American Journal of Medicine and Medical Sciences 2023, 13(4): 395-401
DOI: 10.5923/j.ajmms.20231304.11

Nutritional Status of Patients with Ulcerative Colitis and Methods of Its Assessment

Abdullayeva Umida Kurbanovna

Bukhara State Medical Institute, Bukhara, Uzbekistan

Abstract This paper reflects the principal methods to diagnose the nutritional status disorders in patients with ulcerative colitis. The possibilities of instrumental and laboratory research methods are shown. The attention was paid to gastrointestinal microbiota, as it is well known that small intestinal bacterial overgrowth and microflora disorders in large bowel play an important role and lead to the progression of malnutrition. The search was done using PubMed, Medline, Embase databases.

Keywords Review, Ulcerative colitis, Nutritional status, Anthropometry, Questionnaire survey, Laboratory methods

1. Introduction

Chronic inflammatory bowel diseases (CIBD), which include ulcerative colitis (UC) and Crohn's disease (CD), remain one of the most complex and urgent problems of gastroenterology and coloproctology.

The predominant lesion of young and middle-aged people, high rates of primary morbidity and prevalence of UC, the need for long-term use of expensive and not always sufficiently effective pharmacological agents, persistent disability of patients after surgical treatment, which often ends with the formation of a permanent colostomy, determine the social significance of their diseases [1,2].

According to the results of numerous epidemiological studies, the prevalence of UC and the primary incidence of them are constantly growing in most civilized countries of the world. Thus, according to current data, in Western European countries, the frequency of UVC is 6-15 new cases per 100,000 population. The prevalence of UC in the world is 50-70 cases per 100,000 population [3].

The significant prevalence and relentless increase in the incidence of CIBD, the severity of differential diagnosis and recurrent course, the lack of specific treatment necessitate a deeper study of the clinical features and mechanisms of the development of systemic lesions in UC patients, the development of new diagnostic and treatment regimens for such patients.

Treatment of UC is one of the complex problems of modern gastroenterology. Most of all, methods of so-called basic therapy have been developed, the essence of which is to inhibit the activity of inflammation during exacerbations of UC and to conduct courses of supportive anti-relapse therapy. At the same time, doctors do not pay enough attention to identifying nutritional status disorders in these patients and methods of their timely correction, which, in turn, leads to protein-energy deficiency, complicates the course of the underlying disease and worsens its prognosis [5]. One of the reasons for this is the lack of uniform standards for assessing nutritional status and the risk of its violation, which reduces the possibility of analyzing, summarizing research results and developing algorithms for correcting these violations [6].

Malnutrition refers to the bright and frequent manifestations of UC.

In patients with UC, the violation of the nutritional status is due to a number of reasons:

- loss of nutrients, water and electrolytes with frequent emptying;
- reduction of the suction surface of the mucous membrane due to the inflammatory process or resection of part of the intestine;
- enzymatic insufficiency (malabsorption syndrome, "short" bowel syndrome);
- restriction of nutrition due to pain syndrome and intoxication;
- violation of intestinal motility;
- increased loss of nutrients (chronic blood loss, intestinal exudation of plasma proteins);
- increased energy consumption due to the development of a systemic inflammatory process (increased body temperature, increased pulse rate and respiration, synthesis of acute phase proteins);
- bacterial overgrowth syndrome (BOS) [10].

Given the variety of causes and the rate of development of nutritional insufficiency in this category of patients, there is a need to find the most informative and rapid methods for detecting this condition at the early stages of diagnosis.

Received: Mar. 5, 2023; Accepted: Mar. 28, 2023; Published: Apr. 13, 2023
Published online at http://journal.sapub.org/ajmms

2. Survey

Tables and nutrition questionnaires have been proposed to standardize food evaluation, several items are evaluated using numerical scores. Thanks to them, the degree of risk of malnutrition associated with malnutrition is revealed in order to determine the need for nutritional support.

The main screening tests for malnutrition [11]:

1. Assessment of instant nutrition (Instant Nutritional Assessment, INA).
2. Universal questionnaire for screening of malnutrition (universal screening of Nutrition tools, MUST).
3. Nutritional Risk Screening (Nutritional Risk Screening, NRS).
4. Minimum nutrition assessment (Mini Nutritional Assessment, MNA).
5. Subjective Global Assessment (Subjective Global Assessment, SGA).

