



**SUB THEME – “FOOD SECURITY, POVERTY AND SUSTAINABILITY”
NUTRITIONAL STATUS “AN IMPORTANT VARIABLE FOR BETTER
ACADEMIC PERFORMANCE OF SCHOOL CHILDREN (10-12 YRS)”**

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ABSTRACT

Under-nutrition is a multidimensional issue in India affecting young children. Undernourished children are more prone to illness. By the time they reach school-age, they have a much lower potential to learn compared to their well-nourished peers. This study aimed to assess the relationship between nutritional status and academic performance of school children (10-12 yrs). Fifty school children (10 -12 yrs) including 23 girls and 27 boys were selected from a Government higher secondary school in Vellore with the inclusion criteria of acceptance in the study and mother as an informant. A structured questionnaire was administered to mother of each child. Anthropometrics such as height, weight and head and chest circumferences were measured using a portable weighing balance and a measuring tape from which the body mass index (BMI) was calculated. Nutritional status of the children was assessed. Academic performance of the children was obtained by finding the mean of five subjects taken during term examination. This study results showed that undernourishment was more prevalent among boys than girls. Stunted, wasted and underweight children have obtained lower marks in most of the subjects. From the results, it was observed that nutritionally adequate children performed better academically when compared to undernourished children.

KEY WORDS: *Under-Nutrition, Nutritional Status, Academic Performance, School Children, Structured Questionnaire, Body Mass Index.*

INTRODUCTION

Food insecurity is an important determinant for under nutrition among children. Consuming a sufficient, safe and nutritious food is critical for child growth and development. Intrauterine growth restriction, suboptimum breastfeeding, wasting, stunting, and micronutrient deficiencies is the major contributor to disease burden and poor cognition among school children². Adequate nutrition is essential to ensure healthy growth, proper organ formation and its function, neurological and cognitive development and strong immune system. The National Family Health Survey (2016)⁵ reported that 38.4% of children below 5 years of age are stunted and 21% are wasted in growth. The numbers are alarming when the UNICEF/WHO/World Bank Group joint Child Malnutrition Estimates (2017)¹⁰ categorized India under the critical zone in Southern Asia region with respect to childhood wasting. It also reported that more than half of all wasted children in the world live in Southern Asia¹⁰.

Child malnutrition impacts cognitive function and contributes to low learning ability and poor academic performance. Evidence has shown that physical growth and cognitive development in children are faster during early years of life. By the age of four years, 50% of the adult intellectual capacity has been attained and before thirteen years, 92% of adult intellectual capacity is attained¹¹. Poor nutritional status is also the major cause of low productivity in primary education which may affect the physical and cognitive development in children during their early years of life⁴. Identifying the variables that influence the achievement of school children is of great importance because it would serve as an essential tool for design of education policies.

Over the years, the existence of a link between nutrition and the development of a child's brain has been described by many researchers. Hence, it can be implied that under-nutrition in early life may impact negatively on the future cognitive potentials. Nutritional status and intelligence are influenced by several factors that include parents' socio-economic status, family type, parents' literacy level and family size³.

Strong evidence exists that poor feeding practices are associated with stunted growth and delayed mental development. Thus, there is a relationship between impaired growth status and both poor school performance and intelligence quotient (IQ)⁷. Hence, this present study is aimed to investigate the relationship between nutritional status and academic performance of school children.

OBJECTIVES

Objectives of the study are to,

- 1) Assess the nutritional status of children (10-12 years)
- 2) Study the academic performance of children (10-12 years)
- 3) Evaluate the association between nutritional status and academic performance of children.

MATERIALS AND METHODS

1. Selection of Locale and Sample

This study was carried out by purposive sampling method. About fifty children (27 boys and 23 girls) were selected from the government higher secondary school, Thorapadi, Vellore, Tamilnadu with the following inclusion criteria.

Inclusion Criteria

- Children aged between 10- 12 years.
- Mother as an informant
- Subjects who were able to consent for the participation in the study

Exclusion Criteria

- Subjects who were not willing to participate
- Subjects above or below the specified age group

2. Collection of data

Data was collected after getting permission from school head master. A structured interview schedule was developed and administered to the mother of each children and information regarding age, sex, date of birth, socio economic back ground, birth weight were collected.

3. Anthropometric Assessment

Anthropometric measurements such as height, weight, body mass index, head and chest circumferences of the children were collected by using portable weighing balance and inch tape. Nutritional status of children were assessed by calculating height for age, weight for age and body mass index for age with the help of WHO(2007) growth chart. Children were categorised in to different classes in accordance to their values with standard deviation units of Z scores for comparison.

