



Research Journal of Pharmaceutical, Biological and Chemical Sciences

Comparison of Cognitive Performance Between Boys and Girls in the Age Group of 5 Years to 15 Years Old in a Semiurban Area.

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ABSTRACT

Studies have shown that there exist gender differences in cognitive performance of children. Studies regarding the gender differences in cognitive performance of children between the age of 5 years to 15 years old are less available. The present study is undertaken in a semi urban area (in urapakkam) to compare the cognitive performance in boys and girls of age group 5 to 15 years old and correlate with hemoglobin and BMI levels. Fifty children (25 males, 25 females) were selected randomly and anthropometric assessments such as height in cm, weight in kg and BMI were measured. Hemoglobin was estimated using automated Robin sky's technique. Cognitive assessment was made using Binet Kamath's scale of intelligence. The cognitive performance of girls (95.64 ± 17.03) were better than boys (84.56 ± 25.51), and the difference was not statistically significant ($p < 0.07$)

Keywords: Anthropometric measurements, Hemoglobin, cognitive assessment.

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INTRODUCTION

The word cognition embraces various processes like thinking, knowing, remembering, judging and problem solving. These processes encompass language, imagination, perception and planning which indicates higher level functions of brain.

The behavioral and thinking aspects of females are different from that of the males. There are a few studies to identify the sexual dimorphism in human brain. Various investigations have found that the sex differences in behavior and cognition emerge between the age of 4 and 22 years old [6]. The gender differences influence the mental health of humans. Some of the mental and psychological disorders are more in the males while the other spectrum of disorders is more prevalent in females [7]. The pattern of gender differences whether contributed by hormones, anatomy of the brain itself or social and cultural aspects remain unclear.

The cognitive performance of children is determined by various factors like parental education, social environment, and nutrition of children, parenting and gender inequality.

The prevalence of under nutrition among adolescent girls whose BMI (<18.5) is 68.52% as per Asian and WHO criteria [1]. Malnutrition and iron deficiency anemia influences the intellectual development of children [2].

We compared the intelligent quotient (IQ) test between boys and girls, to substantiate the gender differences. Also we tried to correlate the nutritional factors influencing cognitive performance of the children.

Aim

To compare the cognitive performance between boys and girls of 5 years to 15 years old and also to assess and compare the hemoglobin and BMI of the children.

Objectives

The present study is undertaken in a semi urban area (in urapakkam) to assess and compare the cognitive performance of boys girls of 5 to 15 years old.

MATERIALS AND METHODS

This study was approved by the institution's ethical committee. Fifty healthy children (25 boys, 25 girls) studying in various schools were selected randomly. All the children and their parents were informed about the procedure and written consent was obtained.

Questionnaire was administered and children with any co morbid conditions like congenital heart diseases, profound mental retardation were excluded from the study.

The height (in meters) and weight (in kilograms) of the children were measured using standardized measuring scale.

The hemoglobin of the children were determined by a sterile finger prick and estimated by automated Robin sky's apparatus. Body mass index was calculated using Quetelet's index (kg / m^2) [3].

The cognitive assessment of the children was done using Binet Kamet's scale of intelligence , an Indian version of Stanford Binet's scale of intelligence [4]. The cognitive scores obtained were compared between boys and girls using unpaired 'T' test, and p value of <0.05 was found to be statistically significant.

RESULTS

Table 1: Characteristics of the study group (n = 50)

PARAMETERS	BOYS	GIRLS	p value
IQ	84.56 (25.51)	95.64 (17.03)	0.07 NS
BMI(KG/HT M ²)	15 (1.78)	15.74 (3.03)	0.09 NS
HEMOGLOBIN (g %)	12.31 (1.89)	11.848 (1.98)	0.42 NS

Standard deviation is given in parenthesis NS: not significant, p value of <0.05 is statistically significant.