INA, also known as LAW (an acronym from the first letters of each parameter studied — Lymphocytes, Albumin, Weight), is based on three parameters: the number of lymphocytes in the blood, the level of serum albumin and weight change per unit of time.

MUST, developed in the UK by the Malnutrition Advisory Group, is designed to identify patients at risk of malnutrition who need nutritional support. It is successfully used at the pre-hospital stage because of its simplicity, reliability and validity [12]. The risk of nutritional insufficiency is assessed with the determination of weight and height to calculate body mass index (BMI), the assessment of unintentional weight loss during the last 3-6 months and the presence of any acute clinical condition in which there was insufficient food intake calculated for a period equal to or exceeding 5 days. The total score ranges from 0 to 2, which indicates the presence of a mild, moderate or severe risk of malnutrition (low risk — 0, moderate risk — 1, high risk — 2) [11,12].

NRS is commonly used for hospitalized patients [13]. It relies on the same parameters as MUST, but the severity of the disease and age are also added.

NRS — 2002 is divided into two parts: the first is an initial screening of 4 questions (BMI below 20.5, weight loss over the past three months, reduced food intake over the past week and the presence of severe acute illness), the second part is an assessment of the degree of malnutrition associated with the severity of the disease and age. The survey on the second part of the questionnaire is completed if at least one of the four initial questions has a positive answer; a score above 3 identifies patients with a higher risk of eating disorders [11,14,15].

MNA is a screening test for the determination of malnourishment, which is mainly used in the elderly. It includes a general assessment (lifestyle, physical activity and medication), analysis of the food chart (number of meals, dysphagia and autonomy), subjective symptoms (patient's perception of health and nutrition), as well as the determination of anthropometric parameters (weight, BMI, waist circumference and thickness of the skin fold). A total score below 17 indicates malnutrition, a score from 17 to 23.5 indicates a risk of malnutrition, and a score over 24 indicates a good nutritional status [11,16,17]. It takes about 10 minutes to pass the MNA, the test has a high sensitivity in this category of patients, therefore it is used in a large number of studies.

SGA is based on a standardized questionnaire that includes a medical history (variations in the caloric content of food for treatment, weight loss, gastrointestinal symptoms and functional ability) and clinical examination data (signs of malnutrition in the presence of edema and/or changes in fat and muscle mass) [18].

3. Anthropometric Methods

One of the most accessible and simple markers for assessing nutritional status disorders is body weight and body mass index. The most popular today is the Quetelet index, or im, calculated as the ratio of body weight in kilograms to the square of body length in meters. Numerous studies have proved that the deviation of this indicator from normal values can predict the development of exacerbation of chronic processes, severe course of diseases and the development of severe complications [7,8,11,19].

A BMI value of < 18.5 kg/m2 is considered an indicator of malnutrition, and a value of > 25 kg/m2 indicates overweight. Obese patients have a BMI over 30 kg/m2, while people with a BMI below 14-15 kg/m2 are in a state of exhaustion and are at increased risk of death [8,9,11].

However, it should be noted that it can only be used for an indicative assessment of the determination of nutritional status disorders. The diagnostic sensitivity of BMI T is quite low, since its indicators are significantly influenced by other factors (for example, developed muscle mass, massive edema, ascites, etc.). Therefore, for the verification of malnutrition in clinical practice, BMI is used only in connection with other anthropometric parameters, such as the circumference of the shoulder muscles (CSM) and the thickness of the skin the fat fold above the triceps (SFFAT) [20].

The thickness of the SFFAT characterizes the fat reserves in the body, and the CSM is the somatic pool of protein. The evaluation of these indicators is carried out according to special tables, taking into account gender and age characteristics.

The values characterizing the mass of the shoulder muscles and subcutaneous adipose tissue correlate with a fairly high accuracy with fat-free and fat-free body weight, as well as with the total peripheral protein reserves and body fat reserves, respectively. However, the tests are not indicative for assessing the short-term effect of therapeutic nutrition [20].

A complete description of the body composition can be obtained by determining without body fat and adipose

tissue using special equipment, including the technique of double energy X-ray absorptiometry (DEXA), bioimpedance, TOBEC (total electrical conductivity of the body), ultrasound, computed tomography (CT), magnetic resonance imaging (MRI).

Absorptiometry and bioimpedance measurement are considered the gold standard for measuring body composition [11,21].

Absorptiometry is based on the principle of attenuation of X-ray radiation at two different energy levels; according to the intensity of radiation recorded after passing through tissues, bone tissue can be differentiated from soft parts, such as adipose tissue and muscles. DEXA provides information about bone mineralization.

