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ASSESSMENT OF NUTRITIONAL STATUS IN YEMENI CHILDREN WITH AUTISM SPECTRUM DISORDER, AND THEIR CAREGIVERS' PERCEPTION AND KNOWLEDGE – AT AUTISM REHABILITATION CENTERS, SANA'A

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ABSTRACT

The aim of this study is to assess nutritional status in Yemeni children with Autism Spectrum Disorder (ASD) and to evaluate their parents' perspective and knowledge. A cross sectional, descriptive study was conducted. Data collected from four autism rehabilitation centers in Sana'a Capital. The study population was formed of children with ASD and their parents. A questionnaire was prepared for the purpose of data collection. First part of the questionnaire included a checklist for child's demographic data and anthropometric measures. Second part included parents' demographic data. Third part included data regarding parents' knowledge and perception about nutritional status, feeding behavior, healthy weight, and physical activity of their autistic children, and parents' knowledge regarding risk of obesity in autistic children. Among 82 autistic children, males represented the majority (62.2%), and females represented (37.8%). Their ages ranged between 3.5 years and 12 years. Assessment of BMI reported that autistic children with acute malnutrition represented 19.5%, and those with underweight represented 23.2%. Overweight represented 12.2%, and the minority (4.9%) were obese. The remaining portion (40.2%) were in the range

of normal weight. A strong positive correlation was found between MUAC and BMI. About half of autistic children were belonged to either illiterate parents (26.8%) or parents had only primary education (22%). About two thirds (62.2%) of parents thought that their children were receiving unbalanced diet. According to parents, 53.7% of their autistic children were picky eaters, 12.2% were obsessed with food, 19.5% had lost their appetite, and only 14.6% of children were not affected. As stated by parents, the majority (86.6%) of autistic children had barriers of getting nutritional balance. Those barriers included refuse eating (41.5%), binge eating (13.4%), difficulty swallowing (12.2%), inadequate eating (12.2%), vomiting (4.9%), and pica (2.4%). From parents' perspective, most of autistic children (76.8%) seemed to be hyperactive, (58.5%) were able to use electronic devices. From parents' point of view, their children were not in healthy weight due to either unbalanced nutrition (58.5%) or due to inactivity (12.2%). The remaining parents (29.3%) considered their children in a healthy weight. About two thirds of parents (64.6%) had no knowledge about obesity risk in autistic children. It is recommended to increase awareness among parents towards nutritional status and milestones of their autistic children. There is a need for further research studying the impact of atypical eating behaviors on growth and development of ASD children.

KEYWORDS: autism spectrum disorder, children, nutritional status, parents' knowledge, parents' perception.

1. INTRODUCTION

The clear knowledge about autism began in 1943 by two pioneers; the child psychiatrist Leo Kanner and the pediatrician Hans Asperger.[1] ASD comprises a complex set of behaviorally defined neurodevelopmental abnormalities in two core areas: deficits in social communication and fixated or restricted, repetitive or stereotyped behaviors and interests, including food selectivity.[2]

ASD includes autistic disorder, Asperger syndrome and pervasive developmental disorder.[3] Children with Asperger syndrome have the same problems with autism, but cognitive function remains unimpaired and language abilities develop more typically. Children with Asperger syndrome have unusual interests that they pursue with intensity.[4]

Pervasive developmental disorder not otherwise specified (PDD-NOS) is one of the three ASD. According to The Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) PDD-NOS is a diagnosis that is used for 'severe and pervasive

impairment in the development of reciprocal social interaction or verbal and non-verbal communication skills, or when stereotype a behavior, interests and activities are present, but the criteria are not met for a specific PDD'. This is often called atypical autism. A child with PDD-NOS may develop symptoms after 30 months of age or show atypical symptoms.[5]

