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Differences in Nutrition and Eating Patterns Between Youth with Autism Spectrum Disorder and Neurotypical Youth

Mariam Spieler Tahech
University of Central Florida

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DIFFERENCES IN NUTRITION AND EATING PATTERNS BETWEEN
YOUTH WITH AUTISM SPECTRUM DISORDER AND NEUROTYPICAL
YOUTH

by

MARIAM SPIELER TAHECH

A thesis submitted in partial fulfillment of the requirements
for the degree of Bachelor of Science
in the Department of Health Sciences
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ABSTRACT

Background: Autism Spectrum Disorder (ASD) is a developmental disorder characterized by difficulties with communication, problems with social interactions, and repetitive patterns. A greater proportion of children with ASD tend to experience nutritional difficulties and feeding issues compared to neurotypical (NT) children; however, limited research has been examined that compares nutritional behaviors between children with ASD and NT youth. **Purpose:** The purpose of this study was to examine the differences in gastrointestinal issues, weight concerns, and mealtime behaviors in youth with ASD and NT youth. Data was utilized from the 2019 National Survey of Children's Health which consisted of items related to children's health and well-being. Parent-reported variables on dietary behaviors, child weight concerns, mealtime behaviors, and food insecurity were compared between children with ASD and NT youth using chi-square analyses. **Results:** A total of 868 (weighted sample of 2,068,404) children with ASD and 28,441 (weighted sample of 72,451,623) NT children were included in the analysis. A greater percentage of parents of children with ASD reported weight-related concerns about their child ($p < 0.0001$), difficulty with their child swallowing/chewing food ($p < 0.0001$), their child experiencing GI distress ($p < 0.0001$), and food insecurity ($p < 0.0001$) compared to parents of NT youth. Parents reported no differences in frequency in family mealtime between youth with ASD and NT youth ($p = 0.57$). **Conclusion:** Children with ASD experience more nutrition-related difficulties than NT youth although there were no differences in family mealtime patterns. Future research should examine food insecurity in families of children with ASD and its relationship with nutritional difficulties in this population.

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I. INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder typically diagnosed in early childhood [1]. Worldwide, about 1 in 160 children is diagnosed with ASD [2]. In the United States, this number is reduced to 1 in 54 children [3]. ASD is 4 times more common among boys than girls and is present in all socioeconomic and ethnic groups [3]. This condition is characterized by language impairments and difficulties with social interaction along with repetitive patterns of behaviors. Children with ASD are commonly diagnosed with additional health conditions, which may negatively impact their quality of life. Those co-occurring conditions include epilepsy, sleep disorders, depression, anxiety, picky eating, and obesity, among others [4].

Children with ASD tend to have difficulties with eating behaviors and nutrition, with research indicating that up to 90% of children with ASD may display negative eating behaviors [5]. Food selectivity is the most common feeding issue, being present in up to 70% of children with ASD [5]. It consists of limited consumption of food or the refusal to consume most food items. In addition to food selectivity, other eating patterns and rituals are exhibited by children with ASD. Those atypical behaviors include food avoidance, issues and repetitiveness during mealtime, overeating, and pica [5]. These children also have chewing and swallowing problems as well as sensitivity to smell and taste, leading them to overreact to new foods [6]. Symptoms of food selectivity can range from mild to severe and can often result in nutritional deficiencies. While mild manifestations may not need treatment, severe conditions will require a nutritional intervention [7].

Feeding difficulties have many consequences on the health of children with ASD. The lack of vitamin intake results in vitamin deficiencies, and a diet mainly reliant on fats or complex carbohydrates increases the risk of diabetes, obesity, and cardiovascular disease [6,7]. Gastrointestinal symptoms are also present in those children [6]. Additionally, atypical eating patterns bring challenges to parents, as their attempts to introduce new foods may result in crying, spitting, or aggression [7]. Although children with ASD commonly have feeding issues, diagnosis of eating disorders may be difficult due to communication barriers and the presentation of symptoms.

Research suggests that while feeding difficulties occur in both neurotypical (NT) children and children with ASD, these behaviors may present themselves differently between the two populations and occur at different stages of childhood [7]. Interestingly, there has been limited research investigating the differences in eating behaviors and feeding difficulties in NT youth and youth with ASD. By noting these differences, negative feeding behaviors may be identified early, and interventions can be targeted towards specific eating patterns in youth with ASD. Therefore, the purpose of the current study is to compare the differences in eating behaviors and feeding difficulties between children with ASD and NT children using data from the 2019 National Survey of Children's Health.