Bioimpedance measurement is a contact method for measuring the electrical conductivity of biological tissues, which makes it possible to evaluate a wide range of morphological and physiological parameters of the body. It is performed using special devices-bioimpedance analyzers and is an indirect method for measuring body composition based on two physical components: resistance (R) and reactivity (Xc) [10,21,22].

Resistance is the ability of all biological structures to resist the passage of current, and it is inversely proportional to the water content: fat-free tissues are good conductors (contain water and electrolytes), and adipose tissue and bones are poor conductors (contain little water).

Reactivity is the opposite of the current measured at the levels of cell membranes, fat mass has low reactivity, while fat-free body mass has high reactivity.

The combined analysis of the two data allows us to calculate a new parameter, called the phase angle, and is calculated using the formula: FC = arctg (Xc/R). In healthy subjects, normal values of the phase angle vary between 6° and 8°; a decrease in this indicator below 6° indicates increased catabolic conditions, such as sarcopenia, and an increase indicates muscle hypertrophy. The value of the phase angle of approximately 4.5° indicates a possible expansion of the extracellular space and loss of cell membranes in protein - energy deficiency [10,11,22].

The use of ultrasound in fat-free evaluation is limited because the result strongly depends on the operator [23].

CT is a method that uses ionizing radiation to study areas or layers of the body. MRI is based on the principle of magnetic fields. MRI can be used to estimate the amount of total fat mass and analyze the regional distribution of adipose tissue. However, despite the high accuracy, the high cost of equipment, radiation exposure and low practicality do not justify the use of these methods in ordinary clinical practice [11,22].

4. Laboratory Methods

The protein status of an organism is determined by the state of two main protein pools-somatic (muscle protein) and visceral (protein of blood and internal organs). The assessment of the somatic protein pool is based on the determination of somatometric parameters. Laboratory methods for assessing the nutritional status characterize primarily the visceral pool of protein, which is closely related to the state of protein-synthetic liver function, hematopoiesis and immunity.

Among the laboratory methods for assessing protein intake, the following are the most common:

- determination of the serum content of total protein, albumin, creatinine, urea, short-lived proteins (prealbumin, ferritin, transferrin, retinol-binding protein); in peripheral blood-the absolute content of lymphocytes;
- determination of daily urinary excretion of total nitrogen, urea, creatinine;
- assessment of the nitrogen balance of the body (calculated by the formula: injected protein (g)/6,25 – urea nitrogen (g) – 4). A negative nitrogen balance indicates a catabolic phase of the pathological process [9,20].

The total protein as a generalized indicator, depending on a large number of different components, is low sensitive and can give false negative results due to an increase in the globulin fraction and dehydration. The main role in the assessment of nutritional status is played by albumin, which is a reliable prognostic marker.

The albumin synthesized by the liver has a lifespan of 18-20 days and performs a transport function, forming temporary complexes with bilirubin, bile acids, calcium, hormones, vitamins, as well as with medicinal substances. About 40% of albumin circulates in the vascular bed, and most of it is in the interstitial fluid. The informative value of albumin as a marker of the visceral protein pool depends on the time of existence and the possibility of moving interstitial albumin into the intravascular pool. A simple determination of the serum albumin content should be carried out in order to identify primary hypoalbuminemia, which, firstly, may indicate prolonged preliminary protein starvation, and secondly, allows determining among patients at increased risk of an unfavorable course of any disease, since a direct correlation has been found between hypoalbuminemia and its prognosis [24,25].

A representative of the beta-globulin fraction transferrin, involved in the transport of iron, has a life span of 7-8 days and therefore also cannot be considered as an indicator that reacts quickly to changes in nutrition. In addition, the significance of the definition of transferrin is limited by iron deficiency anemia, since the content of transferrin may increase with iron deficiency, which usually accompanies protein deficiency. But most researchers still recommend using this indicator, because it allows you to increase the probability of assessing the state of the visceral protein pool [20,25].

Currently, new, more sensitive methods for evaluating the visceral protein pool have been developed. Transthyretin (TTR; prealbumin) and retinol-binding protein with

half-lives of 2 days and 12 hours, respectively, have the greatest sensitivity. The short life span of transthyretin (TTR) and retinol-binding protein, a small proportion of their pool in the extravascular space and the rate of synthesis in the liver allow us to recommend these transport proteins for early diagnosis of protein deficiency [25-27].