Aggregated evidence from literature has showed that individuals with ASD can be nutritionally vulnerable, and there has been a significant amount of effort devoted to highlight the need for nutritional interventions in children with ASD. Though parents usually face huge challenge feeding their autistic children, their role was not highlighted enough in nutritional research of autistic children. Little literature exists on the perceptions or feelings of the parents of children with autism, especially regarding how they view the nutritional status of their child. A gap is existing in aspect of parents' feeding experiences and perspectives on the nutritional status of their autistic children. Understanding parents' perspectives on the nutritional status of the ASD children is a vital step towards improving nutritional interventions for those children, and helping to facilitate richer mother-child interactions. Besides, addressing this issue will improve professionals' understanding of feeding difficulties from a parents' point of view. Therefore - in addition to lack of these types of studies in Yemen - the existing gap in the literature concerning parents' perspectives and knowledge provides a justification for further exploration of this issue. To the best of the researcher's knowledge, no single similar study has been conducted in Yemen. The study might highlight a side of ASD and might gain attention into the problem by examining parent perceptions and nutritional status of children with ASD, and it might enhance the parents' awareness and knowledge about nutritional hazards of their children with ASD thus this study was aimed To assess nutritional status in Yemeni children with ASD, and to evaluate their parents' perspective and knowledge.

2. METHODOLOGY

2.1.Study design: Cross – sectional, descriptive study.

2.2.Study area: The study was conducted in 4 different rehabilitation centers in Sana'a Capital (Al-Ettahad Center, CARS Center, Ebn-Al-Tawahod Center, and Child Support Establishment)

2.3.S tudy duration: Data collected in the period from November 12th, 2020 to December 25th, 2020.

2.4.Study population: Children with ASD, and their parents (either mothers or fathers) attending to autism rehabilitation centers. The children were previously diagnosed with ASD by a pediatrician or by a child psychiatrist.

2.5.Inclusion criteria : All children with ASD, of both gender, who aged between 3 and 12 years, and attending rehabilitation centers in the period of data collection.

2.6.Exclusion criteria;Uncooperative children or parents were excluded. Physically disabled, irritable, and nervous children, and children with congenital disease like Down syndrome and growth atrophy were excluded as well.

2.7.Sampling method: A convenient sample; all children with ASD and their parents available during data collection were invited to be involved in the study.

2.8.Study Tool: A pre-designed, semi-structured questionnaire was prepared relying on literature review and study objectives. First part of the questionnaire included a checklist for child's demographic data and anthropometric measures (age, gender, height, weight, and MUAC). Second part included parents' demographic data (mother or father, level of education, monthly income). Third part included data regarding parents' knowledge and perception about nutritional status, feeding behavior, and physical activity of their children with ASD.

2.9.Data collection: After verbal consent taking and explanation purpose of the study to the parents, 82 children with ASD were examined, and their parents (52 mothers, 30 fathers) were interviewed. Procedure of data collection was formed of 2 main parts: anthropometric measures for children, and interview with parents to explore their knowledge and perception regarding nutritional status of their autistic children. Anthropometric measures were taken using standard anthropometric techniques.[6,7] A standard balanced weight scale, and a standard scalded tape were used to measure weight and height. Mid-arm circumference (MUAC) measured with standard calipers for use with pediatric patients. It was measured at the midway between the olecranon and acromion process on the upper left arm. Nutritional status of children was assessed using BMI, which was calculated as weight in kilograms divided by the height squared in meters (kg/m2). BMI-for-age percentiles were calculated based on the BMI-for-age growth chart recommended by the WHO. Children with BMI-for-age percentile < the 5^{th} percentile are considered underweight, children with BMI-for-age percentile > the 85^{th} percentile are considered overweight, and children with BMI for age > the 95^{th} percentile are considered obese.[8]

2.10. Study variables

1-Dependent variables

- nutritional status of autistic children according to their BMI.
- knowledge and perception of parents' in aspects related nutritional status of their autistic children.

2-Independent variables

- Caregiver gender, educational level, economic status.
- Child's eating behavior, physical activity, and eating problems.

2.11. Data Analysis

Statistical Package for the Social Sciences (SPSS) software, version 21 was used for data analysis. Nominal and categorical variables were described by frequencies and percentages. Continuous variables were described by means & SD, minimum and maximum. Chi square test was used to test differences between categories. Simple linear regression was used to test relationship between MUAC and other continuous variables. The test was considered to be significant if p value < 0.05.

2.12 Ethical consideration

During data collection, the aim of the study was briefly explained to parents. A verbal consent obtained from each one before starting asking questions and filling questionnaire. They were also informed that data will be used merely for the purpose of research and will be treated confidentially and no indicative information - like names - will be disseminated.

