Study Of Anthropometric Parameters Along With Postural Changes In Blood Pressure In Children With Autistic Spectral Disorders.

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Abstract: Background and Objective: Autistic spectral disorder (ASD) afflicts one out of every 88 children, a 78% increase in the past 10 years along with increasing lifestyle stresses. The Earlier studies suggests that ASD children had larger head circumferences (HC) and abnormalities in central brain structures often associated with autonomic control. As both growth hormone and Autonomic nervous system (ANS) has same site of central control by hypothalamus, therefore, aim of the study is to investigate coexistence of growth abnormality with ANS dysfunction in ASD children. **Methodology:** An observational CASE-CONTROL study, having 25 age - sex matched subjects (mean age 15 years) each was designed. The CASES satisfied the criteria of ASD according to DSM-IV. The CONTROLS clustered the normal healthy children. The HC, height and weight were measured with a measuring tape and weighing machine respectively. Postural change in blood pressure (BP) was measured with a sphygmomanometer using pediatric cuff. **Results:** Significantly higher HC (P = 0.0001), decreased weight (p=0.00002), decreased basal metabolic indices (BMI) (p=0.02) was found in CASE compared to CONTROL. Height did not differ significantly between groups (P = 0.49).ANOVA application confirms statistical significant variation between group. In both groups , following correlation coefficient were calculated between (1)recorded height-weight-BMI and respective standard 90th percentile values(CDC growth chart) (2) recorded supine BP and expected 90th percentile BP , according to respective age and height percentile (3)HC and BMI (4) BP and height-weight . All the measured correlations show decreased value in CASE then CONTROL. **Interpretation:** These findings infer the probable growth abnormality in ASD. The Flashing result of fall in systolic BP was seen on assuming the erect posture from supine position in CASES. This implies ANS dysfunction. **Conclusion:** The above result clearly suggests the coexistence of marked growth abnormality, with ANS dysfunction in ASD children. **Keywords:-** ASD (Autistic spectral disorder), ANS(autonomic nervous system) dysfunction, anthropometric parameter, BMI (basal metabolic indices), BP(blood pressure), HC(head circumference), growth abnormality , p(probability value) .

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Introduction: The challenges faced by children and their families have changed enormously. As pointed out by Lester Breslow in 2000, there are three eras of modern health care. The first era was of infections (1900-1960) which focused on infectious diseases centering on hospitals and doctors. The second era (from 1960 – till date) focuses on psychosocial disorders. The third era (2000 –onwards) focuses on population based prevention and early intervention extending beyond health care system. The third era is a reflection of second era because of the rising modern day stress factors in the society[1]. Autism is a debilitating neurodevelopmental disorder in children and is typically apparent by 3 years of age. It is characterized by impaired communication, impaired social interaction skills and by restricted repetitive behaviours. Autistic spectrum disorder (ASD) in a broader phenotype includes autism as well as less severe conditions such as Asperger syndrome, Pervasive Developmental disorder-not otherwise specified (PDD-NOS) and Rett syndrome. It occurs 4 times more commonly in males than in females[2]. Autistic spectral disorder (ASD) afflicts one out of every 88 children, a 78% increase in the past 10 years[1].

Genetic and environmental factors play an important role in aetiology of ASD. However, with the recent dramatic increase in prevalence of ASD, exploration of other factors involved in its aetiology is needed. Amel A Kamel et al found 4.5% increase in head circumferences in autistic children than their counterparts. No significant change was found in height and weight measurements[3].On the other hand Mills JL et al found higher level of growth hormones with increase in weight and BMI in ASD[4].So an ambiguity could be inferred about growth abnormality in ASD children.

In addition to traditional neurodevelopmental symptoms, autism also produces symptoms attributable to other organ systems. Some of these manifestations include unexplained constipation or diarrhoea, urinary retention, cold and clammy extremities and sleep disturbances.