In clinical practice, the definition of TTR is used to assess nutritional status, because due to the shortest half-life, it is the most sensitive indicator of protein-energy deficiency (malnutrition), which is possible both in conditions of acute stress and in severe chronic patients. This condition develops as a result of the intensification of catabolic processes in the muscles with the emergence of a negative nitrogen balance in the body. With the loss of nitrogen, the protein-synthetic function of the liver decreases and focuses on the production of acute phase reactors (RAF) with protective functions. At the same time, proteins with trophic functions fade into the background, and their circulation levels decrease (negative RAF). According to various studies, the level of TTR directly correlates with fat-free body weight, the quality of life of patients, objectively reflects the loss of protein, and in chronic patients is a likely prognostic criterion for the course and outcome of the disease [24,28,29].

Retinol binding protein (Retinol binding protein 4, RBP4) was originally known as a vitamin A transporter from the liver through the bloodstream to other tissues. In 2005, cytokine properties were discovered in him. This fact was revealed when studying the causes of insulin resistance in the adipose tissue of mice of the Glut4 null line. It turned out that RBP4 expression in adipose tissue was significantly enhanced in mice of this line. Experimental studies confirm the role of protein in the pathogenesis of insulin resistance. Thus, it was shown that the administration of recombinant RBP4 to intact mice led to impaired glucose tolerance and the formation of insulin resistance in muscle and adipose tissues due to complete blocking of the insulin signaling pathway [30]. In the experiment and in the examination of obese patients, a positive correlation was established between the concentration of RBP4 in the blood and insulin resistance [31].

So, in the study of G. A. Kaminskaya et al. (2012), conducted in 176 patients with various forms of active pulmonary tuberculosis, the serum level of transthyretin was determined and compared with other indicators of nutritional status (albumin, total block), with clinical characteristics of the process and laboratory markers of the acute phase of inflammation. It was found that in the vast majority of patients with tuberculosis, the level of TR is reduced, and in 1/3 of cases it is below 10 mg / dl, which indicates a pronounced nutritional deficiency. The albumin level is a less sensitive indicator of this condition, and the total serum protein does not detect it at all. The degree of decrease in TTR is directly related to the severity of the process, deterioration in the quality of life and an increase in laboratory parameters of the acute phase of inflammation [29,32].

In the studies of M.K. Robinson et al. The results of the preoperative examination of surgical patients are presented, in which two approaches to the assessment of protein - energy deficiency are compared: the first is the study of prealbumin, retinol—binding protein and albumin; the second is the survey data on the assessment of nutritional status based on anamnesis, physical studies and the like. It was shown that examination of patients without prealbumin assessment revealed nutritional status disorders in 104 out of 320 patients (33%), and taking into account prealbumin data, their number increased to 50%, which again allows us to consider TTR as a more sensitive marker for detecting nutritional status disorders [30].

Historically, the gold standard for estimating protein intake is the determination of nitrogen balance. It is calculated as the ratio of the amount of nitrogen consumed by the body and what is excreted from it. A negative nitrogen balance means that the amount of nitrogen released exceeds the amount absorbed and can be used as a marker for assessing malnutrition [24].

It is important to note that among the large list of adverse factors affecting the course and outcome of CIBD, the syndrome of excessive bacterial growth in the small intestine and disorders of the microflora in the colon play a significant role and contribute to the progression of malnutrition [33,34].

It is known that, normally, the specific and quantitative composition of the microflora of each biotope of the gastrointestinal tract is quite stable due to the influence of numerous protective factors both from the host organism and from the microbiota itself.

The content of bacteria in the upper parts of the intestine varies in a narrow range of 103 -104 CFU/ml of intestinal contents, and in the lower parts reaches 1012 CFU/ml. The bulk of bacteria in the colon and lower small intestine are bacteroids, eubacteria, bifidobacteria, peptostreptococci, ruminococci, clostridia and lactobacilli, and in the upper small intestine — bacteroids, lactobacilli and cocci [5].

There is a close relationship between colonies of microorganisms and the intestinal wall, which allows them to be combined into a single microbial-tissue complex, which is formed by micro colonies of bacteria and metabolites produced by them, mucus (mucin), epithelial cells of the mucous membrane and their glycocalyx, as well as cells of the stroma of the mucous membrane (fibroblasts, leukocytes, lymphocytes, neuroendocrine cells, cells microcirculatory bed, etc.).

