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FEATURES OF EATING BEHAVIOR IN CHILDREN WITH DIFFERENT FORMS OF NON-ALCOHOLIC FATTY LIVER DISEASE

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Ключові слова: *діти, харчова поведінка, стеатоз печінки, неалкогольний стеатогепатит*
Ключевые слова: *дети, пищевое поведение, стеатоз печени, неалкогольный стеатогепатит*

Abstract. Features of eating behavior in children with different forms of non-alcoholic fatty liver disease. Stepanov Yu.M., Zavhorodnia N.Yu., Zavhorodnia O.Yu. *Aim – to study the features of the eating behavior (EB) in children with different forms of nonalcoholic fatty liver disease (NAFLD) - simple steatosis (SS) and nonalcoholic steatohepatitis (NASH), to compare the obtained data with the eating behavior of children without liver steatosis. 120 patients aged 7 to 16 years were examined, the average age of the patients was (12.00 ± 2.56) years. The presence and degree of liver steatosis was determined by transient elastography using a FibroScan®502Touch with an assessment of CAP (controlled attenuation parameter). According to the CAP, gender-specific alanine aminotransferase levels and body mass index, patients were divided into 4 groups: 1 group consisted of 26 patients with NASH, 2 group – of 44 patients with SS, 3 group – of 35 patients with obesity without liver steatosis, 4 group (control) – of 15 patients with normal weight without metabolic disorders. The groups were homogeneous in age. Assessment of EB was carried out using the pediatric modification of the Dutch eating behavior questionnaire (DEBQ-C). It was found that most patients with SS (75,0%) and NASH (87,5%) demonstrated an emotional type of EB. The restrictive type of EB was predominant in obese children without hepatic steatosis (73,7%). The total score of the restrictive type of EB in children of the 3 group was significantly higher compared with the data of the 4 group (p<0,05). The external type of EB occurred in 25% of children with SS and was not observed in children with NASH. Thus, children with NAFLD and obesity are characterized by an increased incidence of various types of unhealthy eating behavior compared to children with normal weight, which requires appropriate correction and involvement of psychologists in a team of specialists involved in the health care of the obese children.*

Реферат. Особливості харчової поведінки в дітей з різними формами неалкогольної жирової хвороби печінки. Степанов Ю.М., Завгородня Н.Ю., Завгородня О.Ю. *Мета: вивчити особливості харчової поведінки дітей з різними формами неалкогольної жирової хвороби печінки (НАЖХП) - простим стеатозом та неалкогольним стеатогепатитом (НАСГ), зіставити отримані дані з особливостями харчової поведінки дітей без стеатозу печінки. Обстежено 120 пацієнтів віком від 7 до 16 років, середній вік пацієнтів становив 12,00±2,56 року. Визначення наявності стеатозу печінки проводилось методом транзієнтної еластографії за допомогою апарата «FibroScan®502Touch» з оцінкою контрольованого параметру атенуації ультразвуку (CAP). За показником CAP, гендерспецифічними рівнями аланінамінотрансферази та індексом маси тіла пацієнти були розподілені на 4 групи: 1 групу склали 26 пацієнтів з НАСГ, 2 групу – 44 пацієнти з простим стеатозом печінки, 3 групу – 35 пацієнтів з ожирінням без стеатозу печінки, 4 групу (контрольну) – 15 пацієнтів з нормальною вагою без метаболічних порушень. Групи були однорідними за віком. Оцінка харчової поведінки (ХП) проводилась за допомогою педіатричної модифікації Голландського опитувальника харчової поведінки (DEBQ-C). Установлено, що в більшості пацієнтів з простим стеатозом печінки (75,0%) та НАСГ (84,6%) спостерігався емоційний тип ХП. Обмежувальний тип ХП домінував у дітей з ожирінням без стеатозу печінки (73,7%). При цьому сумарна бальна оцінка обмежувального типу ХП у дітей 3 групи була достовірно вищою порівняно з даними 4 групи (p<0,05). Екстернальний тип ХП зустрічався у 25% дітей з простим стеатозом і не спостерігався в дітей з НАСГ. Таким чином, діти з НАЖХП та ожирінням характеризуються підвищеною частотою розвитку різних типів нездорової харчової поведінки порівняно з дітьми з нормальною вагою, що вимагає проведення відповідної корекції і залучення психологів до команди фахівців, що займаються станом здоров'я дитини.*

Non-alcoholic fatty liver disease (NAFLD) is the most common among chronic diffuse liver diseases in children nowadays. According to epidemiological studies, NAFLD is found in 40% of obese children and in 8% of children with normal body weight [20]. The term NAFLD combines simple steatosis, non-alcoholic steatohepatitis (NASH), liver fibrosis, and cirrhosis, developing as a result of the progression of NASH [13]. Despite some progress in the field of NAFLD research, the mechanisms underlying the initiation and progression of the disease in children are not well understood, the methods of therapeutic correction except for lifestyle modifications do not have sufficient evidence and are therefore not recommended for a wide clinical application. Correction of the diet based on the limitation of daily calorie intake often leads to relapse in weight gain in both children and adults [13].

