

VOLUME LXXVI, ISSUE 3, MARCH 2023

ISSN 0043-5147

E-ISSN 2719-342X

Wiadomości Lekarskie Medical Advances



Official journal of Polish Medical Association has been published since 1928



INDEXED IN PUBMED/MEDLINE, SCOPUS, EMBASE, EBSCO, INDEX COPERNICUS,
POLISH MINISTRY OF EDUCATION AND SCIENCE, POLISH MEDICAL BIBLIOGRAPHY

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The journal *Wiadomości Lekarskie* is cofinanced under Contract No.RCN/SN/0714/2021/1
by the funds of the Minister of Education and Science



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Graphic design / production:

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www.red-studio.eu

Publisher:

ALUNA Publishing House

ul. Przesmyckiego 29,

05-510 Konstancin – Jeziorna

www.wydawnictwo-aluna.pl

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ORIGINAL ARTICLE

PECULIARITIES OF EATING BEHAVIOR IN CHILDREN WITH AUTISTIC SPECTRUM DISORDERS

DOI: 10.36740/WLek202303107

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ABSTRACT

The aim: To determine of the nutrition peculiarities in children with ASD.

Materials and methods: The study involved 37 children with ASD from 2 -12 years and thier mothers, in according to reveal its disorder effect on the clinical course of ASD in children.

Results: It was shown role of irrational nutrition of the mother during pregnancy, peculiarities of family food traditions, problems of breastfeeding and complementary feeding. Eating behavior of mothers during pregnancy were: monotonous nutrition and an inadequate diet. The family food preferences were: varied and included both traditional and specific food preferences (vegan, vegetarian, monotony diet).

Conclusions: The analysis of the eating behavior in the ASD children, taking into account the age peculiarities, was carried out. Intolerance to certain products was noted. Also effectiveness of the elimination diet was shown. Elimination from the diet of the white flour products within 6 months has a positive result which evaluated by digestive and cognitive signs.

KEY WORDS: diet, psycho-cognitive disorders, eating habits, food preferences, digestive system, product intolerance

Wiad Lek. 2023;76(3):508-514

INTRODUCTION

It is difficult to overestimate the relevance of studying autistic spectrum disorders in children (ASD). Today, there is a great increase in ASD incidence in the child population around the world.

Among the mechanisms of ASD development, the structural, genetic, metabolic, energy, and cytochemical disorders in the organism, which occur already at the period of early ontogenesis, are singled out [1–5].

Besides of mental and neurological disorders, children with ASD have many peculiarities of the general health. Peculiarities of the functioning of the brain and autonomous regulation of vital activity of children with ASD are manifested not only in the form of psychological and cognitive changes (aggression and auto-aggression, phobias, the attention deficit and hyperactivity syndrome, sleep disturbance, etc.) but also affect many vital functions, such as nutrition, respiration, metabolism products release [6, 7].

Disorders of digestion and eating behavior are extremely common (up to 90%) occur in this group of children [6–9] and are directly associated with the ASD

development pathogenesis, and also correlate with the severity of clinical symptoms [8–10].

Eating disorders include several types, such as anorexia, bulimia, overeating and avoidant/restrictive food intake disorder.

Avoidant/restrictive food intake disorder (ARFID) is a condition when a child ignores food for various reasons and qualities, and is singled out as a separate nosological unit in DCM-5 and ICD-11. In this case, the diet of children consists of a limited amount of food, which leads to microelement, vitamin and energy deficiency, stunting of body mass and organic diseases [10, 11]. There is a need for the use of nutritional supplements and enteral nutrition. That is why ARFID occurrence prediction and the further development of programs aimed at overcoming the selectivity of nutrition are necessary at habilitation of children with ASD [12–14].

THE AIM

To study the peculiarities of eating behavior and reveal its disorder effect on the clinical course of autistic spectrum damage in children.