TABLE 1 NUTRITION STATUS BASED ON STANDARD DEVIATION Z SCORE OF BMI, HEIGHT AND WEIGHT FOR AGE

S.No	Standard deviation Z Score Value	BMI ¹²	Height for Age ¹³
1	-1 to -1.99	Mild Thin(Grade I)	-
2	-2 to -2.99	Moderately Thin(Grade II)	Stunted
3	Below -3	Severely Thin(Grade III)	Severely stunted
4	+ 2 to +2.99	Overweight	Above normal
5	Above + 3	Obesity	-

3.1 Height measurement:

Height was measured by using a fixed measuring inch tape on the vertical flat surfaced wall. The children were made to stand erect, shoulders straight with bare foot. The Measurements were noted with the help of wooden scale touching on the head of child proportionate to values on the scale.

3.2 Weight measurement:

Weight was measured by a portable weighing balance. Children were asked to stand on the weighing machine with minimal clothing and bare feet. The values were noted.

3.3 Head circumference

Head circumference is measured by passing an inch tape across the forehead and around the full circumference of head of an each child. The head circumference is a physical index of both past

nutrition, brain development and a good predictor of later intelligence of a child¹, and it is used as the most sensitive anthropometric index of prolonged under nutrition associated with intellectual impairment⁴.

3.4 Chest circumference

Chest circumference is measured by passing an inch tape around the fullest part of the chest of all children.

3.5 Body Mass Index (BMI)

BMI was calculated by dividing weight (kg) of the child with the square of height (M). It was further categorized by plotting their BMI values on the age and sex specific WHO growth charts and the Z score were calculated.

3.4 Academic performance of children in term examination

Academic performance of the children was collected by taking average marks of all subjects (Tamil, English, Mathematics, Science and Social science) in term I and term II examination.

3.5 Statistical Analysis

SPSS version (16.0) was used to analyse the data. Data were expressed in terms of mean and standard deviation for comparison and specific conclusion were derived.

RESULTS AND DISCUSSION

1. Anthropometric Assessment of children according to their sex

TABLE 2 ANTHROPOMETRIC ASSESSMENT OF THE CHILDREN (N=50)

Anthropometric Indices	WHO ¹³		Boys N=27		Girls N=23	
	Boys	Girls	Mean ±SD	Minimum - Maximum	Mean ±SD	Minimum -Maximum
Age (years)	10.72	10.79	10.72±1.21	9.9-11.6	10.79±1.37	10.16-11.6
Weight(kg)	-	-	31.15±8.44	20.2-55.0	33.83±9.04	21.1-55.3
Height(cm)	141.3	143.38	136.71±7.61	122-153	137.7±5.93	127-150
BMI	16.76	17.0	16.47±3.05	12.99-23.8	17.54±3.61	13.08-25.9
Head Circumference(cm)	-	-	50.66±1.79	47-54.8	49.71±1.06	46.0-53.0
Chest Circumference(cm)	-	-	62.39±6.60	55-81	64.72±7.37	54.0-81.0

The Table 2 stated the mean anthropometric indices of studied children. A total of 50 children in the age 10 -12 years were included in the study. This study comprised of 27 boys (55%) and 23 girls (45%) with the overall mean age of 10.75 years. Mean age of the boys and girls were 10.72 and 10.79 respectively. The results showed that girls are having higher values in height (137.7), weight

(33.83), BMI (17.54) and chest circumference (64.72) when compared to boys. It may be concluded from the **Table 2**, the girls had higher values in weight, height, chest circumference and BMI than boys which may be due to the fact that the body physique is influenced by climatic, hereditary, nutritional, and racial factors, as reported by Rastogiet al (2008). Mean Body mass index of all girls wereslightly above the values of WHO standard indicates that girlswere in standard categories when compared to boys in over all observation. Higher value of BMI of girls may be due to the age of the study population which is closer to the age of growth spurt.

4.2 Nutritional status of the children

TABLE 3 NUTRITIONAL STATUS OF THE CHILDREN (STANDARD DEVIATION UNITS OFZ SCORE) (N=50)

S. No	Categories	Nutritional status of the children	Standard Deviation Units of Z Score	Boys (N=27)	Girls (N=23)	Total (N=50)
1	Height for Age HAZ	Normal(Good nutrition)	-1 to+1	88.88	86.95	88
		Stunted	-2 to -2.99	7.4	13	10
		Severely stunted	Below -3	3.7	-	2
		Above normal	+ 2 to +2.99	-	-	
2	BMI for Age	Normal(Good nutrition)	-	37	43.47	40
		Mild Thin(Grade I)	-1 to -1.99	22.2	30.44	26
		Moderately Thin(Grade II)	-2 to -2.99	18.5	13.04	16
		Severely Thin(Grade III)	Below -3	7.4	-	4
		Overweight	+ 2 to +2.99	14.8	13.04	14
		Obesity	Above + 3	-	-	