II. LITERATURE REVIEW

1. Description of Autism Spectrum Disorder

a. Definition and Characteristics of Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that is characterized by deficits in communication and social interaction along with repetitive patterns of behaviors. This disorder can range from mild to severe symptoms, as some people with ASD are able to live independently while others require permanent care [2]. Currently, there is no cure for ASD, although it can be treated with different therapeutic approaches. Some include parent-mediated interventions, applied behavior analysis (ABA), speech therapy, sensory-oriented therapy, music therapy, and occupational therapy [4]. Pharmacological interventions, in this situation, may be used to treat coexisting diseases instead of ASD itself [4].

ASD is typically diagnosed during childhood by a psychiatrist, physician, licensed mental health practitioner, or clinical psychologist [8]. The medical diagnosis of ASD is based on its definition from the Diagnostic Statistical Manual of Mental Disorders (DSM-V) of the American Psychological Association [8]. However, this definition has changed throughout the years; consequently, differing prevalence rates over time [8].

b. Prevalence of Autism Spectrum Disorder

The Center for Disease Control and Prevention (CDC) Autism and Developmental Disabilities Monitoring Network (ADDM) is the most common ASD prevalence study [8]. The CDC has made several prevalence studies of ASD since 2000, which involves 11 sites in the United States. Its latest study about ASD indicates a prevalence rate of 18.5 per 1000 (1 in 54) children aged 8 years old [3]. The CDC not only shows that ASD is 4 times more common

among boys than girls but also reports that ASD prevalence differs by site [9]. Additionally, the CDC indicates that ASD prevalence is higher in non-Hispanic white populations and socioeconomically advantaged groups [9]. Although this disorder is present in all ethnic groups, the prevalence differences by ethnicity have lowered in recent years [9]. This reduction may represent an improvement in diagnosing children with ASD.

2. Nutrition and Eating Behaviors in Youth with ASD

a. Issues with Nutrition

i. Selective Eating

Selective eating in children with ASD is common and begins at a very early age [10]. This condition negatively affects their health since it increases their risk of nutritional deficiencies; consequently, leading to gastrointestinal issues and obesity [10]. Atypical eating behaviors, such as repetitiveness during mealtime and overeating, also raise their risk of malnutrition [10]. Children with ASD have a strong preference for calorie-dense foods, choosing to consume starches, processed foods, and snacks while rejecting fruits and vegetables [10]. Besides those children feeling uncomfortable when eating with other people, they commonly have sensitivity to smell, taste, touch, and visual appearance of food [10]. A cross-sectional study established that about 90% of children with ASD do not process sensory information as neurotypical children [10]. Another study identified different levels of sensory sensitivity in ASD children, as well as an equivalent relationship between extreme sensory sensitivity and the severity of food selectivity [10].

ii. Gastrointestinal Issues

Gastrointestinal (GI) symptoms are frequent among children with ASD, as shown in a study with 140-170 ASD children, in which 24-63% had at least one GI manifestation, including constipation, abdominal bloating, diarrhea, or gastroesophageal reflux (GERD) [10]. Another study was conducted with 50 neurotypical children, 50 children with ASD, and 50 children with other developmental condition [10]. This study indicated that 70% of children with ASD presented with GI symptoms compared to 42% of children with other developmental condition and 28% of neurotypical children [10]. Food selectivity affects the intestinal microbiota composition of children with ASD; therefore, exacerbating their GI symptoms [10]. Short-chain fatty acids (SCFAs) have many health benefits; however, their accumulation has negative impacts on the nervous system [10]. Serotonin is a multifunctional neurotransmitter involved in mood modulation, memory, and other physiologic processes. Alterations in gut microbiota increase intestinal inflammation, leading to high levels of serotonin and consequently disturbing behavioral effects on the brain [10]. High levels of SCFAs and serotonin were noted in children with ASD [10]. Additionally, those children showed increased intestinal permeability, resulting in increased pro-inflammatory cytokines and alteration in the gut microbiota composition [10].

