Assessment of Nutritional Status and its Impact on the Academic Performance and Psychological Behaviour in School Going Children (10-12 Years)

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Abstract: *The relationship between nutrition, health, learning and behavior is undeniably strong. Child health and nutrition are strongly associated with educational achievement. The aim of the study was to assess the nutritional status and its impact on the academic performance and psychological behavior in school going children (10-12 years). The data of 100 children from schools of Hyderabad was collected through questionnaires that included general information, anthropometric measurements, nutritional habits, academic performance, classroom behavior and home behavior. The study revealed that 34% of the total sample was underweight, 33% was normal weight and 33% were overweight. There was significant difference between mean intake and RDA of nutrients (p<0.05). BMI had an impact on the academic performance of 10 year old boys, 11 year old boys and 12 year old girls. Strong correlation was observed in classroom behavior with home behavior of 10 year old boys (+0.968), 11 year old girls (+0.89) and 12 year old girls (+0.91). A weak correlation was seen in behavior of 11 year old boys (-0.23). It can be concluded that influences of nutrition has an important role to play in the overall psychological performance of the child be it academics or behavior.*

Keywords: Nutrition, BMI, Academic Performance, Home Behavior, Classroom Behavior

1. Introduction

An integral component of daily life that contributes to the neurological, physical, mental, emotional and social well-being of individuals is said to be healthy nutrition. [1]Nutritional well-being is determined by consuming safe food as part of an appropriate and balanced diet that contains adequate amounts of nutrients in relation to bodily requirements. [2]

Good nutrition during childhood lays the foundation for a healthy individual at later years of life. School-aged children grow rapidly; hence, it is of necessity to make provision for the needed diet at this stage of development. Good nutrition is the first line of defence against numerous childhood diseases, which can leave indelible mark on a child for life. Children are the future of every nation. Children of today would later become functioning members of the society. Their health, academic achievement and attainment are major determinants of the economic growth and overall progress of the nation. The early years of life is a time of rapid brain development which includes neural plasticity, working memory, attention and inhibitory control. Poor nutrition during the formative years could have irreversible consequences. [3]

Adequate brain function is a prerequisite for efficient cognition and the performance of organized behaviour. One crucial factor is the supply of metabolic fuel to the brain, in the form of glucose. Mental activity that allows cognitive appreciation of the world and appropriate behavioral responses to environmental conditions should be protected from moment-to-moment fluctuations in nutritional status from one meal to the next, and, more generally, from variations in nutrient availability under a broad range of life situations, as long as major nutritional or energy insufficiencies do not occur. Many studies suggest that poor nutritional status can indeed adversely affect brain function and impact on cognition and behaviour. [4]

2. Aim

To assess the nutritional status and its impact on the academic performance and psychological behavior in school going children aged between 10-12 years.

3. Objectives

- To assess the nutritional status of school going children aged 10-12 years through anthropometry.
- To examine the impact of nutritional status on the academic performance and psychological behavior of the child.

4. Literature Survey

Jianghong Liu and Adrian Raine 2017 undertook a study that concluded that poor nutrition translates into reduced positive social behaviors. A cross-sectional study was undertaken by Abhishek Agarwal et al., 2018 thatshowed that nutrition has a significant impact on the scholastic performance. Similarly a study was conducted by Bhoomika R Kar et al., 2007 gave evidence that Chronic protein energy malnutrition (stunting) affects the ongoing development of higher cognitive processes during childhood years rather than merely showing a generalized cognitive impairment.

A study was conducted by Veena SR et al., 2014 suggested that in the absence of pathological overweight/obesity, greater adiposity measures may represent better nutrition,

and thus better cognitive function. A study was conducted by Gabriela da Silva et al., 2011 also suggested an adverse impact of inadequate nutritional status on school performance. The study done by Kleinmann R E et al., 1998 is evidence for children from families that report multiple experiences of food insufficiency and hunger are more likely to show behavioral, emotional, and academic problems on a standardized measure of psycho-social dysfunction than children from the same low-income communities whose families do not report experiences of hunger.

5. Methodology

To assess the nutritional status and its impact on the academic performance and psychological behavior of school going children (10-12 years), a survey was carried out by random sampling method with three questionnaires directed towards the subject, their teacher and parent.

Target population
For the study, 100 samples of children were selected from 3 different schools studying in 4th,5th and 6th classes respectively. The samples were taken from three different schools located in Hyderabad.

Tools and techniques
Three well structured, pretested questionnaires were constructed that contained a list of both open-ended and close-ended questions targeted towards gathering necessary information vital to the study.

Each questionnaire had questions that were for the following groups:
1) The children (subject)
2) The teacher of the subject
3) The parent of the subject.

Anthropometry
- Height was measured using a measuring tape while the participants were barefoot and eyes looking forward.
- Weight was estimated using a digital weighing machine for all the participants.
- Body mass index (BMI) is used to evaluate the relative weight for height, using a mathematical ratio of weight (in kilograms) divided my height (in squared meters).
- The obtained results were compared to the WHO standards and the individuals were classified as wasted, overweight and obese according to their BMI.

