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MEALTIME CHALLENGES AND MATERNAL HEALTH HISTORY OF CHILDREN WITH AUTISM: A CROSS-SECTIONAL INVESTIGATION

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Abstract

Food behaviors in children with autism are poorly understood but tend to be more severe and long-lasting. However, there have been few studies on the subject in Asian countries. The main objective of this study was to identify the various mealtime issues (extensive choking, coughing, or gagging while eating, tantrums and meltdowns at mealtimes, swallowing problems, chewing problems, etc.) faced by children with autism. In addition, this study explores how factors like family history (parents' blood type incompatibility, inheritance), the length of the pregnancy, the mother's mental health, and her age at the time of conception may affect the baby's development and increase the risk of autism. Participants in this study were 120, including 58 children with autism and 62 children without autism. We survey parents with children aged 2–12 years. Children with autism were selected from two different autistic organizations. Data were analyzed through univariate methods, descriptive statistics, and Pearson's Chi-square ($\chi 2$) test. Also, an unadjusted odds ratio with a 95% confidence interval (CI) was used to define the various predictors of mealtime challenges. In the autism group, approximately 60% of children have different types of mealtime challenges; around 77% of mothers experienced mental health issues (depression, anxiety) during pregnancy. Almost 32% of the children in the autism group had family members who also had autism spectrum disorder (ASD). Children with autism (OR=6.864, CI=2.924-16.112, $p < 0.001$) became more hyper when consuming carbohydrates compared to children without autism. Study results indicated that children with autism face noticeably greater difficulties during meals than children without autism.

Keywords: Autism spectrum disorder, South Asia, eating disorder, Bangladesh, Food behavior

Introduction

Since the early 1900s, autism has been used to describe various neuropsychological disorders. The concept of autism comes from the Greek word autos, which means 'self.' It indicates a scenario in which a person is disconnected from his or her social circle. For example, he may become an isolated oneself. Eugen Bleuler, a Swiss psychiatrist, developed the word autism (Hampson & Blatt, 2015; O'Rourke, 2023). Around 1911, Eugen Bleuler began using it to describe a group of symptoms associated with schizophrenia. ASD often known as autism spectrum disorder is a complicated, progressive disease defined by constant complications in social engagement, speech, nonverbal communication, and limited or regular activities. Autism spectrum disorder is a neurobiological syndrome resulting from environmental and genetic factors that influence brain development. (Naznin et al., 2020). The understanding of the most plausible etiologic pathways for ASD is being expanded by recent studies. But, at present, there is not a single comprehensive explanation. According to some scientists, trusted sources of environmental factors, including as exposure to chemicals, play a part in the development of autism, while others believe that trusted sources of genetic variants are the cause. Recent research has shown that ASD risk is increased in infants with bigger birth weights and lengths (Niculae, 2020). Asperger's syndrome, autism, and severe developmental disability are the three subgroups of PDD-NOS mentioned by the Centers for Disease Control and Prevention (CDC). However, now they are referred to as autism spectrum disorders (ASD) (Hodges et al., 2020).

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According to the CDC, one out of every 54 (8-year-old) children is autistic (Knopf, 2020). This figure has risen from the earlier estimates of one in 59 prevalence (*Autism Research*, 2021). Boys are three to four times more likely than girls to have autism spectrum disorder., and many girls with ASD have less noticeable symptoms than boys (Wigdor et al., 2022). According to the CDC, ASD affects people of all races, ethnicities, and socioeconomic backgrounds (*Webmd*, 2023). Autism symptoms include abnormal social and communication behaviors. They also include particular interests and repetitive behaviors. (*AEIOU Foundation*). Autism most commonly reveals itself between the ages of one and two years. Some children express multiple symptoms of autism, whereas others exhibit only a few symptoms. Communication and emotional and social connections are typically challenging in the case of children struggling with ASD. The majority of the parents noticed the symptoms of autism at the age of 12-24 months of their children. Children with autism will have symptoms for the rest of their lives, but they may improve as they get older. In their early years, approximately 40% of children with ASD are unable to speak at all, whereas 25% to 30% do but slowly lose their ability to speak. Some children with autism do not speak until they are older (Pathak, 2021).

