Original Research Article

IJCRR
Section: Healthcare
Sci. Journal
Impact Factor
4.016

A STUDY ON THE ASSESSMENT OF BMI AND ITS ASSOCIATION WITH IQ AMONG RURAL PRIMARY SCHOOL CHILDREN IN WEST BENGAL, INDIA

Koushik Bhowal[1], Indrani Mukherjee[2], Debnath Chaudhuri[3]

[1]P.hD Fellow, Department of Biochemistry and Nutrition, All India Institute of Hygiene and Public Health, Kolkata; [2]Professor, Department of Applied Psychology, Calcutta University, Kolkata, India; [3]Professor, Department of Biochemistry and Nutrition, All India Institute of Hygiene and Public Health, Kolkata, India.

ABSTRACT

Background: Malnutrition, both under and over, is a serious public health problem related to increased risk of mortality, morbidity and overall development of children. Coexistence of undernutrition and overnutrition among Indian children has been reported.

Objective: To investigate the association between body mass index and IQ of rural primary school children.

Methods: A community based cross-sectional and descriptive study was undertaken in Government rural primary schools of Shimulpur, Salka, Kumarhut, Ramnagar in the districts 24 Parganas North and South, West Bengal, India among 560 children aged 6 to 8 years (class II to IV). Anthropometric measurements were taken to assess body mass index. Raven's Progressive Matrices Test was done to determine IQ grades of these students.

Results: 28.03% and 28.75% of rural primary school children under study were wasted and severely wasted, respectively while 3.39% and 1.08% were overweight and obese according to BMI. Only 0.37% and 50.71% of rural children had 95th (intelligently superior) and 5th (intelligently impaired) percentile of IQ grades. Body mass index of children has significant positive correlation with IQ (P≤ 0.05).

Conclusions: Higher body mass index is associated with lower IQ grades in rural children.

Key Words: BMI, IQ, Children, Rural, Primary school

INTRODUCTION

Malnutrition is widely recognized as a major health problem in developing countries[1]. Growing children in particular are most vulnerable to its consequences[2]. According to Benson[3], malnutrition is a physical condition or process that results from the interaction of inadequate diet and infection and is most commonly reflected in poor infant growth, reduced cognitive development, anemia and blindness. Childhood malnutrition can be evaluated anthropometrically [4-5] which is among the cheapest and most common methods available to assess human body composition, especially in developing countries[6]. Body mass index (BMI) is commonly used to quantify anthropometrics to identify individuals at risk due to its simplicity[7]. BMI cut-off points are also used clinically to identify individuals for screening; determine the type and intensity of treatment; monitor individuals for effects of treatment over time[8].

Child development is an important determinant of health over the life course[9] and its relationship with cognitive development have grown in the last few decades. Early developmental opportunities establish a critical foundation for children's academic success, health, and general well-being[10]. Research suggests that malnutrition alone does not cause irreversible damage to the brain but is believed to result from a complex interaction between environmental factors and malnutrition[11]. Nutrition is one of the crucial factors affecting cognitive development in children as many studies indicate that childhood IQ associated with childhood obesity and BMI values [12-15].

Corresponding Author:
Dr. Debnath Chaudhuri, Professor, Department of Biochemistry and nutrition, All India Institute of Hygiene and Public Health, Kolkata, India; Ph: 09830090381; E-mail: dchaudhuri_bn@rediffmail.com.

Received: 28.10.2015 **Revised:** 12.11.2015 **Accepted:** 30.11.2015

India contributes to about 5.6 million child deaths every year due to under nutrition, more than half of the world's total[16]. At the same time high prevalence of overweight and obesity have important public health consequences globally[17] as well as in India[18]. However, though there are reports[19-22] available regarding the prevalence of under-nutrition and over-nutrition or obesity among children in West Bengal, no attempts was made to find out association between body mass index and IQ of them.

Objectives of study

a) To determine the body mass index and IQ of them.
b) To assess malnutrition of rural primary school children in terms of body mass index.
c) To examine the association between body mass index and IQ.

MATERIALS AND METHODS

Study design and Settings

Students were randomly selected considering some inclusion criteria. These are, (i) children were apparently healthy and not suffering from any chronic diseases or physical disabilities (ii) participated in this study voluntarily.

This study was carried out among four rural primary school children of Shimulpur, Salka Kumarhut, Ramnagar, West Bengal, India. A total of 560 students aged 6–8 years (280 boys and 280 girls) participated in the study.

Ethical consideration

This study was approved by the Institutional Ethical Committee of All India Institute of Hygiene and Public Health, Kolkata, Ministry of Health and Family Welfare, Govt. of India.

During surveys to the schools guardian meetings were held in presence of the headmaster of the schools and the parents accompanied by their children before conducting of the study in order to give an elaborate explanation and idea of the objectives of the study. Informed written consent was also obtained from mothers of the students.

Table 1: Parameters measured

Parameters	Tools/Methods
Body Mass Index	Anthropometric method using height and weight [23]
Psychological Test (IQ) of the Learners	Raven's Progressive Matrices Test (non-verbal intelligence test) [24]

Statistical methods

Descriptive statistics were computed for all the continuous variables. SPSS, Windows version 21.0 (Chicago, USA) were used for the statistical analysis.