Functions of normal microflora:

- colonization resistance: intermicrobial antagonism-production of organic acids, hydrogen peroxide, muramidase, antibiotic-like substances, inhibition of translocation of microorganisms from the intestinal lumen into the systemic circulation;
- metabolic: formation of amino acids, vitamins, hormones, bioactive amines and other biologically active substances;

- immunomodulatory: activation of the immune system: induction of the synthesis of immunoglobulins, lysozyme, interferon, pro- and anti-inflammatory cytokines;
- detoxification: hydrolysis of metabolic products of proteins, lipids, carbohydrates, deconjugation of bile and hydroxylation of fatty acids, inactivation of histamine, xenobiotics and o carcinogens;
- antimutagenic;
- digestive: enhancing the activity of enzymes, digestive and motor functions of the gastrointestinal tract, body weight control;
- anti-carcinogenic [6].

Normal number and composition of microflora, as well as its functional activity in various parts of the digestive tract can take place only with a normal physiological state of the body. For example, the entry of microorganisms into the small intestine from above is prevented by hydrochloric acid and gastric juice enzymes, lysozyme, bile acids, secretory immunoglobulin A.

From the colon, the penetration of microbes into the ileum is also limited by the active propulsive motility of the small intestine and the ileocecal valve. With an insufficient level of hydrochloric acid secretion, violation of intermicrobial interactions and the integrity of the intestinal barrier, conditions are created for the active translocation of microorganisms into the upper gastrointestinal tract [33].

Changes in the composition of the microflora are one of the most important causes of both inflammatory and functional diseases of the digestive system.

Bacterial overgrowth syndrome (BOS) is a pathological condition caused by the colonization of the proximal parts of the small intestine by conditionally pathogenic microflora coming from the upper gastrointestinal tract (or upper respiratory tract), or retrograde translocation of fecal microflora.

The diagnostic criterion of BOS is excessive colonization of the bacterial microflora of the small intestine (at a concentration of > 105 microorganisms in 1 ml of small intestine aspirate) or a qualitative change in the bacterial microflora of the small intestine (the presence of so-called fecal microorganisms) at lower values > 103 CFU/ml in the presence of manifestations of malnutrition [34].

At the same time, the syndrome of excessive bacterial growth, being a consequence of pathological conditions, in turn, increases the manifestations of the existing pathology and the severity of disorders of the digestive and absorption processes.

Deconjugated bile acids formed in large quantities during BOS, as well as other products of bacterial cleavage of chyme components due to their cytotoxic action cause organic changes in the intestinal mucosa, which, in turn, leads to a deterioration in the absorption and assimilation of nutrients.

Currently, there are many methods of diagnosing BOS, they have different sensitivity, specificity and accessibility for use in practice. The most common indirect methods, in particular respiratory: hydrogen breath tests with glucose, lactose or lactulose, based on the ability of small intestine bacteria to break down sugar to form hydrogen. In a patient with BOS, when taking sugar, the concentration of hydrogen in the exhaled air increases. The method is used only for the approximate determination of the degree of bacterial contamination of the small intestine and requires special equipment.

The gold standard for the diagnosis of BOS is considered to be a direct method of bacteriological examination of the aspirate of the proximal small intestine with the detection of an increased content of microorganisms. The criterion of excessive growth varies from 103 to 106 CFU/ml in different authors. The presence of Enterobacteriaceae family bacteria in the small intestine is ambiguously assessed in the literature. Conducting research in this direction with accurate methods of microbiological verification remains an urgent task [33,34].

The role of short-chain fatty acids in the human intestine

During their vital activity, microorganisms produce short-chain fatty acids (SCFA) inherent in each strain of microorganisms.

SCFA refers to the biochemical markers of symbiosis of the microflora inhabiting the colon and the human body. The SCFA formed as a result of microbial metabolism are important both for the colon and for the macroorganism as a whole. The synthesis of SCFA is an important factor of colonization resistance, ensuring the stability of the composition of the intestinal microflora, one of the mechanisms of which is the maintenance of optimal pH values in the lumen of the colon. An increase in the concentration of SCFA is combined with a decrease in osmotic pressure in the colon due to the cleavage of polysaccharides [31].

Among the short-chain fatty acids produced by the microbiota in the intestine, the most important are acetic (designated as C2, i.e. contains 2 carbon atoms), propionic (C3), butyric/isobutyric (C4), valerian /isovalerian (C5), kapron /isocapron (c6). The normal microflora of the colon, processing undigested carbohydrates in the small intestine, produces the listed acids with a minimum number of their lysoforms. At the same time, with a violation of microbiocenosis and an increase in the proportion of proteolytic microflora, these fatty acids begin to be synthesized from proteins mainly in the form of lysoforms, which negatively affects the condition of the colon, on the one hand, and can be a diagnostic marker, on the other [28].