The most common symptoms leading to a decrease in the quality of life in children with NAFLD, according to pediatric studies, are fatigue, anxiety, mood disorders, and concentration problems [17]. The formation of anxiety and depressive disorders in patients with NAFLD is closely associated with severity of obesity progression, the relationship between these phenomena is bidirectional and may be related to unhealthy eating behavior (EB) [9]. The dynamics of the total number of reported cases indicates an increase in the prevalence of EB disorders among the general population, which requires research aimed at studying the psychosocial risk factors for their development [5]. Eating behavior disorders are an independent component of risk factors for developing chronic non-communicable diseases. It has been established that eating disorders are associated with a high risk of developing type 2 diabetes mellitus, metabolic syndrome, and its components [1].

The concepts of unhealthy eating behavior and eating disorder should be differentiated. The concept of eating behavior implies a value attitude to food and its intake, includes the choice of food, the method of cooking and eating. The following types of unhealthy eating behavior are distinguished: emotional, external and restrictive [10]. Emotional eating behavior is usually formed as a reaction to stress or negative emotions, emotional discomfort acts as a stimulus to eating. External eating behavior is manifested by an increased reaction to external stimuli associated with eating – the appearance of the food, smell, texture – and is characterized by the attitude to food as a way of communication and encouragement. Restrictive eating behavior is characterized by excessive control and limitation of the meal's number and the amount of food, which are usually replaced by periods of overeating, leading to feelings of guilt and a decrease in self-esteem [22]. Among the eating disorders in accordance with DSM-5 (The Diagnostic and Statistical Manual of Mental Disorders, 5th edition), in turn, there are picacism, rumination, restrictive eating disorder (including sensory aversion to food, post-traumatic eating disorder and eating disorder associated with the disease), anorexia nervosa, bulimia nervosa, episode overeating disorder, and unspecified eating disorder [18, 23].

Pre- and puberty periods are key in the emergence and development of bodily-associated psychological problems and unhealthy eating behavior [2]. Eating behavior deviations, in particular, emotional eating behavior, are considered serious problems of the healthcare system, as they promote obesity even after weight loss [12]. In this regard, an understanding of the psychosocial and emotional processes associated with unhealthy eating behavior is certainly important for determining the ways of psychological defense and the formation of certain skills that can help adolescents develop healthy relationships with their body and with food [14]. The North American Society of Pediatric Gastroenterologists, Hepatologists and Nutritionists (NASPGHAN) recommends to pay attention to psychosocial problems and assessing the need for psychological assistance in children with NAFLD [13]. Unhealthy eating behavior, in our opinion, can be a marker of the need for psychological support for such patients and, at the same time, a feature that determines the strategy for effective nutritional correction and lifestyle modification.

The aim of our work is to study the features of eating behavior in children with various forms of NAFLD (simple steatosis and NASH), as well as to compare the obtained data with the EB in children with obesity and normal weight without liver steatosis.

MATERIALS AND METHODS OF RESEARCH

We examined 120 patients aged from 7 to 16 years, the average age of the patients was (12.00±2.56) years. The research was conducted in accordance with the principles of bioethics set out in the WMA Declaration of Helsinki – "Ethical principles for medical research involving human subjects" and "Universal Declaration on Bioethics and Human Rights" (UNESCO).

The presence and extent of liver steatosis was determined using a FibroScan®502Touch with a controlled attenuation parameter (CAP) measurement. The diagnosis of NASH was performed on the basis of gender-specific levels of alanine aminotransferase

(ALT) and presence of liver steatosis. The presence of obesity was established on the basis of body mass index (BMI) calculation and its comparison with the Z-score suggested by WHO [11].

Patients were divided into 4 groups according to the presence of NASH and obesity / overweight: the 1 group consisted of 26 patients with NASH, 2 group – of 44 patients with simple steatosis, 3 group – of 35 patients with obesity without liver steatosis, 4 group – of 15 patients with normal weight without metabolic disorders. The eating behavior was assessed using the pediatric modification of the Dutch Eating Behavior Questionnaire (DEBQ-C) [21] adapted in Russian by Savchikova Yu.L. [3] and validated in the pediatric cohort [15, 16, 24]. The questionnaire consists of 20 items, each with 3 answer options: "never", "sometimes", and "very often", which are rated on a scale from 1 to 3. Scoring was performed by the conventional method [8]. Unhealthy type of EB was diagnosed if the average value of the scores exceeded the average for restrictive, emotional and external EB in patients with normal weight, which was 1.6; 1.3 and 2.0, respectively.

