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The prevalence of malnutrition and other related factors among children with autism spectrum disorder

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ABSTRACT

Introduction: Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties with social interaction and communication and by restricted and repetitive behavior. Children with ASD are at risk of nutritional problems that could impact growth and anthropometric indices over the short and long term. The aim of the present study was to determine the prevalence of malnutrition and other factors related to malnutrition among children and adolescents with ASD.

Methods: To assess the prevalence of malnutrition indicators among preschool children with ASD, a cross-sectional study was conducted on 81 children and adolescents who referred to the Subspecialized and Specialized Autism Akbar Children's Hospital, Mashhad University of Medical Sciences, Mashhad, Iran. Weight and height were assessed based on standard protocols and the z-score of anthropometric indices was determined for all participants. The interviewer asked the parents of the participants about nutritional problems.

Results: In the current study, the mean±SD of age was 3.7±10.1 years old. Among the participants, %3.7 presented with diarrhea, %33.3 with constipation, %4.9 with reflux, %3.7 with flatulence, and %1.2 with steatorrhea. The prevalence of both food neophobia and food allergy was %16. Regarding appetite, %18.5 had poor appetite while %23.5 had moderate and %58 had good appetite. Based on standardized z-scores, the overall prevalence of being underweight, risk of becoming overweight, overweight, and obesity was %12.3 ,%22.2 ,%1.2, and %7.4, respectively. Furthermore, %4.9 participants presented with stunting.

Conclusion: Based on the aforementioned prevalence, improving nutritional problems and anthropometric indices among ASD children and adolescents is a crucial issue.

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Introduction

Autism Spectrum Disorder (ASD) refers to a group of complex neurological and developmental disabilities with a prevalence of 1 in 54 for males and 1 in 252 for females age 8 years in the United States (1).

The prevalence of autism in Iran is close to its global prevalence and it is estimated that there are 790,000 individuals with autism in the Iranian population (2). Furthermore, "spectrum" refers to the wide heterogeneity of symptoms that are related to the atypical cognitive profile, executive dysfunction, and unusually restricted or repetitive behavior (3) presented in individuals.

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Children with ASD (62%, range: 30–84%) experience significantly more feeding difficulties than the normal population. The term feeding difficulties describe problems with limited food intake, restrictive diets, and the impact on nutrition, and food preference. These feeding difficulties include picky eating, limited independent feeding, need for increased feeding times, and a highly restrictive food repertoire.

Children with feeding difficulties are at risk of developmental delays, stunting, and nutritional inadequacies related both to malnutrition as well as obesity (4). There are inconsistent results of evaluating body weight for children with ASD. An investigation on Body Mass Index (BMI) showed that about 75% of the males exhibited BMI below the 50th percentile, indicating that male children with ASD may be at particularly high risk for low body weight compared to females (5).

On the other hand, a study done on 100 ASD Egyptian children showed increased weight and BMI with rising occurrence in subcutaneous fat thickness and a decrease in muscle mass in males and older children (6).

Feeding problems in children with ASD may manifest as anatomical, metabolic, gastrointestinal, or motor or sensory difficulties, resulting in an increased risk for gastrointestinal problems. In addition, abnormal eating patterns may trigger gastrointestinal difficulties and alter the gut microbiome in children with ASD (7).

Due to these concerns, certain diet interventions such as a balanced healthy diet could be useful in alleviating some ASD–related symptoms. Moreover, many autistic individuals suffer from gastrointestinal problems such as abnormalities of the bowel mucosa, dysfunctions associated with selective permeability, and significant differences in composition of the gut microbiota.

Studies have suggested that certain gut bacteria, oxidative stress, and changes in intestinal permeability could be involved in the etiology of ASD (8). The aim of the current study was to evaluate the nutritional status and the prevalence of gastrointestinal problems in children with autism spectrum disorder.

Materials and Method

This trial was conducted during 2020-2021 as an across sectional, single-center research, in the tertiary center of the Mashhad University of Medical Sciences. Study group: Eighty-one children between the ages of 3 and 18 years were treated at the Specialized Autism Centers that consist of pediatric psychologists, pediatric neurologists, and pediatric nutritionists.

The diagnosis was made by a pediatric psychologist and pediatric neurologist according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) (American Psychiatric Association, 2000). All the children were enrolled in the current study after receiving informed consent from their parents. Exclusion criteria were patients with known metabolic disease, diabetes mellitus, or celiac disease.

Weight (kg) and height (cm) were evaluated by standard tools and the BMI data for weight and height BMI (kg/m2) were calculated. Comparison of weight, height, and BMI between groups was calculated using World Health Organization (WHO) AnthroPlus software (World Health Organization, 2009).

Lastly, calculated z-scores were used in the analyses. Demographic and gastrointestinal evaluations were collected subjectively by using a standard checklist. Nutritional consumption was obtained through a 24-hour dietary recall by a registered dietitian. Food pattern and elimination of food groups were estimated based on a food record. Statistical analysis: Baseline demographic characteristics are presented as means and standard deviations (SD) for continuous variables or as numbers and percentages for categorical variables.

Results

Eighty-one patients were recruited into the study. Demographic characteristics of the participants are shown in Table 1.

Table1: Demographic characteristic of the participants

Gender Percent (%)	**Male**	**85.5%**
	Female	**14.8%**
Age	10.19(3.71)	
Minimum	2.80	
Maximum	18.70	
Mean anthropometric measurement		
Weight Z score	0.708(1.55)	
Minimum	-3.25	
Maximum	6.49	
Height Z score	0.439(1.46)	
Minimum	-3.54	
Maximum	5.33	
BMI Z score	0.34(1.52)	
Minimum	-4.50	
Maximum	2.90	

The mean±SD of age was 10.1±3.7 years old.