These symptoms suggest underlying autonomic dysfunction[5]. Pathologic examinations have revealed abnormalities in central structures often associated with autonomic control, such as brainstem, amygdale, limbic system, cerebellum, and prefrontal lobes[6]. Earlier studies have revealed that amygdale has an excitatory role in producing autonomic responses, via its connections with lateral hypothalamus[7]. As both growth hormone and ANS function has, same site of central control by hypothalamus, therefore, aim of the study is to investigate coexistence of growth abnormality with ANS dysfunction in ASD children.

Less light has been thrown regarding postural variation in Blood Pressure (BP) in ASD. In autonomic dysfunction, fall in systolic BP on change of posture is 10 mm Hg or more, a phenomenon often called orthostatic hypotension[8]. In our study, we found various correlations within anthropometric parameters. We also measured postural change in BP. The aim is to establish coexistence of growth abnormality and postural fall of BP in ASD children.

Methodology: The CASE - CONTROL epidemiological approach was used to conduct this study. Each group comprised of 25 no of age-sex matched subjects. The age group ranged from 5-19 years in both CASE (mean age=15.64 years) and CONTROL (mean age=15.2 years). CASES satisfied the criteria of ASD, according to *diagnostic and statistical manual of mental disorder 4th edition,* DSM-IV, (American Psychiatric Association 1994)[9].The criteria for categorization of ASD is based on three main areas:-(1)Impaired social interaction [Part 1] (2)Impaired communication [Part 2] (3)Restrictive range of activities and interest [Part 3]. ASD was diagnosed when a child met six (or more) of 12 criteria confined in three broad areas mentioned above, with at least two sub criteria from part 1,and one each from part 2 and 3. The additional criteria includes onset of symptoms before the age of 3 years[10].General central nervous system examination was carried out to exclude medical or heritable condition that may produce symptoms suggestive of ASD. The ASD CASES were selected from a residential school for children with special needs. (DESTINATION,H/No59,Bhagadattapur,Kahilipara, Guwahati-19)

Healthy children who comprised the CONTROL group were selected from Mothers Child School, Anandanagar, Guwahati-5. The HC, height and weight were measured with a calibrated measuring tape and weighing machine respectively. The blood pressure was measured with a calibrated sphygmomanometer using pediatric cuff. The BP was recorded first at supine position, then BP was measured immediately, followed by 2nd and 5th minutes recording after the subject regained the erect posture. The study was conducted in the Department of Physiology, Gauhati Medical College, Assam, India, which holds a institutional ethical committee of its own. The study was ethically weighed, has a novel approach and is beneficial for the society.
Statistical Analysis of data was done by calculating the following: - (1) Mean (2) Standard deviations [SD] (3) Confidence of interval [COI] (4) correlation coefficient [r]. Student t test application proved the statistical significance in variation. P-values were thereby calculated. Statistical significant variation was confirmed by ANOVA application.

Result: Table1 contains the values of various parameters for both CASES and CONTROLS. Following can be concluded from table1. (1)Significantly higher HC was found in CASE compared to CONTROL. (2)CASE also had significantly decreased weight & body mass indices (BMI) than CONTROL. (3)Height did not differ significantly between groups. ANOVA application confirms statistical significant variation of anthropometric parameters between the two groups of CASE and CONTROL. (Table2)

We compared the anthropometric parameters with internationally set standards (CDC growth chart[11]) in both the groups. We also compared the recorded supine BP with the expected international standard BP for respective age and height percentile (BP chart for Age and height percentile[12]). We calculated the correlation coefficients[r].