Autism spectrum disorder (ASD) affects one out of every 36 children, reported on the CDC's Autism and Developmental Disabilities Monitoring (ADDM) Network. (Maenner et al., 2023). We have less information on the number of infants and adults affected by this horrible, lifelong developmental neurological disorder in many underdeveloped countries, including Bangladesh(*Global Autism Movement and Bangladesh*). The prevalence of all sorts of neurodevelopmental impairments is 7.1 percent, according to a recent 2013 pilot research in Bangladesh that involved community health workers. According to the survey, 0.15 percent of persons have autism, with 3% staying in Dhaka and 0.07% staying in the countryside. (*Global Autism Movement and Bangladesh*). Only 200 psychiatrists and a small number of other health professionals serve the country in the face of such a high disease burden. These, with a plethora of scientific and medical concerns, must be addressed as soon as possible (Mannan, 2017). The number of autistic children is increasing every day, and it is critical to figure out what causes autism.

Sensory difficulties are common among children with autism. They can be exceedingly sensitive to particular sensations or, on the other hand, extremely indifferent to specific experiences (Bandini et al., 2017). Food and eating appear to be one of the most frequent sensory difficulties. Other difficulties in the domain of Sensory processing may arise. They may only eat meals on specific menus if they have visual sensitivity. They may also be unable to eat meals in direct contact with one another on their plate. Children with autism may find it difficult to maintain long-term attention on a single task A child could find it challenging to eat while seated. Compared to ordinarily developing children, children with Asperger's Syndrome tend to be fussier eaters and have less alternatives for what they like to eat (Bandini et al., 2013). In children with three Asperger's Syndrome, refusals to consume food are common due to a variety of factors, including texture, adherence, taste, smell, combinations, and form.(Hubbard et al., 2014). Other nutritional deficiencies have been linked to autism and its symptoms, like not getting enough methyl B12, not getting enough vitamin D, and folic acid deficiency. The incidence of eating troubles in children with ASD is estimated to be between 46% and 89%, as reported by (Ledford & Gast, 2006). These conditions may include peculiar eating patterns, dietary customs, and food preferences. Kids with autism can have strict and rigid eating habits that affect their eating (Sharp et al., 2013). Children with ASD may experience strict and rigid eating habits. Psychologist Melissa Olive, who specializes in the treatment of children with ASD with food-related issues in her New Haven, Connecticut office, has observed that some of these individuals limit their dietary intake to the extent that nutritional deficiencies are present, leading to weight loss, malnourishment, and stunted growth (Nath, 2014).

In terms of the diverse types of food consumed, sixty percent of people eat fewer than 20 different types of foods, and 53 percent have nutrient deficiencies. Almost 80% of the children in danger are under the age of five (Cornish, 1998). The biggest persistent concerns for children with ASD appear to be food/texture selectivity and a lack of variety (Bandini et al., 2010). Taste, smell, color, and texture sensitivity can all be present in people with autism (Hubbard et al., 2014). They might limit or completely avoid particular meals or even entire dietary groups including highly flavorful foods, fruits, and vegetables, as well as particular textures like foods that are slick or mushy (Schreck & Williams, 2006).

Food selectivity, commonly known as 'picky eating,' is a widespread issue among kids who have Autism Spectrum Disorder. This is particularly concerning as it has a negative impact on food consumption and family

meals (Jacobi et al., 2003). The selective eating patterns in children with ASD have been linked to inadequate dietary intake, an unwillingness to consume fruits and vegetables, difficulties with eating habits, and dietary habits (Bandini et al., 2010; Curtin et al., 2015; Hubbard et al., 2014; Postorino et al., 2015). According to Dr. Olive, ASD children learn to avoid certain foods because they cause digestive problems, such as bloating and abdominal pain. Some young children have trouble swallowing or consuming meals with a particular texture, fragrance, or color. These kids could be suffering from a feeding issue. Many children with autism symptoms are averse to trying new activities. This issue is called neophobia. Selectivity in food consumption in children with autism does not always lead to a decrease in body weight or physical development. In fact, certain eating patterns that prioritize carbohydrates and snack foods in adolescence and adulthood may be linked with an increased risk of becoming overweight, diabetic, and cardiovascular disease. Eating a small variety of meals may cause more immediate health issues, such as

- Poor bone growth
- Constipation
- Vitamin and mineral deficits

According to studies, children with autism consume less calcium and protein than other children, which may result in diseases that can be avoided by modifying the way one eats. However, successfully addressing feeding disorders can have far-reaching effects, such as better health, higher standard of living for children and their families, fewer mental health issues for children, and a reduced risk of long-term eating issues (Piazza & Addison, 2007).