The study of Gorrindo et al. was conducted by recruiting 121 children and dividing them into 3 groups (children with co-occurring ASD and gastrointestinal dysfunction, children with isolated ASD, and children with isolated gastrointestinal dysfunction) [11]. This study aimed to investigate associations between gastrointestinal dysfunction (GID) and ASD, as well as to compare parental reports of GID with pediatric gastroenterologists' evaluations [11]. Based on the study, functional constipation is the most common GID condition in children with ASD [11]. This can be attributed to younger age along with increased social and communication impairments [11]. GERD was the second most prevalent condition in children with ASD and

GID [11]. In addition, parental report of GID in children with ASD was equivalent to gastroenterologists' diagnosis of GID [11].

iii. Nutritional Deficiencies

Nutritional deficiencies, which are mainly associated with food selectivity, are commonly seen in children with ASD. These two conditions increase their risk of malnutrition, leading to obesity and altered composition of intestinal microbiota [10]. Although children with ASD have a small repertoire of accepted foods, their protein intake is reported as adequate [10]. Since they tend to reject vegetables and low-energy-dense foods, their fiber intake is inadequate [10]. Additionally, micronutrient intake in children with ASD is frequently poor, indicating deficiencies in zinc, calcium, iron, copper, potassium, vitamin A, folic acid, vitamin B-12, vitamin C, choline, vitamin D, vitamin E, and riboflavin [10]. Due to low levels of vitamin D and calcium, children with ASD have an increased risk of fractures and decreased development of bone mineral density [10]. Finally, high levels of sodium intake were observed in this population secondary to high consumption of processed foods [10].

Vitamin C is an essential nutrient that is mostly found in fruits and vegetables. Hence, a diet that lacks the consumption of those foods would lead to vitamin C deficiency (scurvy) [12]. Signs and symptoms of scurvy include malaise, fatigue, follicular hyperkeratosis, purpura, and bleeding gums, among others [12]. Musculoskeletal problems such as bone pain, limping, and refusal to walk are also observed in children with scurvy [12]. Due to a lack of vitamin C intake, children with ASD are at increased risk of scurvy compared to neurotypical children [12]. Case series performed by Ma et al. exhibited the frequency of scurvy at Boston Children's Hospital and its coexistence with ASD [12]. The cases indicated a greater frequency of scurvy among children with ASD [12]. This increase can be associated with food selectivity and a diet deficient

in fruits and vegetables. The absence of multivitamin consumption in children with ASD is another risk factor seen in 100% of the cases [12]. However, working with a nutritionist and adding supplemental vitamins to their diet would be a beneficial way to reduce scurvy frequency among children with ASD.

iv. Obesity

Obesity is described as an excessive amount of body fat with a body mass index (BMI) over 30. This issue is more prevalent among children with ASD than neurotypical children. Also, obesity-related complications like hypertension are more frequently observed in adults with ASD [10]. The association between obesity and ASD has multiple factors. Children with ASD are usually diagnosed with a certain eating difficulty or feeding behavior that makes dietary intervention less efficient and contributes to increased overall energy intake [13,14]. Low levels of physical activities along with increased sedentary behaviors and screen time are noted in this population [13,14]. Those behaviors occur due to physical limitations, such as low muscle tone, and deficits in communication and social interaction [14]. In addition, children with ASD frequently have disorders that are related to obesity, including ADHD, gastrointestinal problems, and sleeping issues [13]. Some pharmacological treatments of ASD, particularly antipsychotic medications, are also associated with weight gain [13,14]. Finally, more than 36 genes and genetic variations like 16p11.2 deletion and 11p14.1 microdeletion have been linked to ASD and obesity [13,14].

Cerebral regulatory mechanisms that control energy intake and expenditure are correlated to obesity. Two neuronal networks called default-mode network (DMN) and central executive network (CEN) are involved in the regulation of social cognition and executive control, respectively [14]. As a direct result, Kahathuduwa et al. performed an exploratory secondary

analysis by examining resting-state functional magnetic resonance imaging (rs-fMRI) functional connectivity of DMN and CEN in three categories of children (children with ASD only, children with obesity only, and children with both ASD and obesity compared to non-obese neurotypical children) [14]. Those experiments indicated that ASD and obesity are linked to abnormalities in rs-fMRI functional connectivity in DMN and CEN [14]. Hypoconnectivity between the anterior and posterior regions of DMN and impairment between the primary frontal cortical node of CEN and many brain regions were noted in children with ASD and children with obesity [13]. Additionally, children with severe ASD symptoms have increased hypoconnectivity than children with mild ASD symptoms [14]. However, children with both ASD and obesity exhibited hyperconnectivity between the anterior and posterior DMN [14]. In conclusion, children with ASD and obesity have different rs-fMRI functional connectivity in DMN and CEN than children with isolated ASD and isolated obesity.