Table1:- Comparison of Height-weight-BMI between CASE and CONTROL

parameter	MEAN		SD		COI		P VALUE
	Cases	Controls	Cases	Controls	Cases	Controls	
Height	153.6	162.96	16.81	14.74	6.58	5.78	0.49176
Weight	40	62.56	12.59	12.88	4.93	5.05	0.00002
BMI	16.82	23.24	4.08	2.34	1.6	0.91	0.02101
Head Circumference	54.2	47.24	4.57	2.62	1.79	1.02	0.00019

Table2:-Application of ANOVA over the anthropometric parameters

Group	SS	DF	MS	F	P
Between	37,373.848	57	57.474	119.822	0.000
Within	8983.021	144	62.382		
TOTAL	46,356.869	149			

In Figure1, higher mean HC in CASES is seen compared to control. On the other hand, mean

height-weight-BMI show decreased values in CASES. Figure2 illustrates increased r-value of height-weight-BMI-BP in CONTROLS compared to CASES. BMI r-value shows a significant variation among all parameters. We further compared the HC with their respective BMI of individuals in each group. Figure3 clearly depicts higher correlation coefficient in CONTROLS.

Figure 1-Comparision of mean height-weight-BMI in CASE & CONTROL

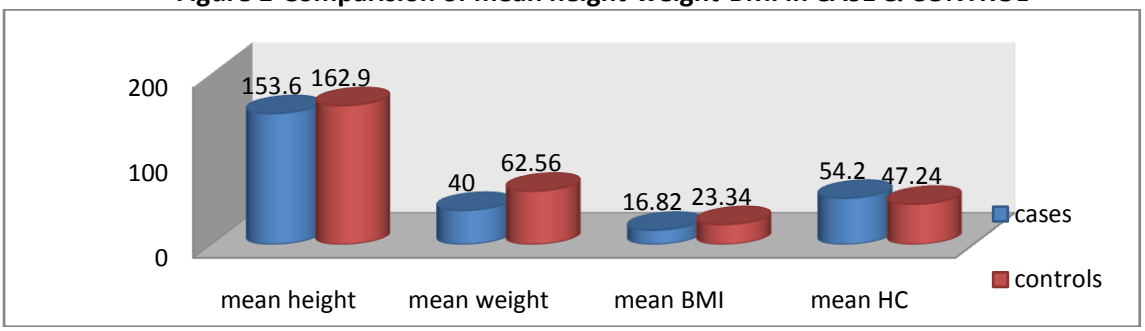


Figure2:- Comparison of correlation coefficients between height-weight-BMI-BP and their expected standard values in both CASE & CONTROL

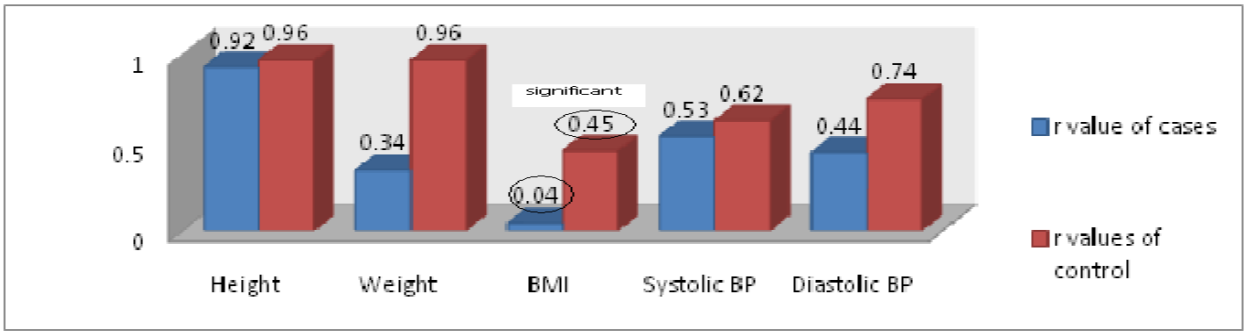
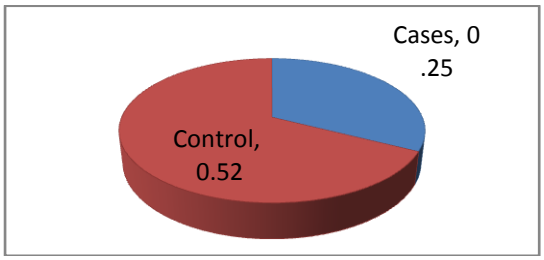


Fig 3:-Comparison of correlation coefficients between HC and BMI in CASE-CONTROL.



