтические подходы к аномальным выделениям из влагалища у женщин репродуктивного возраста

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**Цель исследования.** Повышение эффективности лечения и профилактика рецидивов патологических выделений из влагалища при неспецифическом вагините у женщин репродуктивного возраста.

**Материал и методы.** Обследовано 114 женщин в возрасте 18-39 лет с патологическими выделениями из влагалища и 31 здоровая женщина. Изучен микробиоценоз влагалищного отделяемого и кала. Проведена реакция SHK, определены сукцинатдегидрогеназа и кислая фосфатаза иммунокомпетентных клеток крови, интерлейкины ИЛ-1 ( $\beta$ ), ИЛ-4, ИЛ-8, ИЛ-10. Изучены личностная и ситуативная тревожность, невротизм и депрессия.

**Результаты.** Основными причинами патологических выделений из влагалища были бактериальный вагиноз, аэробный вагинит, кандидозный вульвовагинит и трихомониаз. Заболевание сопровождалось нарушением микробиома влагалища и кишечника. Выявлены нарушения активности ферментов энергообеспечения и гидролиза в гранулоцитах и лимфоцитах крови. Отмечено преобладание провоспалительных интерлейкинов, что приводит к нарушению иммунного ответа и затяжному воспалительному процессу. Выявлено нарушение психологического состояния пациенток.

**Заключение.** Аномальные выделения из влагалища сопровождаются нарушением биоценоза влагалища и кишечника, нарушением метаболизма иммунокомпетентных клеток, повышением сывороточных интерлейкинов, преобладанием провоспалительных интерлейкинов над противовоспалительными, психологическими нарушениями. У женщин с аномальными выделениями из влагалища через 3 месяца терапии отмечены лучшие результаты биоценоза и метаболических нарушений, снижение уровня сывороточных интерлейкинов.

**Ключевые слова:** патологические выделения из влагалища, лечение, микробиота, иммунокомпетентные клетки, интерлейкины, психологическое состояние, качество жизни

**Для цитирования:** Резниченко Н.Ю., Резниченко Г.И., Одинаева Н.Ф., Емченко Я.О., Таварова Н.М. Терапевтические подходы к аномальным выделениям из влагалища у женщин репродуктивного возраста. Евразийский научно-медицинский журнал «Сино». 2024; 5(4): 21-36. <https://doi.org/10.54538/2707-5265-2024-5-4-21-36>

**Relevance.** In gynecology and dermatovenerology, the problem of abnormal vaginal discharge and disorders of the microbiocenosis of the genital tract in women of reproductive age is currently being actively considered, since their share has recently been increasing. It is known that the vaginal ecosystem is strictly individual, changing at different periods of life and under the influence of various environmental factors [1-3].

A common cause of abnormal vaginal discharge is bacterial vaginosis, with a prevalence ranging from 19% to 68% [4, 5], with aerobic vaginitis accounting for 5–24% [6]. Clinical manifestations of mixed vulvovaginitis with abnormal vaginal discharge are observed in only 25% of patients and in most cases do not have a pronounced inflammatory reaction, although the impact of asymptomatic forms of the disease on women's health remains significant [7, 8].

Nonspecific vaginitis, which is the cause of abnormal vaginal discharge, is given great attention, since its consequences can be miscarriage, premature birth, and low birth weight. Untreated bacterial vaginosis and other vaginitis in women significantly increase the level of pelvic inflammatory disease, which contributes to the chronicity of the process and causes a tendency to relapse [9].

Vaginitis also increases the risk of sexually transmitted infections (gonorrhea, chlamydia, HIV infection, etc.) and is a co-factor in the occurrence of precancerous lesions of the cervix against the background of infection with the human papillomavirus [8, 10-12].

The most common cause of abnormal vag-

inal discharge is the development of nonspecific vaginitis due to the activation of opportunistic aerobic and anaerobic bacteria, which, under the influence of various factors, begin to dominate over vaginal lactobacteria.

Despite numerous treatment regimens for bacterial vaginosis and nonspecific vaginitis, the frequency of their recurrence remains high. Recurrences of bacterial vaginosis account for more than 50% in the first year after treatment, and 30–40% of recurrences in the first three months after treatment [9, 13].