The main objective of our study was to identify the various mealtime issues children with autism might have. Additionally, we explored the potential effects of a number of variables, such as pregnancy length, mother's mental health, age at conception, and family history (including parent's blood type compatibility and inheritance patterns), on child development and a possible increase in the risk of autism.

Materials and Method

- **Purposive Sampling in Dhaka City:** The study employed purposive sampling techniques to select participants from Dhaka City. This method involves intentionally selecting individuals who meet specific criteria relevant to the research objectives.
- **Information Sources:**
    a. Parents and Institutions: Data was collected from both parents and relevant institutions involved in the care and support of autistic children.
    b. Organizations: The study obtained data on autistic children from two specific organizations: Society for the Welfare of Autistic Children (SWAC) and the Angel Foundation for Children with Special Needs. These organizations likely specialize in providing services and support to autistic children and their families.
- **Data Collection:**
    a. The researchers collected data on a total of 120 participants for the survey.
    b. Participant Criteria: The participants consisted of parents with children aged 2 to 12 years.
    c. Children with Autism: Out of the 120 participants, 58 children belonged to this group, which comprised children diagnosed with autism.
    d. Children without Autism: The remaining 62 children from the participant pool formed this group, comprising children who did not have a diagnosis of ASD.

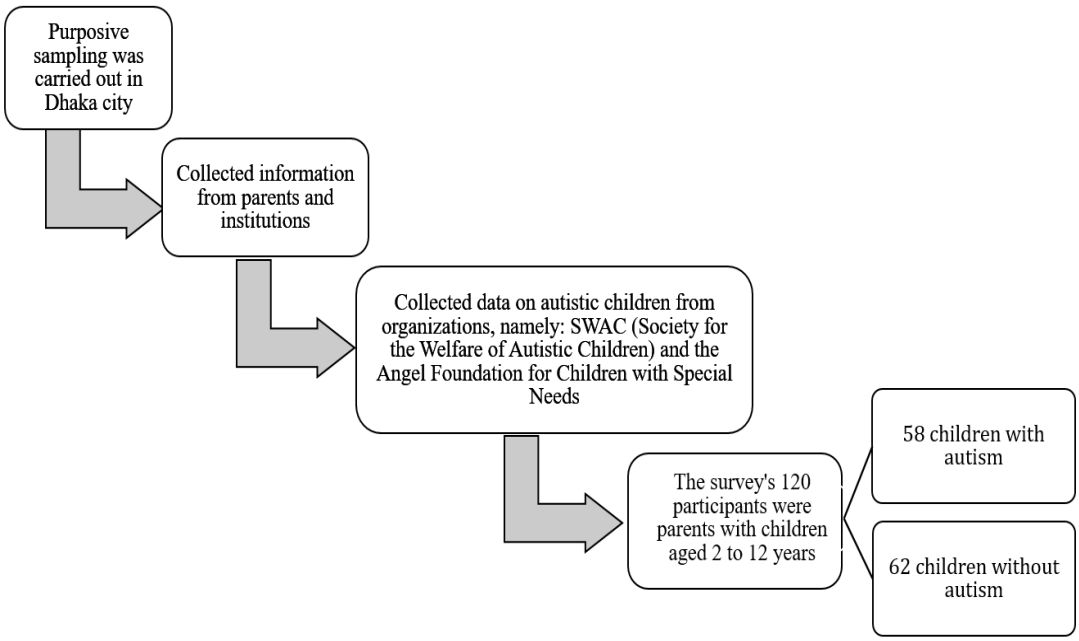

Figure 1. Sample selection flow chart

A face-to-face survey was conducted to collect information from the respondents. The survey questions included the child's age, food behavior, and family history. In this study, we exclusively gathered information about blood groups from mothers of children diagnosed with ASD. To identify the parent's blood type incompatibility of children with ASD groups, we asked whether the mother or her husband has different Rh blood types (the mother had a Rh-negative blood type while the father had a Rh-positive blood type, or vice versa). Furthermore, mothers were asked to provide information regarding their pregnancy period and mental health status. In order to understand more about the feeding difficulties that their children encountered, we also interviewed mothers of children with ASD and without ASD.