We compare Recorded supine BP with respective height-weight of children in both groups. Correlation Coefficient values were thereby determined. Decreased values of r can be seen in CASES compared to CONTROLS as depicted graphically in Figure4.

Figure4:-Comparison of correlation coefficients between BP and height-weight in CASE-CONTROL

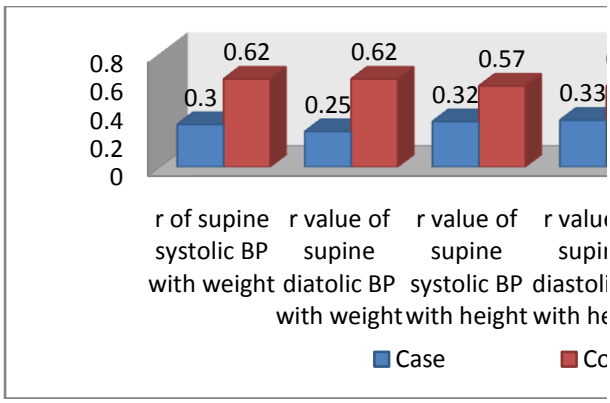
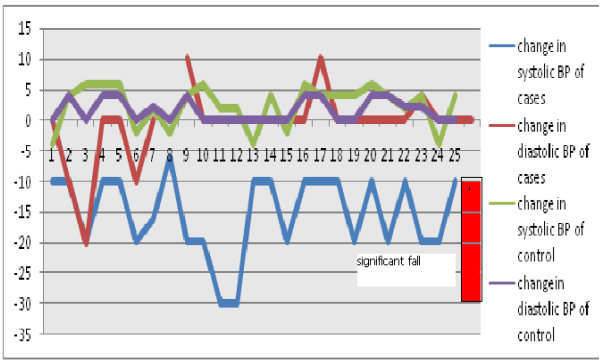


Figure5:- Comparison of change in postural BP in CASE-CONTROL



With change in posture from supine to erect position, flashing results were seen. The systolic BP shows significant fall in CASES on change of posture. Systolic BP in CONTROLS shows insignificant fall/slight increase. Both the groups show no change/slight increase in diastolic pressure. These finding is well depicted in Figure 5.

Discussion: The underlying aetiology of ASD is like a big puzzle. However, the full picture of ASD is not yet clear. ASD begins at an early age but remains, unidentified until the child shows behavioural abnormality. Therefore, tremendous effort has been carried out to identify children at potential risk of ASD, as early as possible. Our study suggest larger head circumference in ASD children. Stephen R also saw similar results in his study in Autistic children through MRI brain images[13].Therefore, simple periodic measurement of HC can be used as early warning tool for possible ASD.

In this study ASD children show marked variation in anthropometric parameters. The result is in accordance with Mills J et al[4] and Amel A kamel et al[3] where they found no significant variation in height. On the other hand, our study differs from Mills J et al [4] study as we obtain decrease in weight and BMI of ASD children. Our study confers that height-weight-BMI have lesser correlation coefficient with their expected standard values compared to healthy children. It can thus be concluded that ASD children are present with marked growth abnormality.

In our study ASD children revealed decreased correlation coefficient for BP with height-weight compared to healthy children. Significant change in postural blood pressure implies ANS dysfunction in ASD. This is also explained by the finding of Ming X et al, where they found reduced cardiac vagal tone and reduced cardiac sensitivity of baroreflex in autistic spectral disorders[14].The significant fall in systolic BP is reflection of potential risk for developing orthostatic hypotension in ASD children.

Conclusion: There is marked growth abnormality which coexists with ANS dysfunction in ASD children. Tools required for measurement of parameters are readily available and can be used for early identification of ASD by both Parent and

Physician. Hence early intervention and better development of these children with special need is possible.

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