The occurrence of recurrences of the disease due to insufficient or incorrect therapy can lead to a decrease in the quality of life of patients. In this regard, there is a growing interest among researchers in studying the quality of life of patients, since it is an integral indicator that reflects the degree of adaptation of a person to the disease and the ability to perform their usual functions in accordance with their socio-economic status [14, 15].

Determining the quality of life became possible with the introduction into medical practice of a number of special questionnaires, the main purpose of which is to study the indicators of quality of life, such as COLS [15], which allows assessing various components of the patient's life during the illness.

Considering various aspects of abnormal vaginal discharge in nonspecific vaginitis, it should be noted that the literature does not sufficiently address issues related to the quality of life of patients.

Late presentation of patients, untimely detection of pathology, duration of therapy, re-

currence confirm the relevance of the problem of abnormal vaginal discharge in women of active reproductive age and encourage the search for new ways of therapy in order to improve their quality of life.

The above substantiates the relevance of abnormal vaginal discharge in nonspecific vaginitis in women of reproductive age and encourages their further study. The reason for this is the widespread use of antibacterial drugs of systemic and local action against anaerobes in nonspecific vaginitis, repeated courses of treatment, which contributes to the formation of reservoirs of multiresistant strains of opportunistic microorganisms such as *A. Vaginae* and *G. Vaginalis* and the creation of antibiotic-insensitive biofilms by these bacteria, which leads to 80% recurrence of the disease in the first year after taking antibiotics [16-18]. There is also no single treatment tactic for patients with abnormal vaginal discharge on the background of nonspecific vaginitis.

Thus, the treatment of patients with abnormal vaginal discharge in reproductive age requires the search for new ways to correct and restore the physiological state of the microbiocenosis of the vaginal biotope.

The development and implementation in clinical practice of qualitatively new methods of treatment of nonspecific vaginitis, which combine high efficiency with respect to conditionally pathogenic associated microflora, absence of damaging effect on biological structures of the macroorganism and lacto- and saprophytic autoflora, non-invasiveness, affordable cost and ease of use, is an urgent

task of modern gynecology and dermatovenereology.

Today, there are many different drugs for the treatment of nonspecific vaginitis, which are the cause of abnormal vaginal discharge [19, 20]. The most commonly used is the appointment of metronidazole 400-500 mg orally twice a day for 5-7 days, or intravaginally metronidazole gel 0.75% once a day for five days, or intravaginally clindamycin cream 2% once a day for seven days [7].

However, standard treatment protocols regarding the choice of systemic or local drugs, the duration of their administration, do not fully affect the pathogenetic links of the disease.

Thus, the priority area in the therapy of abnormal vaginal discharge and nonspecific vaginitis is, despite certain successes and the introduction of new technologies into gynecological practice, the issue of choosing the optimal treatment tactics. Today, this issue has not been finally resolved, which justifies the relevance of conducting research and studying alternative methods of therapy for patients in this cohort. The principles of therapy, based on achieving and maintaining control over abnormal vaginal discharge in nonspecific vaginitis, allow not only to significantly improve the quality of life, but also to reduce the frequency of complications and relapses in patients, especially inflammatory ones.

**Objective:** To improve the effectiveness of treatment and prevent recurrence of abnormal vaginal discharge in nonspecific vaginitis in women of reproductive age.

**Materials and Methods.** According to the aim of the study, 114 women aged 18-39 years with complaints of abnormal vaginal discharge were examined before and 3 months after standard treatment.

44 (38.6%) of the examined patients were diagnosed with bacterial vaginosis, 57 (50.0%) with aerobic vaginitis, 18 (15.8%) with vulvovaginal candidiasis, and 12 (10.5%) with trichomoniasis.

The control group included 31 healthy women without abnormal vaginal discharge and with no chronic somatic pathology of a similar age.

The study was approved by the ethics committee of the medical institution.

The main criteria according to which patients were included in the study:

- the presence of clinical and laboratory manifestations of nonspecific abnormal vaginal discharge due to four main causes: bacterial vaginosis, aerobic vaginitis, vulvovaginal candidiasis and trichomoniasis;

- age 18-39 years;

- informed consent signed by the patient to participate in the study.

