Age peculiarities of intestinal microbiocenosis disorders in the patients with ulcerative colitis and Crohn’s disease

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Abstract. Background. Inflammatory bowel diseases (IBD) such as ulcerative colitis (UC) and Crohn’s disease (CD) remain one of the most difficult and challenging gastroenterology problems. The impact of intestinal microflora and its changes on the development and progression of IBD has not been studied enough. The most dominant etiological hypothesis is that IBD is the result of an abnormal immune response to an altered intestinal microbiota caused by an environmental factor or pathogenic microorganisms in a genetically predisposed host. Altered gut microbiota dysbiosis in IBD is generally recognized, but the dependence of this change on the age still needs to be studied. The purpose of the study is to investigate the peculiarities of intestinal dysbiosis and the frequency of small intestinal bacterial overgrowth (SIBO) in patients with IBD depending on nosology and age.

Materials and methods. One hundred and twenty patients with IBD aged 19 to 79 years (average (43.90 ± 1.40) years) were examined; among them 83 patients had UC, and 37 ones had CD. All patients were divided into two groups according to nosology and age. The patients underwent a hydrogen breath test to detect SIBO, bacteriological examination of feces, and short-chain fatty acid (SCFAs) chromatography in coprofiltrate. Results. The profound qualitative and quantitative changes of the colon microflora and high frequency of SIBO in patients with IBD were revealed. The dependence of changes in the microflora composition of the small and large intestine in a patient on age and nosology was discovered. The decrease in the concentration of Bifidobacteria in the content of the colon was found mostly in young patients with CD, while the decrease in the number of Lactobacilli was mostly found in elderly patients in both groups. The frequency of hemolytic biovars of Escherichia coli, opportunistic enterobacteria, and fungi of the genus Candida in the colon increased with age. There were changes in both the total content and indices of some SCFAs in patients of both groups versus healthy persons that indicated the suppression of the metabolic activity of normal microflora in patients. Decreased levels of acetic and butyric acid indicated the severity of suppression of the production of these metabolites.

Conclusions. The elderly patients were found to have a greater tendency to develop SIBO, a decrease in the colon Lactobacilli concentration, as well as an increased frequency of detection of conditionally pathogenic flora and fungi of the genus Candida. In young patients, there is mainly a subcompensated form of dysbiosis with a decrease in the concentration of Bifidobacteria. With age, there is also suppression of acetic and butyric acid production. The results of this study will allow clinicians to select therapeutic tactics in these patients more carefully, namely, will influence the choice of drugs that modulate the intestinal microbiota, taking into account not only the nosology but also the patient’s age.

Keywords: inflammatory bowel disease; intestinal microflora; small intestinal bacterial overgrowth; short-chain fatty acids; ulcerative colitis; Crohn’s disease
Introduction

Crohn’s disease (CD) and ulcerative colitis (UC), known as chronic inflammatory bowel disease (IBD), are multifactorial, potentially debilitating diseases with probable genetic heterogeneity and unknown etiology. The steady increase in morbidity and prevalence of IBD on almost all continents make researchers consider IBD as one of the main important global health problems [1].

Unfortunately, the exact etiology of IBD remains unclear, and effective treatment is still not found. Today, the most accepted hypothesis of the pathogenesis of CD is the complex interactions between environmental factors, the immune system, and the microbial flora in a genetically predisposed person, which lead to aberrant nominal reactions and chronic inflammatory bowel disease [2]. It is believed that an inappropriate immune response to altered microbiota (or pathogenic microorganisms) under the influence of environmental factors contributes to the development of IBD.

It is known that the intestinal microbiota in healthy people has many benefits for the health of the host, in terms of protection against pathogens, for the nutrition, metabolism, and the immune system. Microbiota with more than 100 trillion microorganisms is involved in the fermentation of complex undigested polysaccharide polymers, the production of short-chain fatty acids (SCFAs), the synthesis of vitamins, energy production, the integrity of the intestinal mucosa, and pathogens. Numerical studies have shown that a patient with IBD shows significant changes in the composition of the microbiota compared with a healthy individual [4, 5].

