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DIETARY BEHAVIOR OF AUTISTIC CHILDREN

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ABSTRACT

Objectives: This study aimed to obtain information about the dietary pattern and feeding problems of autistic children in Mumbai. **Methods:** It was a cross sectional study conducted on autistic children from various special schools in Mumbai. Fifty autistic and fifty age and gender matched typically developing (TD) children were selected for the study. The age group of children was 5-15 years. General information, details about their eating behavior and food habits of the children was collected from parents using a questionnaire. **Results and Conclusion:** Frequent gastrointestinal problems were reported in 30% autistic versus 18% typically developing children. Significantly lesser number of autistic children tried out new foods as compared to typically developing children (χ^2= 11.413, p= 0.003). Problematic meal time behaviors were seen in 70% of autistic and only in 26% of typically developing children. Playing while eating, swallowing food without chewing and not sitting in one place while eating were the most frequently reported meal-time behaviors in autistic children. Autistic children had a higher intake of beverages and snacks. They also consumed fewer fruits and vegetables per week compared to typically developing children. Nutritional interventions for children with ASD should be based on their preferences, appetite, feeding problems, etc.

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INTRODUCTION

Autism Spectrum disorder refers to a range of neuro developmental abnormalities (Ouseley and Cermark, 2014). The symptoms of autism usually appear within the first three years of life. Initially the symptoms are mild and manifested as irritability, visual inattention, poor eye contact, staring at objects, lack of response to voices, delayed onset of babbling etc. Later the symptoms become more prominent and may be manifested as difficulty in social communication, restricted or repetitive behaviors and interests (Zwaigenbaum *et al.,* 2005). Autistic children may face several food related challenges such as food selectivity, aggressive meal-time behavior, gastrointestinal (GI) disturbances, nutritional deficiencies, etc. Several studies have reported that autistic children are selective eaters and show high rates of food refusal (Fodstad and Matson, 2008; Bandini *et al.,* 2010; Beighley *et al.,* 2013). They may be selective in terms of texture, color, taste, method of preparation and even presentation of their food (Williams and Seiverling, 2004). Atypical meal time behavior in autistic children such as hitting others or self, not sitting in one place, crying, screaming, throwing away food, etc. has been reported by many (Provost *et al.,* 2010;Handayani *et al.,* 2012; Mazurek *et al.,* 2013). Several GI symptoms are commonly seen in autistic children. GI complications have been reported more in autistic children as compared with typically developing (TD) children (Valicenti-McDermott *et al.,* 2008; McElhanon *et al.,* 2014;Chaidez *et al.,* 2015). Studies on dietary pattern of autistic children have showed that children with ASD preferred energy dense foods (Schreck *et al.,* 2004; Evans *et al.,* 2012). They were reported to consume fewer fruits and vegetables and daily servings of sweetened non-dairy beverages. The purpose of this study was to obtain information about the dietary pattern and feeding problems faced by autistic children in Mumbai.

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MATERIALS AND METHODS

This was a cross-sectional study consisting of 50 autistic children and 50 age and gender matched TD children. The

participants were selected using the purposive sampling technique. Children with identified autism were taken from various special schools in Mumbai. Children with severe visual, auditory or motor problems were excluded from the study. Informed consent was taken from the parents/caregivers of the children. Informed consent was also taken from TD children above 7 years. Inter System Biomedica Ethics Committee (letter number: ISBEC/NR-31/KM-JVJ/2017) approved the study. The parents were asked several questions to understand their child's eating behavior such as: number of meals, appetite, meal-time rituals, problems faced while feeding them, etc. A food frequency questionnaire (FFQ) was used to assess their food consumption patterns. The food items in the FFQ were divided into following groups- milk and milk products, beverages, sweets, snacks, cereals, pulses, non-vegetarian foods, chocolates, nuts and dry fruits, vegetables and fruits. Parents were asked to report consumption, frequency and portion of various food items by their child. Measuring cups were shown to them to ensure reporting of portion size was according to standard measures. The data was analyzed using the statistical package for the social sciences (SPSS) version 22.0.

RESULTS

In both the groups, there were 37 boys and 13 girls. The mean age of the participants was 8.98 ± 3.10 years. In both the groups, more children were non-vegetarian (64% autistic and 86% TD). Eight percent autistic children reported to have abdominal discomfort or loose motions and did not tolerate milk and milk products. Therefore, they were given a lactose free diet. None of the typically developing children were taking supplements. However, sixteen percent of autistic children took nutritional supplements for either calcium, vitamin D, multivitamins or fish oil.