The exclusion criteria from the study were:

- the presence of other possible causes of abnormal vaginal discharge (gonorrhoea, chlamydia and other sexually transmitted infections; pelvic inflammatory disease, non-infectious causes);

- refusal of dynamic observation;

- women with severe concomitant somatic and mental illnesses.

All patients were examined according to existing standards, which included anamnes-

tic, clinical, microscopic and microbiological examination methods.

Treatment of abnormal vaginal discharge was carried out according to the standard [7]. For the treatment of bacterial vaginosis, a 5-7-day course of metronidazole (topical or oral) or a 7-day course of clindamycin intravaginally was prescribed; for the treatment of aerobic vaginitis, clindamycin was used topically. As a therapy, women suffering from vulvovaginal candidiasis received antifungal drugs from the group of imidazole derivatives orally or intravaginally, and in case of recurrent vulvovaginal candidiasis, the initial course of treatment was started with imidazole derivatives followed by long-term maintenance therapy with this group of drugs. In case of trichomoniasis, treatment was carried out with antiprotozoal drugs from the group of imidazole derivatives, in case of recurrent or persistent forms - repeated courses of treatment with imidazole derivatives in a higher dose were carried out. A mandatory condition for confirming the diagnosis of trichomoniasis was treatment of the sexual partner and abstinence from sexual intercourse until the end of therapy. In addition, in the complex treatment of abnormal vaginal discharge, topical combined antimicrobial and antiseptic drugs such as chlorhexidine, octenidine, povidone-iodine and probiotics were used.

All women underwent bacteriological examination of vaginal discharge and feces before treatment and after 3 months.

To clarify some pathogenetic links of the mentioned pathology, we assessed the energy

and functional metabolism of immunocompetent blood cells by determining the features of carbohydrate metabolism in immunocompetent cells of peripheral blood: lymphocytes and granulocytes (neutrophils, eosinophils, basophils, among which neutrophils are the majority) in the dynamics of treatment using histochemical studies with the use of a Periodic Acid - Schiff (PAS) reaction of preparations with amylase for differentiation of glycogen and other glycoproteins.

The results were recorded by a semi-quantitative method according to the intensity of staining: 3 (+++) - red staining, 2 (++) - pink-red, 1 (±) - pale pink, 0 (-) - no staining.

The state of activity of enzymes of energy metabolism of lymphocytes succinate dehydrogenase (LDH) was studied according to Nartsisov R.P. [21] and hydrolytic enzyme acid phosphatase (AF) was studied based on their cytochemical study in granulocytes and lymphocytes of blood cells in patients with abnormal vaginal discharge in the dynamics of treatment according to Goldberg Barka [22]. The obtained results were evaluated by a semi-quantitative method, with the calculation of the average cytochemical coefficient (CCC). The average cytochemical coefficient (CCC) is calculated by the Kaplow formula (According to Kaplow).

Interleukins IL-1 ( $\beta$ ), IL-4, IL-8, IL-10 were determined by the method of enzyme immunoassay.

The psychological state of the patients was assessed by the level of personal anxiety according to the Spielberger-Khanin scale, the level of situational anxiety according to the

Spielberger-Khanin scale, the level of neuroticism according to L.I. Wasserman, and the level of depression according to the Beck scale [15].

The quality of life of patients with abnormal vaginal discharge was determined by the standard CQLS questionnaire [15], which assessed 10 indicators to which the patients responded regarding satisfaction within 3 months. Each indicator was assessed in points from 0 (unfavorable indicator) to 10 (the most favorable), and an integrative indicator was used for analysis.

The obtained results were statistically processed using standard computer programs using the paired Student's t-test with the calculation of the arithmetic mean (M) and the standard error of the arithmetic mean (m) or the Wilcoxon signed test depending on the normality of the distribution of differences. The normality of the data distribution was checked using the Shapiro-Wilk test at a significance level of 0.01. When using all statistical methods, except for the Shapiro-Wilk test, the significance level was taken equal to 0.05 - the difference between the data was considered significant at  $p < 0.05$ .

