

## Predictors of the Development of Functional Disorders of the Gastrointestinal Tract in Young Children

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**Abstract:** The article presents the results of a retrospective study of case histories of 89 children from 2 months to 16 years with pathology of the gastrointestinal tract. Predictors of the development of such disorders as functional dyspepsia, functional constipation and protein-energy malnutrition have been identified. The connections between intrauterine and postnatal pathology and the development of functional gastrointestinal disorders in older age are considered, and their pathophysiological mechanisms are noted.

**Keywords:** gastroenterology; gastrointestinal tract; functional disorders; pediatrics; dyspepsia; constipation.

To optimize diagnosis and competent choice of treatment tactics, the doctor needs to distinguish the manifestations of functional disorders of the digestive organs from organic pathology and, already at the stage of preventive examination, promptly identify children who have risk factors that can lead to them, divide predictors of the development of disorders such as functional dyspepsia, functional constipation and protein-energy malnutrition in children. The causes of functional disorders of the digestive organs lie in a violation of the neurohumoral regulation of the gastrointestinal tract[1]. The doctor faces a difficult task: to identify the etiology of the disease in each individual patient, without resorting to excessive examination, and to eliminate the provoking factors. It is important to remember that gastrointestinal symptoms can occur in both sick and healthy people, and functional disorders can only be diagnosed based on the frequency, duration, and duration of disease manifestations [1].

Meanwhile, although the Rome III criteria present functional disorders as a pathology with a favorable course and outcome, medical experience indicates that their prolonged course and lack of proper treatment can lead to serious structural damage [2]. All this suggests that functional disorders of the digestive system are a complex and multifaceted problem that requires careful attention, careful diagnosis and timely prescription of therapy [1]. At the same time, the elimination of provoking factors is the primary task at the beginning of treatment of any pathology. The study was conducted at a children's city clinic.

Case histories of 89 children were selected, including 40 boys and 49 girls, the children's ages ranging from 2 months to 16 years. Many patients had a combination of organic and functional pathology of the gastrointestinal tract. After selecting the main indicators for assessing the anamnesis of the first year of life of children, the frequency of occurrence of functional dyspepsia and constipation. These indicators were gestational age, type and duration of feeding in the first year of life, the course of pregnancy and childbirth, the presence of gastrointestinal tract diseases in the child's parents, weight and body length of the newborn. The groups included both normal and average values of these indicators, as well as deviations from them, and then

their comparative analysis was carried out. In this work, data are presented in absolute values and relative values (percentages).

**Results and discussion** Functional dyspepsia is a complex of symptoms related to the gastroduodenal region (pain in the epigastric region, heartburn, early satiety, feeling of fullness after eating), in the absence of any organic, metabolic or systemic diseases that can explain these manifestations. Symptoms occur at least 4 times a month for more than 2 months before diagnosis. In the present study, the diagnosis was established in 36 children (40%). Functional dyspepsia was diagnosed among premature infants in 100% of cases (6 children) and in 36.3% of those born at a gestational age of 37 weeks or more (29 children). In the group of children with a birth weight greater than average (the average weight of a child was considered to be 3–4 kg), the diagnosis was established in 57% of cases (4), among those born with an average birth weight - already in 33% of cases (20). Complications of pregnancy (preeclampsia, smoking, acute respiratory viral infections, Rhesus conflict, maternal anemia, vaginal bleeding, polyhydramnios, etc.) probably influenced the occurrence of functional dyspepsia in 29 babies (48.3%). If the pregnancy proceeded normally, symptoms of dyspepsia were detected only in 7 patients (24%). In 50% (3 cases) of sick children, the father is over 40 years old, in 26.3% of children (5) - younger. Research conducted by geneticist K. Stefansson and his colleagues showed that every year two mutations accumulate in a man's DNA, which are also present in his germ cells. At least 50% of active genes transmitted from parents take part in the formation of the fetal nervous system, which, if the father is over 40 years old, can lead to disruption of the nervous regulation of the digestive organs, and in severe cases - to the development of autism and schizophrenia in the child [3,4].

In the group of children whose mothers had disturbances of the normal microflora of the urogenital tract (candidiasis, herpes, myco- and ureaplasmosis, original articles 21 forcipe volume 2 No. 2 2019 eISSN 2658-4182 chlamydia, etc.), 60% of patients were identified (6 observations), and only 38% (30) - among patients whose mothers did not have a gynecological history. The microflora of the birth canal, upper respiratory tract and mother's intestines plays a large role in the contamination of the infant's gastrointestinal tract. The formation of normal flora in a child can lead to disruptions in the regulation of the functions of the digestive system, as well as reduce resistance to the effects of pathogenic microorganisms [5]. Nutrient deficiency may occur, which will negatively affect the physical development of children. It should also be noted that the number of pregnancies, which for various reasons exceeded the number of births, probably served as one of the predictors of the development of functional dyspepsia in 46% (6) of children. Indeed, at the same time, only 26.5% of children fell ill (9), all of whose mothers' pregnancies ended in childbirth. 64.7% of sick children were born by cesarean section (11 observations), 34% by natural birth (18). According to some authors, delivery by cesarean section causes a decrease in the body's resistance to bacterial effects and the development of dysfunction of the central and enteric nervous system [6]. Functional constipation is a rare, difficult, painful or incomplete bowel movement with stool of varying degrees of density and diameter, observed over a period of 2 weeks to 2 months. In most cases, the first complaints of constipation appear at 2–4 years of age. but the pathological complex itself begins to form much earlier [7]. This can lead to the formation of organic pathology of the colon and social maladaptation of children. In our observation, functional constipation was diagnosed in 24 children (27%).