b. Selective Eating and Selective Eating Disorder

i. Description

Selective eating is characterized by individuals that have a small repertoire of accepted meals, as they prefer to consume certain foods and refuse others. This condition, which is commonly seen in children with ASD, can range from mild to severe cases. While mild cases are not associated with health risks, severe cases increase the risk of malnutrition, sometimes requiring tube feeding [15]. Mari-Bauset et al. conducted a systematic review of the literature from 1970 to 2013 related to selective eating in children with ASD [15]. This study reports that children with ASD exhibited higher rates of eating habits than neurotypical children [15]. These atypical eating behaviors have a strong association with food selectivity. Children with ASD also

have sensitivity towards smell, taste, touch, hearing, and sight, which causes behavioral and eating issues [15]. When those children experience symptoms of nausea, vomiting, or choking, the problem could be related to sensory disorders [15]. In this case, therefore, selective eating occurs as a response to those symptoms.

In addition to sensory sensitivity, children with ASD typically have gastrointestinal disorders and motor skills issues [15]. One of the studies retrieved from Marí-Bauset et al. shows that children with ASD have increased motor skills problems than neurotypical children [15]. Therefore, they frequently have difficulties with swallowing, chewing, and handling food, which results in depression and violent behaviors [15]. However, if none of those factors are identified, selective eating can be related to rigidity behavioral characteristics [15]. Thus, selective eating in children with ASD can be associated with atypical eating behaviors or physiological issues in sensory information or motor skills.

ii. Prevalence

Selective eating is prevalent among children with ASD, as reported in several studies conducted by Marí-Bauset et al. [15]. One of the studies indicated that more than 60% of parents admitted that their children with ASD had strong food selectivity [15]. Another study reported that 72% of parents stated that their children ate a limited repertoire of food and 57% stated reluctance to try new foods [15]. Additionally, one study reported that 70% of children with ASD chose foods based on their texture, compared to 11% of neurotypical children [15]. Children with ASD also tend to refuse more foods than neurotypical children, as they rejected 41.7% of foods offered compared to 18.9% in neurotypical children [15]. Finally, another study found that 70% of children with ASD display characteristics of selective eating [15].

iii. Negative Effects on These Behaviors

Selective eating negatively affects the health of individuals with ASD. This condition occurs in early childhood but typically discontinues throughout adulthood. Selective eating in children with ASD increases their risk of nutritional deficiencies, obesity, and gastrointestinal issues [10]. Malnutrition is also observed in those children due to their atypical eating behaviors and a strong preference for processed foods [10]. In addition to having a small repertoire of accepted meals, children with ASD frequently reject fruits, vegetables, and low-calorie dense foods [10]. The refusal of those foods disturbs their health and exposes them to different disorders. Selective eating in children with ASD also impacts them socially and emotionally, as they have challenges sharing a meal with others; consequently, avoiding social events.

A study conducted by Folta et al. describes the emotional and social impact of selective eating among 20 transition-age youth with ASD [16]. All participants reported more difficulties with selective eating during their childhood [16]. They described being able to consume more types of meals, including foods that they considered undesirable [16]. Since their food selectivity improved throughout the years, the impact of selective eating on their health decreased [16]. All participants developed strategies to cope with social events that involved food [16]. Additionally, they described their family and peers as being less judgmental about their selective eating compared to their childhood [16].

