A Study on Comparison of Anthropometrics of Autism Spectrum Disorder Children with Normal Children

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Abstract:
Background: Children with Autism Spectrum Disorders (ASD) have various eating abnormalities which results in malnutrition.[*]
Aim: To study the growth and development of the ASD children with respect to their anthropometric measurements of age group 2 to 6 years.
Methods: Anthropometric methods was used in the study with three basic variables (height, weight and head circumference) and a single variable (Body Mass Index / BMI) was utilized. All the anthropometrics were taken following standard techniques.
Results: The incidence of stunting, underweight and wasting was higher in ASD children. The mean standard deviation was calculated for both the groups. The mean standard deviation for height, weight and head circumference of ASD children were 101.73±9.4, 16.05± 3.25 and 49.93± 2.4. The prevalence of malnutrition was significant (p<0.05).
Conclusion: The present study shows deviation in the anthropometric measurement in ASD children when compared to normal healthy children of same age group.

Keywords: Autism Spectrum Disorders, anthropometrics, height, weight, head circumference, body mass index

1. Background

Nutrition is a major factor in bringing out the maximum potentiality that one is endowed with both physically and mentally. Good nutrition depends on an adequate food supply. The direct effects of under nutrition are occurrence of frank and sub clinical nutritional deficiency diseases. The indirect effects are high morbidity and mortality among young children, retarded physical and mental growth, lowered vitality leading to lowered productivity and reduced life expectancy.[1]

Heredity and environment has major role in the growth and development of a child. It is important to a child to have a weight proportionate to his / her height. Deviation in weight and height are the concern only when there are extreme or when the child shows other evidence of lack of vigour.[2]

During the first two years of life, which are characterized by rapid physical and social growth and development many changes occur that affect feed and nutrient intake. The adequacy of infant's nutrient intake affects their interaction with their environment. Healthy well-nourished infants have the energy to respond to end learn from the stimuli in their environment and to interact with their parents that encourage bonding attachments.[3]

A child grows in more than one way. It relates to his physical, mental, emotional, social and cultural growth.

Weight and height are common general measures of physical growth. However, it is a crude index which doesn't take any individual variations into considerations. Measurement of weight and height are easy.[2]

Anthropometry is the use of body measurements to assess nutritional well-being. In children anthropometry is usually used to track growth or failure to growth. An individual's anthropometric status refers to as his / her nutritional status.[4]

The goals of nutritional assessment are to-
1) Identify individuals who require aggressive nutrition support,
2) Restore or maintain an individual's nutrition status,
3) Identify appropriate Medical Nutrition Therapy and
4) Monitor the efficacy of these intervention.[5]

Assessment of nutritional status is one of the first step in formulation of any public health strategy to combat malnutrition. The principle aim of such an assessment is-
1) To determine the type, magnitude and distribution of malnutrition in different geographic areas
2) Identify the risk groups and to determine the contributing factors.

Just as there is not one measure of physical fitness, there is not just one indicator of nutritional health. One of these factors are termed as the ABCDs of nutritional assessment. Anthropometric, bio chemical, clinical observations and dietary intake.

The measurements that are selected should be simple and quickest to measure and the easiest to reproduce, providing simultaneously maximum information concerning a number of nutritional problems.[6]

- Body weight: Body weight is the most widely used and the simplest reproducible anthropometric measurement for the overall evaluation of nutritional status of young children.
- Height: The height of the individual is influenced both by genetic and environmental factors. The maximum growth potential of an individual is decided by hereditary factors. The environmental factors such as nutrition and morbidity, determine the extent of achievement of the genetic potential.
- Head Circumference: Head size relates to the size of brain which increases quite rapidly during infancy.
- Psychological development and malnutrition: Intervention with nutritional supplementation in combination with intellectual stimulation especially during the early years of growth and development has beneficial effects on nutritional status and mental development.[7]

Autism spectrum disorder (ASD) is a general term for a group of complex disorders of brain development.[8] The disorders are characterized in varying degrees by difficulties in social interactions including verbal and nonverbal communications and repetitive behavior. Autism spectrum disorder appears to have its roots in very early brain development.

In recent years, reported frequencies for ASD across U.S. and non U.S countries have approached 1% of the population, with similar estimates in child and adult samples. It remains unclear whether higher rates reflect an expansion of the diagnostic criteria of DSM- IV to include sub threshold cases, increased awareness, differences in study methodology, or a true increase in the frequency of ASD.[9]

Prevalence of ASD seems to have increases in recent decades. There have been attempts to find the responsible agent at various levels, from genetics to environmental factors. The main suspects seem to be hormonal and other growth promoting agents.[10]

India is home to about 10 million people with autism and the disability has shown an increase are the last few years. According to statistics by the center of for disease control and prevention (CDC), one is every 88 children today is born with ASD against a ratio of one 110 few years back.[11]

Children with ASD are at risk of developing nutritional deviation.[12] Researchers at Mercus Autism Centre at Emory University School of Medicine found that the children with autism have inadequate nutrition more often than those unaffected.[13] Those affected by autism might not obtain adequate intake of all nutrients, which theoretically could lead to neuro chemical imbalance that in turn could influence behavior. Chronic eating problems have been associated with social difficulties and reduced academic performance. Nutrition is implicated as a potential area for the prevention and treatment of autism .[14]

2. Methods
40 diagnosed cases of ASD children were included in the survey as per inclusion criteria. The data for ASD children and normal healthy school going children (control group) from the age group of 2 to 6 years was collected. Height, Weight and Head circumference was taken using all standard techniques. The data was analysed statistically using SPSS Version 20.0. The mean standard deviation of height, weight and head circumference was calculated. Each of them were further subjected to "t" test to see the significance (p<0.05).