Table I. The features of pregnancy course and eating behavior in mothers of children with ASD

| Characteristic of pregnancy, food preferences and eating behavior | Absolute value | Relative value M ± m, % |
|--|----------------|----------------------------|
| Pregnancy: singleton | 35 | 94,5 ±3,7 |
| multiple | 2 | 5,4 ±3,7 |
| Way of getting pregnant: - natural | 32 | 86,5 ±5,6 |
| - full IVF protocol | 5 | 13,5±5,6w |
| The term of complicated pregnancy occurrence: 1st trimester | 23 | 62,2±7,9 |
| 2nd trimester | 3 | 8,1±4,5 |
| 3rd trimester | 5 | 13,5±5,6 |
| Method of delivery: childbirth natural | 26 | 70,3±7,5 |
| Caesarian section | 11 | 29,7 ±7,5 |
| Gastro-intestinal diseases before / during the pregnancy | 8 11 | 21,6±6,8 29,7 ±7,5 |
| Mother's food habits during pregnancy: -high carbohydrate food | 26 | 70,3±7,5 |
| -meat products | 6 | 16,2±6,0 |
| -fruit | 4 | 27,0±7,3 |
| -milk products | 2 | 5,4±3,7 |
| -fish | 4 | 10,8±5,1 |
| -non-food products (earth, chalk) | 1 | 2,7±2,6 |
| -exotic food | 1 | 2,7±2,6 |
| -salty and sour foods | 1 | 2,7±2,6 |
| -vegan | 3 | 8,1±4,5 |
| -vegetarian (ovo- / lacto- eating) | 4 | 10,8±4,5 |
| Food habits in the family: -bread and flour products (cereals, bread) | 26 | 72,2±7,3 |
| -milk products | 5 | 13,5±5,6 |
| -meat | 10 | 27,0 ±7,3 |
| -fish dishes | 1 | 2,7±2,6 |
| -healthy eating diet | 12 | 33,3±7,6 |
| -traditional cuisine of Ukraine | 33 | 89,2±5,1 |

MATERIALS AND METHODS

The study involved 37 children aged 2 to 12 years (the mean age (3,7±2,4) years). The distribution by gender was uneven: (72,9±7,3) % were boys and (27,1±7,3) % were girls. The inclusion criteria to the study: a confirmed ASD diagnosis, the age 2–11 years old, the informational consent for participation in the experiment. The exclusion criteria: acute and chronic pathology of the central nervous system, acute encephalopathy, children's cerebral palsy, epilepsy, genetic diseases affecting the central nervous system), hereditary metabolic disorders (phenylketonuria, Wilson's disease, etc.), organic diseases of the gastrointestinal tract (peptic ulcer, hepatitis, cholecystitis, etc.).

In order to evaluate the food preferences in children with ASD, the ChEDE-Q questionnaire (Children Eating Disorder Examination Questionnaire) in the author's modification was used. To assess the psycho-cognitive functions dynamics in children with ASD, the ATEC test

(autism treatment evaluation checklist) was used.

The obtained digital data were statistically processed using the Microsoft Excel package. Statistical processing of the data involved an assessment of the normality of the data distribution. Continuous and categorical variables were defined as mean (M), standard deviation (m), relative (%). The normally distributed numerical variables were compared with an independent sample t-test. Numerical variables that were not normally distributed were compared with the Mann–Whitney U-test. The statistical significance of the indicators was determined at the level of $p \leq 0,05$.

RESULTS

Among the examined children, the ratio of boys and girls was 3:1, which indicates gender inequality among children with ASD. When evaluating the clinical features of the ASD course in children, the anamnestic data as-