**Results and Discussion.** Analyzing the results, it was found that all patients had classic manifestations of anovulatory vaginal discharge. Before the start of treatment, the complaint concerned vaginal discomfort in 65.8% of patients; irritation - in 72.8%; heartburn - in 51.8%; itching - in 72.8%; edema - in 41.2%; hyperemia - in 61.4%; dyspareunia - in 71.9%; dysuria - in 28.9%; signs of inflammation - in 53.5%. When determining

pH, an increase of more than 5 was observed in 91.2%; aminotest with 10% CI - in 44.7%.

3 months after the start of treatment, the women were re-examined. At the time of the re-examination, the clinical picture was significantly better than before the start of treatment. Thus, vaginal discomfort was noted in 22.8% of patients; irritation - in 21.1%; heartburn - in 27.2%; itching - in 36.0%; edema - in 14.0%; hyperemia - in 24.6%; dyspareunia - in 41.2%; dysuria - in 12.3%; vaginal discharge - in 18.4%; signs of inflammation - in 13.2%; pH more than 5 - in 21.9%; aminotest with 10% CI - in 7.9%. In 36 (31.6%) patients, relapses of the disease were observed, which required repeated courses of therapy.

The presence of complaints of abnormal vaginal discharge, clinical manifestations and recurrences of nonspecific vaginitis three months after the start of treatment requires the search for pathogenetic changes that do not allow the clinical signs of the pathological process to be completely eliminated.

In order to search for probable pathogenetic disorders in patients with abnormal vaginal discharge and their subsequent correction, we studied the vaginal microbiocenosis before and after 3 months from the start of treatment. Taking into account the probability of simultaneous microbiota disorders, the microbiological composition of the intestine was studied before and after 3 months from the start of treatment. The results obtained are presented in Table. 1-2.

As can be seen from Table 1, in patients with abnormal vaginal discharge before the start of treatment, compared with healthy

subjects, a statistically significant decrease in the vaginal secretion of *Lactobacillus* spp. and an increase in the content of *Escherichia coli*, *Proteus*, *Clostridium* spp., *Staphylococcus* spp., *Streptococcus* spp., yeast-like fungi of the genus *Candida*, *Gardnerella vaginalis*, *Mobiluncus* spp. was observed, which indicates a significant imbalance of the vaginal microflora in patients of this cohort. In patients, the beneficial flora was replaced by pathogenic and conditionally pathogenic.

The results of the examination of women with abnormal vaginal discharge, conducted three months after the start of treatment, are noteworthy, which showed a significant improvement in the qualitative composition of the vaginal biotope by all indicators, but, despite the significant improvement, complete normalization of the vaginal microbiome did not occur. Thus, compared with the control group, 3 months after the start of treatment, there was a statistically significant decrease in the vaginal secretion of *Lactobacillus* spp. and an increase in *Escherichia coli*, *Staphylococcus* spp., *Streptococcus* spp., *Gardnerella vaginalis*, *Mobiluncus* spp., and yeast-like fungi of the genus *Candida* (Table 1).

Numerous epidemiological studies reflect the increasing prevalence of abnormal vaginal discharge in modern conditions, which is characterized by an association with various diseases of the gastrointestinal tract and, first of all, with disorders of the intestinal microbiocenosis. However, microbiological examination of the intestine in such patients is unreasonably rare. In this regard, we conducted a study of the intestinal microbiocenosis in

**Table 1. Vaginal microbiocenosis of patients (lgCFU/ml)**

Microorganisms	Control group	Patients	
		before treatment	3 months after the start of treatment
Lactobacillus spp.	7,1±0,27	4,5±0,27*	5,8±0,24*●
Escherichia coli	2,5±0,18	5,0±0,28*	3,7±0,21*●
Proteus	1,5±0,21	3,0±0,26*	2,1±0,24●
Clostridium spp.	1,5±0,23	3,2±0,27*	1,9±0,30●
Staphylococcus spp.	2,1±0,25	5,7±0,34*	3,1±0,30*●
Streptococcus spp.	2,0±0,22	3,8±0,31*	3,0±0,29*
Corynebacterium spp.	1,9±0,23	2,6±0,18	2,1±0,15
Гриби рода Candida	1,6±0,16	4,1±0,29*	2,9±0,31*●
Gardnerella vaginalis	1,8±0,17	5,7±0,31*	3,5±0,28*●
Mobiluncus spp.	2,0±0,21	5,5±0,38*	3,5±0,21*●

**Notes:** \* – significant difference (P <0.05) compared to the control group; ● – significant difference (P <0.05) before and 3 months after the start of treatment.