GI Disturbances: In this study, a greater number of younger autistic and TD children had GI disturbances than older children. One or more GI symptoms were reported by 30% autistic children as compared to only 18% typically children. Ten percent autistic children and eight percent TD children frequently suffered with constipation. Loose motion was reported in 4% of children in both the groups. Eating behaviors: When the parents of the participants were enquired about various eating and meal time behaviors of their child, the following was obtained.

Having same meal as the family: A significant difference was found between both the groups in terms of having same meal as rest of the family (χ^2= 8.696, p=0.003). Eighty four percent of autistic children had the same meal as rest of the family and all the TD children had the same meal as rest of the family.

Trying out new foods: A significantly lesser number of autistic children tried out new foods as compared to TD children (χ^2= 11.413, p= 0.003). Sixty six percent of autistic children were willing to easily try out new foods as against 92% of TD children.

Fed themselves or by a parent: Sixty six percent of autistic children preferred to be fed by the parent/caregiver as compared to only 20 percent of TD children. It was also seen that greater number of autistic children who required assistance of parent/caregiver while eating was in the younger age group.

Time taken to complete meals: Majority of the children in both the groups completed their meals in less than 20 minutes (62% autistic v/s. 66% TD). Slightly greater number of autistic children (38%) took more than 20 minutes to complete their meals as compared to TD children (34%).

Meal time behaviors: A greater number of autistic children were reported to show one or more negative eating behaviors compared to TD children. The most commonly reported behaviors were: playing while eating, not sitting in one place, swallowing food without chewing, hitting themselves or others, eating slowly, pushing food away, stuffing mouth with food, etc. It was seen that 80% of younger autistic children showed one or more negative eating behavior as compared to 20% older autistic children. Thus, it could be said that problematic meal time behaviors were more occurring in younger ages. The mean intake of various foods was compared between the autistic and TD group. Table 1 shows the mean intake of selected foods in both groups of children.

Milk and milk products: Higher number of TD children consumed milk and milk products on a weekly basis as compared to autistic children. Only paneer consumption was significantly greater by the TD children compared to autistic children (p=0.03).

Beverages: Mean consumption of carbonated beverages and non-carbonated drinks such as fruit juices, tang, rasna, etc., was higher by the autistic children. However, this was not significant.

Sweets: Sweets were consumed by fewer autistic children as compared to TD children. But laddoos, peda or barfi was consumed by a greater number of autistic children (n=14) as compared to TD children (n=9). The mean consumption of sheera in autistic children was significantly higher than the TD children(f= 4.36, p=0.05). Sheera being soft and easy to eat may be the reason for autistic children choosing to eat it.

Snacks: Mean consumption of biscuits, cream biscuits and maggi was higher by autistic children as compared to TD children and that of chips, samosa, pakoda, etc. was greater for the TD children. A significant difference was seen in consumption of chakli by the two groups (f= 9.60, p=0.005).

Cereals and pulses: A higher number of TD children consumed other varieties like puri, paratha rice, biryani pulao, khichdi, oats, daal, etc., as compared to autistic children who preferred chapati. Khichdi consumption in autistic children was almost twice as compared to TD children. But consumption of none of these foods was significant.

Non-vegetarian foods: Eggs, fried chicken/mutton/fish and gravy consumption was more in TD children as compared to autistic group.

Vegetables: Spinach and brinjal were consumed by slightly higher number of autistic children as compared to TD children. Potato was consumed by 19 autistic children and 38 TD children. But the mean amount consumed by autistic children was more as compared to TD children. More number of TD children consumed higher portions of rest of the other vegetables. Some parents of autistic children reported that their child did not prefer to eat any vegetables at all. Therefore, they had to mash or puree it and incorporate it in their meals.