3. RESULT AND DISCUSSION

Children with ASDs are reported to have food aversions and habitual eating behaviors.[9] Autism involves behavioral, medical and psychological effects which have been found to be connected to nutrition.[10]

Parents of children with ASD are faced with great challenges facing their child's limited food preferences and eating behaviors. Some parents feel that changes in their child's diet may make a difference in how the child feels or acts.[10] This study has evaluated the nutritional status of 82 children with ASD through estimation their BMI and MUAC. It also has included corresponding 82 parents (52 mothers and 30 fathers) to assess their nutritional perception towards their autistic children.

3.1.Distribution of the sample according to age

Current study included 82 children with ASD. Their ages ranged between 3 years and 12 years, with mean and SD of 8 ± 1.9 years. The majority of children 49 (59.8%) were in the age of 7 to 9 years. (Table 3.1.).

Table 3. 1: Distribution of the sample according to age.

Age groups	Count	Percent
3 - 6 years	16	19.5%
7 - 9 years	49	59.8%
10 - 12 years	17	20.7%
Total	82	100%

Minimum = 3 years, Maximum = 12 years, Mean ± SD = 8 ± 1.9 years.

Current study included 82 children suffering from autism. Their ages ranged between 3 years and 12 years, with mean and SD of 8 ± 1.9 years. Similar mean age (8.6 ± 2.1 years) was reported by Alshaban et al.[11] In present study, the majority of children 49 (59.8%) were in the age of 7 to 9 years. This may depict that autistic disorder tends to decrease in frequency with increasing age. Slightly lower ages mentioned in other published studies on autism of which most patients were below five years old.[12,13] According to Coo et al., the paucity of cases diagnosed in the older age group may be attributed to the less severity of manifestations or cases are misclassified as intellectually disabled or as having learning difficulties rather than ASD.[14]

3.2 Distribution of the sample according to gender

Out of 82 children in the sample, males represented the majority (51 = 62.2%), and females accounted for (31 = 37.8%), with male to females ratio 1.6 : 1. (Table 3.2.).

Table 3. 2: Distribution of the sample according to gender.

Gender	Count	Percent
Males	51	62.2%
Females	31	37.8%
Total	82	100%

Out of 82 children with ASD in this study, males represented the majority (62.2%), and females represented 37.8%, with male to females ratio 1.6 : 1. The gender distribution found in the current study is comparable with international autism data in which ASD reported to be more prevalent among males.[15,16,17] A close rate (males = 58%, and females = 42%) was reported from Pakistan.[41] In a study from a neighboring Arab country autistic males

represented 81%.[11] Some authors reported higher (3.6-fold higher) prevalence of ASD in males than females.[13] Others reported even higher male to female ratio of 9:1.[18]

3.3 Distribution of the sample according to respondent

Most of the caregiver respondents (63.4%) were mothers, and minority of them (36.6%) were fathers. (Table 3.3.).

Table 3. 3: Distribution of the sample according to respondent.

Respondent	Count	Percent
Mothers	52	63.4%
Fathers	30	36.6%
Total	82	100%

3.4 Distribution of the sample according to parents' education

Illiteracy among parents represented 26.8%. Parents who had primary education represented 22%, and who had secondary education represented 19.5%. Parent with high school education represented 18.3%. The minority of parents (13.4%) had university education. (Table 3.4).

Table 3: 4. Distribution of the sample according to parents' education.

Parents' education	Count	Percent
Illiterate	22	26.8%
Primary school	18	22%
Secondary school	16	19.5%
High school	15	18.3%
University	11	13.4%
Total	82	100%

Results of this study revealed that there is a strong positive correlation between MUAC and BMI (correlation coefficient = 0.75). Recently, mid-upper-arm circumference (MUAC) has been proposed as another important indicator with reasonable accuracy of nutritional status in children.[19] It has been reported that the MUAC is a strong significant predictor of BMI.[19,20]

In this study, illiteracy among parents represented 26.8%. Parents who had primary education represented 22%, and who had secondary education represented 19.5%. Parent with high school education represented 18.3%. The minority of parents (13.4%) had university education. This result is compatible with what addressed by UNESCO in which adult illiteracy rate in Yemen has been estimated to be 36%.[21] The illiteracy rate (26.8%) among caregivers of autistic children in this study was much higher than among caregivers in Pakistan (2%)[22], Qatar (zero).[11] Higher illiteracy rate among parents may add a burden to

the nutritional status of this group of children. Illiterate parents may not understand their autistic child's needs.

