

Impact of family income on anthropometric measurement of Primary School children

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■ **ABSTRACT** : The investigation was carried out to study the impact of family income on the anthropometric measurements of Primary School (PS) children selected from three different schools of high, middle and low educational standards and expenses. The effect of family income on body dimensions like height, weight, MUAC, skinfold thickness, weight for age, height for age and weight for height were studied. The family income of three different groups were estimated by using interview method and by filling proformas. The anthropometric measurements were assessed by using weight balance for weight, vertical anthropometric rod for height, Zerfas tape for MUAC, Harper's caliper for skinfold thickness. These anthropometric measurements were then compared with the NCHS standards. Statistical procedures viz., percentage, mean, correlation co-efficient and standard deviation were used. The results showed that the anthropometric measurements of Primary School (PS) children is significantly affected by family income.

■ **KEY WORDS**: Anthropometric measurements, Skinfold thickness, Family income, Malnutrition, Mid upper arm circumference

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Malnutrition continues to be the world's most common health problem and alone a biggest contributor to child mortality, nearly one third of the children in the developing world are either underweight or stunted and more than 30 per cent of the developing world's population suffer from micronutrient deficiencies. In modern age malnutrition continues to be a serious public health problem and has for a long time been recognized as consequence of poverty since most of the world's malnourished children live in the developing nations of Asia, Africa and Latin America where those most affected are from low income

families. The children from households with a low or very low socio-economic status has 2.5 times the risk of being underweight relative to upper socio-economic status.

A study by Ashok *et al.* (2014) highlight the double nutritional problem, undernutrition among the poorer section on one hand and increase case of obesity among stronger section of population on the other side.

Conditions for early life (from conception to two years) provide the foundations for adult life. Vicious interactions between malnutrition, poor health and impaired cognitive development set children on lower

development paths and lead to irreversible changes. Both prevalence and the severity of food insecurity increase as household incomes decrease. The main causative factors for malnutrition are inadequate food intake and poor health status that are influenced by poverty and lack of access to food, feeding practices and family size. Socio-economic factors predicted a strong positive association with the health determinants of primary school going children (Singh and Sheth, 2014). Another study by Thakur *et al.* (2016) and Sodha (2015) stated that socio-economic status is a vital contributing factor in determining health and well-being since it affects one's attitudes, knowledge, as well as exposure to various health risk factors. Environmental factors, diseases, inadequate diet and the poverty appear to be for more important than genetic predisposition in producing deviations from the reference value. Therefore, the assessment of growth not only serves as one of the best global indicators of child's nutritional status, but also provides an indirect measurement of the quality of life of an individual child. Gupta *et al.* (1976) reported that income directly relates to purchasing power of nutrients. In view of the still high prevalence of underweight and stunted growth due to under nutrition, this study was conducted to measure and inspect anthropometric measurement (weight, height MUAC and skinfold fatness) and their assessment (weight-for-age, height-for-age and weight-for-height) among Primary School (PS) children aged 6-11 yrs. old of different income groups living in Pantnagar Campus. The study also focused on gender and age differentials in the children's growth status, mainly height-for-age (an indicator for chronic malnutrition) and weight-for-height (an indicator for acute malnutrition). The risk of malnutrition was high among children having joint families, children whose mother's educational qualification was less than 6th standard and children of working mothers (Anurag *et al.*, 2012). Similarly, A study by Kaushik *et al.* (2015) stated that the education of parents has been found to be associated with nutritional status of children, there is requirement to increase the educational qualification of parents to enhance the nutritional status.

Objectives :

- To estimate the family income of primary school children
- To assess their anthropometric measurements