Table 1: BMI classification according to WHO (Z score) 2007

-3 SD	Severely wasted
-2 SD	Wasted
-1 SD	Normal
Median	Normal
+1 SD	Risk of overweight
+2 SD	Overweight
+3 SD	Obese

Questionnaire
The questionnaire included data regarding the general information, anthropometric measurements, nutrition habits, academic performance, home and school behaviors. The questions were asked to the subject, their respective teacher and parent.

Data analysis
- The anthropometric data was analyzed using the BMI, Z-score classification and percentiles given by WHO (2007).
- Data collected from the sample n=100 were statistically analyzed. An uni variate analysis was conducted to obtain summary statistics such as frequencies, percentages, mean and standard deviation.
- Independent sample t-test was used to compare the mean dietary intake with the recommended dietary allowances by ICMR (2010) for selected age group.
- Chi- square test was used for interferential analysis with the significance level set at 0.5 (5%) to compare the BMI inference with academic performance of the subjects.
- Pearson's coefficient of correlation test was used to correlate the subjects behavior at home and school.

6. Results and Discussion

### 6.1 Results on the Anthropometry of the subjects

The age wise and gender wise distribution of samples was done.
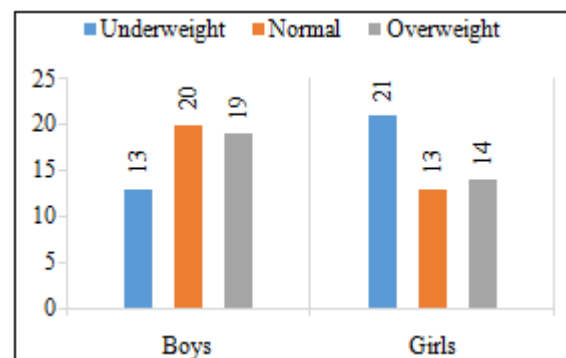

Figure 1: BMI of the subjects

The present study conducted on 100 school going children showed that 52% of the total sample was boys and 48% were girls. According to WHO classification from the figure it can be seen that about 13% underweight subjects were boys while 21% were girls, whereas among the subjects having normal BMI 20% were boys while only 13% were girls. The overweight samples had 19% boys and 14% girls. This revealed that girls were more malnourished than boys. A study was conducted by Veena SR et al., (2014) showed that According to the WHO classification, 8 (3.1%) boys and 11 (3.9%) girls were overweight/obese and 79 (30.3%) boys and 67 (24.0%) girls were underweight.

6.2 Nutritional habits of children
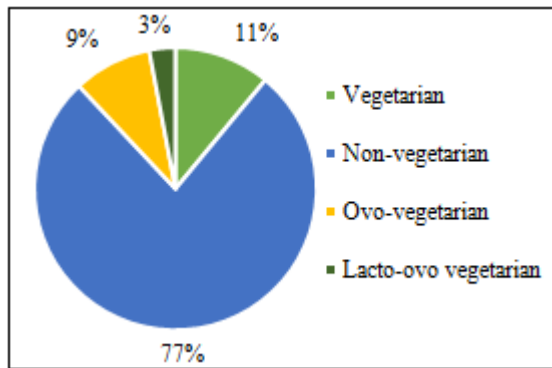
Figure 1: Food preference of school going children (10-12 years) n=100

It was observed that most of the subjects are non-vegetarian (77%) followed by 11% vegetarians, 9% ovo-vegetarian and 3% lacto-ovo-vegetarian.
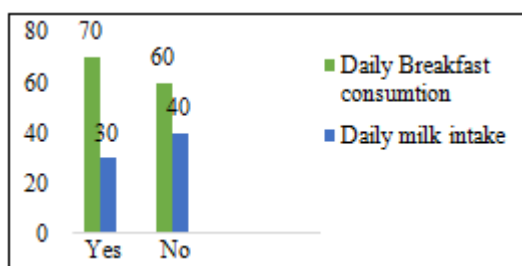
Figure 2: Daily breakfast eating and milk drinking habits n=100

It was seen that about 70% have breakfast and 30% skip breakfast. It also outlines that 60% of total children drink milk everyday and 40% do not. There is a profound significance of daily breakfast consumption in school going children as the first meal of the day provides with the energy for entire day.

24 Hour Dietary Recall:

To know the significance in the difference of the mean dietary intake of the subjects a t-test was applied by comparing means of their nutrient intakes and the RDA (Dietary guidelines for Indians- A manual 2011, National Institute of nutrition). The results showed that there was significant difference in the mean energy, protein, carbohydrates, iron and zinc intake and the RDA ($p<0.05$). This difference may arise due to lack of appetite, breakfast skipping, more consumption of empty calories and poor diet quality.