Gastrointestinal manifestation was detected in about 50% of participants, hence, 3.7% present-

ed with diarrhea, 33.3% with constipation, 4.9% with reflux, 3.7% with flatulence, and 1.2% with steatorrhea. The prevalence of both food neophobia and food allergy was 16%. According to the parents' records, 18.5% of participants had poor appetite, 23.5% had moderate and 58% had good appetite. Based on standardized z-scores, the overall prevalence of being underweight, risk of becoming overweight, being overweight, and obesity was 1.2%, 22.2%, 12.3%, and 7.4%, respectively. Among the participants, 4.9% presented with stunting.

Evaluation of the 24–hour food record of the participants showed that about 25% of patients did not eat from either of the two main food groups (diary or meat) during their daily regimen. The reason being that the subgroups of daily foods like bread and milk were omitted by some parents of patients as they were concerned about their effect on the severity of symptoms on their child and sometimes, exclusions were due to their physicians' orders. On the other hand, about 70% of participants were interested in eating fruits and vegetables.

In the obese group, the mean age was 13.2 (3.5) and all of them were male. About 71% of participants were eating high energy dense foods like cake, ice cream, and fruit juice. Moreover, 65% of total autism children consumed appetite stimulant medicine such as risperidone or aripiprazole. However, in the obese groups only 50% of children used these medications

groups (diary or meat) during their daily regimen. The reason being that the subgroups of daily foods like bread and milk were omitted by some parents of patients as they were concerned about their effect on the severity of symptoms on their child and sometimes, exclusions were due to their physicians' orders. On the other hand, about 70% of participants were interested in eating fruits and vegetables. In the obese group, the mean age was 13.2 (3.5) and all of them were male. About 71% of participants were eating high energy dense foods like cake, ice cream, and fruit juice. Moreover, 65% of total autism children consumed appetite stimulant medicine such as risperidone or aripiprazole. However, in the obese groups only 50% of children used these medications.

Discussion

The current study on 81 individuals with diagnosed ASD shows interesting results in comparison to global statistics. Approximately a quarter of ASD children were obese and all of them were males. Eating high density snacks were more prevalent in this population and half of the patients consumed appetite stimulant medicine. Furthermore, 50% of participants had gastrointestinal symptoms.

While in recent studies, 75% of subjects exhibited BMI below the 50th percentile (9), in this study only 1.2% of the individuals were diagnosed as underweight. The prevalence estimates of obesity among children with ASD was estimated at 17% by a meta-analysis done on 20 eligible studies .The children with ASD had a 58% greater risk of developing obesity compared with normally developed children (10).

In our study, 20% of ASD children were obese, which was a little bit higher than the meta-analysis study result. This result emphasizes the aforementioned inconsistency in the link between ASD and BMI. Also, the 41.9% of combined risk of becoming overweight, being overweight, and being obesity demonstrates the high risk of obesity in the ASD-diagnosed population and therefore, special attention to the diets of these individuals should be given (11-13).

Previous studies showed that the causes of the high prevalence of being overweightn and obesity, or in other words, the low prevalence of being underweight, could be related to the high appetite of children with autism disorder, the use of drugs such as risperidone or aripiprazole, and the consumption of high energy dense foods (10).

In the present study, we also found this critical association. Barnhill et al. observed the gender of obese people with autism was male in 92% of participants. In our study it was 100%, which indicates that the prevalence of obesity in males with autism disorder is higher than females (14).

To further demonstrate the importance of carefully planned diets, the high manifestation of gastrointestinal problems can be brought to the spotlight. About 50% of the participants showed symptoms of gastrointestinal maladies ranging from diarrhea, constipation, reflux, flatulence, and steatorrhea. Nearly all of these disorders could be traced back to malnutrition or treated by customized diet plans. Leader et al. found that overall, 82.4% (n=112) of participants experienced at least one gastrointestinal symptom such as abdominal pain, nausea, bloating, constipation, and diarrhea within the last three months.

Moreover, similar to our study, it has been shown that abdominal pain and constipation were the most common symptoms in these patients (15, 16). Having a customized diet based on each individual's physiology, pathology, and ASD condition could have a significant impact on one's health, and alleviate most symptoms. Seeing that some parents already used this as a tool to successfully improve their child's condition, suggests promising results. Although gluten–free

and dairy–free diets were one of the most common customized diets that were prescribed to ASD patients to alleviate their GI and behavioral symptoms, their real effects on ASD patients were not clear as these diets are commonly used in patients with known celiac disease and cows mild protein allergy disease.

One of the causes of digestive problems in ASD patients was related to the presence of bacterial dysbiosis in the digestive system (17), which was one of the limitations of the present study because the current study only examined the subjective symptoms of digestive problems.

Another limitation of the present study was the lack of evaluation of physical activity in children with autism, which is an important factor related to the level of obesity. It is recommended that in future studies, these factors be evaluated accurately. Despite these results, a more thorough and longer follow-up is needed to fully understand the dietary habits of these children and the role dietary habits have in the multi–disciplinary management of nutritional, gastrointestinal, and behavior problems in ASD patients.

Conclusion

a more thorough and longer follow-up is needed to fully understand the dietary habits of these children and the role dietary habits have in the multi–disciplinary management of nutritional, gastrointestinal, and behavior problems in ASD patients.

Conflict of interest

The authors declare no conflicts of interest.

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