Data Processing and Analysis:

The required data after collection have been processed and analyzed to extract the findings of the study. For processing and analysis purposes, Statistical Package for Social Scientists (SPSS) software was utilized.

To compare frequencies and find out associated factors of ASD, we conducted a descriptive analysis, Pearson Chi-Square test. Additionally, based on reported exposures, within a 95% confidence interval, odds ratios (OR) are shown to indicate the risk factors of mealtime challenges.

Result

In Bangladesh, autism is a complex disorder, especially among children. In Dhaka city, 1.5/1000 (within a 7200-population) children are affected by ASD.

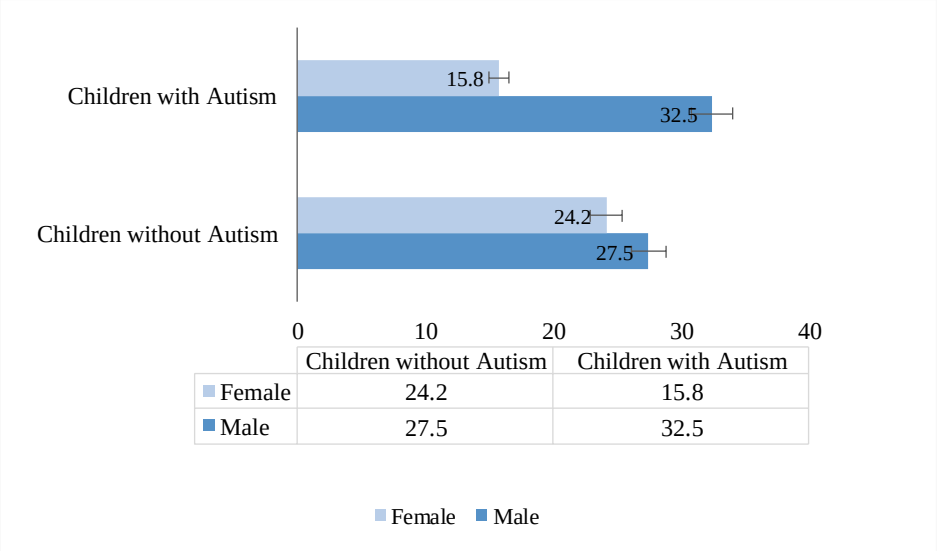

Figure 2. Bar diagram shows the percentage distribution of male and female children.

To obtain more detailed information on autism, divide 120 children into four age groups: 2 <= age <5, 5<= age <= 7, 8<= age <=10 and 10<age <=12. The mean age of autistic children is 8. From all of the food behavior, it was found that 60% of children have feeding disorders. The ages of children were between 2 and 12 years old. The mean age of children is 8. Among 120 children, 60% were male whereas 40% were female.

		Children without Autism	Children with Autism	Total
Gender	Male	33 27.5%	39 32.5%	72 60.0%
	Female	29 24.2%	19 15.8%	48 40.0%
Total		62 51.7%	58 48.3%	120 100.0%

Table 1 shows that 64.2% of autistic children had food allergies. Out of 64.2% of the children, 18.6% are between the ages of 2 and 5. Most of the children between the ages of 5 and 7 have allergies, which is 24.3%. Nine children between the ages of 8 and 10 have allergies. 5.5% of children between the ages of 10 and 12 were allergic to food. One hundred and twenty children were all vaccinated when they were young. Only 17.9% of parents of children with autism have a blood type that doesn't work well with their children. The rest of the parents don't have any problems.