3. Nutrition and Eating Behaviors in Neurotypical Youth

a. Types of Eating Issues in Neurotypical Children

Eating issues occur in neurotypical youth although they are more prevalent among children with ASD. The DSM-V identifies six eating disorders, which consist of anorexia nervosa, rumination disorder, bulimia nervosa, binge eating disorder, pica, and

avoidant/restrictive food intake disorder (ARFID) [17]. The DSM-V also created another category called “other specified feeding or eating disorder” that includes symptoms of other eating disorders [17]. ARFID is characterized by the refusal of food related to its appearance, color, smell, taste, texture, and temperature [17]. Neurotypical children who only consume smooth foods may have oral motor problems, possibly affecting their speech [17]. Since growth and development occur during childhood, eating disorders in this group may lead to health complications and serious life-threatening conditions [17]. Additionally, malnutrition resulting from eating disorders can cause them to experience lethargy, delayed growth, and other symptoms [17].

b. Prevalence of Eating Issues in Neurotypical Children

Eating issues are commonly seen in neurotypical youth, as 25% of infants and children have a type of feeding problem [17]. By collecting the data from the Adolescent Brain Cognitive Development (ABCD), Rozzell et al. were able to examine the prevalence of eating disorders in children aged 9 and 10 [18]. The prevalence of eating disorders in children has increased throughout the years, as 1.4% of them had any eating disorder diagnosis [18]. The prevalence of anorexia nervosa was 0.1%, other specified feeding or eating disorders was 0.7%, bulimia nervosa was 0%, and binge eating disorder was 0.6% [18]. Although sex differences were not noted in children with eating disorders, those differences become evident after adolescence [18].

III. METHODS

1. Study Design and Data Source

This secondary analysis utilized data from the 2019 National Survey of Children’s Health (NSCH) dataset [21], a national dataset that examines health and well-being in children (Child and Adolescent Health Measurement Initiative, 2020). The U.S. Census Bureau conducted the 2019 NSCH from June 2019 through January 2020 on behalf of the Health Resources and Services Administration’s Maternal and Child Health Bureau within the U.S. Department of Health and Human Services. More detailed information about the sampling and administration of the survey is available in the NSCH 2019 Methodology Report.

2. Measures

ASD diagnosis: ASD status was determined by a parent’s response of “yes” to the question, “Has a doctor ever told you that this has Autism or Autism Spectrum Disorder?” Responses of “ever told, but do not currently have the condition” and missing responses were removed from the analysis.

Demographic measures: Child age (years), sex (males, females), and race/ethnicity were provided by parents. Child race and ethnicity were combined into one category with the following options: 1) Hispanic; 2) White, non-Hispanic; 3) Black, non-Hispanic; 4) Asian, non-Hispanic; and 5) Other, non-Hispanic.

Weight concerns: Weight concerns were measured by two items. Parents were asked to report whether their child’s doctor or other health care provider ever told them that their child is overweight (Yes/No). Parents were also asked the question, “Are you concerned about this

child's weight?". Parents could respond with "Yes, concerned it is too high", "Yes, concerned it is too low", or "No, not concerned".

Nutritional difficulties: Parents were asked to report on two separate items regarding physical issues surrounding nutrition and diet. The first item asked parents to indicate whether their child had frequent or chronic difficulty with eating or swallowing in the past 12 months. The second item asked parents to indicate whether their child had frequent or chronic difficulty with digesting food, including stomach/intestinal problems, constipation, or diarrhea in the past 12 months. Parents could respond "Yes" or "No" to both items.

Mealtime behavior: Parents were asked the question, "During the past week, how many days did all the family members who live in the household eat a meal together?" Parents could respond with "0 days", "1 – 3 days", "4 – 6 days", or "every day".

Food affordability: Parents were asked the question, "Which of these statements best describes your household's ability to afford the food you need in the past 12 months?" Parents could respond with "We could always afford to eat good nutritious meals", "We could always afford enough to eat but not always the kinds of food we should eat", "Sometimes we could not afford enough to eat", and "Often we could not afford enough to eat".

3. Statistical Analysis

Means and frequencies were calculated for demographic variables and child health factors for both youths with ASD and NT youth. A chi-square test compared the differences in weight concerns, nutrition issues, mealtime behaviors, and food accessibility between youth with ASD and NT youth. All analyses were conducted using SAS Version 9.4 with a significance level set at $p < 0.05$.

IV. RESULTS

Sample

A total of 868 (weighted sample of 2,068,404) children with ASD and 28,441 (weighted sample of 72,451,623) NT children were included in the analysis. Table 1 below presents the characteristics of the sample.