The exclusion criteria were: presence of diabetes mellitus 1 or 2 type, viral, autoimunne liver diseases or liver storage diseases.

Statistical processing was performed using Statistica 6.0 (license number AGAR909 E415822FA), differences were considered significant at $p<0.05$ [7].

RESULTS AND DISCUSSION

According to the results of our study unhealthy EB was detected in 70% of examined children: among 1 group children unhealthy EB was observed in 100,0%, 2 group – in 81.8% of patients, 3 group – in54.3% of cases, 4 group – in 20% of patients (Fig. 1).

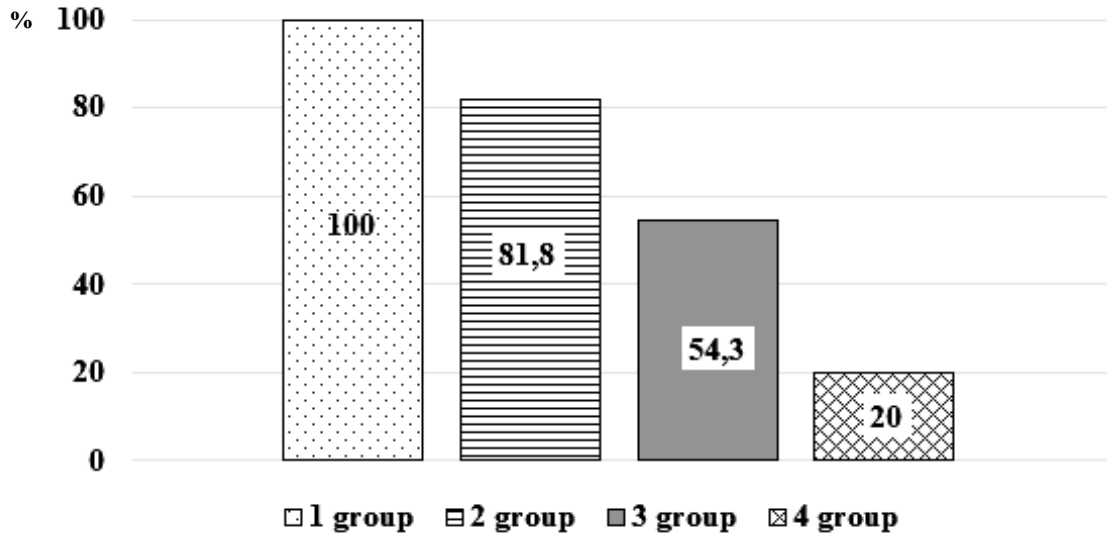

Fig. 1. The frequency of detection of unhealthy EB among the studied groups

When analyzing the data of the eating behavior questionnaire, it was found that in most patients with SS (75.0%) and NASH (84.6%) the emotional type of EB dominated (Fig. 2). Moreover, the total score of emotional EB in 1 group of children was significantly higher compared to other groups and significantly differ from the control group ($p=0.005$), which reflects a higher severity of clinical symptoms in these patients (Table).

External type of eating behavior was found in 25% of children with SS and was not observed in children with NASH (Fig. 2). The overall score of the external type of EB among the examined patients was the highest in 2 group and differed significantly from the control group ($p<0.05$).

Restrictive type of eating behavior, according to our study, prevailed among children of 3 group (73,7%) (Fig. 2). The total score of restrictive eating behavior was significantly higher in children of 3 group compared to data of 4 group ($p<0.05$).

To date, the nutrition and eating behavior influence on the nature and degree of ectopic fat accumulation remains debatable. On the one hand, the psychological features of NAFLD patients formed as a result of reduced quality of life, and increased anxiety, may contribute to the development

of emotional overeating. On the other hand, insulin resistance accompanying NAFLD in almost 100% of cases can also lead to the unhealthy eating behavior development, forming a vicious circle [6]. The development of the emotional type of EB is a kind of protection against daily stresses. According to adult clinical studies, more than 60% of obese patients have emotional type of EB [2, 4]. In 15-20% of overweight patients a certain type of emotional type of EB is diagnosed – compulsive overeating. It has been demonstrated that in patients undergoing treatment for obesity, this particular type of EB increases significantly, reaching about 50% [19]. The obtained data shows that diet therapy prescribed without considering the emotional component worsens the degree of EB in obese patients, which, of course, worsens the nutritional status of patients and can aggravate the course of the disease.