**Table 2. Intestinal microbiocenosis in patients (lgCFU/g)**

Microorganisms	Control group	Patients	
		before treatment	3 months after the start of treatment
Bifidobacteria	9,0±0,24	7,87±0,18*	8,25±0,22*
Lactobacilli	7,1±0,24	6,06±0,34*	6,45±0,17*
Staphylococcus	1,7±0,33	2,24±0,42	1,97±0,29
Streptococcus	6,2±0,37	6,54±0,34	6,40±0,31
Escherichia coli	7,6±0,41	7,48±0,45	7,26±0,39
Non-fermenting Escherichia coli	0,4±0,12	1,74±0,25*	0,96±0,15*1
Proteus	0,4±0,13	1,14±0,2*	0,62±0,17
Enterobacter	1,9±0,18	2,57±0,21	2,18±0,16
Candida fungi	1,0±0,21	1,54±0,26	1,15±0,21

**Notes:** \* – significant difference (P <0.05) compared to the control group; ● – significant difference (P <0.05) before and 3 months after the start of treatment.

women with abnormal vaginal discharge (Table 2).

In patients with abnormal vaginal discharge before treatment, a statistically significant decrease in the number of bifidobacteria and lactobacteria was found, compared with a group of healthy women. A significant difference was also found in the number of non-fermenting Escherichia coli, Prote-

us between patients with abnormal vaginal discharge and healthy women. There were trends in the number of staphylococci, enterobacter, and Candida fungi in patients with abnormal vaginal discharge compared with healthy women, which indicates the presence of intestinal dysbiosis in them. 3 months after the start of treatment, the examination noted a trend towards normalization of the intes-

tinal microbiome in this cohort of patients. But the presence of a statistically significant, in comparison with healthy, decrease in the number of bifido- and lactobacteria and an increase in the number of non-fermenting *Escherichia coli* indicates a microbial shift in the intestinal biota, the replacement of anaerobic flora with aerobic. In fact, there are still manifestations of dysbiosis, which must be taken into account when organizing the planning of medical care for patients with abnormal vaginal discharge and carrying out preventive measures.

Thus, the initial changes in the intestinal microbiocenosis, as well as the vagina in patients with abnormal vaginal discharge indicate the presence of a systemic process in the body, which proves the need for preventive measures aimed at restoring the microbiocenosis of the body.

It is important for making further decisions about treatment to clarify the nature of pathogenetic changes in patients with abnormal vaginal discharge and the relationships between various body systems, which play a significant role both in ensuring protective and adaptive reactions under the influence of extraordinary stimuli and in implementing adaptive and trophic processes in the tissues of organs that have been subjected to aggression. In this regard, to establish pathogenetic changes in patients of this cohort, the study determined the level of glycogen and glycoproteins, the activity of acid phosphatase and succinate dehydrogenase in immunocompetent cells of peripheral blood.

During the study, it was found that in patients with abnormal vaginal discharge, the result of the PAS reaction has a statistically significant lower staining of both lympho-

**Table 3. Indicators of the intensity of staining of blood granulocytes after performing histochemical PAS reaction with enzymatic control (amylase treatment), acid phosphatase activity of granulocytes**

Indicators, units of measurement	Control group	before treatment	Patients 3 months after the start of treatment
<b>Granulocytes</b>			
PAS reaction	1,32±0,07	0,80±0,06*	1,07±0,06*
Amylase and PAS reaction	0,75±0,07	0,46±0,05*	0,62±0,06
Color difference	0,57±0,06	0,34±0,03*	0,45±0,04*
KF	0,478±0,037	0,316±0,033*	0,394±0,037*
<b>Lymphocytes</b>			
PAS reaction	0,25±0,03	0,16±0,01*	0,20±0,02
Amylase and PAS reaction	0,15±0,02	0,10±0,01*	0,12±0,01
Color difference	0,10±0,01	0,06±0,01*	0,08±0,01
KF	0,281±0,031	0,214±0,023*	0,237±0,027
LDH, granule	25,7±0,09	22,5±0,06*	23,6±0,1*●

**Notes:** \* – significant difference (P <0.05) compared to the control group; ● – significant difference (P <0.05) before and 3 months after the start of treatment.

cytes and granulocytes (Table 3), which indicates a decrease in their glycogen level. The results obtained when assessing the staining under the influence of amylase indicate the presence of a decrease in the content of both glycogen and glycoproteins in lymphocytes and granulocytes.