Table 1: Demographic characteristics of youth with ASD & NT youth

Variables	ASD youth	NT youth	p-value
Age (years)	11.05 ± 4.4	9.48 ± 5.18	<0.0001*
Sex			<0.0001*
Males	699 (81.4%)	14,565 (50.3%)	
Females	169 (18.6%)	13, 876 (49.7%)	
Race			0.56
White	670 (63%)	22,385 (67%)	
Black	79 (17%)	1976 (13.8%)	
Other	119 (20%)	4080 (19.5%)	

*significantly different with p<0.05

Weight Concerns

Chi-square results indicate that a greater percentage of parents of youth with ASD have been told that their child is overweight/obese compared to parents of NT youth (15% vs 7%, p<0.0001). Parents of children with ASD showed concern about their child being overweight (17%) and underweight (9%). Parents of NT youth also expressed concern about their kids being overweight (7%) and underweight (3%). These results indicate an increased weight concern in parents of children with ASD than in parents of NT children (Table 2).

Table 2: Weight concerns by ASD youth and NT youth

Variables	ASD youth	NT youth	p-value
Doctor weight concerns			<0.0001*

Overweight/obese	128 (15%)	1927 (7%)	
No concerns	734 (85%)	26,431 (93%)	
Parent weight concerns			<0.0001*
Overweight	143 (17%)	2103 (7%)	
Underweight	76 (9%)	850 (3%)	
No concerns	643 (75%)	25,371 (90%)	

*significantly different with $p < 0.05$

Nutritional Difficulties

A greater percentage of parents of children with ASD reported that their child had trouble swallowing or chewing food (6% vs 1.5%, $p < 0.0001$) and experienced stomach or gastrointestinal issues compared to parents of NT children (23% vs 9%, $p < 0.0001$). Results from these analyses are presented in Table 3.

Table 3: Nutritional difficulties by ASD youth and NT youth

Variables	ASD youth	NT youth	p-value
Trouble Swallowing/chewing			<0.0001*
Yes	49 (6%)	417 (1.5%)	
No	813 (94%)	27,926 (98.5%)	
Stomach/GI issues			<0.0001*
Yes	197 (23%)	2494 (9%)	
No	666 (77%)	25,819 (91%)	

*significantly different with $p < 0.05$

Mealtime Behavior

There were no differences between reported days per week of eating meals together as a family among parents of youth with ASD and NT youth ($p = 0.57$). Slightly under 50% of both samples reported having meals together as a family on a daily basis, while less than 5% of both samples reported never having meals together as a family (Table 4).

Table 4: Mealtime behavior by ASD youth and NT youth

Variable	ASD youth	NT youth	p-value
Eat meals as a family (days/week)			0.57
0 days	47 (4%)	892 (3%)	
1 – 3 days	233 (26%)	6985 (23%)	
4 – 6 days	265 (27%)	9413 (30%)	
Every day	308 (43%)	10,756 (43%)	

Food Affordability

A greater percentage of parents of NT youth reported being able to always afford nutritious meals compared to parents of youth with ASD (69% vs 55%, $p < 0.0001$). Table 5 displays the percentages of both samples.

Table 5: Food affordability by ASD youth and NT youth

Variable	ASD youth	NT youth	p-value
Food affordability			$<0.0001^*$
Always afford good nutritious meals	503 (55%)	20577 (69%)	
Always afford, but not always nutritious meals	277 (36%)	6322 (26%)	
Sometimes could not afford enough to eat	50 (6%)	863 (4%)	
Often not afford enough to eat	20 (2%)	136 (1%)	

*significantly different with $p < 0.05$

V. DISCUSSION

The purpose of this study was to examine the differences in weight concerns, eating and GI issues, family mealtime, and food affordability in NT youth and youth with ASD. It was hypothesized that youth with ASD would have more weight concerns, eating and GI issues, have fewer family meals together, and have less food security compared to NT youth. These hypotheses were mostly upheld with parents of youth with ASD reporting greater weight concerns, eating and GI difficulties, and food insecurity. However, there were no differences in the frequency of family mealtime between NT youth and youth with ASD.