From the table, it is clear that 15.9% of parents of autistic children were related to the child's other parent before they got married. None of the other parents had this problem. It's important to know that 74.9% of kids live in nuclear families and 25.1% live in joined families. Also, 32.0% of children have autism that runs in their families, while 68% don't have any of these problems. Table 2 shows that most of the children (32.5%) experienced the first symptom of this disease at age 25– 30 months. Autism started at 6-12 months in only 3.6% of children, whereas 14.2% have noticed the symptoms at 13–18 months.

Table 1.Distribution of Children with Autism group according to their medical and family history

Age group	Allergic to food		Parent's blood type incompatibility		Parents were relative before marriage		Children's family status		Autism problem in other family member	
	Frequency (%)		Frequency (%)		Frequency (%)		Frequency (%)		Frequency (%)	
	Yes	No	Yes	No	Yes	No	Nuclear family	Joined family	Yes	No
2 ≤ age <5	10 (18.6)	8 (12.4)	3 (6.2)	15 (24.8)	2 (5.2)	16 (25.8)	12 (22.6)	06 (8.4)	07 (9.4)	11 (21.6)
5 ≤ age ≤ 7	12 (24.3)	8 (9.2)	3 (6.1)	17 (28.4)	3 (6.1)	17 (28.4)	14 (25.9)	06 (8.6)	08 (12.2)	12 (22.3)
8 ≤ age ≤10	9 (15.8)	6 (10.1)	2 (4.1)	13 (21.8)	1 (3.1)	14 (22.8)	12 (20.6)	03 (5.3)	06 (8.9)	9 (17.0)
10< age ≤ 12	3 (5.5)	2 (3.1)	1 (1.5)	4 (7.1)	1 (1.5)	4 (7.1)	3 (5.8)	2 (2.8)	01 (1.5)	4 (7.1)
Total	34 (64.2)	24 (34.8)	9 (17.9)	49 (82.1)	07 (15.9)	51 (84.1)	41 (74.9)	17 (25.1)	22 (32.0)	36 (68.0)

Table 2. Distribution of Children with Autism group according to children age during disease start

Age Group (Months)	Frequency (n)	Percentage (%)
6-12	2	3.6
13-18	7	14.2
19-24	14	20.8
25-30	19	32.5
31-36	13	20.8
37-41	3	8.1
Total	58	100

The disease started at 19-24 months in 20.8% of children. Children whose age is (31-36) months have the same percentage as children whose age is (19-24) months. Only 8.1% of children have noticed the symptoms at (37–41). Table 3 shows that most of the mothers of autistic children's ages were 24–27 during their pregnancy, and the percentage was 35.

Table 3. Distribution of Children with Autism group according to their mother's pregnancy history

Age Group (years)	Mother's age during pregnancy	Pregnancy Duration	Mother's pregnancy duration in weeks	Mother's mental health (depression, anxiety)	
	Frequency (%)		Frequency (%)	Yes	No
				Frequency (%)	Frequency (%)
20-23	7 (10.8)	36 weeks	8 (11.7)	6 (9.1)	1 (1.7)
24-27	20 (35)	37 weeks	6 (9.1)	15(25.6)	5 (9.4)
28-31	18 (30)	38 weeks	3 (7.5)	15 (22.1)	3 (7.9)
32-35	12 (21.7)	39 weeks	28 (50)	10 (17.9)	2 (3.8)
35-40	1 (2.5)	40 weeks	13 (21.7)	1 (2.5)	0 (0)
Total	58 (100)	Total	58(100)	47 (77.2)	11 (22.8)

Only 10.8% of a mother aged 20–23 during their pregnancy. In the 28–31 age range, mothers are 30%, while 21.7% are from the age of 32–35. The lowest number of mothers (2.5%) were between 35 and 40 years old. On the other hand, the majority of the mothers (50%) gave birth to their children at 39 weeks. 11.7% of mothers' pregnancy duration was 36 weeks, and 9.1% was 37 weeks. Only 7.5% of mothers gave birth to their children at 38 weeks, while 21.7% completed their full pregnancy weeks. On the other hand, 77.2% of mothers suffered from depression or anxiety, while 22.8% didn't. Table 4 gives information about some food behaviors of autistic children. Around 55% of children choke, cough, or gag while consuming their food, and the rest of the children can eat their food without any problems.