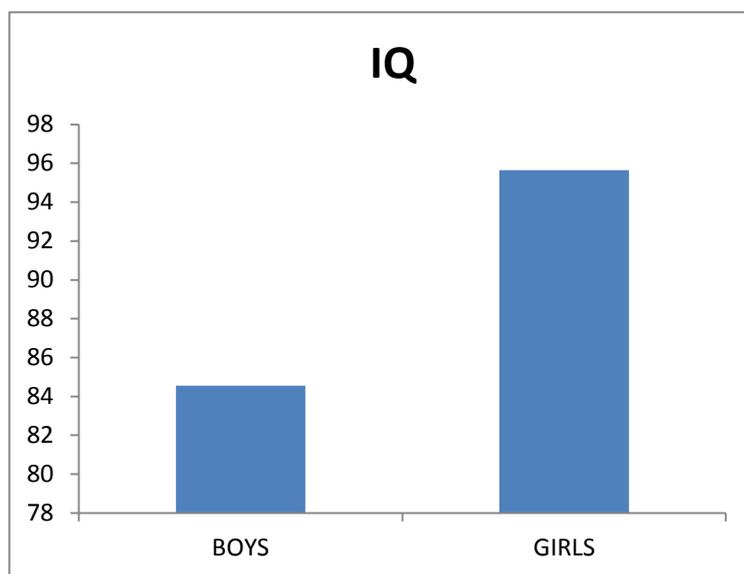
This study is done to compare the cognitive performance between boys and girls. The BMI and hemoglobin were also estimated and the results were analyzed.

Table 1 shows the mean baseline characteristics of the study group. The mean IQ of the girls were 95.64 ± 17.03 and the boys were 84.56 ± 25.51 . The mean BMI of the girls were 15.74 ± 3.03 and the boys were 15 ± 1.78 as compared to the normal BMI of 18.5 - 25.(5). The mean hemoglobin of the girls were 11.85 ± 1.98 and the boys were 12.31 ± 1.89 , taking 12 g/dl as the normal value.(1). The student’s unpaired t test was done for statistical analysis.

In this study the mean hemoglobin level was less in girls as compared to the boys. The mean IQ levels and the BMI were more in girls as compared to that of the boys. But the mean difference was not found to be statistically significant.

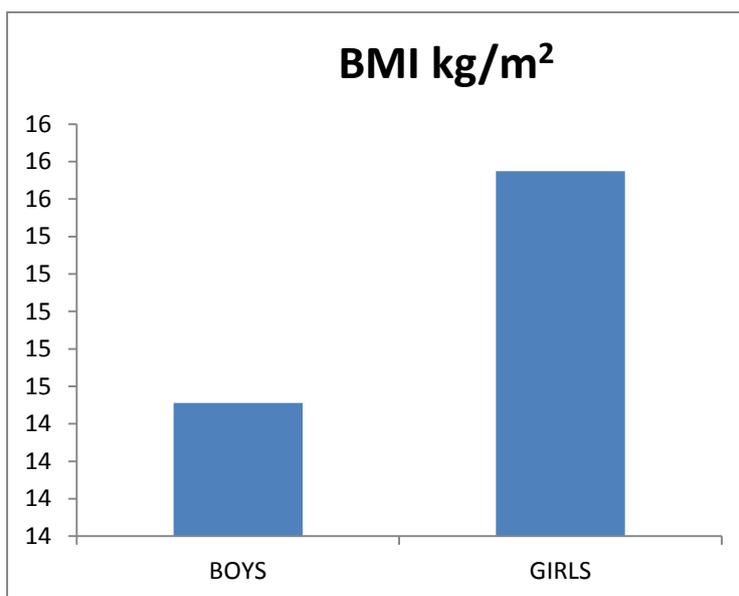
Figure 1. Compares the mean IQ between boys and girls. In this figure the mean intelligence quotient of girls(95.64 ± 17.03) are greater than that of boys(84.56 ± 25.51) studied, though it was not statistically significant (p value = 0.07).