Research is continuing on the study of the level of SCFA in CIBD. According to M.D. Karpatskaya, in the blood serum of patients with UC, there is an increase in the absolute content of SCFA compared to the norm and the group with irritable bowel syndrome ((0.503 ± 0.004) mg /g; (0.195 ± 0.004) mg /g and (0.193 ± 0.004) mg /g, respectively). At the same time, in the C2-C4 profile, a decrease in the proportion of acetic acid was found with an

increase in the proportion of propionic and mainly butyric acids. Presumably, this is due to the increased permeability of the intestinal wall in UC, whereas in irritable bowel syndrome there were no deviations from the norm in the indicators of the content of SCFA, which is explained by the integrity of the intestinal wall in this pathology [18].

In UC, according to the results of the study of SCFA, an increase in the activity of anaerobic microorganisms was also revealed, however, the genera of clostridium, fusobacteria, eubacteria prevail, and those strains that have hemolytic activity. It is noted that the change in the qualitative composition of the SCFA, which characterizes the generic composition of the intestinal microflora, is clearly dependent on the localization of inflammation, the activity of the pathological process and the severity of the disease. This is due to the fact that different populations of microorganisms dominate in different parts of the colon, utilization and absorption of LC in different parts of the colon occurs in different ways, and with increased bleeding there is an increase in the activity of hemolytic flora [29].

The work of Indian authors revealed a decrease in the level of butyrate in fecal samples in patients with UC [30]. One of the reasons for the decrease in butyrate levels in patients with CIBD is a significant decrease in the number of butyrate-producing microorganisms. The condition of mucosal and fecal microflora associated with Crohn's disease, ulcerative colitis and healthy people was studied. There was a sharp decrease in butyrate producers (in particular, Faecalibacterium prausnitzii) both in fecal samples and biopsies of the colon mucosa in patients with inflammatory bowel diseases compared with healthy individuals. At the same time, a significant increase in bacteria of the genera Bifidobacterium and Lactobacillus was observed [31].

In recent years, the most informative and probable method of diagnosing intestinal dysbiosis (90-95% probability) is gas-liquid chromatography. The method is based on the separation and analysis of various components of the intestinal contents, primarily the ratio of various short-chain fatty acids: acetic, propionic, butyric and valerian, kapron, isobutyric and others. The change in their quantity and ratio characterizes the state of the intestinal microflora: the predominance of normoflorins or pathogenic microorganisms and their relationship.

The determination of SCFA in the circle has a higher sensitivity and specificity for assessing the state of intestinal microflora compared to traditional bacteriological examination of feces and allows us to consider the issue of intestinal eubiosis and dysbiosis from a new perspective, and also provides high accuracy in determining the generic affiliation of aerobic and anaerobic microorganisms [32].

There is also a method of gas chromatography in combination with mass spectrometry, based on the determination of specific components of bacterial cells in various biological media. The method allows to identify up to 170 types of aerobic and anaerobic bacteria and fungi. The disadvantages of the latter methods are their high cost due to the use of special computerized equipment [33].

Summarizing the above, it can be stated that the development of the syndrome of excessive bacterial growth in the small intestine and the violation of the microflora in the colon in the pathology of the gastrointestinal tract contribute to the progression of malnutrition.

5. Conclusions

Timely detection and adequate correction of nutritional status disorders are very important at the stages of diagnosis and treatment of UC. It can be argued that nutritional insufficiency complicates the course of the underlying disease and worsens its prognosis. We have reviewed the main methods for assessing nutritional status, but currently there are no uniform standards for its assessment for patients with UC, and this requires further research.

REFERENCES

[1] Sorochan O.V., Stoykevich M.V., Tatarchuk O.M., Vinnik N.V. Treatment of patients with chronic inflammatory bowel diseases with nutritional deficiency. South Ukrainian Medium scientific journal. 2017; 16(16): 86-89. (in Ukrainian).