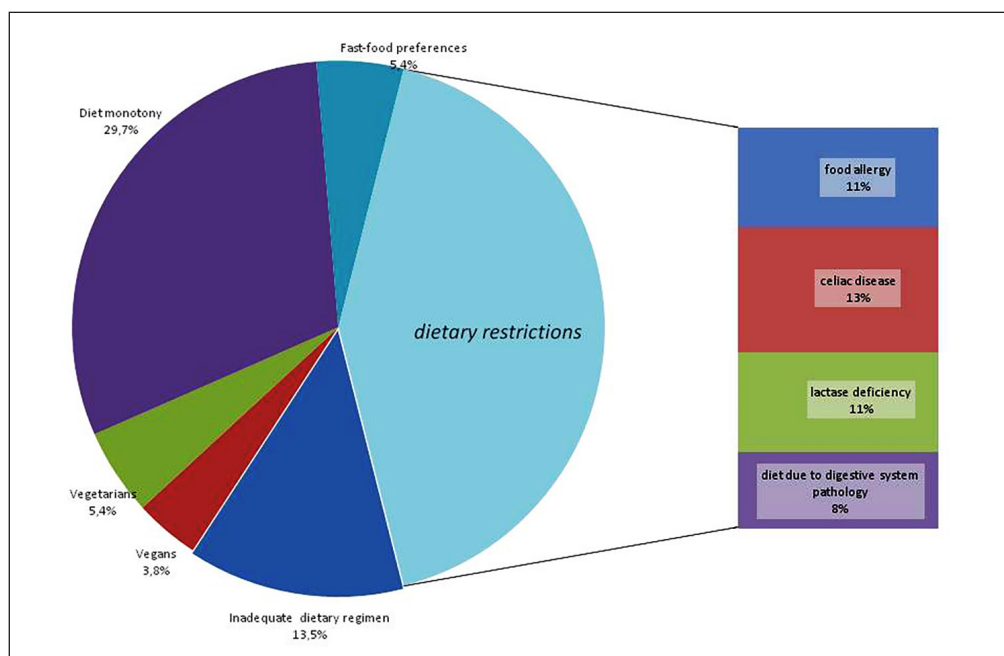


Fig. 1. Eating behavior peculiarities in ASD children's mothers.

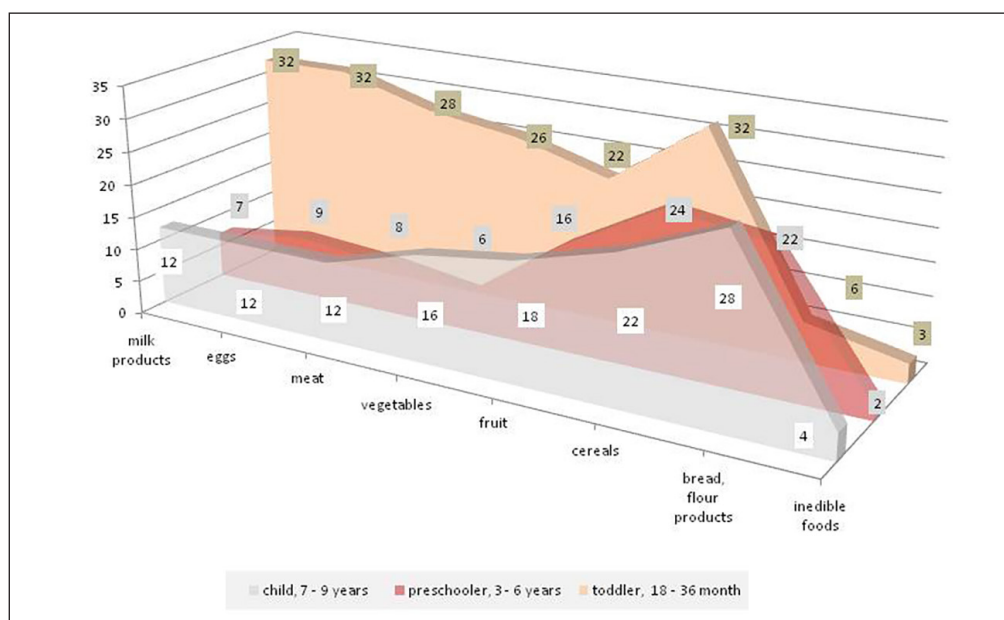


Fig. 2. Eating preferences in ASD children of different age groups

sociated with eating behavior of a child and his family were thoroughly analysed.

Taking into account the proved role of the pregnant woman's diet on the development of different pathologies in future in a child, a special attention was paid to studying the antenatal period characteristics, as well as food preferences of the pregnant women (Table I).

Among the data presented in the table, a high incidence (83,8±6,1%) of the complicated course of pregnancy draws the attention, and in some cases (13,5±5,6) % of problems were registered even at the pregravid period, as the result of which the spontaneous pregnancy did not occur and the parents had to fall back on modern reproductive technologies. In most cases,

an induced pregnancy ended with operative delivery, which is associated with a number of features: a change in the formation of the intestinal microflora, which in turn affects the functioning of the digestive system, modification of immune and metabolic processes, an impact on the formation of the cerebrointestinal axis, and indirectly, on the subsequent child's eating behavior.

When studying the mother's eating behavior, a special attention was paid to forced dietary restrictions associated with various pathological conditions (Fig. 1). It is important to note that only in (21,6±6,8) % of cases such pathological conditions were documented and confirmed, most of them were chronic patholo-

gy of the digestive system (gastroesophageal reflux disease, chronic gastroduodenitis, gastric ulcer, pancreatitis, cholecystitis) and food allergy. In other cases, food restrictions were set independently on the basis of a subjective opinion and the sense of various diets effectiveness (low lactose, gluten-free), but without confirmation by laboratory tests.