Figure 1: Comparison of IQ between boys and girls



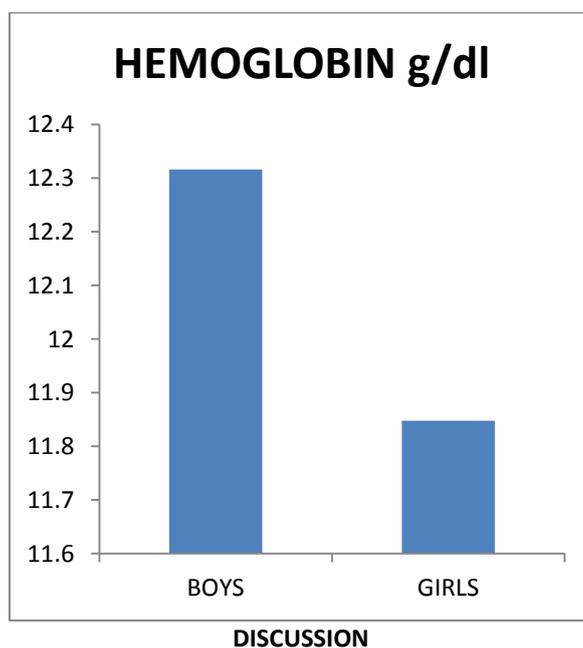
The BMI of the girls compared with the boys is shown in Figure 2. The mean BMI of the girls were 15.74 ± 3.03 and the boys were 15 ± 1.78 . The p value for the BMI is 0.09 which is statistically less significant.

Figure 2: Comparison of BMI between boys and girls



The mean hemoglobin of the girls when compared to boys were less, but it was statistically less significant with a p value of 0.42. And this is shown in figure 3.

Figure 3: Comparison of HB between boys and girls



DISCUSSION

A group of 25 boys and 25 girls of 5- 15 years old were selected and their cognitive assessment, hemoglobin estimation and BMI calculation were done. The results were compared using student's unpaired 'T' test.

The study shows that the cognitive performance of the girls are better as compared to that of boys. In our study also the girls performed better than that of boys in various aspects of cognition like execution, memory, language, comprehension and intelligence assessed by Binet Kamet's scale of intelligence.

The sex differences in behavior and cognition emerge between the age of 4 and 22 years [6]. In a study done by Roshal K. Len root et. al, using MRI, it was found that female brains have proportionately more gray matter and the brain size of males are greater [6].

Margaret M. Mccarty et. al explains three types of sex differences from rodent and animal literature. They are enumerated as follows:

- Absolute sexual dimorphism in behavior which is directly associated with reproduction like territory defense, nurturing etc. The number, shape and biochemical make-up of participating neurons and glial cells either correlate with sex differences in behavior or rarely linked directly to it.
- The second difference has varying degrees of overlap between male and female responses to anxiety, stress, somatosensory thresholds, pain sensitivity etc. The bioengineering studies done in mice by reverse translation of the gene for voltage gated calcium channel implicated in bipolar disorder found to be haplosufficient and exhibited greater effects of increased anxiety and depression in females than males. With this insight on further human study led to the identification of two intronic single nucleotide polymorphisms found in association with increased prevalence of mood disorders in females only.
- The third difference is that the sexes either converge or diverge responding to the challenge, i.e. The neurophysiology is different, but the response is same. For example, male parenting and nurturing in animals, as the males do not have hormonal environment experienced by females like pregnancy and parturition [7].

In our present study we found these gender differences in assessing various aspects of cognition like language, memory and executive functions. During the assessment we found that the performance of girls in these aspects of cognitive function was better than that of the boys.

In a study on "Reframing sexual differentiation of brain" Margaret M. Mccarty et. al found that the classical dominant model of hormone mediated organization has to be re-evaluated and parallel model of multiple sex-specific signals and pathways to be reconsidered. This emphasis on the role of environment, which is also influenced by epigenetic mechanisms [8].

The environment influences the nutritional status of the children [8]. The influence of iron deficient anemia on behavioral studies was done by Thomas Walter [9], and found that iron deficiency affects myelination of the brain.

In our study we measured hemoglobin which is an indirect measure of iron deficiency and found that girls have less value of hemoglobin as compared to boys. The performances of girls as compared to boys were better, but this could not be explained by our study. Also we found that the BMI, which is an indicator of nutritional status, was found to be high among the girls than that of the boys and so the cognitive performance. This may show that other factors influence the cognitive performance.

CONCLUSION

In the study we compared the IQ between the boys and girls and found that cognitive performance of girls were better than that of boys though it was not statistically significant.

We would like to analyze and compare the various aspects of cognition in future.

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