3.5 Distribution of the sample according to socioeconomic status (SES)

Most of families had either low income (45%) or middle income (50%). Only minority (5%) of families had high income. (Table 3.5.).

Table 3: 5 Distribution of the sample according to socioeconomic status.

SES	Count	Percent
Low	37	45%
Middle	41	50%
High	4	5%
Total	82	100%

In current study, most of ASD children had belonged either to low income (45%) or middle income (50%) families. Only minority (5%) of them had belonged to high income class. This economic status is not different from general economic status for Yemeni population in which poverty and food insecurity are prevailing.[23-25] Similar findings were reported in other developing countries.[22]

3.6 Comparing anthropometric parameters according to gender

Table below illustrates differences in anthropometric measures between males and females. Males have higher means in height (mean difference is 6.5 cm), and weight (mean difference is 1.9 Kg). However, differences are not statistically significant (p values > 0.05). Both males and females are nearly equal as regard MUAC and BMI. (Table 3.6.)

Table 3: 6. Comparing anthropometric parameters according to gender.

Anthropometric measure	Gender	Count	Mean	Minimum	Maximum	Standard Deviation	Mean Difference	P value
Height (cm)	Males	51	122.91	98.00	150.00	12.04	6.5	.066
	Females	31	116.39	79.00	150.00	16.88		
Weight (Kg)	Males	51	23.33	14.00	56.60	8.38	1.9	.316
	Females	31	21.38	10.80	48.00	8.58		
MUAC (cm)	Males	51	17.03	10.00	26.00	3.24	-0.1	.874
	Females	31	17.15	13.50	27.00	3.38		
BMI	Males	51	15.12	11.03	25.16	3.11	-0.27	.709
	Females	31	15.39	12.02	25.02	3.43		

In current study, males had higher means in height and weight than females. However, differences are not statistically significant. Both males and females are nearly equal as regard MUAC and BMI**.**

3.7 Distribution of the sample according to nutritional status

Children with acute malnutrition represented 19.5%, and those with underweight represented 23.2%. Overweight represented 12.2%, and minority (4.9%) were obese. The remaining portion (40.2%) were in the normal range weight. (Table 3.7.).

Table 3: 7. Distribution of the sample according to nutritional status.

BMI categories	Count	Percent
Acute malnutrition	16	19.5%
Underweight	19	23.2%
Normal	33	40.2%
Overweight	10	12.2%
Obese	4	4.9%
Total	82	100%

Current study revealed that autistic children with acute malnutrition represented 19.5%, and those with underweight represented 23.2%. Overweight represented 12.2%, and the minority (4.9%) were obese. The remaining portion (40.2%) were in the normal range weight. These findings are generally consistent with literature in which children with ASD are vulnerable to both overnutrition and undernutrition.[26,17,27] Obesity rate (4.9%) in this study was lower than (8%) from study in Pakistan[22], and (20%) in USA.[9,28] Curtin et al. (2010) reported that the prevalence of obesity in children with ASD was 28.8% higher when compared to children without ASD.[29] In addition, Phillips et al. (2014) stated that the prevalence of obesity was two times higher among children with ASD than that of children with other developmental and physical disabilities.[30] Children with ASD having a high obesity rate may result from a combination of poor nutrition knowledge and low physical activity levels.[28]

Overweight children in this study represented 12.2% which is similar to what reported in the literature.[22,28]

This study revealed a considerable proportion of acute malnutrition (19.5%), and underweight (23.2%) among autistic children. These rates are comparable to what reported in a study from Pakistan (36% were reportedly underweight)[22], but higher than rate reported

from Iran (8.7% were reportedly underweight).[31] Other studies also showed high risks of being underweight in autistic children.[26]

3.8 Comparing nutritional status according to gender

Table below shows that rate of underweight is more among males than females (25.5% vs 19.4%), and overweight is also more among males than females (15.7% vs 6.5%). On the contrary, obesity is more among females than males (9.7% vs 2%). Nevertheless, that difference is not statistically significant (p value > 0.05). (Table 3.8)

Table 3: 8. Comparing nutritional status according to gender.