The presented diagram shows that the features of the eating behavior of mothers during pregnancy were the monotonous nutrition (29,7±7,5%), as well as an inadequate diet (13,5±5,6%).

As a rule, the mother's gastronomical predilections to high-carbohydrate food was noted, which in most cases was associated with family food traditions. This made it possible to assume the influence of the food priorities of the mother and family on the formation of the child's eating behavior in the future.

After the birth, most of the children were breast-fed or mixed-fed (67,6±7,7)%; (10,8±5,1)% of children were breast-fed for more than 12 months. At the same time, the average period for the introduction of complementary food was 4–6 months (4,2±2,0) in (47,2±8,2) % of children. Most often complementary feeding started with vegetable puree (81,1±6,4) % and milk porridge (18,9±6,4)% with buckwheat and rice flour (72,9±7,3)%.

During the experiment course the analysis of the eating behavior in the examined children with taking into account the age peculiarities was carried out (Fig. 2).

At the younger age period (from the introduction of complementary food (4,9±2,2) months to (2,7±1,6) years, a priority intake of products of whole and preformed milk, cereals and groat, fruit and vegetable puree was noted. At the older age period (from (2,7±1,6) years to (8,3±2,8) years) food preference shifted towards excessive intake of bread and flour products, which can be associated with the emergence of an independent food search in a child with ASD and high availability and variety of shapes/kinds/flavours in the given food group. We can also note the frequent use of bread and flour products (crackers, cookies, biscuits) in the form of snacks and rewards (for example, when introducing the behavioural therapy), which does not have a favourable effect on the general somatic health of children with ASD.

Intolerance to certain products (vomiting and stool changes) was noted in (21,6±6,7)% of the respondents, and most often was associated with intake of dairy products and meat, which further necessitated the introduction of elimination diets. The gluten-free diet was followed by (27,0±7,3)% of children with a laboratory-confirmed increase in the concentration of IgG to gliadin, as well as a pronounced increase in the values of antibodies to tissue transglutaminase (tTG-IgA).

Taking into account the data obtained, effectiveness of the elimination diet was evaluated, which showed that elimination from the diet of the white flour products within 6 months gives a positive result in the form of the ATEC test score regression in 51,3% of ASD children — falling from 61 points to 50–60 points level ($p>0,05$). Improvement in behaviour was noted in (30,0±7,6)% of children, improvement of stool in (20,0±6,5)%, removal of digestive system problems — in (40,0±8,0)%. In spite of the fact that the positive influence of the used diets did not reach the reliable level, the obtained changes in children's behaviour, smoothing of complaints of digestive system problems, approval of parents gives an opportunity to consider the food correction as an important direction of the individual therapeutic programs with ASD.

Considering the role of the child's and family's eating habits, which at an early age underlie stable taste habits and form the attitude to the process of eating, during the examination the variants of eating behaviour patterns, such as bulimia nervosa, anorexia nervosa, compulsive overeating and selective eating disorder were assessed. Based on the data obtained, bulimia nervosa and anorexia nervosa were absent at the given group of ASD children. While compulsive overeating was noted in (8,1±4,5)% of children, and ARFID took place in (91,9±7,6)%.

It should be noted that all the children at the time of the study were at the age when the child should already have a formed eating interest and eating behavior. At the same time, (59,5±8,0)% of the examined children have to be forced and stimulated to eat because they have no hunger, and (32,4±7,7)% constantly have poor appetite, (45,9±8,1)% of children did not want to eat a certain product, and (29,7±7,5)% preferred a monotonous diet and homogenous food consistency in spite of absence of swallowing failure.

In (75,7±7,0)% of the examined children the ARFID development was connected with the use of the food as rewards, of them (62,2±7,9)% preferred quick meals.

In the formation of eating behavior in a child with ASD, it is necessary to note the attention of parents to the problem of the process of nutrition and eating. The family of a child with ASD is subject to close attention from society and is limited in the possibility of free movement and physical activity accessible to families with common children. When choosing a catering establishment to visit, in (83,8±6,1)% of cases, "fast food", "takeaway" food is preferred. Taking into account the psychological characteristics of children with ASD, preference in daily activities is given to calm games and developing static activities; (64,9±7,8)% of respondents have insufficient physical activity during

the day, which also contributes to the disruption of the formation of healthy eating habits and adversely affects the digestive system. The parents of children with ASD in (72,9±7,3)% are in permanent psychological stress, which is revealed in close attention of parents to the development, treatment, and, most importantly, to the nutrition of the child. The steady intention to vary the diet of a child with ASD with different products, a tendency to regular frequent meals, the demand to eat up a portion increases neurotic attitude in the family and negativity to food in a child with ASD. This group of children very needs balanced diet with essential nutrients in strict accordance with the age necessities of the growing organism.