The patients with UC and CD have a higher content of opportunistic and pathogenic flora (Bacteroides spp., Eubacterium spp., and others) in conditions of chronic inflammation and reduced content of beneficial bacteria that maintain the stability of the normal microflora of the gastrointestinal tract [6]. As a result, the production of some metabolites, including short-chain fatty acids, such as butyrate, propionate, and acetate, is reduced. These SCFAs are associated with the excitation of anti-inflammatory and antitumor reactions that promote the growth of intestinal epithelium. Butyrate is considered to be the main source of energy for the intestinal epithelium and helps to produce mucin (gel-like inner layer) in the lumen, which sets the physical barrier. SCFAs deficiency leads to atrophy of the epithelium and inflammation of the mucosa [7]. Recently, the most informative and reliable method of diagnosing intestinal dysbiosis (90–95% reliability) is the method of gas chromatography to determine the absolute and relative content of SCFAs in coprofiltrate, which allows in a short time to assess structural changes and metabolic activity of intestinal microflora [8].

Another manifestation of intestinal dysbiosis in patients with IBD is the syndrome of small intestinal bacterial overgrowth (SIBO). The causes that can lead to a violation of the microbiocenosis of the small intestine may be such as dysfunction of the ileocecal valve (common in patients with CD), taking nonsteroidal anti-inflammatory drugs, starvation, stress, infectious, and non-communicable diseases, enzymopathy (lactase, gluten deficiency) and some other factors [9]. Diagnosing SIBO is quite long and troublesome. An alternative to the costly and painstaking aspiration method for detecting SIBO, which requires special equipment and culture, is the hydrogen breath test (HBT) with glucose loading. The test is quite simple to perform and has a high specificity, which successfully allows introducing this method in routine clinical practice.

It should be noted that the intestinal microbiota changes not only under the disease influence but also with age. Studies show that the species composition of the intestinal microbiota in elderly people differs from the composition in young ones. There is also no chronological threshold or age at which the composition of the microbiota suddenly changes; the changes occur gradually under the influence of the external factors (environment, stress, diet, and health, as well as under the influence of drugs, etc.) [10].

Given that current therapy for IBD is focused mainly on suppressing the immune system and is not always effective, there is a need to develop and apply other treatment methods. Some authors believe that dietary recommendations, with a known ability to modulate the intestinal microbiome, as well as the use of prebiotics, probiotics, antibiotics, and/or fecal transplants, are a unique opportunity to improve IBD treatment outcomes [11, 12].

In connection with the above, the aim of our study is to determine the severity of dysbiotic disorders of the quantitative and qualitative composition of the colon microflora, as well as the SIBO frequency in patients with IBD depending on nosological forms and age.

Materials and methods

We examined 120 patients with IBD aged 19 to 79 years (average 43.90 ± 1.40 years), among them 83 patients with UC and 37 ones with CD. All patients were divided into two groups according to nosology and age (according to the WHO classification: from 25 to 44 years — young age, 45–59 years — middle age, 60–75 years — old age). The young group included 66 patients, the middle age group consisted of 30 patients, and the elderly group included 24 patients.

To determine the state of the microbiota of the small intestine, namely SIBO presence, a hydrogen breath test with glucose loading was performed using a gas analyzer Gasro’ Gastrolyzer from Bedfont Scientific Ltd (UK). The method is based on measuring the concentration of hydrogen in the air exhaled by a patient after ingestion of glucose solution (50 g per 250 ml of water), at regular intervals (0, 15, 30, 45, and 60 minutes). Hydrogen (H₂), which is formed in the intestinal lumen as a result of metabolic activity of the existing microflora, absorbs, enters the systemic bloodstream, and then excreted by the lungs as a component of exhaled air. The threshold level of hydrogen evolution is 10 ppm. In the presence of an increased amount of anaerobic microflora, there is an increase in the concentration of H₂ in the exhaled air. An increase in its level compared to the initial by 10 ppm or more indicates that a patient has a syndrome of bacterial overgrowth. The study was conducted under the standards [13].
Microbiological research methods

The studies of the species and quantitative composition of the colon microflora were performed by sowing ten-fold dilutions (10^{−1}–10^{−9}) on a standard set of selective and differential diagnostic nutrient media for the isolation of aerobic and anaerobic microorganisms. Gradation of deviations in the composition of the intestinal microflora was carried out in three stages: I degree — compensated dysbiosis (D I), mild; II degree — subcompensated (D II), average; III degree — uncompensated (D III), severe dysbiosis.