Analyzing the data obtained in the dynamics of treatment of patients with abnormal vaginal discharge, we established a tendency to increase the color during standard treatment. The lack of complete normalization of the color indicates a long-term decrease in both glycogen and glycoproteins in them 3 months after the start of standard treatment. Long-term metabolic disorders in immunocompetent blood cells may be the cause of impaired immunity in patients with abnormal vaginal discharge and the development of relapses. This requires corrective measures to normalize metabolic processes in immunocompetent cells, which, probably, can be a way to recovery and prevent exacerbations.

Lymphocyte hydrolytic enzymes acid phosphatase (AP) and lymphocyte succinate dehydrogenase (LDH) provide various functional needs of an immunocompetent cell and allow us to judge the intensity of intracellular metabolic processes, and in combination with clinical symptoms of the disease, they are an indicator of the state of the immune process, complementing the results of traditional immunological and clinical studies.

Analysis of the activity of AP granulocytes, the majority of which were neutrophils, showed a decrease in its activity in patients with abnormal vaginal discharge before treatment (Table 3). In the dynamics of treatment, AP activity increased, but when using only standard treatment, it remained statistically significantly lower than in the healthy group.

It is known that the activity of hydrolytic enzymes ensures the role of neutrophils as the first line of cellular defense of the body. A decrease in the activity of hydrolysis processes indicates a corresponding manifestation of the functional activity of cells, bactericidal function, impaired phagocytosis, which contributes to the susceptibility to infection and the severity of inflammatory processes in women, including with abnormal vaginal discharge.

When studying the activity of AP lymphocytes in patients with abnormal vaginal discharge, similar changes were found, although less significant than in granulocytes. Perhaps this is due to the pathogenesis of the disease and the need to ensure phagocytosis of bacteria for vaginal sanitation.

The activity of LDH, which characterizes the energy supply of the cell in patients with abnormal vaginal discharge, was significantly lower than in the healthy group. During the treatment process, it increased in patients, but 3 months after the start of treatment it remained lower than in healthy ones. Considering that LDH is one of the key enzymes of metabolic oxidation, and its localization is associated with the inner membrane of mitochondria, the activity of LDH in this case reflects a decrease in the number of active mitochondria, the energy potential of cells and their functional state.

The detected disturbances in the activity of energy supply and hydrolysis enzymes in granulocytes and blood lymphocytes reflect a decrease in the functional activity of these cellular elements, which may affect their provision of bactericidal and immunological protection in patients with abnormal vaginal discharge, as well as contribute to a more severe course and exacerbation of the disease. The

**Table 4. Interleukin levels in patients with abnormal vaginal discharge**

Indicators, units of measurement	Control group	Patients	
		before treatment	3 months after the start of treatment
IL-1 ( $\beta$ ), pg/ml	35,8 $\pm$ 2,07	71,9 $\pm$ 3,46*	52,7 $\pm$ 2,86*
IL-4, pg/ml	22,7 $\pm$ 1,61	34,1 $\pm$ 1,94*	28,1 $\pm$ 1,73*
IL-8, pg/ml	18,7 $\pm$ 1,7	65,4 $\pm$ 3,7*	29,7 $\pm$ 2,9*●
IL-10, pg/ml	14,3 $\pm$ 1,7	25,8 $\pm$ 1,9*	20,4 $\pm$ 2,2*

**Notes:** \* – significant difference ( $P < 0.05$ ) compared to the control group; ● – significant difference ( $P < 0.05$ ) before and 3 months after the start of treatment.

detected changes in the PAS reaction, LDH and acid phosphatase activity, which determine the nature of the functional activity of granulocytes and lymphocytes, are of great importance for the development of therapeutic strategies for the treatment of patients.