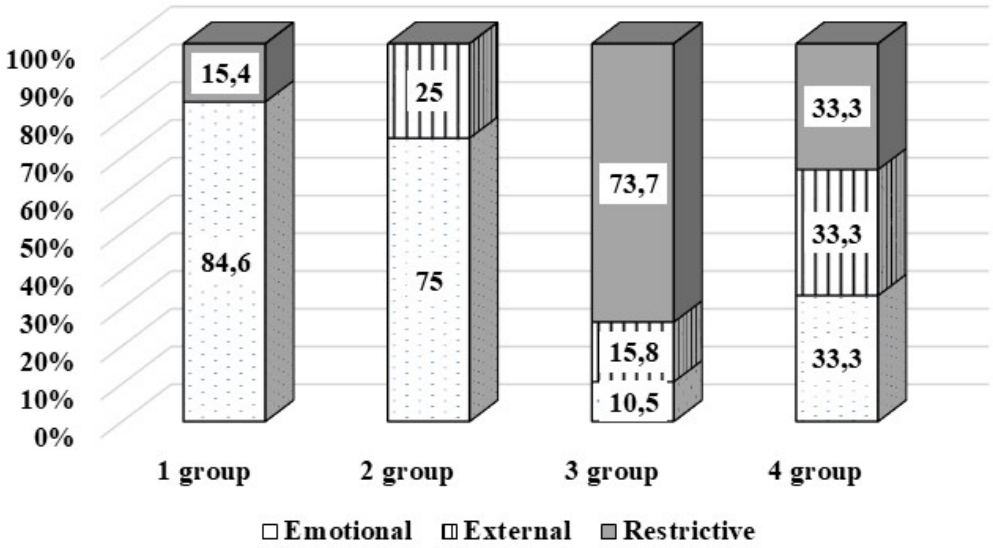

Fig. 2. The structure of the types of unhealthy EB among the studied groups

According to Fadeenko G.D., Nikiforova Y.V. (2016) in adult NAFLD patients with arterial hypertension, there was a predominance of external type of eating behavior, which correlated with the severity of metabolic disorders: patients with external type of eating behavior had higher BMI and the visceral adipose tissue fraction in comparison with patients with emotional eating behavior [5]. Our study demonstrates the differences in the dominant types of eating behavior in children and adults with NAFLD: in particular, the predominance of emotional eating behavior in children is opposite to external eating behavior in adults. A possible explanation for this fact may be the greater availability of communication related to food intake (as a sign of external EB), the greater availability of alternative methods to relieve emotional stress in adults (including psychological assistance, treatment by a psychologist, psychotherapist, sedative medications, as well as alcohol, smoking) compared to children for whom eating is the main way to get pleasure and relieve stress.

Total score depending on the type of unhealthy EB in the studied groups

Unhealthy EB type	1 group (n=26)	2 group (n=44)	3 group (n=35)	4 group (n=15)
	M±SD	M±SD	M±SD	M±SD
Emotional	2.8±0.83*	2.59±0.80	2.54±0.82	1.53±0.51
External	1.70±0.77	2.27±0.884*	2.15±0.89	1.80±0.82
Restrictive	2.14±0.57	3.03±0.89	3.40±0.91*	2.20±1.32

Note. * p <0,05 – significance of differences according to the Mann-Whitney U-test in comparison with 4 group.

The restrictive type of unhealthy EB usually occurs because of self-restriction and the use of too strict diets that only worsens the psychosomatic state of patients. Self-limitation is the leading reason for non-compliance with dietary recommendations, which should be considered in the correction of eating behavior [5]. Gradual changes in diet should be recommended for such children.

Thus, overweight and obese children are characterized by a significant increase in the incidence of unhealthy eating behavior, compared to children with normal weight. Among NAFLD children unhealthy EB is much more common than in obese children, and the progression of the disease is accompanied by a further increase in the frequency of these disorders: every child with NASH has unhealthy eating behavior. Among children with SS and NASH the emotional type of eating behavior dominates, while obese children without steatosis show a predominantly restrictive type of eating behavior, which requires specific correction and involvement of psychologists, psychotherapists in the team of specialists taking care of NAFLD children. Therefore, the type of eating behavior should be taken into account during the dietary correction, as non-compliance with nutritional modification contributes to the worsening of eating disorders, nutritional status of patients and complicates the course of the disease. Demonstrated features should also be considered when creating a personalized therapeutic intervention plan.

CONCLUSION

Thus, our study demonstrates differences in eating behavior in children depending on the presence of obesity and different forms of NAFLD. Obese children are characterized by an increased incidence of various types of unhealthy eating behavior compared to children with normal weight. Among children with simple hepatic steatosis and NASH the emotional type of eating behavior predominates, while obese children without steatosis have a predominantly restrictive type of eating behavior. The obtained data should be considered when creating an individual treatment plan for children with different types of NAFLD and obesity.

Conflict of interests. The authors declare no conflict of interest.

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