Findings from this study are consistent with prior reports that suggest youth with ASD are more likely to be overweight or obese compared to their NT peers [19]. Interestingly, the results revealed that a larger percentage of parents of children with ASD were concerned that their child was either overweight or underweight compared to parents of NT youth, which suggests that concerns may be more related to malnutrition rather than overeating and weight gain. Although much of the research regarding the weight status of youth with ASD focus on obesity-related concerns, a few studies have also reported concerns about children being underweight [22]. There is research that suggests that children with ASD are more likely to have nutrient deficiencies compared to NT youth, regardless of weight status.

Interestingly, the findings from this study also reveal that a greater percentage of parents of children with ASD report that food affordability is an issue compared to NT children. While most of the research has attributed nutrition-related difficulties, such as food selectivity, to symptoms of ASD, our study provides initial evidence that socioeconomic factors may also play a role in the dietary patterns of youth with ASD. Prior studies have commented on the financial

strain on families of children with ASD, attributing this to treatment costs and the necessity for one parent/caregiver to stay at home to care for the child with ASD [23, 24]. Additionally, families experiencing financial hardships are more likely to live in areas with limited accessibility to healthy foods, further contributing to nutritional deficiencies in children [25]. Future work should consider food affordability and how it may affect nutrition-related behaviors in youth with ASD.

In contrast to our initial hypothesis, there were no differences in the frequency of meals eating together between families of youth with ASD and families of NT youth. Previous research has shown that children from families that share meals together at least three times per week are more likely to be at a healthier weight and have healthier dietary patterns compared to children from families who share fewer than three meals per week [26]. Furthermore, studies have expressed that family mealtime may even be more important for nutrition in youth with ASD compared to NT youth due to the critical role that parents/caregivers play in the treatment process for their child [27]. To our knowledge, this is the first study that has directly compared family mealtime frequency between youth with ASD and NT youth, finding that over 70% of parents of both populations reported having meals with their children at least four or more times per week. Although further research is necessary, it appears that family mealtime frequency is not an issue in families of youth with ASD. It should be noted, however, that social desirability may factor in the high frequency of reported family meals [28]. If possible, objective measures should be implemented for future research on family mealtime behaviors.

It should be noted that there were differences in sample characteristics between youth with ASD and NT youth. Youth with ASD were significantly older and had a greater percentage of males in their sample compared to NT youth. As the information on ASD diagnosis was not

available in children ages three and under, this could partly account for the age difference between the two samples. Additionally, the greater percentage of males in youth with ASD aligns with national estimates that indicate that ASD is four times more common in males than females [3].

Limitations

Several limitations should be mentioned. All variables were based on parent-report, and therefore, were prone to bias. Actual body mass index (BMI) was not able to be assessed since BMI was only collected in children ages 10 – 17 and would have excluded a large number of the participants. Additionally, as this was previously collected data, obtaining more in-depth information was not feasible. Future research should consider qualitative methods to obtain more detailed information on mealtime behavior patterns and nutritional difficulties.

VI. CONCLUSION

Autism Spectrum Disorder (ASD) is characterized by repetitive behaviors along with difficulties with communication and social interaction. Children with ASD commonly have other medical issues, including feeding difficulties and atypical eating patterns. Those problems negatively affect their overall health. Food selectivity is common among this group, which leads to nutritional deficiencies, obesity, and gastrointestinal issues. While neurotypical children also have those problems, they occur at lower rates compared to children with ASD.

To distinguish the differences in feeding difficulties and eating behaviors between children with ASD and NT youth, the data from the 2019 National Survey of Children's Health [21] was used. One survey performed with parents of children with ASD and parents of NT children showed a great discrepancy in nutrition between those kids. This data indicated greater concerns about weight-related issues and nutritional difficulties in parents of children with ASD compared to parents of NT youth. However, both parents reported eating meals together as a family at the same frequency. Additionally, when compared to parents of NT children, parents of children with ASD expressed that food affordability was a problem. Thus, future research should analyze the effects of socioeconomic status and food insecurity on the nutritional difficulties of ASD youth.

When comparing ASD youth with NT youth, the first group shows a higher percentage of food difficulties and atypical eating patterns. In addition, this group exhibits greater rates of obesity, nutritional deficiencies, selective eating, and gastrointestinal issues. However, there is not enough research discussing the eating differences between children with ASD and NT youth. This study, therefore, aims to provide information about those differences. By analyzing those

issues, future studies can create early interventions that will help to minimize the negative effects of feeding difficulties in children with ASD.

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