Table 1. Mean Intake of foods by Autistic and TD children

Food Categories	Autistic	Typically Developing	F,p
Milk and Milk products (cup)			
Milk	7.45±6.07 (n=34)	6.09±2.92 (n=49)	1.84,0.17
Curd	1.16±0.97 (n=12)	1.04±0.97 (n=22)	0.11,0.73
Paneer	0.26±0.06 (n=9)	0.43±0.25 (n=13)	4.96,0.03
Beverages (cup)			
Carbonated Beverages	1.71±1.51 (n=22)	1.14±1.88 (n=20)	1.15,0.28
N.C Beverages	1.40±1.14 (n=30)	0.73±0.86 (n=13)	3.54,0.06
Sweets (pc/no.)			
Laddo/Barfi	1.14±0.81 (n=14)	2.27±2.79 (n=9)	2.07,0.16
Sheera	1.18±1.05 (n=8)	0.47±0.21 (n=10)	4.36,0.05
Kheer/Firni	1.05±1.00 (n=9)	0.60±0.27 (n=14)	2.55,0.12
Jam (tbsp)	4.50±4.46 (n=15)	5.44±6.16 (n=17)	0.23,0.62
Snacks (cup)			
Banana/ Potato chips	1.66±1.79 (n=28)	1.99±1.77 (n=34)	0.55,0.46
Lays/Kurkure	2.79±2.29 (n=36)	2.87±2.58 (n=41)	0.02,0.88
Chakli	1.15±0.72 (n=9)	0.48±0.33 (n=15)	9.60,0.005
Cream Biscuit (no.)	12.69±11.76 (n=35)	9.75±10.98 (n=32)	1.10,0.29
Plain Biscuit (no.)	10.38±8.66 (n=34)	8.37±9.46 (n=32)	0.81,0.37
Samosa	1.16±0.92 (n=24)	1.56±1.28 (n=27)	1.22,0.27
Pakoda	2.61±1.90 (n=9)	4.30±4.38 (n=13)	1.17,0.29
Maggi	1.71±1.58 (n=23)	1.29±1.46 (n=33)	1.40,0.24
Cereals and Pulses (no./cup)			
Chapati	14.7± 7.22 (n=46)	12.9± 8.58 (n=43)	1.21,0.27
Paratha	2.03±1.92 (n=22)	1.74±1.88 (n=30)	0.30,0.58
Plain rice	8.85±5.55 (n=46)	9.04±6.21 (n=48)	0.24,0.87
Biryani/Pulao	2.35±2.47 (n=17)	2.38±2.13 (n=36)	0.40,0.95
Khichdi	2.65±2.06 (n=18)	1.47±2.16 (n=25)	3.23,0.07
Daal	6.75±2.99 (n=42)	5.88±2.51 (n=46)	2.18,0.14
Non-vegetarian foods (pc./cup)			
Egg	4.08±2.03 (n=29)	3.63±1.99 (n=39)	0.83,0.36
Chickkn gravy	0.89±0.85 (n=22)	1.38±1.24 (n=42)	2.65,0.10
Mutton gravy	1.10±0.98 (n=22)	1.45±1.25 (n=36)	1.28,0.26
Fish gravy	1.01±0.89 (n=19)	1.08±1.08 (n=27)	0.05,0.81
Chickn/mutton/fish fry	2.13±2.51 (n=18)	1.91±1.35 (n=36)	0.18,0.67
Vegetables and Fruits (cup)			
Spinach	0.69±0.63 (n=22)	0.94±0.79 (n=18)	1.48,0.22
Potato	2.00±2.35 (n=19)	1.60±1.59 (n=38)	1.80,0.18
Brinjal	0.80±0.51 (n=17)	0.83±0.88 (n=12)	0.09,0.92
Ladyfinger	0.740.67 (n=28)	0.81±0.73 (n=36)	0.19,0.66
Cauliflower	0.58±0.35 (n=24)	0.72±0.73 (n=35)	0.80,0.37
Tomato	1.61±1.38 (n=22)	2.1±1.83 (n=28)	1.39,0.24
Apple	1.37±1.04 (n=33)	1.40±2.04 (n=46)	0.00, 0.92
Banana	3.22±2.07 (n=28)	3.62±2.19 (n=41)	0.59, 0.44
Guava/Pear	0.70±0.64 (n=10)	1.19±1.03 (n=28)	2.01, 0.16
Orange	0.78±0.66 (n=8)	1.06±0.73 (n=33)	1.02, 0.31
Papaya	0.52±0.49 (n=9)	0.73±0.58 (n=21)	0.88, 0.35

Fruits: Fruits such oranges, pineapple, watermelon and grapes were consumed by very few autistic children. Parents reported that they limited the intake of these fruits by their children as they frequently caught cold. In TD children, fruit consumption was higher than the autistic children. Thus, it was observed that autistic children consumed a limited variety of food items from each food group. Autistic children had a higher intake of beverages, biscuits, chakli, noodles/pasta, sheera, etc. Also, autistic children consumed less fruits and vegetables as compared to TD children.