Short-chain fatty acid chromatography in the patient’s coprofiltrate was performed on a Crystal-5000 chromatograph according to the method of Guohua Zhao (2006). The control values of the content of QLC in the feces were: acetic acid (C2) — 0.013–0.028 μl/ml, propionic acid (C3) — 0.0043–0.0057 μl/ml, butyric acid (C4) — 0.00068–0.0008 μl/ml.

Statistical methods

To optimize the findings and automate data processing, the obtained indicators were entered into a database management system built using an integrated application package Statistica for Windows 6.0.

Descriptive and inductive statistics were used for statistical data analysis. The comparison of the average values of the variables was carried out using parametric methods (Student’s t-test) with a normal distribution of these features, expressed in the interval scale. Differences between the two indicators were considered probable at p < 0.05. The conformity of the type of distribution of the features of the normal distribution was checked using the Shapiro-Wilk method. In other cases, a nonparametric method (Mann-Whitney U test) was used. The χ² test was used to compare the particle distribution of two or more variables. The correlation analysis was performed according to Pearson (for data expressed in interval scales) and according to Spearman (for data expressed not in interval scales). All calculations were performed in SPSS 9.0 for Windows.

All measuring equipment used in the work were metrologically verified in the prescribed manner.

Results

The analysis of the frequency of SIBO detection showed that the changes in the state of the microflora of the small intestine were observed in 62.5 % of patients with IBD in equal proportion by nosology.

The analysis of HBT indicators depending on age showed that the largest changes in the concentration of hydrogen in exhaled air were observed in elderly patients (Table 1).

At the same time, significant differences were concerned with the compared results of young and elderly patients with UC and CD (p < 0.05).

Thus, a larger number of patients with IBD are characterized by disorders in the microbiocenosis of the small intestine in the form of SIBO, which were significantly dependent on age and prevailed in elderly patients.

The study of the state of the colon microbiocenosis was performed in 114 patients with IBD. Among them, there were 80 patients with UC and 34 patients with CD. The young group included 62 patients, the middle-age group consisted of 30 patients, and 22 men were in the elderly group.

Table 1 — Indicators of HBT in the studied patients (ppm), M ± m

| Measurement time, min | IBD (n = 120) | UC (n = 83) | CD (n = 37) |
|-----------------------|--------------|-------------|-------------|
|                       | young age (n = 66) | middle age (n = 30) | elderly age (n = 24) | young age (n = 43) | middle age (n = 22) | elderly age (n = 18) | young age (n = 23) | middle age (n = 8) | elderly age (n = 6) |
| 0                     | 10.3 ± 2.1 | 7.2 ± 2.1 | 6.7 ± 2.1 | 7.5 ± 1.1 | 8.2 ± 2.6 | 8.1 ± 2.0 | 6.5 ± 3.6 | 7.4 ± 2.9 | 11.5 ± 1.9 |
| 15                    | 19.7 ± 1.6 | 15.8 ± 1.7 | 15.8 ± 1.7 | 14.9 ± 2.7 | 16.1 ± 1.2 | 16.1 ± 1.2 | 14.9 ± 1.4 | 13.5 ± 1.3 | 14.3 ± 2.1 |
| 30                    | 27.8 ± 2.6 | 16.7 ± 1.9 | 36.7 ± 1.9 | 24.3 ± 2.6 | 22.2 ± 1.9 | 28.2 ± 1.9 | 22.2 ± 1.8 | 14.3 ± 2.1 | 25.1 ± 3.3 |
| 45                    | 23.4 ± 2.2 | 28.2 ± 3.2 | 39.2 ± 3.2 | 29.6 ± 2.5 | 28.1 ± 3.0 | 39.1 ± 3.0 | 20.1 ± 3.3 | 15.1 ± 3.3 | 41.6 ± 2.8 |
| 60                    | 17.5 ± 2.9 | 12.5 ± 2.1 | 22.5 ± 2.1 | 18.7 ± 3.2 | 14.6 ± 2.8 | 34.6 ± 2.8 | 15.7 ± 2.8 | 11.6 ± 2.8 | 32.4 ± 2.7 |
| Mean                  | 21.8 ± 2.3 | 14.1 ± 2.4 | 24.4 ± 2.4 | 21.4 ± 3.1 | 17.8 ± 2.3 | 25.2 ± 2.3 | 24.6 ± 2.6 | 12.4 ± 2.7 | 25.4 ± 2.9 |

Note. * — p < 0.05 — significance of differences between HBT indices in patients with UC and CD depending on age.