RESULTS

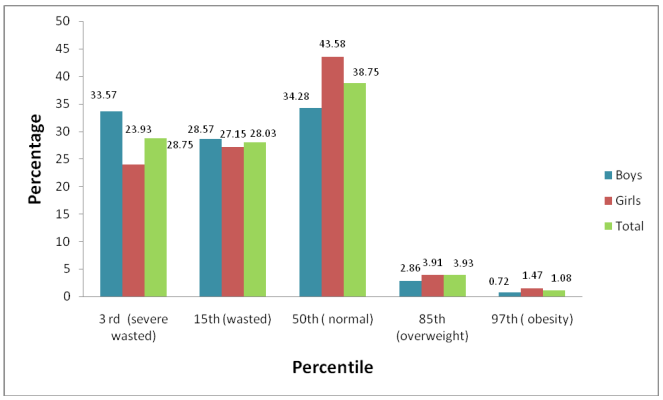

Figure 1: Distribution of Rural Primary School Children According to Body Mass Index for Age (N=560)

According to BMI for age, out of 280 boys 33.57% were severely wasted, 28.57% wasted, 34.28% normal, 2.86% overweight and 0.72% obese; out of 280 girls 23.93% were severely wasted, 27.15% wasted, 43.58% normal, 3.91% overweight and 1.43% obese; out of total 560 children 28.75% were severely wasted, 28.03% wasted, 38.75% were normal, and 3.93% overweight and 1.08 obese (Fig. 1).

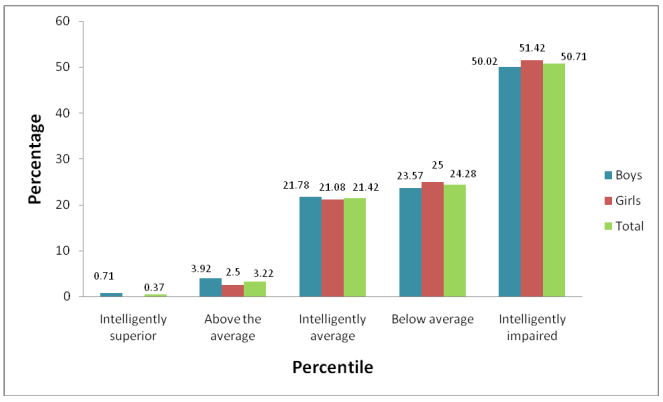

Figure 2: Distribution of Rural Primary School Children According to IQ (N=560).

According to the Raven Progressive Matrices test out of 280 boys 0.71%, 3.92%, 21.78%, 23.57% and 50.02% were intelligently superior, above the average, intelligently average, below average, intelligently impaired respectively; out of 280 girls 2.5%, 21.08%, 25% and 51.42% were above the average, intelligently average, below average, intelligently impaired, respectively; Out of total 560 school children 0.37%, 3.22%, 21.42%, 24.28% and 50.71% were intelli-

gently superior, above the average, intelligently average, below average, intelligently impaired respectively (Fig.2).

DISCUSSION

It is important that the assessment of malnutrition should be based on outcome measures rather than input measures. The suggested outcome measures include anthropometric measures like BMI, clinical signs of malnutrition, biochemical indicators and physical activity. Outcome indicators are more closely related to health and functional capacity. Among the outcome measures, anthropometric measures are considered to have an advantage over other indicators since body measurements are sensitive to even minor levels of malnutrition whereas biochemical and clinical indicators, on the other hand, are useful only when the level of malnutrition is extreme. According to BMI 28.03% of the total children were wasted and 28.75% of them were severely wasted (figure.2). Severe wasting was found to be more in case of boys (33.57%) in comparison to girls (23.93%). Moreover, wasting was also found to be high in boys (28.57%) than girls (27.15%). The figures for wasting existed are better than those reported by some studies in India and in West Bengal[25-26]. Body mass index is positively correlated ($P \leq 0.01$) ($r = 0.41$) with IQ.

Assessment of IQ of the children according to Raven Progressive Matrices test revealed an undesirable finding. 50.71% of them (figure.3) found to have lowest IQ grade (intelligently impaired), only 0.37% student had the highest level of IQ (intelligently superior) and only 3.22% were above the average level of intelligence grade. Study revealed that though IQ level of the students were not optimum, boys were having higher IQ grades than girls in terms of higher three IQ grades.

It is interesting that while the prevalence of under nutrition was high among the study population, at the same time 4.47% of them were either overweight or obese according to BMI even in these rural areas. A study profile of the rates of overweight and obesity among children of various states of India[26-28] showed that the prevalence of overweight among students was lower than those reported in those studies but still there is a situation for concern as it is observed that 30% of obesity begins in childhood and out of that 50% to 80% become obese adults[29].

CONCLUSION

- This study among the rural school children reveals that the boys are more vulnerable to under nutrition but girls are more prone to overweight and obesity.
- Boys were intelligently superior to girls.
- A significant positive correlation between body mass index and IQ exists among them.
- Overweight and obesity exists in rural population in both sexes.

LIMITATION OF STUDY

In this study nutritional status of the children was assessed by anthropometry. Biochemical estimations will be able to provide a better understanding of the nutritional status and in particularly the prevalence of micronutrient malnutrition.

ACKNOWLEDGEMENT

Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

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