Nutritional status	Males	Females
Acute malnutrition	10 (19.6%)	6(19.4%)
Underweight	13 (25.5%)	6 (19.4%)
Normal	22 (43.1%)	11 (35.5%)
Overweight	8 (15.7%)	2 (6.5%)
Obese	1 (2%)	3 (9.7%)
Total	51 (100%)	31 (100%)

Pearson Chi-Square (4) = 4.235, p value = 0.516

In this study the underweight is more among males but the obesity is more among females. Nevertheless, that difference is not statistically significant. These findings are consistent with findings in a previous study in which no significant differences in BMI were found between males and females.[26]

3.9 Prediction of BMI using MUAC (by regression)

Table and graph below illustrate that the slope of the linear regression line is significantly different from 0. (Table 3.9. & Figure 3.1.).

Therefore, BMI for the sample can be predicted from a given MUAC by the following equation.

BMI = 2.46 + 0.75 * MUAC

Table 3. 9. Prediction of BMI using MUAC (by regression)

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	2.46	1.239		1.987	.050	2.461	1.239
MUAC	.75	.071	.761	10.486	.000	.747	.071
a. Dependent Variable: BMI							

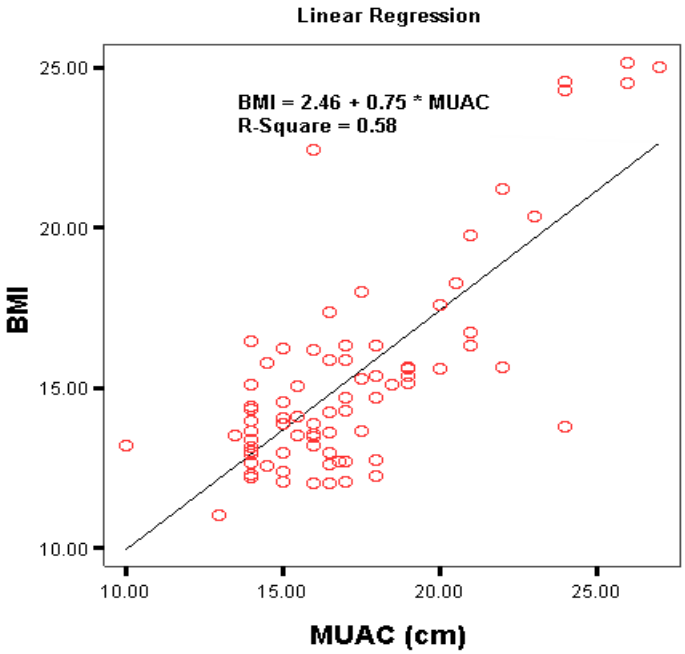

Figure 3: 1. Prediction of BMI using MUAC.

3.10 Prediction of height using MUAC (by regression)

Table and graph below illustrate that the slope of the linear regression line is significantly different from 0. (Table 3.10. & Figure 3.2.).

Therefore, height for the sample can be predicted from a given MUAC by the following equation.

Height = 80.68 + 2.33 * MUAC

Table 3: 10. Prediction of height using MUAC (by regression)

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	80.68	7.191		11.219	.000	80.680	7.191
MUAC	2.33	.414	.533	5.629	.000	2.329	.414
a. Dependent Variable: Height							