Of particular interest was the study of interleukins, which take an active part in the body's immune response and the inflammatory process, which is a pathogenetic mechanism of the development and course of abnormal vaginal discharge. The results of the quantitative study of interleukins are presented in Table 4. In patients with abnormal vaginal discharge, a statistically significant increased level of the studied interleukins was found. After 3 months from the start of standard treatment, a decrease in the concentration of interleukins was observed, but its level remained elevated compared with the results obtained in healthy subjects.

Of interest were the relationships between pro- (IL-1 ( $\beta$ ), IL-8) and anti-inflammatory interleukins (IL-4, IL-10), the concentration of which was increased before the start of treatment and decreased 3 months after the start of therapy. Since the normal values of various interleukins in the blood serum of the control group were different, we converted the concentration of interleukins into percent-

ages (the average concentrations of the corresponding interleukins in healthy subjects were taken as 100 percent). This allowed us to obtain the average values in percentages of pro- and anti-inflammatory interleukins and calculate their ratio. It was found that the increase in the level of pro-inflammatory interleukins before the start of treatment in patients with abnormal vaginal discharge was 2.75 times, while anti-inflammatory interleukins were only 1.92 times higher than in the control group (the ratio of pro-inflammatory and anti-inflammatory interleukins was 1.43, which explains the presence of an inflammatory process in these patients. After 3 months of treatment, despite the decrease in the level of pro-inflammatory interleukins, their ratio with anti-inflammatory interleukins remained 26% higher.

The results obtained indicate the prevalence of pro-inflammatory interleukins in patients with abnormal vaginal discharge, which leads to a violation of the immune response and the development of a long-term inflammatory process.

During the study, we paid great attention to determining the features of the psychological state of patients with abnormal vaginal discharge, the results of which are presented in Table 5. As can be seen from Table 5, in

patients with abnormal The level of personal anxiety was the same in patients with vaginal discharge and healthy individuals. This is due to the fact that personal anxiety is formed at an early age and has a certain stability.

As can be seen from Table 5, if the average value of the integral indicator of personal anxiety in patients with abnormal vaginal discharge corresponded to a moderate level of anxiety, then situational anxiety reached a high level. Reactive anxiety in patients with this pathology is due to high situational tension, concern and anxiety.

Patients with abnormal vaginal discharge had a significantly higher level of neuroticism compared to healthy women (Table 5). Thus, the integral indicators of neuroticism according to L.I. Wasserman in healthy women corresponded to a low level, while in patients with abnormal vaginal discharge they corresponded to neuroticism of medium severity. This indicates an increase in their emotional excitability, as a result of which negative experiences arise, such as anxiety, tension, irritability, confusion. A hypochondriac fixation

on somatic sensations arises. This can lead to a deterioration in the quality of life of patients.

At the same time, women with abnormal vaginal discharge had a significantly higher level of the integral depression index on the Beck scale compared to healthy individuals (Table 5), while healthy individuals on average did not have signs of depression. At the same time, the average score on the Beck scale in patients with abnormal vaginal discharge corresponded to a state of subdepression.

Thus, during the study, we identified some features of the psychological state of patients with abnormal vaginal discharge, which were characterized by fluctuations in situational anxiety, increased levels of neuroticism and depression.

One of the important criteria for assessing the effectiveness of long-term treatment results and relapse prevention is the quality of life of patients. In this regard, we determined the indicators of quality of life in patients with abnormal vaginal discharge.

**Table 5. Levels of situational and personal anxiety, neuroticism, and depression**

Indicators, units of measurement	Control group	Patients	
		before treatment	3 months after the start of treatment
Level of personal anxiety according to the Spielberger-Khanin scale, points	37,9±0,38	38,1±0,38	38,0±0,29
Level of situational anxiety according to the Spielberger-Khanin scale, points	38,4±0,48	42,5±0,29*	40,7±0,43*1
Level of neuroticism according to L.I. Wasserman, points	4,2±0,23	7,6±0,23*	5,9±0,37*1
Level of depression according to the Beck scale, points	3,1±0,37	7,8±0,38*	5,2±0,37*1

**Notes:** \* – significant difference (P <0.05) compared to the control group; ● – significant difference (P <0.05) before and 3 months after the start of treatment.

