CORRELATION BETWEEN NUTRITIONAL STATUS AND MEMORY AMONG SCHOOL CHILDREN

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ABSTRACT

The aim of the study was to assess the correlation between nutritional status and memory among the school children and to find the association between the study variables and selected socio-demographic variables. A descriptive survey approach with correlational descriptive survey design was used for the study. Simple random sampling technique was used to select 50 school children. Height and weight of each child was monitored to calculate BMI and thereby to assess the nutritional status. Level of memory of each child was assessed through interview schedule by using Modified NIMHANS Tests of memory for children. Data was collected and analyzed using descriptive and inferential statistics. Out of the sample, 30% were undernourished, 48% were normally nourished, 20% had overweight and 2% were obese. According to the level of memory majority of subjects 56% had average memory, whereas 20% had below average memory and 24% had above average memory. The study findings revealed that there was a weak positive correlation that exists between nutritional status and memory \([r = 0.281, p < 0.05]\). Also, there was a significant negative correlation between BMI scores of overweight children and their memory \([r = -0.732, p < 0.05]\). Significant association was found between nutritional status of children and education of mother \([\chi^2 = 28.86, p < 0.05]\). Hence, study concludes that majority of school children are having normal nutritional status and average memory; and that there is a weak positive correlation between nutritional status and memory. A negative correlation was found between BMI scores of overweight children and their memory scores, which highlights that, in case of overweight children, as BMI increases memory decreases.

INTRODUCTION

Nutritional status during school age is a major determinant of nutritional and health status in adult life. Globally, health hazards associated with undernutrition and micronutrient deficiencies remain a major public health problem. At the same time, past three decades have witnessed the emergence of overnutrition as a problem in school-age children in developed countries and in affluent urban segments in developing countries [1].

Anthropometric measurements such as height, weight, mid arm circumference, skin fold thickness are valuable indicators of nutritional status. WHO has recommended various indices based on anthropometry to evaluate nutritional status of school children. BMI is the most appropriate variable for nutritional status [2].
Undernutrition not only affects physical appearance and energy levels, but also directly affects many aspects of the children's mental functions, growth and development which has adverse effects on children's ability to learn and process information and grow into adults who are able to be productive and contributing members of society. Stunting in early childhood is common in developing countries and is associated with poorer cognition and school achievement in later childhood [1]. Normal cognitive abilities like attention, concentration and most importantly the memory are essential factors which directly or indirectly determine the scholastic and overall achievements of an individual. These are the basic milestone of an individual and it is responsible for many changes that take place during the later life. Moreover school age is considered as the dynamic period of growth and development because children undergo physical, mental, emotional, and social changes. The school children are easily accessible, capacitive and responsive group. Keeping in view all these facts, this study was taken up to assess the relation between nutritional status and memory of school children.

**MATERIALS AND METHODS**

**Research design**

The study design was a non-experimental correlational descriptive survey design.

**Setting of the study**

The study was conducted at Iyer High School, Bangalore and Gnana Teja English Higher Primary School, Bangalore.

**Sampling**

Fifty School children between 7-11 years were selected using simple random sampling technique.

**Description of the tool**

Section A: Socio-demographic data consisting of age, gender, class of study, number of siblings, ordinal position in the family, education of parents, occupation of parents and type of food habit.

Section B: Nutritional assessment using BMI reference chart.

Section C: Memory assessment using Modified NIMHANS Tests of Memory For Children.

Content validity was established by submitting the tool to eleven experts. The Reliability of the tool was done by using coefficient Test- retest Method. The reliability found was 0.96.

**Statistical analysis**

The data obtained were analyzed in terms of objectives of the study by using descriptive and inferential statistics. Karl's Pearson's correlation (r) test was used to find the correlation between nutritional status and level of memory. χ² test was used to find the association between nutritional status and level of memory with the selected socio demographic variables.

**RESULTS**

The results reveal that majority of subjects were 10 years old (32%), were males (54%), belonged to 4th standard (32%), had more than one sibling (46%), were youngest according to ordinal position (42%) and had mixed dietary pattern (80%). (Table 1). With regard to education of mother, majority (32%) were graduates. (Figure 1). Overall BMI scores of the school children reveal that 48% of children had normal nutrition, 30% of children had undernutrition, whereas 20% were overweight and 2% were obese. The mean score obtained for BMI was 16.57 with SD of ±3.22. (Figure 2).

Figure 3 illustrates that out of the fifty sample, majority (56%) of children had average memory, 24% had above average memory and 20% had below average memory. The mean value of memory scores was 51.34 with SD ±10.83.

Table 3 reveals that calculated correlation coefficient (r) value between nutritional status and memory was 0.281. The table (r) value was 0.273 (at 0.05 level) which was less than calculated 'r' value. Hence there was a significant positive correlation identified between nutritional status and memory among school children.

Table 4 shows that the calculated correlation coefficient (r) value between BMI of overweight children and their memory was -0.732. The table (r) value was 0.549 (at 0.05 level of significance) which was less than calculated ‘r’ value. So there was a negative correlation found between BMI scores of overweight children and their memory scores.