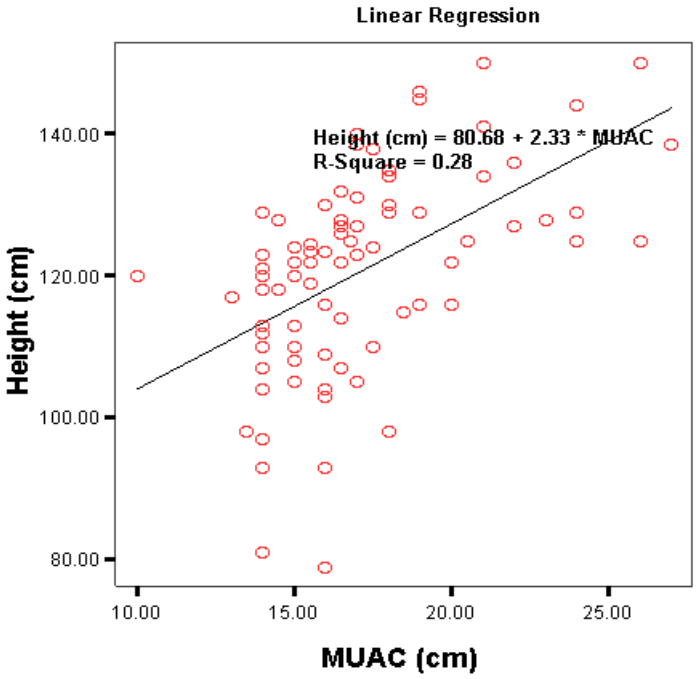

Figure 3: 2. Prediction of height using MUAC.

3.11 Prediction of weight using MUAC (by regression)

Table and graph below illustrate that the slope of the linear regression line is significantly different from 0. (Table 3.11. & Figure 3.3.).

Therefore, weight for the sample can be predicted from a given MUAC by the following equation.

Weight = - 14.46 +2.17 * MUAC

Table 3: 11. Prediction of weight using MUAC (by regression)

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	-14.46	2.714		-5.328-	.000	-14.460-	2.714
MUAC	2.17	.156	.841	13.899	.000	2.170	.156
a. Dependent Variable: Weight							

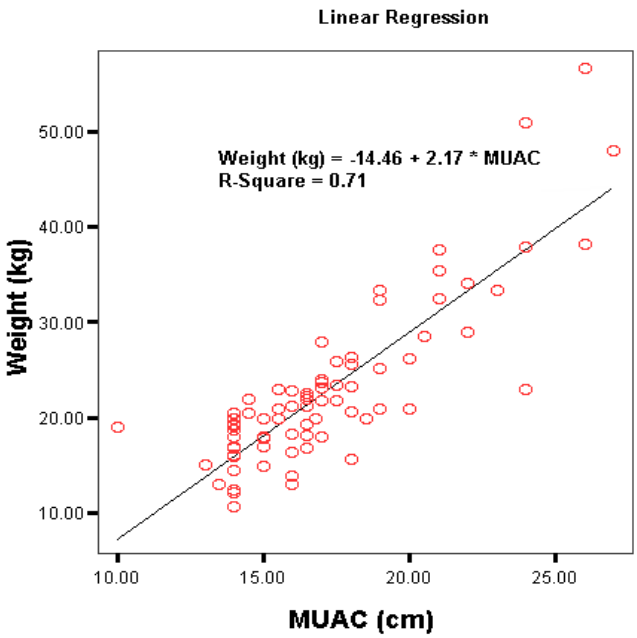

Figure 3: 3. Prediction of weight using MUAC.

3.12 Parents' perception about child's diet balance

About two thirds (62.2%) of parents think that their children receive unbalanced diet. (Table 3.12.)

Table 3:12 Parents' perception about child's diet balance.

Diet balancing	Count	Percent
Balanced diet	31	37.8%
Unbalanced diet	51	62.2%
Total	82	100%

In current study, about two thirds (62.2%) of parents think that their children receive unbalanced diet. This result is consistent with a study conducted in Turkey in which 58% of parents stated that children stated that their children were fed unbalanced diet.[32] A study from USA reported that parents of children with autism have perceived their children to be under-nourished. Those parents were significantly more likely to admit frustration and/or anxiety when feeding their child with autism.[33]

3.13 Food selectivity by autistic children

More than half (53.7%) of autistic are picky eater. The remaining are either obsessed with food (12.2%) or lose the appetite (19.5%) (Table 3.13.).

Table 3: 13 Food selectivity by autistic children.