6.3 Effect of BMI on the academic performance of the subject

Chi-square test was applied to assess the impact of BMI on the academic performance of the subject. The results revealed that the calculated value of 10 year old boys (11.71) was greater than the table value (9.48). This shows that there was a significant impact of BMI on the academic performance of 10 year old boys. Similarly there was a less significant effect of BMI on 12 year old girls (8.043) and 11 year old boys (8.746) academic performance. Results also showed that BMI had no role to play in 10 year old girls (1.053) and and 11 year old girls (1.629) and 12 year old

boys (1.284) academic performance as the calculated values were far less when compared to the table value.

The findings of this study can be correlated with the study conducted by Michelle Florence et al., (2008) on the Diet Quality and academic performance.The results of his declared that Students with decreased overall diet quality were significantly more likely to perform poorly in academics.
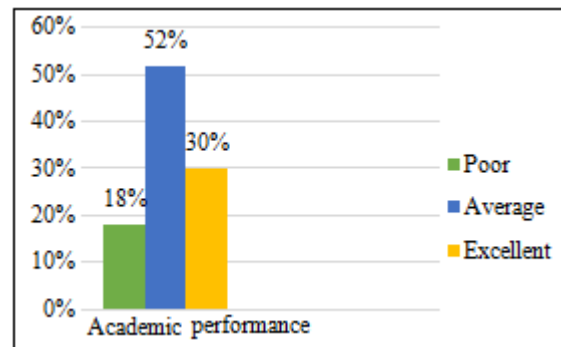
Figure 3: Bar diagram depicting the academic performance of school going children aged 10-12 years (n=100)

The figure depicts that 18% of the total subjects had poor academic performance while 52% had an average school grade and the remaining 30% were excellent.

6.4 Correlation between the home and school behavior

On correlating the home and school behaviors, the results revealed that there was a very high strength correlation between classroom and home behaviors of 10 year old boys (+0.968), 11 year old girls (+0.8905) and 12 year old girls (0.913). A low strength correlation was also seen that the classroom behavior and home behavior of 11 year old boys which could be contributed by lack of breakfast, an inability to build or maintain satisfactory interpersonal relationships with peers and teachers or a general pervasive mood of unhappiness or depression may drive the child to do things not normal that may help him gain attention.

This can be correlated with a study conducted by Janina R, Galler and Frank Ramsey (1988) that showed that a history of malnutrition was associated with an increase in behavioral impairment in school, especially attention deficits at age 9-15 years.

7. Summary and Conclusion

The academic performance of children impacts their future educational attainment and health and has therefore emerged as a public health concern. Maximizing brain function is a prime factor in seizing appropriate cognitive capability – for example, ability to focus, comprehension, evaluation, and application – in learning.

Adequate brain function is a prerequisite for efficient cognition and the performance of organized behaviour. One crucial factor is the supply of metabolic fuel to the brain, in the form of glucose.

A number of researchers have quoted that malnutrition can have adverse effects on the cognitive as well as behavioral well being of a child. Proper nutrition is a powerful good: people who are well nourished are more likely to be healthy, productive and able to learn. Good nutrition benefits families, their communities and the world as a whole. Malnutrition is, by the same logic, devastating.

This study consists of 100 subjects, reflecting the sex distribution of the general population the sample consisted of more boys 52% than girls 48%. The age group of the subjects was 10-12 years. According to WHO BMI standards the anthropometric measurements showed that the children were underweight 34%, normal 33% or overweight 33%. Majority of the subjects were non-vegetarian 77% followed by 11% vegetarian, 9% ovo-vegetarian and 3% lacto-ovo-vegetarian.

Dietary intake of school children was assessed through a 24 Hour dietary recall, calculations of which were compared to the RDA by applying a t-test, the results showed that there was difference in the mean intake and the RDA.

Chi-square analysis showed that the effect of BMI on the academic performance was significant.

Children learn behavior by watching and imitating others. Many types of behavior detract from learning. The teacher of the subject was interviewed to know the nature of classroom behavior of the child and the parent of the child was interviewed for the home behavior. On correlating the two behaviors it could be seen that the classroom behavior and home behavior were closely related except in the case of 11 year old boys which could be due to numerous factors.

Thus from the present study it can be concluded that good health and nutrition are needed for maintaining normal BMI that in turn results in good academic performance. There exists a correlation between the school and home behavior of children that may arise due to the nutritional factors or other factors such as peer pressure. However, poor nutrition often poses a serious barrier to equipping children with necessary tools and skills for success.

8. Recommendations

Further studies must include a set of biochemical tests that may help in determining the nutritional profile of the children to detect the micro-nutrient deficiencies that in turn may have caused attention problems. Children along with their parents must be educated on the importance of a healthy diet and a even healthier environment where the children can freely express themselves. Teachers must make the children aware of ill effects of breakfast skipping and lack of physical activity, as they can pose a serious harm to the child's lifestyle in terms of nutrition and overall health.

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