DISCUSSION

Feeding problems have been reported by 25% of TD children versus 80% children with developmental disabilities (Manikam and Perman, 2000). Feeding problems being complex, researchers have categorized the term 'feeding problems' in autistic children differently. Their definition includes one or more of the following characteristics: food selectivity (Cornish, 1998; Fields *et al.,* 2003), partial or total food refusal (Ahearn, *et al.,* 2001; Schreck *et al.,* 2004), problematic meal time behaviors (Collins *et al.,* 2003), etc. Studies have reported a higher frequency of gastrointestinal problems in autistic children as compared to TD children (Afzal *et al.,* 2003; Ibrahim *et al.,* 2009; Wang *et al.,* 2011).

Our study also showed similar results. However, our study reported a much lower occurrence of GI symptoms compared to the study of Valicenti-Mcdermott *et al.,* (2006) who reported 70% autistic children to have GI symptoms. In the present study many autistic children did not have the same meal as rest of the family and they also refused to try out new foods. Liu *et al.,* (2016) had reported that approximately 24% of autistic children in their study did not try out new foods easily. Younger autistic children in this study required assistance while eating or preferred to be fed by their parent/ caregiver as compared to autistic children in the older age group. Similar results were obtained by Collins *et al.,* (2003) who had reported that older children with development disability had better feeding skills as compared to younger children. Parents of several autistic children reported that their child ate by themselves certain foods and in certain situations only. The situations were- dry food items like chips, biscuits, etc., tiffin in school, or only the food items which they liked.

The results of this study are similar to other studies which reported that autistic children showed more frequent meal time behavioral problems than children without autism (Johnsen and Handen, 2008; Martins *et al.,* 2008; Handayani *et al.,* 2012). Similar to the findings of Schmitt *et al.,* (2008) and Nadon *et al.,* (2011), our study showed that autistic children

consumed few foods from each food group. But the amount consumed for several food items was greater in autistic children as compared to TD children. This suggests that dietary pattern of autistic children is limited in terms of variety and not quantity. Parents of autistic children may face challenges while ensuring that their child receives adequate nutrition. In the present study, autistic children showed atypical meal time behaviors, refused to try out new foods and were selective in their food choices. There are many factors responsible for feeding problems in autistic children. Twachtman-Reilly *et al.,* (2008) suggested two categories of factors which influence the feeding problems. They are physiological issues and behavioral issues. Physiological issues include impaired oral motor control. Thus, they may find it difficult to chew or swallow food of certain textures and thus avoid them. Avoiding certain foods, preferring bland food, drooling, stuffing mouth or swallowing without chewing are also indicators of sensory processing difficulties in these children. Autistic children may be hyper or hypo sensitive to certain textures and flavors. Behavioral issues include inconsistent cognitive flexibility due to which they may stick to certain feeding rituals such as particular mealtimes, insisting on specific methods of food preparation, utensils, texture, etc. GI problems being commonly seen in autistic children, may be the reason for elimination of certain foods from their diet. Food neophobia (fear of trying out new foods) may prevent them from trying out new foods. This study also observed that autistic children had a limited food choice from different food groups. For autistic children, each symptom must be dealt individually. Increase the child's water intake in case of constipation. Ensure adequate intake of fiber rich foods by including fruits and vegetables in their diet. Fruits and vegetable can be offered in the form of fresh juices, smoothies, soups, etc. Make the meals presentable and visually attractive so that the child eats the food. Limit intake of chips/ biscuits by keeping them out of their reach and sight. Also, limit their intake of juices and carbonated drinks. Alter the consistency of foods depending on the child's preference. If the child is not able to chew hard foods like nuts, they can be powdered and added in their milk. Since, children with ASD are very particular about rituals and habits, fixed meal times should be followed. Feed them at regular intervals and when they are hungry. Bring changes in their meals gradually and try to incorporate foods from all food groups.

Conclusion

A thorough assessment and evaluation of dietary pattern and meal time behaviors of autistic children should be done. The possible cause for individual feeding problems should be understood in order to implement proper interventions.

Conflict of Interest: The authors declare that they have no conflict of interest.

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