Table 4. Mealtime challenges in the Child as Risk Factors for the Autism group; as Numbers (Percentages) and Comparison between Children with Autism group and Children without Autism group.

Mealtime Challenges	**Children with Autism (N=58)**	**Children without Autism (N=62)**	**Pearson Chi-square test**		**Odds Ratio**
	% (N)	% (N)	χ 2	p-value	OR (95% CI)
Extensive choking, coughing, or gagging while eating					
Yes	55.2(32)	9.7(6)	28.664	<0.001	11.487(4.276-30.861)
No	44.8(26)	90.3(56)			-
Chewing problem					
Yes	60.3(35)	9.7(6)	34.202	<0.001	14.203(5.263-38.330)
No	39.7(23)	90.3(56)			-
Swallowing problem					
Yes	58.6(34)	8.1(5)	34.914	<0.001	16.150(5.635-46.288)
No	41.4(24)	91.1(57)			-
Tantrums and meltdowns at mealtimes					
Yes	55.2(32)	12.98(8)	24.093	<0.001	8.308(3.361-20.537)
No	44.8(26)	87.1(54)			-
Getting stressed over new food					
Yes	56.09(33)	17.7(11)	90.783	<0.001	6.120(2.659-14.083)
No	43.1(25)	82.3(51)			-
Loss of appetite					
Yes	55.2(32)	25.8(16)	10.768	<0.001	3.538(1.640-7.635)
No	44.8(26)	74.2(46)			-
Refusing to eat one or more food groups					
Yes	55.2(32)	19.4(12)	16.555	<0.001	5.128(2.269-11.589)
No	44.8(26)	80.6(50)			-
Want food of a particular color					
Yes	58.6(34)	17.7(11)	21.366	<0.001	6.568(2.849-15.142)
No	41.4(24)	82.3(51)			-
Getting sick due to carbohydrate intake					
Yes	57.0(33)	16.1(10)	21.661	<0.001	6.864(2.924-16.112)
No	43.0(25)	83.9(52)			-
Feel hesitate if anyone is present in the room during eating					
Yes	31.0(18)	14.5(10)	4.689	0.030	2.650(1.078-6.513)
No	69.0(40)	85.5(53)			-

Among 120 children, 60.3% have a chewing problem, whereas 39.7% never suffer from this problem. Meanwhile, almost 58.6% of respondents have swallowing problems, while 41.4% are problem-free. From the result of this analysis, it was found that 53.4% have breathing problems during the eating period, whereas 46.6% are like normal children. It is a characteristic of the children in the study group that 55.2% of autistic children have tantrums and meltdowns at mealtime, while 44.8% of children with autism don't have tantrums and meltdowns at mealtime. Among 120 children from the study group, 56.09% have different stressed behaviors, while 43.1% haven't. Furthermore, our research revealed that 65.5% of children get revolted by the smell of some foods, and 34.5% don't. In this study, it was found that 44.8% of autistic children don't have a loss of appetite and 55.2% of autistic children have. Table 4 shows that 55.2% of autistic children refuse to eat one or more food groups, and 44.8% of autistic children do not refuse to eat one or more food groups. This study showed that children with autism often refuse food because of a concern about a particular color. Most of the children preferred yellow and red-colored foods. In this study, 58.6% of respondents preferred to eat certain colored foods, while 41.4% had no particular color choice. Table 4 also shows that 57.0% of children got sick due to carbohydrate intake, and 43.0% didn't. So, from this study, it is clear that most children get sick due to carbohydrate (Sugar, Lactose) intake. Each child's experience of autism looks different. The personality of each one is unlike. In this study, 31% of children felt nervous if they met a person in the room, while 69% of children showed normal behavior.

Discussion

In our study, approximately 60% of children with ASD reported feeding issues. This is aligned with research showing that, despite the fact that children with ASD are five times more prone to having mealtime difficulties compared to their developing peers. Clinical concerns about feeding difficulties are frequently overlooked because these children continue to grow normally *(Marcus Autism Center*).