*Number in parenthesis indicates percentage

The above **Table-3** represents the nutritional status of children. It was assessed by using WHO standard deviation Z Scores. Overall about twelve percent of the total sample (stunted10% and severely stunted 2%) were identified as stunted children. There was no much difference studied between boys and girls in regard to their height for age. Based on BMI for age, overall about forty six percent of the children were undernourished (Grade I(26%), II(16%), III(4%)Thinness) whereas only 40 percent of the children were in normal category.Girls were reported slightly higher in Grade I thinness (30.44%) when compared to boys (22.2%). In contrast boys were noted higher prevalence of thinness in moderate (18.5%) and Severe (7.4%) category. There is no much significant difference exist in percentage of overweight among boys and girls.

4.3 Association between nutrition status and academic score

TABLE 4 ASSOCIATION BETWEEN NUTRITIONAL STATUS AND MEAN ACADEMIC SCORE (N=50)

S.No	Nutritional status of the children	Mean Academic Score	
		Boys (N=27)	Girls (N=23)
1	Good Nutrition(Normal)	45.8	48.73
2	Mild Thin Grade I	40.3	44.50
3	Moderate Thin Grade II	34.95	41.06
4	Severely Thin Grade III	30.0	-
5	Over weight(Above normal)	42.15	57.3

From the Table-4 it is evident that mean academic score of the children is dependant to the nutritional status. Girls are having higher academic mean score than boys. Well nourished girls had secured highest score (48.73 and 57.3) among all other categories. Lowest academic scores were observed in moderately thin boys and girls. Similar results were found in a Nigeria study "A weak relationship exists between nutritional status and academic performance and the variation could be as a result of genetics and environmental factors such as a result of imbalance in food intake of the population. Well nourished children performed academically good than the others, which could mean that the children who were well fed and well nourished tend to do better academically than those who are not⁶.

CONCLUSION

This study results revealed that totally around 46% of children were suffering from one or the other form of under nutrition, possibly due to inadequate diet and food insecurity. Undernourishment was prevalent among boys than girls in studied population. Well nourished children performed better academically than undernourished children. The girls had higher academic scores than boys though the difference was not significant. Strengthening of food and health services in school and creating awareness about food safety and security among parents is required for better future.

REFERENCES

1. Botting, N., Powls, A., Cooke, R.W. & Marlow, N. Cognitive and educational outcome of very low-birth weight children in early adolescence. *Developmental Medicine and Child Neurology*, 1998, 40, 652-660.
2. Black, R. E., Victora, C.G., Walker, S.P. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*. 2013, 382(9890), 427-451.
3. Ejekwu, AD., ENE -Obong, H.N., Oguizu, O.J. Nutritional status and cognitive performance among children aged 5-12 years from urban and rural areas of Enugu State. *Afr J Psychol Study Soc Issues*. 2012, 15(2), 481-96.
4. Ivanovic, D. Does undernutrition during infancy inhibit brain growth and subsequent intellectual development. *Nutrition*, 1996, 12, 568-571.
5. National Family Health Survey -4 (2015 - 2016) India Fact Sheet .Retrieved from <http://rchiips.org/NFHS/pdf/NFHS4/India.pdf>

6. Opoola, F., Adebisi, S.S., Ibegbu, A.O. The study of nutritional status and academic performance of primary school children in Zaria, Kaduna State, Nigeria. *Ann Bioanthropol* [serial online] 2016, 4, 96-100.
7. PAHO. Nutrition, Health and Child Development. (PAHO Scientific Publication No. 566). Washington, DC: Pan American Health Organization; 1998.
8. Rastogi, P., Nagesh, K.R., Yoganarasimha, K. Estimation of stature from hand dimensions of North and South Indians. *Leg Med (Tokyo)* .2008. 10,185-9.
9. Strupp, B.J., Levitsky, D.A. Enduring cognitive effects of early malnutrition; a theoretical appraisal. *J Nutr.* 1995,125,2221-32.
10. UNICEF/WHO/World Bank Group Joint Child Malnutrition Estimates (2017) Levels and trends in child malnutrition [Fact Sheet]. Retrieved from https://data.unicef.org/wp-content/uploads/2017/06/JME-2017_brochure_June-25.pdf
11. Vernon, P.E. The development of cognitive process. In: V. Hamilton & P. Vernon (Eds). *Development of Intelligence*. London Academic Press Inc. 1976, 507-541.
12. World Health Organisation, Training course on Child Growth Assessment WHO, Geneva, 2008.
13. World Health Organisation, Growth reference data for 5-19 years, <https://www.who.int/growthref>, 2007.