DISCUSSION

Nutrition is a very important aspect of the successful life of any organism. Nutrition problem deserves a special attention in children with ASD. Considering to numerous data, problems with the introduction of new foods, unsuccessful attempts to vary the ways of preparing and serving dishes, problems with the way of eating are typical for children with ASD [13–16], which was confirmed by this research.

The study conducted by Nugren G, Linnsand P, Hermansson J. was showed that 76% of children diagnosed with ASD have the problems with food, and 28% demonstrated a selective eating behavior, there were also nutritional problems in the form of refusal to eat, behavior problems during meals, rituals, which is correlated with the obtained data [14, 15].

The eating behavior of a child with ASD is a constant source of stress for the family, which only exacerbates the existing problem.

Malnutrition at the early childhood can lead to deficiency of body mass, height, or vice versa — to obesity in the future. In addition to metabolic changes, in children with ASD and ARFID, there are gastrointestinal tract disorders, the occurrence of allergic and deficient conditions (both macronutrient and micronutrient: mineral deficiencies, vitamin deficiencies) [17, 18]. Eating behavior disorders often underlie the development of functional disorders of the digestive system, which can transform into the organic chronic pathology [19], which was also observed in our patients in the study on the characteristics of the cerebrointestinal interaction, during which the markers of neuroinflammation in children with autism and concomitant functional pathology of the digestive system were identified [20, 21].

Selective nutrition in favour of the choice of wheat products, due to the convenience of intake and high availability for any family, is noted everywhere. There are

views on the need to limit products of white wheat flour and products containing gluten, a so-called gluten-free diet [22–24]. Opinions on this issue vary, but surely, the refusal of gluten-containing products is not dangerous and cannot harm the health of the child [25–30]. The exceptions are cases in which a child with ASD may experience stress due to the abrupt withdrawal of the usual foods containing gluten.

In our study, cases of the negative effect of the elimination diet in the form of the emergence of protest behavior (aggression and auto-aggression) were also registered when white flour products were cancelled. It was found that in families of children with ASD, the level of stress in the family is significantly higher than in families raising normotypical children [30]. Based on the results of this study, recommendations were developed for the correction of ARFID in children with ASD based on applied behavior analysis. Separately it should be noted that, unfortunately, these recommendations did not take into account the presence of diseases of the digestive system and other concomitant somatic pathologies. That is why in our study, when making a plan for the correction of ARFID in children with ASD, anamnestic features were always taken into account and the concomitant somatic pathology diagnosis was carried out, which affects the child's eating behavior and which needs to be corrected in the first place.

To correct eating behavior in children with ASD, individual correcting programs were used and, if necessary, a transdisciplinary team of specialists was involved, consisting of a paediatrist, gastroenterologist and nutritionist, correctional teacher and psychologist.

The effectiveness of the correction of eating behavior was demonstrated in 83.8% of children with ASD. At the same time, the appetite improvement, the expansion of the diet, the normalization of stool was accompanied not only by improvement of psycho-cognitive indicators (improvement of social contact, a decrease in the frequency of unwanted behavior, normalization of night sleep), but also by a regression of clinical manifestations of functional disorders of the digestive system.

An integrated individual approach allows achieving the normalization of eating behavior, improving the state of somatic health in a child with ASD, and also contributes to the harmonization of intra-family relations.

CONCLUSIONS

Eating behavior is an essential component of autistic disorders in children. The most common pattern of eating behavior in ASD is selective eating behavior. The formation of eating behavior in a child with ASD is influenced by many factors, among which irrational

nutrition of the mother during pregnancy, peculiarities of family food traditions, problems of breastfeeding and complementary feeding, the presence of concomitant pathology and forced keeping to elimination diets. The presented factors, together with the problems of socialization, require careful further study.

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Conflict of interest:

The Authors declare no conflict of interest

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Received: 22.09.2022

Accepted: 18.02.2023

A – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article

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