Section: Miscellaneous

Original Research Article

A CROSS SECTIONAL STUDY TO COMPARE THE COGNITIVE FUNCTIONS IN NORMAL AND OBESE SCHOOL CHILDREN

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ABSTRACT

Background: It was reported that BMI is associated with the cortical volume in the prefrontal cortex. **Aims and Objectives:** The present study was undertaken to compare the cognitive functions in normal and obese school children.

Materials and Methods: A total of 40 male and female obese children and 40 age and gender matched healthy children after obtaining the assent from the parents and guardians. Spatial and verbal memory test was administered as mentioned in the literature. Recording of auditory and visual reaction time was performed using the Reaction time apparatus manufactured by the Anand agencies, Pune.

Results: There was a significant decrease in the spatial memory scores in the obese children when compared with the healthy children. Verbal memory scores also significantly less in obese children when compared to healthy children. Visual reaction time for red and green light was significantly longer in obese children compared to the healthy children. Auditory reaction time for high pitch was significantly longer in obese children compared to healthy children.

Conclusion: The study results support that the cognitive functions are comparatively decreased in the obese children. Hence, the cognitive functions have to be considered in the management of the obesity. Further detailed studies are required in this area.

Keywords: Reaction time, Cognition, Obesity, Memory, School children.

INTRODUCTION

Obesity is more prevalent nutritional disorder in children worldwide with a prevalence of about 21-24 percentage. It is a public health concern that the prevalence of childhood obesity is increasing. As obesity is linked with the cardiovascular diseases and non-communicable diseases like diabetes mellitus, care must be taken to prevent these diseases to develop in these subjects.[1] Interestingly, underweight prevalence is also found to be high in children.[2] Lack of adequate nutrition is most common cause for the deaths in the infants and children.[3] Studies have reported altered cognitive functions in both the obese and underweight children. Eating excess of fat diet and excess of sugars in diet causes secretion of excess amounts of insulin, altered lipid distribution, increased blood pressure. These changes are reported to alter the functional status of blood-brain-barrier and alter the function of brain areas associated with the memory and attention especially the hippocampus and influence the cognitive functions.[4] Interestingly, it was reported that BMI is associated with the cortical

volume in the prefrontal cortex.[5] Another study testified that loss of memory is one of the consequences that are associated with the obesity.[6] All the domains of the cognitive functions were reported to decline with increase in the BMI.[7] Hence, it is the need of time to assess the BMI status in the children and start the management. The studies related to this area were sparse in our region. Hence, the present study was undertaken to

Aim and objectives: The present study was undertaken to compare the cognitive functions in normal and obese school children.

MATERIALS AND METHODS

The present study was a cross-sectional study recruited a total of 40 male and female obese children and 40 age and gender matched healthy children after obtaining the assent from the parents and guardians. The study protocol was approved by the institutional human ethics committee. The children were screened for inclusion and exclusion criteria. Obese children, healthy within the age group of 6-12 years, whose parents were willing to give assent, were part of the study. Children with any health complications were excluded from the study. Cognitive functions were assessed using the spatial and verbal memory test and auditory and visual reaction time assessment. All the children were trained about these tests prior to the actual recording. Spatial and verbal memory test was administered as mentioned in the literature.[8] Recording of auditory and visual reaction time was performed using the Reaction time apparatus manufactured by the Anand agencies, Pune.[9] With this instrument we can record the reaction time of right and left hand separately. However, in this present study we have recorded the reaction time of dominant hand only.

Statistical Analysis: Data was analysed using SPSS 21.0 version. Student t test was applied to observe the significance of difference between the groups. The probability value of less than 0.05 was considered as significant.

RESULTS

Table 1 presents the demographic data of the participants. Body weight was significantly higher in the obese children compared to healthy children. There was a significant decrease in the spatial memory scores in the obese children when compared with the healthy children. Verbal memory scores also significantly less in obese children when compared to healthy children. Visual reaction time for red and green light was significantly longer in obese children compared to the healthy children. Auditory reaction time for high pitch was significantly longer in obese children compared to healthy children.

Table 1: Demographic data of the participants

Parameter	Obese children (n=40)	Healthy children (n=40)	P value
Age (years)	9.07±2.09	8.40±1.96	0.3744
Height (cm)	41.54±7.60	28.08±5.16	0.0001***
Weight (kg)	128.71±11.19	126.43±9.12	0.5588

Data was presented as mean and SD. ***P<0.001 is significant.

Table 2: Spatial and verbal memory and auditory and visual reaction time of the participants

Parameter	Obese children (n=40)	Healthy children (n=40)	P value
Spatial memory	5.53±1.41	6.67±1.19	0.0175*
Verbal memory	4.64±1.74	5.93±0.92	0.0214*
Visual reaction time (red)	0.046±0.016	0.024±0.01	0.0197*
Visual reaction time (green)	0.063±0.015	0.034±0.01	0.0045
Auditory reaction time (high pitch)	0.066±0.01	0.051±0.014	0.059
Auditory reaction time (low pitch)	0.07±0.011	0.056±0.015	0.1073

Data was presented as mean and SD. ***P<0.005 is significant.

DISCUSSIONS

The present study was undertaken to compare the cognitive functions in normal and obese school children. There was a significant decrease in the spatial memory scores in the obese children when compared with the healthy children. Verbal memory scores also significantly less in obese children when compared to healthy children. Visual reaction time for red and green light was significantly longer in obese children compared to the healthy children. Auditory reaction time for high pitch was significantly longer in obese children compared to healthy children. Childhood obesity is prevalent worldwide and it is associated with risk of cardiovascular disorders.[10] Hence, childhood obesity is a important public health issue that has to be addressed. Neurocognitive impairment was reported in the obese children.[11] Further, it was reported that the prevalence of obesity was high in boys than the girls.[12] interestingly, it was reported that the childhood obesity is linked with the development of diabetes in children.[13] Hence, it is understood that the obesity in children deteriorate the physical and psychological health as well.[14] Overweight and obesity are more prevalent in the children residing in cities.[15] Hence, it was suggested to screen the school children in urban areas and manage or prevent the obesity with effective therapies.[16] Many studies reported the

decline in the cognitive functions in obese children as well as adults.[17,18] The present study agrees with the reports as there was declined cognitive functions observed in the obese children when compared with the healthy children. Hence, it is very much needed to screen the children and implement the management strategies at the same time they should be educated about the obesity and consequences also.

CONCLUSION

The study results support that the cognitive functions are comparatively decreased in the obese children. Hence, the cognitive functions have to be considered in the management of the obesity. Further detailed studies are required in this area.

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