Food selectivity	Count	Percent
Picky eater	44	53.7%
Obsessed with food	10	12.2%
Loses the appetite	16	19.5%
Does not affect	12	14.6%
Total	82	100%

This study showed that more than half (53.7%) of parents stated that their autistic children are picky eaters. The remaining children are either obsessed with food (12.2%) or lose their appetite (19.5%). Only 14.6% of children are not affected. A previous study also revealed this food selection habits but with different distribution (33% of children are picky eater, 25% of the children are obsessed with food, 5% of children have loss of appetite).[32] Food selectivity is commonly reported in children with ASD who only eat narrow array of foods than their peers, and their food choices are influenced by texture, color, and smell.[34] Some children with ASD may only eat high calorie foods such as chicken nuggets and French fries because of the yellow color.[35] Others tend to be "picky eaters" and consume significantly fewer fruits and vegetables and more servings of sugared beverages, both of which have been shown to increase obesity.[36] As many as 70% of children with ASD were described as selective eaters.[37,38] Feeding a child with ASD can be difficult responsibility for parents. Parents of children with autism are faced with their child's limited food preferences and eating behaviors. Parents felt irritated, frustrated, guilty or concerned if their children did not eat a balanced meal.[33]

3.14 Barriers of getting nutritional balance

As perceived by parents, the majority (86.6%) have barriers of getting nutritional balance. Refuse eating was the most frequent cause (41.5%). Other cause include vomiting (4.9%), difficulty swallowing (12.2%), binge eating (13.4%), inadequate eating (12.2%), and pica (2.4%). (Table 3.14.).

Table 3: 14 Barriers of getting nutritional balance.

Barrier of getting nutritional balance	Count	Percent	Cumulative Percent
Vomiting	4	4.9%	4.9%
Difficulty swallowing	10	12.2%	17.1%
Refuses eating	34	41.5%	58.5%
Binge eating	11	13.4%	72%
Inadequate eating	10	12.2%	84.1%
Pica	2	2.4%	86.6%

None	11	13.4%	100%
Total	82	100%	

As reported by parents in this study, the majority (86.6%) have barriers of getting nutritional balance. Refuse eating was the most frequent cause (41.5%). Other causes include vomiting (4.9%), difficulty swallowing (12.2%), binge eating (13.4%), inadequate eating (12.2%), and pica (2.4%). These findings also reflected in the literature. Bandini et al. (2010) indicated that food refusal was more common (41.7%) in those children with ASD.[39] Vomiting, difficulty swallowing, binge eating, inadequate eating, holding food in the mouth, and pica were also reported in previous studies in that group of children.[32]

3.15 Daily water consumption

Children who usually drink less than one cup of water accounted for 7 (8.5%), 22 (26.8%) consume 1 to 2 cups of water daily, 21 (25.6%) consume 3 to 4 cups of water daily, and 32 (39%) of children consume more than 4 cups of water per day. (Table 3.15.).

Table 3: 15 Daily water consumption.

Amount of water drunk / day	Count	Percent
< 1 cup	7	8.5%
1 to 2 cups	22	26.8%
3 to 4 cups	21	25.6%
> 4 cups	32	39%
Total	82	100%

3.16 Affecting physical activity by autism

Most of autistic children (76.8%) are hyperactive, minority of them (8.5%) are hypoactive. Regular physical activity found in (14.6%) of children. (Table 3.16.).

Table 3: 16 Affecting physical activity by autism.

Affecting physical activity	Count	Percent
Causes increase	63	76.8%
Causes decrease	7	8.5%
No difference	12	14.6%
Total	82	100%

According to parents of autistic children in this study, most of their children (76.8%) are hyperactive, minority of them (8.5%) are hypoactive. Regular physical activity found in (14.6%) of children. Different rates were reported in a previous study which showed that 11%

of children had high physical activity, 55% had low physical activity, 34% had normal physical activity.[32]

3.17 Ability to use electronic devices

More than half (58.5%) of autistic children in this study are able to use electronic devices like cell phones, tablets, televisions, video games, computers. The remaining portion (41.5%) suffer from inability to use these devices. (Table 3.17.).

Table 3: 17 Ability to use electronic devices.

Usage of electronic devices	Count	Percent
Yes	48	58.5%
No	34	41.5%
Total	82	100%

More than half (58.5%) of autistic children in this study are able to use electronic devices like cell phones, tablets, televisions, video games, computers. The remaining portion (41.5%) suffer from inability to use these devices.

3.18 Barriers of using electronic devices

Autism is the main barrier preventing use of electronic devices. It was found in 24.4% of children. Family and school represented barriers in 15.9% and 1.2% of children respectively. (Table 3.18.).

Table 3: 18 Barriers preventing usage electronic devices.