Figure 1 — Frequency of SIBO depending on age
The results of the microbiological studies of the colon content in patients with IBD showed the presence of profound changes in the qualitative and quantitative composition of the microflora in 99.1% of patients.

As can be seen from Table 2, the patients with subcompensated and decompensated forms of dysbiosis predominated among young patients, while subcompensated and decompensated forms of dysbiosis were defined in the same number of patients in elderly individuals.

According to the nosological feature, 75.0% of patients with CD had a compensated form of dysbiosis, 44.4% of patients with IBD experienced subcompensated dysbiosis.

The distribution of patients depending on age and nosology is shown in Table 2.

The average number of microorganisms in the colon content depending on age and nosology are shown in Table 3. According to the obtained data, there are significant differences in the composition of the patients’ normal colon flora in all study groups. The decrease in the concentration of *Bifidobacteria* in the colon content was found mostly in young-aged patients with IBD, while the decrease in the number of *Lactobacilli* was revealed in 90.9% of elderly patients, namely in all patients with CD and in 88.9% of elderly patients with UC.

The frequency of isolation of yeast-like fungi of the genus Candida was almost the same in patients with IBD. However, it should be noted that in patients with UC the frequency of detection of fungi of the genus Candida increased with increasing age of patients. Besides, in the group of elderly patients, the frequency of detection of conditionally pathogenic flora was higher.

### Study of the content of short-chain fatty acids in feces

We investigated the content of SCFAs C2-C4 in the feces for a more detailed study of intestinal microbiocenosis disorders in patients with IBD. Using gas chromatography, we studied coprofiltrates in 49 patients with IBD, among them, there are 35 patients with UC and 14 individuals with CD.

There are 24 patients in the young-aged group, 12 patients in the middle-aged, and 13 men in the elderly groups.

### Table 2 — The state of colon microbiocenosis in patients with IBD depending on age and nosology

| Group | Total | Norm | Grade of colon microbiocenosis |
|-------|-------|------|-------------------------------|
|       |       |      | the first | the second | the third |
|       | N     | %    | N          | %          | N          | %          |
| IBD   | 114   |      |            |            |            |
| young age | 62  | 100 | 1 | 1.6 | 18 | 29.0 | 30 | 48.4 | 13 | 21.0 |
| middle age | 30  | 100 | 0 | 0    | 9  | 30.0 | 10 | 33.3 | 11 | 36.7 |
| elderly age | 22 | 100 | 0 | 0    | 6  | 27.2 | 8  | 36.4 | 8  | 36.4 |
| CD    | 34    |      |            |            |            |
| young age | 22  | 100 | 1 | 4.5   | 6  | 27.3 | 10 | 45.5 | 5  | 22.7 |
| middle age | 8   | 100 | 0 | 0    | 1  | 12.5 | 2  | 25.0 | 5  | 62.5* |
| elderly age | 4  | 100 | 0 | 0    | 3  | 75.0 | 0  | 0    | 1  | 25.0 |
| UC    | 80    |      |            |            |            |
| young age | 40  | 100 | 0 | 0    | 12 | 30.0 | 20 | 50.0 | 8  | 20.0 |
| middle age | 22  | 100 | 0 | 0    | 8  | 36.4 | 8  | 36.4 | 6  | 27.2 |
| elderly age | 18 | 100 | 0 | 0    | 3  | 16.7 | 8  | 44.4 | 7  | 38.9 |

Note. * — p < 0.05 — the difference between the groups of patients of young and middle age with CD grade III dysbiosis ($\chi^2 = 4.18; p < 0.05$).

### Table 3 — The patients with altered concentrations of microorganisms depending on age and nosology

| Microorganism | IBD (n = 114) | CD (n = 34) | UC (n = 80) |
|---------------|---------------|-------------|-------------|
|               | young age     | middle age  | elderly age | young age | middle age | elderly age | young age | middle age | elderly age |
| *Bifidobacterium* | 30.7 | 23.3 | 13.6 | 31.8 | 50.0 | 0 | 30.0 | 13.6 | 16.7 |
| *Lactobacillus* | 82.3 | 86.7 | 90.9 | 68.2 | 87.5 | 100.0 | 90.0 | 86.4 | 88.9 |
| *Candida* | 35.5 | 40.0 | 36.4 | 36.4 | 62.5 | 0 | 35.0 | 31.8 | 44.4 |
| Conditionally pathogenic flora | 37.1 | 36.7 | 40.9 | 50.0 | 50.0 | 25.0 | 30.0 | 31.8 | 44.4 |
Depending on the age of patients with IBD, there was the suppression of the metabolic activity of normal microflora, which manifested itself in the changes of both the total content and indices of some SCFAs versus healthy individuals (Tables 4–6).