[2] Deputy Zakharash, N.D. Kucher, Zakhara Yum, etc., authors; Deputy Zakharash, editor. Surgery: textbook. Vinnytsia: New Book; 2014. 360-365 p. (in Russian)

[3] Nagornaya jav. Comparative analysis of the prevalence of inflammatory bowel diseases among the population of rural and industrial regions of Western Ukraine. Actual problems of modern medicine: Bulletin of the Ukrainian Medical Dental Academy. 2015; (52): 95-98. (in Ukrainian).

[4] Stepanov Yu.M., Skir Dayu, Petyshko op. Chronic inflammatory bowel diseases: epidemiological features in Ukraine. Gastroenterology. 2017; 51(2): 97-105. Doi: 10.22141/2308-2097.51.2.2017.101703. (in Ukrainian)

[5] Rudnev S.G., Mozhokina G.N., Bogorodskaya E.M., Galygina N.E., Nikolaev D.V., Russian O.E. Study of nutrition and body composition in patients with tuberculosis. Russian pulmonology. 2013; (1): 101-107. doi: 10.18093/0869-0189-2013-0-1-101-107. (in Russian)

[6] Rocha R, Sousa UH, Reis TLM, Santana GO. Nutritional status as a predictor of hospitalization in inflammatory bowel disease: A review. World J Gastrointest Pharmacol Ther. 2019 Mar 7; 10(2): 50-56. doi: 10.4292/wjgpt.v10.i2.50.

[7] Yadav DP, Kedia S, Madhusudhan KS, et al. Body Composition in Crohn's Disease and Ulcerative Colitis: Correlation with Disease Severity and Duration. Can J Gastroenterol Hepatol. 2017; 2017: 1215035. doi: 10.1155/2017/1215035.

[8] Stepanov YuM, Boiko TY, Sorochan OV, Stoikevych MV, Shkaredna AS. Bioimpedancemetry in evaluating nutritional status of patients with chronic inflammatory bowel diseases. Gastroenterologìa. 2015; (56): 59-66. doi: 10.22141/2308-2097.2.56.2015.81498. (in Ukrainian).

[9] Scaldaferri F, Pizzoferrato M, Lopetuso LR, et al. Nutrition and IBD: Malnutrition and/or Sarcopenia? A Practical Guide. Gastroenterol Res Pract. 2017; 2017: 8646495. doi: 10.1155/2017/8646495. 12. Sandhu A, Mosli M, Yan B, et al. Self-screening for malnutrition risk in outpatient inflammatory bowel disease patients using the Malnutrition Universal Screening Tool (MUST). JPEN J Parenter Enteral Nutr. 2016 May; 40(4): 507-10. doi: 10.1177/0148607114566656.

[10] Goost H, Vidakovic E, Deborre C, et al. Malnutrition in geriatric trauma patients: Screening methods in comparison. Technol Health Care. 2016; 24(2): 225-39. doi: 10.3233/THC1112.

[11] Tran QC, Banks M, Hannan-Jones M, Do TND, Gallegos D. Validity of four nutritional screening tools against subjective global assessment for inpatient adults in a low-middle income country in Asia.Eur J Clin Nutr. 2018 Jul; 72(7): 979-985. doi: 10.1038/s41430-018-0217-8.

[12] Donini LM, Poggiogalle E, Molfino A, et al. MiniNutritional Assessment, Malnutrition Universal Screening Tool, and Nutrition Risk Screening Tool for the Nutritional Evaluation of Older Nursing Home Residents. J Am Med Dir Assoc. 2016 Oct 1; 17(10): 959. e11-8. doi: 10.1016/j.jamda.2016.06.028.

[13] Spooren CEGM, Wintjens DSJ, de Jong MJ, et al. Risk of impaired nutritional status and flare occurrence in IBD outpatients. Dig Liver Dis. 2019 Sep; 51(9): 1265-1269. doi: 10.1016/j.dld.2019.05.024.

[14] Adamenko E.I., Silivonchik N.N. Assessment of the status of nutrition: an educational and methodological manual [Electronic resource]. Minsk: BSU; 2009. 7-11 p. (in Russian)

[15] Sergi G, De Rui M, Stubbs B, Veronese N, Manzato E. Measurement of lean body mass using bioelectrical impedance analysis: a consideration of the pros and cons. Aging Clin Exp Res. 2017 Aug; 29(4): 591-597. doi: 10.1007/s40520-016-0622-6.

[16] Lemos T, Gallagher D. Current body composition measurement techniques. Curr Opin Endocrinol Diabetes Obes. 2017 Oct; 24(5): 310-314. doi: 10.1097/MED.0000000000000360.