The calculated χ² values were less than the table values for all socio-demographic variables except for education of mother (χ² = 28.86). Hence no association was found to exist between nutritional status and mentioned socio-demographic variables. At the same time findings reveal a significant relationship between nutritional status and education of mother. In terms of memory also, calculated χ² values were less than the table values in terms of all selected socio-demographic variables. Hence, there was no significant association between level of memory and selected socio-demographic variables.
Table 1. Frequency and Percentage Distribution of Socio Demographic Data of School children

| Socio-demographic variables | Frequency [n=50] | Percentage (%) |
|-----------------------------|-----------------|----------------|
| Age                         |                 |                |
| 7 years                     | 8               | 16             |
| 8 years                     | 7               | 14             |
| 9 years                     | 12              | 24             |
| 10 years                    | 16              | 32             |
| 11 years                    | 7               | 14             |
| Gender                      |                 |                |
| Male                        | 27              | 54             |
| Female                      | 23              | 46             |
| Class of study              |                 |                |
| 2\textsuperscript{nd} standard | 7            | 14             |
| 3\textsuperscript{rd} standard | 12           | 24             |
| 4\textsuperscript{th} standard | 16           | 32             |
| 5\textsuperscript{th} standard | 11           | 22             |
| 6\textsuperscript{th} standard | 4            | 8              |
| Number of siblings          |                 |                |
| No siblings                 | 10              | 20             |
| One sibling                 | 17              | 34             |
| More than one sibling       | 23              | 46             |
| Ordinal position            |                 |                |
| Single child                | 10              | 20             |
| Eldest child                | 15              | 30             |
| Middle child                | 4               | 8              |
| Youngest child              | 21              | 42             |
| Type of food habit          |                 |                |
| Vegetarian                  | 10              | 20             |
| Mixed                       | 40              | 80             |

Table 2. Mean and standard deviation of weight, height, BMI scores and memory scores.

| Sl. No | Variables | Maximum score | Mean   | Standard deviation |
|--------|-----------|---------------|--------|--------------------|
| 1      | Weight    | --            | 29.86  | ±7.93              |
| 2      | Height    | --            | 133.56 | ±8.92              |
| 3      | BMI       | --            | 16.57  | ±3.22              |
| 4      | Memory    | 80            | 51.34  | ±10.83             |

Table 3. Correlation between nutritional status and memory among school children

| Sl. No | Variables         | Mean     | SD      | Correlation coefficient (r) |
|--------|-------------------|----------|---------|----------------------------|
| 1      | Nutritional status| 16.57    | ±3.22   | 0.281                      |
| 2      | Memory            | 51.34    | ±10.83  | S*                         |

Table 4. Correlation of BMI scores of school children in overweight, normal nutrition and undernutrition category with their memory scores

| Sl. No | Nutritional status | Memory | Correlation coefficient (r) |
|--------|--------------------|--------|-----------------------------|
|        | Mean               | SD     |                             |
| 1      | Overweight         | 55.7   | ±7.67                       | -0.732 S* |
| 2      | Normal nutrition   | 54.33  | ±10.27                      | -0.31     |
| 3      | Undernutrition     | 43.53  | ±10.26                      | 0.031     |
DISCUSSION

Present study results reveal that majority of school children are normally nourished (48%) and are having average memory (56%). The study findings on nutritional status of children are supported by a cross-sectional study on Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka, in 2007, revealed that out of 1000 children between 12-15 years 23.9% (215) were underweight, 60.6% (546) were normal, 11.4% (103) were overweight and 4% (36) were obese [3].

Also a significant positive correlation was found between nutritional status and memory among school children (r=0.281 at 0.05 level of significance). Findings are supported by a correlational study on Nutritional status and level of intelligence among school children which was conducted in Dharwad district, Karnataka. Sample of study comprised of randomly selected 102 school children aged between 7-9 years, studying in 3rd standard at Government English Medium School. The study revealed that nutritional status was positively and significantly correlated (0.67%) with level of intelligence, which is again a cognitive ability as like memory. It was highlighted that the children with normal nutritional status exhibited better level of intelligence than wasted and stunted children [4].

The findings reveal a significant relationship only between nutritional status and education of mother. This is supported by a study which was conducted in Patna, on Differentials of nutritional status in school-age children and the associated factors. Nutritional status of 700 school children between 6 to 11 years were assessed. A clear association was inferred between the education of mother and nutritional status of the child; value of $\chi^2$ and p being 53.2330 and 0.0001 respectively. In case of illiterate, primary educated and undergraduate mothers the percentage of grade III and II malnutrition showed higher incidence. But in contrast malnutrition was almost nil in families were mother possessed technical or post graduate qualification. But the findings of same study contradict in case of association between nutritional status and number of siblings as well as education of father and gender of the child. Families with single child had the highest percentage of normally nourished children (44.4%) and with an increase in the family size, a
significant decrease in the percentage of normally nourished children, lowest being 8.82 % in a family with six children, was observed. It was also observed that the nutritional status of the female children were markedly poor in comparison to the male children in the middle income group. A clear association was inferred between the education of father and nutritional status of the child; value of $\chi^2$ and $p$ being 48.56 and 0.0006 [5].

There was no significant association between level of memory and selected sociodemographic variables. The study findings can be supported by the findings of a study conducted on Effect of socio-economic variables on immediate memory span of School Children at Hisar. A sample of 204 school children between 10-12 years was selected from the schools of Hisar city. The association between memory span and various variables showed that there is no statistical significance with age, sex, family type and type of school. At the same time, study findings contradict in case of income, caste, education of parents, occupation of parents and school environment which showed a statistically significant relationship [6].

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CONFLICT OF INTEREST
The authors declare that they have no conflict of interest.

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