Thus, the level of acetic acid (C2) in 100% young-aged, middle-aged, and elderly patients with IBD was reduced versus control (p < 0.001). This fact indicated a pronounced inhibition of the producers of this metabolite, which was confirmed microbiologically. Hemolytic Escherichia coli biovars were sown in patients with IBD, moreover, their domination over Escherichia coli with normal enzymatic activity was observed. It should be noted that the decrease in acetic acid was significant with age. Indices of propionic acid (C4) in all groups tended to increase in comparison with the control, and butyric acid (C4) decreased in middle-aged and elderly patients.

An increased anaerobic index (AI) indicates the shift in the redox balance aside of oxidized acids. (Note. AI is the ratio of the sum of concentrations (C) of reduced acids to less reduced: (C propionic + C butyric) / C acetic (Gunzalus I., Steiner R., 1963)). In our opinion, such AI changes...
can be explained by the simultaneous suppression of the production of all SCFAs, which means structural and metabolic intestine imbalance because of disease progression. In young-aged and elderly patients, the AI increased and was 1.57 and 1.46, respectively, which reflected the suppression mainly of acetic acid (E. coli and anaerobic populations) (Fig. 2).

It was determined that synthesis, absorption, and utilization of SCFAs with the length of carbon atoms C2-C4 was disrupted in patients with IBD, regardless of nosology, but depending on age. That is why the content and especially the ratio of individual SCFAs in coprofiltrate had different changes.

Therefore, multidirectional deviations of these metabolites from the control can be the biochemical markers of structural and functional disorders of the intestinal microbiocenosis. Taking into account the above, the determination of SCFAs can have diagnostic and prognostic significance.

Conclusions

The profound changes in the qualitative and quantitative composition of the colon microflora were in 99.1 % of patients and SIBO in 62.5 % of ones with IBD. The dependence of microflora changes of the small and large intestine in patients on age and nosology was revealed. 95.8 % of elderly patients had SIBO, which was revealed almost 2 times less in middle-aged and young-aged patients.

There was subcompensated dysbiosis in young-aged patients, while middle-aged and elderly patients had more often decompensated dysbiosis. The decrease in the Bifidobacteria concentration in the colon was found mostly in young-aged patients with CD, while the reduced Lactobacillus level was mostly found in elderly patients in both nosology groups. The frequency of hemolytic biovars of Escherichia coli, conditionally pathogenic flora, and fungi of the genus Candida also increased with age.

Depending on the age of patients with IBD, there were changes in both the total content and indices of some SCFAs compared with healthy people, which indicated the suppression of the metabolic activity of normal microflora. Thus, 100 % of patients had a reduced level of acetic acid (C2) versus control, which indicated a pronounced inhibition of the production of this metabolite, namely Escherichia coli with normal enzymatic activity. Butyric acid (C4), which is an energy substrate for colon epitheliocytes, was reduced in middle-aged and elderly patients that indicated the need for an additional source of this metabolite for this age group.

The results of this research will allow clinicians to select therapeutic tactics in these patients more carefully, namely, will influence the choice of drugs that modulate the intestinal microbiota, taking into account not only the nosology form but also the patient’s age.

Conflicts of interests. Authors declare the absence of any conflicts of interests and their own financial interest that might be construed to influence the results or interpretation of their manuscript.

References

1. Kaplan GG. The global burden of IBD: from 2015 to 2025. Nat Rev Gastroenterol Hepatol. 2015 Dec;12(12):720-7. doi:10.1038/nrgastro.2015.150.

2. Nishida A, Inoue R, Inatomi O, Bamba S, Naito Y, Andoh A. Gut microbiota in the pathogenesis of inflammatory bowel disease. Clin J Gastroenterol. 2018 Feb;11(1):1-10. doi:10.1007/s12328-017-0813-5.

3. Khan I, Ullah N, Zha L, et al. Alteration of Gut Microbiota in Inflammatory Bowel Disease (IBD): Cause or Consequence? IBD Treatment Targeting the Gut Microbiome. Pathogens. 2019 Aug 13;8(3):126. doi:10.3390/pathogens8030126.