[17] Wagner DR. Ultrasound as a tool to assess body fat. J Obes. 2013; 2013: 280713. doi: 10.1155/2013/280713.

[18] Bharadwaj S, Ginoya S, Tandon P, et al. Malnutrition: laboratory markers vs nutritional assessment. Gastroenterol Rep (Oxf). 2016 Nov; 4(4): 272-280. doi: 10.1093/gastro/gow013.

[19] Keller U. Nutritional Laboratory Markers in Malnutrition. J Clin Med. 2019 May 31; 8(6). pii: E775. doi: 10.3390/jcm8060775.

[20] Lee JL, Oh ES, Lee RW, Finucane TE. Serum Albumin and Prealbumin in Calorically Restricted, Nondiseased Individuals: A Systematic Review. Am J Med. 2015 Sep; 128(9): 1023.e1-22. doi: 10.1016/j.amjmed.2015.03.032.

[21] Gavrilina N.S., Sedova G.A., Kosyura S.D. Insufficient nutrition in patients with chronic pancreatitis. The medicinal truth. 2015; (1): 122-127. (in Russian)

[22] Abdullaev Riu, Komissarova O.G. Transtyretin (prealbumin), its role in norm and pathology. Tuberculosis and lung diseases. 2012; (2): 3-7. (in Russian)

[23] Dellière S, Cynober L. Is transthyretin a good marker of nutritional status? Clin Nutr. 2017 Apr; 36(2): 364-370. doi: 10.1016/j.clnu.2016.06.004.

[24] Maramygin D.S., Sitnikov R.V., Sumenkova D.V. Adipokines in the pathogenesis of metabolic syndrome. Innovative science. 2017; 3(4): 197-207. (in Russian)

[25] Martynov V.L., Khaertdinov A.H., Kazarina N.V. Babukhin valve insufficiency as a cause of the syndrome of excessive bacterial growth in the small intestine. Medical almanac. 2015; (36): 46-50. (in Russian)

[26] Arbatskaya M.D. The syndrome of excessive bacterial growth in the intestine and impaired absorption processes: pathogenetic diet therapy. Experimental and clinical gastroenterology. 2009; (6): 84-96. (in Russian)

[27] Jandhyala SM, Talukdar R, Subramanyam C, Vuyyuru H, Sasikala M, Nageshwar Reddy D. Role of the normal gut microbiota. World J. Gastroenterol. 2015 Aug 7; 21(29): 8787-803. doi: 10.3748/wjg.v21.i29.8787.

[28] Sun M, Wu W, Liu Z, Cong Y. Microbiota metabolite short chain fatty acids, GPCR, and inflammatory bowel diseases. J Gastroenterol. 2017 Jan; 52(1): 1-8. doi: 10.1007/s00535-016-1242-9.

[29] Belmer S.V., Arbatskaya M.D., Hakobyan A.N. Short-chain fatty acids in the treatment of functional intestinal diseases in children: theoretical justification and practical application [Electronic resource]. Moscow: Prima Print; 2015. 48 p. (in Russian)

[30] Morrison DJ, Preston T. Formation of short chain fatty acids by the gut microbiota and their impact on human metabolism. Gut Microbes. 2016 May 3; 7(3): 189-200. doi: 10.1080/19490976.2015.1134082.

[31] Kumari R, Ahuja V, Paul J. Fluctuations in butyrate-producing bacteria in ulcerative colitis patients of North India. World J Gastroenterol. 2013 Jun 14; 19(22): 3404-14. doi: 10.3748/wjg.v19.i22.3404.

[32] Wang W, Chen L, Zhou R, et al. Increased proportions of Bifi dobacterium and the Lactobacillus group and loss of butyrate-producing bacteria in infl ammatory bowel disease. J Clin Microbiol. 2014 Feb; 52(2): 398-406. doi: 10.1128/JCM.01500-13.

[33] Primec M, Mičetić-Turk D, Langerholc T. Analysis of short-chain fatty acids in human feces: A scoping review. Anal Biochem. 2017 Jun 1; 526: 9-21. doi: 10.1016/j.ab.2017.03.007.

[34] Lotti C, Rubert J, Fava F, Tuohy K, Mattivi F, Vrhovsek U. Development of a fast and cost-effective gas chromatograph ymass spectrometry method for the quantification of short-chain and medium-chain fatty acids in human biofluids. Anal Bioanal Chem. 2017 Sep; 409(23): 5555-5567. doi: 10.1007/s00216-017-0493-5.