Among children who were bottle-fed, 13 people (54%) fell ill, while among those who received breast milk only 1 child (8.3%) fell ill. Consuming formula (or non-adapted cow's milk products) may contribute to constipation due to its high protein to carbohydrate content, as well as an imbalance between phosphorus and calcium. Note that such constipation is resistant to traditional therapy, and symptoms can be eliminated by excluding foods containing cow's milk protein from the baby's diet [8,9]. In the group of children whose mothers have a history of intestinal diseases, functional constipation was diagnosed in 60% (3 cases), but if the mother did not have these pathologies - only in 25% (21 cases). 17 sick children (34.7%) had a history of

gastrointestinal tract infection; 7 children (17.5%) did not suffer from infectious diseases. Interestingly, intestinal infections disrupt the maturation of the intramural ganglia and lead to the development of dystrophic changes in them, as a result of which the visceral sensitivity of the rectum is disrupted and its motility is reduced: this creates favorable conditions for the development of constipation. The etiology of protein-energy deficiency is diverse: it is caused by nutritional, infectious, hereditary causes, caused by defects in the regimen and the action of damaging factors in the prenatal period. We will consider it as insufficient nutrition of a child, which is characterized by a stop or slowdown in the increase in body weight and proportions, metabolic disorders, asthenia, and delayed physical development, since in this study it was errors in the diet that led to protein-energy malnutrition in children [10].

In medical practice, the term “protein-energy malnutrition” (PEM) most fully reflects the failure of metabolic processes, while the resulting imbalance of nutrients and energy leads to measurable undesirable clinical effects [5]. We observed 21 children with this pathology (24). Mention should be made of the so-called Barker effect—the effect of “fetal programming”[11]. DJ Barker (1993) showed a connection between body size at birth and the subsequent development of pathology in adulthood. His hypothesis suggests that during the process of fetal adaptation to nutritional deficiency during periods of intense division, the expression of certain genes is disrupted. This leads to constant disruption of metabolic activity throughout the postnatal period. At the same time, it is important to remember that even short periods of reduced nutrient intake lead to a reduction in the number of cells in some organs, thus changing their structure and activity [7,8]. 2 (16.7%) children were breastfed during the first year of life, 6 (27.3%) children were breastfed for more than a year, and it was established from the anamnesis that they were not given rational complementary foods in sufficient quantities. Against the background of insufficient nutrition, the production of cortisol sharply increases in a child under conditions of reduced insulin synthesis; this leads to increased catabolism processes [9]. As a result, insulin-dependent tissue growth is disrupted, growth slows down, and body weight decreases. In addition, atrophy of the mucous membrane occurs in the gastrointestinal tract, enzymatic activity decreases, motility of the digestive organs is impaired, and dysbiosis appears. Protein-energy deficiency was diagnosed in 3 (50%) premature children and 17 (21.3%) children born at term. Characteristics of the course of labor can also help identify predictors of protein-energy malnutrition. Mothers had one or another birth pathology (long anhydrous interval, umbilical cord entanglement, fetal hypoxia, vacuum extraction, narrow pelvis, etc.) in 8 cases (32%), in 11 (17%) the birth was without complications. Among children born via cesarean section, the diagnosis was established in 41% (7 cases) of babies, while among those born naturally - only in 19% (10 cases). A child born by cesarean section has a number of features that affect the formation of the microflora of his gastrointestinal tract [9]. This includes administering antibiotics to the mother during surgery, late breastfeeding, and staying in the hospital separately from the mother. Changes in the bacterial flora of a child are currently considered as a comorbid condition in the concept of the development of functional disorders of the digestive organs [10].

Thus, the following predictors for the development of functional dyspepsia can be identified: prematurity, birth weight exceeding average, pregnancy complications, father's age over 40 years, pathology of the mother's urogenital microflora, as well as births by cesarean section and the number of pregnancies, for one reason or another exceeded the number of births. Functional constipation more often developed in formula-fed children and in those whose mothers had a history of intestinal diseases. Against the background of insufficient nutrition, the production of cortisol sharply increases in a child under conditions of reduced insulin synthesis; this leads to increased catabolism processes [9].

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