It was found that in patients before treatment, the integral indicator of quality of life according to O.S. Chaban was significantly lower ( $58.7 \pm 1.8$ ) than in healthy subjects ( $73.4 \pm 1.6$  points), which indicates a negative impact of the disease on the quality of life. 3 months after the start of standard treatment, the value of the integral indicator of quality of life according to O.S. Chaban significantly increased ( $64.2 \pm 1.4$ ), but remained lower than in healthy subjects. The above indicates that standard therapy of patients with abnormal vaginal discharge for 3 months does not provide normalization of quality of life and indicates the need to involve additional measures in the treatment process to improve the quality of their life and, possibly, a longer treatment and prevention process in order to improve the quality of life.

Thus, the results of the study highlighted above indicate that the main causes of abnormal vaginal discharge in the examined women were bacterial vaginosis, aerobic vaginitis, vulvovaginal candidiasis and trichomoniasis. Analyzing the results obtained, it was found that before the start of treatment, patients had complaints of pathological vaginal discharge, dyspareunia, irritation, itching, hyperemia. The course of the disease was accompanied by disturbances in the state of the vaginal and intestinal microbiome, which is likely a manifestation of dysbiosis of the whole organism. Even 3 months after the start of treatment, women still have manifestations of dysbiosis, which must be taken into account when organizing the planning of medical care for patients with abnormal vaginal discharge and carrying out preventive measures.

In this regard, it is important to determine some pathogenetic features of the disease in women of this cohort to improve approaches

to therapy and prevention of relapses. During the study, patients with abnormal vaginal discharge were found to have impaired activity of energy supply and hydrolysis enzymes in granulocytes and blood lymphocytes, which reflect a decrease in the functional activity of these cellular elements, which may affect their provision of bactericidal and immunological protection in patients with abnormal vaginal discharge, as well as contribute to a more severe course and exacerbation of the disease. The results obtained indicate the prevalence of pro-inflammatory interleukins in patients with abnormal vaginal discharge, which leads to a violation of the immune response and the development of a prolonged inflammatory process.

The examination conducted before the start of therapy and after 3 months revealed some features of the psychological state of patients with abnormal vaginal discharge, which were characterized by fluctuations in situational anxiety, increased levels of neuroticism and depression.

Quality of life indicators in patients with abnormal vaginal discharge remain low even 3 months after standard therapy, indicating the need for additional measures and, possibly, a longer treatment and prevention process to improve quality of life.

**Conclusion.** The course of abnormal vaginal discharge is accompanied by a violation of the biocenosis not only of the vagina, but also of the intestine, as well as metabolic disorders of immunocompetent cells of the peripheral blood, an increase in the level of serum interleukins, the prevalence of pro-inflammatory interleukins over anti-inflammatory, disorders of the psychological state (increased situational anxiety, neuroticism and depression), a decrease in the quality of

life. After 3 months from the start of standard therapy, women with abnormal vaginal discharge, compared with the data before treatment, have better results of the biocenosis not only of the vagina and intestine, but also a decrease in metabolic disorders of immunocompetent cells of the peripheral blood, a decrease in the levels of serum interleukins, a decrease in the prevalence of pro-inflammatory interleukins over anti-inflammatory, an improvement in the psychological state and quality of life. The obtained results of the study indicate the need for longer-term measures than those provided for by the standard of medical care, aimed at normalizing the microbiome of vaginal secretions and the intestine, the metabolism of immunocompetent cells in peripheral blood, serum interleukin levels, the relationship between pro-inflammatory and anti-inflammatory interleukins, psychological state (situational anxiety, neuroticism and depression), and quality of life.

Prospects for further scientific research are to continue the study of nonspecific vaginitis in women in order to develop highly effective treatment methods.

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**FINANCING**

There was no financial support.

**ФИНАНСИРОВАНИЕ**

Финансовой поддержки не было.

**CONFLICT OF INTEREST**

The authors declare no conflict of interest.

**КОНФЛИКТ ИНТЕРЕСОВ**

Авторы заявляют об отсутствии конфликта интересов.

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