3. Results
The results of the present study conducted on ASD and normal children are discussed below:

Anthropometrics	Cases	Control
	Mean±SD	Mean±SD
Height	101.73±9.4	94.45±11.30
Weight	16.05±3.25	18.07±4.70
Head Circumference	49.93 ± 2.4	46.83 ± 4.54
BMI	15.65±1.95	20.03±0.89

Table 1: Distribution of Anthropometrics in Cases and Control (n= 40 in each group)

Table 1 depicts the anthropometrics of both cases and control group. The mean standard deviation of cases for height, weight, head circumference and BMI was 101.73±9.4, 16.05±3.25, 49.93 ± 2.4, 15.65±1.95. Similarly, for control group height, weight, head circumference and BMI it was 94.45±11.30, 18.07±4.70, 46.83 ± 4.54, 20.03±0.89. The mean score on anthropometric measurements of children is given in Figure 1.
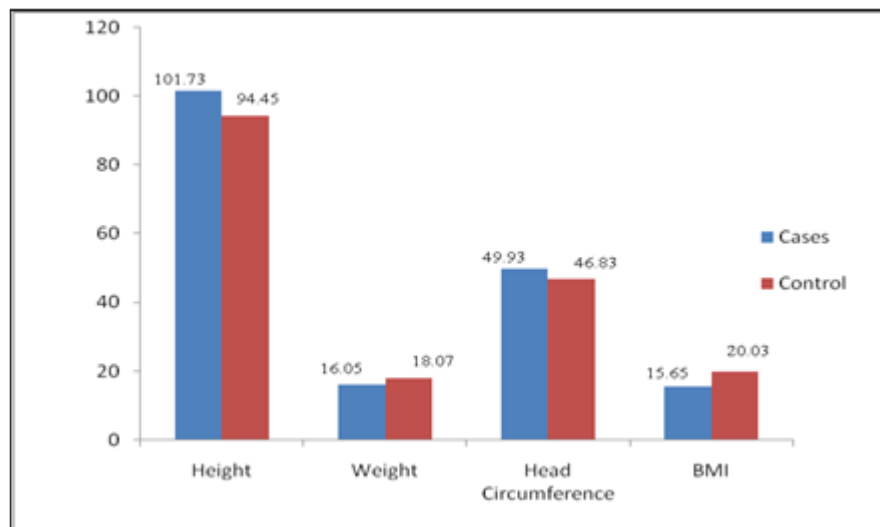
Figure 1: Mean Score of Anthropometric Measurements of Cases and Control.

Groups	Mean±SD	F	t value	df	Significance
Control	94.45±11.30	2.03	3.12	78	0.002
Cases	101.73±9.4				

Table 2: Distribution of Height between the groups (n= 40 in each group)
P= < 0.05

"t"test was done which showed that there was statistical significance in the height between the control and the cases at 5 % level of significance.
The reflection of stunting / short stature in children with ASD was found in study carried out in China. The percentage of stunting and short stature was significantly higher.[15]

Groups	Mean±SD	F	t value	df	Significance
Control	18.07±4.70	6.30	2.23	78	0.02
Cases	16.05±3.25				

Table 3: Distribution of Weight between the groups (n= 40 in each group)
P= < 0.05

"t" test was done which showed that there was statistical significance in the weight between the control and the cases.
A cross sectional study carried out on Omani ASD children age three to five years of age showed a prevalence of malnutrition. The most common type of malnutrition was underweight, followed by wasting and stunting. None of the participants showed evidence of overweight or obesity.[16]

Groups	Mean±SD	F	t value	df	Significance
Control	46.83 ± 4.54	74.50	3.81	78	0.00
Cases	49.93 ± 2.4				

Table 4: Distribution of Head Circumference between the groups (n= 40 in each group)
P= < 0.05

"t" test was done which showed that there was statistical significance in the head circumference between the control and the cases.
Head circumference growth in individuals with an Autism Spectrum Disorder (ASD) has been well characterized in the first two to three years of life and reflects a period of acceleration followed by a period of deceleration when compared normal children. While this altered growth trajectory has been consistently found for head circumference. Studies have focused on infancy and early childhood, and no longitudinal data have been collected in older children with ASD. The review focuses on the physical growth trajectory of individuals with ASD, and proposes that a general growth dysregulation is present in ASD.[17]

Groups	Mean±SD	F	t value	df	Significance
Control	15.65±1.95	18.29	12.87	78	0.00
Cases	20.03±0.891				

Table 5: Distribution of BMI between the groups (n= 40 in each group)
P= < 0.05

The BMI was calculated and its statistical analysis showed significant difference between the two groups i.e. cases and control.
In a case control study carried out by showed difference in the BMI of ASD children when compared to normal healthy children. Using the controls value as a reference, the BMI distribution in children with ASD was distorted.[18]

4. Discussion
Children with ASD are known to suffer from nutritional deficiencies due to poor eating habits. This study focused on the assessment of ASD children in terms of height, weight, head circumference and Body Mass Index (BMI).
It was observed that children with ASD were on the higher side of anthropometric i.e., height when compared to normal children. These children were found to be on the lower side in their weight when it was compared to the control group. This was further reflected in their BMI which was again below the normal value. Over all it was concluded that ASD children were malnourished. The study was statistically significant at five percent level of significance.
It is recommended that the care givers / parents of children with this disorder should be counselled regarding the dietary habits with regular training programmes for better adjustment of these children with their daily food intake and acceptance so that their nutritional requirements are fulfilled thus reducing rate of malnutrition in this set of children.
- → Regular weight and height measurements should be taken so that development of these children are achieved.
- → This study is a part of PhD thesis
- → There is no conflict of interest to be declared
- → This is a self-funded study

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