Barriers preventing usage electronic devices	Count	Percent
School	1	1.2%
Family	13	15.9%
Autism	20	24.4%
Does not affected	48	58.5%
Total	82	100%

Autism is the main barrier preventing use of electronic devices. It was found in 24.4% of children. Family and school represented barriers in 15.9% and 1.2% of children respectively. A similar study found that 67% of autistic children were able to use the electronic devices and 33% were unable to use electronic devices because of autism.[32]

3.19 Special needs during physical activity

Special needs during physical activities increase in 28 (34.1%), and decrease in 7 (8.5%) of autistic children. (Table 3.19.).

Table 3: 19 Special needs during physical activity.

Needs during physical activity	Count	Percent
Increase	28	34.1%
Decrease	7	8.5%
No difference	47	57.3%
Total	82	100%

3.20 Barriers for keeping healthy weight

As perceived by parents, 48 (58.5%) of children are not in healthy weight due to unbalanced nutrition. Inactivity is considered the barrier in 10 (12.2%) of children. (Table 3.20.).

Table 3: 20 Barriers in autistic children for keeping healthy weight.

Barriers for keeping healthy weight	Count	Percent
Unbalanced nutrition	48	58.5%
Inactivity	10	12.2%
No barrier	24	29.3%
Total	82	100%

As stated by parents, their children are not in healthy weight due to either unbalanced nutrition (58.5%) or due to inactivity (12.2%). The remaining parents (29.3%) considered their children in a healthy weight. These findings are comparable to findings in a similar study in which parents stated that their autistic children were not in ideal weight due to either unbalanced diet (42%), or inactivity (5%).[32] On the contrary, some authors reported that the majority of parents felt that their children's weight was normal.[40,41]

3.21 Parents' knowledge about obesity risk in autistic children

About two thirds of parents (53, 64.6%) did not know that autistic children are more risky to be obese. (Table 4.21.).

Table 3: 21 Parents' knowledge about obesity risk in autistic children.

Know about obesity risk in autistic children	Count	Percent
Yes	29	35.4%
No	53	64.6%
Total	82	100%

In this study, about two thirds of parents (64.6%) did not know that autistic children are more risky to be obese. This might be reflected by the high illiteracy rate found in this study. This finding is similar to finding in a previous study where 61% of parents were not aware of risk of obesity in autistic children.[32] Indeed, it was established in the literature that there is a

relationship between parents' adequate knowledge and the nutritional status of children with ASD.[42]

3.22 Correlation between parents' knowledge about obesity risk and actual BMI of their autistic children

Acute malnutrition and overweight among children of parents who did not hear about risks of obesity are more compared to other group (28.3% vs 3.4%, and 18.9% vs 13.8% respectively). The difference is statistically significant (p value < 0.05). (Table 3.22.)

Table 3: 22 Correlation between parents' knowledge about obesity risk and actual BMI of their autistic children.

BMI scoring	knowledge about obesity risk	
	Yes n (%)	No n (%)
Acute malnutrition	1 (3.4%)	15 (28.3%)
Undernutrition	13 (44.8%)	6 (11.3%)
Normal	11 (37.9%)	22 (41.5%)
Overweight	4 (13.8%)	10 (18.9%)
Total	29 (100%)	53 (100%)

Pearson Chi-Square (3) = 15.358, p value =.002

4. CONCLUSION

Nutritional unbalance is common among children with ASD, and challenging feeding behaviors are more pronounced in those children. In this study males were more affected by ASD. The mean age of the studied cases was 8 ± 1.9 years. Most of autistic children belonged to parents with low education and low monthly income. BMI estimates revealed a spectrum of malnutrition mainly underweight and acute malnutrition, followed by overweigh, and a minority of obese autistic children. A strong correlation was found between MUAC and BMI, therefore, MUAC considered to be a reasonable predictor for BMI and nutritional status. Maintenance of nutritional balance and optimal dietary intake remains a big challenge for parents of autistic children. The majority of parents felt that their children receive unbalanced diet, and were not in ideal weight, and most of parents stated that their children had abnormal eating behaviors; mainly picky eating, food obsession, or loss of appetite. According to parents, most of children with ASD were hyperactive, and could use electronic devices. About two thirds of parents did not know that autistic children are more vulnerable to be obese.

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