4. Sartor RB, Wu GD. Roles for Intestinal Bacteria, Viruses, and Fungi in Pathogenesis of Inflammatory Bowel Diseases and Therapeutic Approaches. Gastroenterology. 2017 Feb;152(2):327-339.e4. doi:10.1053/j.gastro.2016.10.012.

5. Takahashi K, Nishida A, Fujimoto T, et al. Reduced Abundance of Butyrate-Producing Bacteria Species in the Fecal Microbial Community in Crohn’s Disease. Digestion. 2016;93(1):59-63. doi:10.1159/000441768.

6. Bourkovskaya VA, Beloborodova EI, Akimova LA, et al. Disturbed intestinal microecosystem in chronic inflammatory intestinal diseases and absorption function of the small intestine. Siberian Journal of Clinical and Experimental Medicine. 2009;24(4-2):40-45. (in Russian).

7. Vemuri R, Gundamaraju R, Shastri MD, et al. Gut Microbial Changes, Interactions, and Their Implications on Human Lifecycle: An Ageing Perspective. Biomed Res Int. 2018 Feb 26;2018:4178607. doi:10.1155/2018/4178607.

8. Bel’mer SV, Ardatskaya MD, Akopian AN. Faktory sottozabolotnosti kishennogo trakta: ideologiya, patogeneza i prakticheskoe primenenie [Factors pathogenesis of lower gastrointestinal tract: ideology, pathogenesis and practical application]. Moscow: Prima Print; 2015. 48 p. (in Russian).

9. Stepanov YuM, Titova MV, Tataruchak OM. Large intestine microbiocenosis disorders and the incidence of small intestinal bacterial overgrowth syndrome in patients suffering from inflammatory bowel diseases. Gastroenterologa. 2020;54(1):44-50. doi:10.22141/2308-2097.54.1.2020.199141. (in Ukrainian).

10. O’Toole PW, Jeffery IB. Gut microbiota and aging. Science. 2015 Dec 4;350(6265):1214-5. doi:10.1126/science.aac9469.

11. Green N, Miller T, Suckind D, Lee D. A Review of Dietary Therapy for IBD and a Vision for the Future. Nutrients. 2019 Apr 26;11(5):947. doi:10.3390/nu11050947.

12. Tarasiuk A, Eibl G. Nutritional Support and Probiotics as a Potential Treatment of IBD. Curr Drug Targets. 2020;21(14):1417-1427. doi:10.2174/1389450121666200504075519.

13. Rezaie A, Buresi M, Lembo A, et al. Hydrogen and Methane-Based Breath Testing in Gastrointestinal Disorders: The North American Consensus. Am J Gastroenterol. 2017 May;112(5):775-784. doi:10.1038/ajg.2017.46.
Резюме. Актуальность. Хронические запальные воспалительные заболевания кишечника (ХЗЗК), а также неспецифический вяжущий колит (НВК) и болезнь Крона (БК), остаются одной из наиболее сложных и актуальных проблем гастроэнтерологии в мире. В настоящее время остается недостаточно изученным вопрос о влиянии микрофлоры кишечника и ее постганглионарных модуляторов на течение воспалительных заболеваний. Мета исследования: установить зависимость изменений состава микрофлоры тонкой и толстой кишки у пациентов с ХВЗК от возраста и нозологии. Результаты. Установлено наличие глубоких изменений химического состава короткоцепочечных жирных кислот (КЖК) в копрофильтратах пациентов с ХЗЗК. Знаменито снижение концентрации бифидобактерий и увеличение концентрации лактобактерий у пациентов молодого возраста по сравнению с пожилыми пациентами. Снижение концентрации бифидобактерий в кишечнике пациентов с ХЗЗК приводит к уменьшению концентрации продуктивных бактерий, что свидетельствует о снижении метаболической активности нормальной микрофлоры кишечника. У больных молодого возраста преимущественно выявляются субкомпенсированные формы дисбактериоза, тогда как у пациентов пожилого возраста выявляются субкомпенсированные формы дисбактериоза. Выводы. Результаты исследования позволяют более точно подбирать терапевтическую тактику при лечении пациентов с ХЗЗК и БК. Ключевые слова: короткоцепочечные жирные кислоты; неспецифический вяжущий колит; болезнь Крона.