ASD is identified in females at a substantially lower rate than in males (Jasmin et al., 2009). In our paper among 120 children, 60% were male and 40% were female. Our research supports a recent study that found that men tend to be more likely than women to develop autism. (Barbaro & Freeman, 2021). Because of the underdeveloped gut mucosal immune system, young autistic children are more susceptible to sensitization to common food. Food allergies were more common in children under the age of five than in children aged five to seventeen. Food allergies were equally prevalent in both boys and girls. From a study, it was indicated that there were 8603 food allergies, 24,218 respiratory allergies, and 18,703 skin allergies among the 192,573 children aged 4 to 17 years old involved. Our study finds an alignment with some previous studies (Williams et al., 2011), (Youssef et al., 2021) that found the prevalence of food allergies was high (64.2%) among ASD Children.

The most crucial factor in the prevalence of autism is inheritance. Our study finds an alignment with some previous studies that found the total percentage of ASD that can be linked to genetic inheritance is estimated to be around 30–40% (Landrigan et al., 2012). Our study found that 32.0% of the autism prevalence is due to genetics. The number of premature deliveries (births occurring before 37 weeks of gestation) have been rising and now account for 15% of all births in the United States.(Angelidou et al., 2012). premature infants have a four times increased chance of being diagnosed with ASD and are also more susceptible to infections, While exposure to possible neurotoxins may be due to the delayed development of their gut-blood-brain barriers (Angelidou et al., 2012), maternal stress in the latter stages of pregnancy may affect the offspring's development neurologically. Numerous prospective studies have demonstrated that mother stress during pregnancy increases the risk of early behavioral, cognitive issues, mixed-handedness, and later behavioral and emotional issues (Abdelrazek & Rice, 2021; Ronald et al., 2011).

According to earlier research (Archer & Szatmari, 1991; Schreck et al., 2004; Vissoker et al., 2015) children with ASD experience 56% to 87% more mealtime problems than children with typical development. Due to their difficulties with chewing, autistic youngsters avoid eating meals that are challenging for them to swallow (Schreck et al., 2004). Mealtimes required extra care for children with ASDs since they frequently choked, coughed, or threw up (Nadon et al., 2011). Besides, children with autism are more prone to avoid and reject certain kinds of food than typically developing children. (Johnson et al., 2008; Martins et al., 2008; Schreck et al., 2004). Due to their sensitivity to the digestion of food due to carbohydrate intolerance, autistic kids may have some of gastrointestinal problems (Chidambaram et al., 2020; Sumathi et al., 2020).

Limitations

Despite the insightful findings, the research has some limitations. First of all some parents did not answer all of the questions and some women were hesitant about sharing information that could have had an impact on the outcomes. Parents may be convinced to complete the questionnaire if given more thorough explanations, which would increase the accuracy of the findings. Another factor is that we lacked comprehensive information on fathers due to a lack of time. Other variables, such as the parent's level of education, their level of stress, or their socioeconomic status, were not taken into consideration when we examined parental feeding style. Another fact is that we were unable to find information about maternal supplementation during pregnancy, which might have helped us learn more about the risk of autism in new offspring. Finally, as a result of a few restrictions, we were unable to visit various groups of individuals with autism, which reduced the sample size.

Conclusion

The study's findings emphasize the necessity of addressing mealtime issues in children with ASD, since these kids are more likely to struggle during mealtime than their peers in the same social setting. Revolt over unfamiliar food was the most common of the numerous eating and mealtime behaviors observed in children with ASD. This study tried to correlate a mother's prenatal history with ASD and found that PMH (perinatal mental health) and early delivery play a vital part in increasing a child's risk of having ASD. Since pregnancy is the most critical time for any woman, it is recommended that mental well-being, proper diagnostic care, and dietary supplements be utilized to maintain a progressive balance in the prenatal period to lower the risk of early delivery and developing ASD. In addition, autism should be diagnosed as soon as possible so that appropriate training (via promotion or prevention), a dietary regimen, and a healthy environment can be provided to the child at a young age to improve their quality of life.

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Conflict of interest

The authors have no conflicts of interest to declare.

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