of primary school children

- To analyze the effect of family income on their anthropometric measurements

■ RESEARCH METHODS

An institutional (school) based cross sectional and descriptive study was conducted to see the impact of family income on anthropometric measurements of 150 Primary School (PS) children age between 6 to 11 years. Primary School children were selected from three different schools having great differences in their fee structures. Random sampling technique was used to select the sample from school students. Data collection were through proforma that was a pretested questionnaire. Anthropometric measurements in which body weight, height, MUAC and skinfold thickness were measured using the standardized procedures. Weights of the students were recorded using a scale with minimum accuracy of 0.5 kg. Heights were measured by vertical anthropometric rod. Students were wearing minimum cloths and no shoes during measurements. Weighting scale was set to the zero before taking every measurement. For taking MUAC, zerfas tape was used at the midpoint of upper arm, marked between the tip of acromion process of scapula and the olecranon process of ulna of left forearm, hanging relaxed. The measurement of skinfold thickness was made on the dorsal side at the same midpoint in the left hand where mid-upper arm circumference by using Harper's skinfold caliper. The Primary School (PS) children were classified under various degree of malnutrition on the basis of Gomez classification for weight for age and Waterlow classification on for weight for height. The observed weight of a child was expressed as percentage, using the 50th percentile (median) of NCHS reference data as the reference point the children were classified as severe, moderate, mild and normal if their weight for age were in the range of <60 per cent, 60-75 per cent, 70-90 per cent and > 90 per cent, respectively of the NCHS reference median and in normal, wasting, stunting, stunting and wasting degree of malnutrition if there weight for height were in the range of >9 per cent, 80-90 per cent, 70-80 per cent and <70 per cent, respectively of the NCHS reference median weight for height. The statistical procedures used to analyse the data for the interpretation of results were mean, standard deviation, correlation co-efficient and ANOVA.

RESEARCH FINDINGS AND DISCUSSION

A total of 150 school children from three Primary Schools of different socio-economic standards were taken in the study. More than half (60%) children of Campus School (CS) had their family income above Rs. 15,000/- per month, 36 per cent between Rs. 10,000/- to Rs. 15,000/- per month whereas the family income of 50 per cent children of Saraswati Shishu Mandir (SSM) was between Rs. 5,000/- to Rs. 10,000/- per month and 46 per cent children had their family income between Rs. 10,000/- to Rs. 15,000/- per month. On the other hand, 58 per cent children of Primary School (PS) belong to the families with monthly income varied from Rs. 1,000/- to Rs. 5,000/- and remaining 42 per cent monthly family income group were Rs. 5,000/- to Rs. 10,000/- per month. The data indicated that the children of high income family had the school fee more than other two schools. The middle and low income group children were admitted to Saraswati Shishu Mandir (SSM). The children of Primary School (PS) were of low family income group. These observation showed that family income of the child decides their educational standards (Table 1).

These results showed that the parents of different

family income groups were educating their children in the schools of different standards and fee structure depending upon their family income.

The anthropometric measurements viz., height, weight, mid-upper arm circumference and skinfold thickness at triceps were studied separately for the boys and girls of three schools. The comparison of data was carried out with NCHS standards for the height of boys and girls. The highest mean height of boys (128.20 cm) was observed in case of Campus School (CS) boys followed by Saraswati Shishu Mandir(SSM) boys (125.95 cm) and Primary School (PS) boys (120.08 cm). No significant difference was obtained between the heights of Campus School (CS) boys and Saraswati Shishu Mandir (SSM) boys. The heights of Primary School (PS) boys were significantly ($P < 0.01$) lower than that of other two schools. The heights of Campus School (CS) boys having highest family income in all were even higher than NCHS standards due to their better nutrient intake.

Similar to boys, the height of Campus School (CS) girls was also significantly ($P < 0.01$) higher than Saraswati Shishu Mandir (SSM) girls followed by Primary School (PS) girls. The height of Campus School

Table 1 : Mean values of family income of children of three different primary schools family income (Rs.)

Particular	Primary schools			C.D. (P=0.01)
	CS	SSM	PS	
Family income	22712.00	9518.00	4296.00	356.156
Source	d.f.	s.s.	m.s.	f-value
Treatment	2	0.8993 E+10	0.4496 E+10	96.575**
Error	147	0.6844 E+10	0.4656 E+10	
Total	149	0.1584 E+10		

cd	1	2	=	cd	1%	0.356156 E+04**
cd	2	3	=	cd	1%	0.356156 E+04**
cd	3	3	=	cd	1%	0.356156 E+04**

Table 2 : Distribution of children according to mid-upper arm circumference classification

Category	MUAC (in cm)	School											
		CS				SSM				PS			
		Boys		Girls		Boys		Girls		Boys		Girls	
n	%	n	%	n	%	n	%	n	%	n	%		
Normal	>13.5	25	100	25	100	20	80	17	68	14	56	9	36
Mild malnourished	12.5-13.5	0	0	0	0	95	20	7	28	8	32	11	44
Malnourished	>12.5	0	0	0	0	20	0	1	4	3	12	5	20
Mean % weight for age		18.30		17.90		17.26		16.91		14.98		14.80	

C.D. (P<0.01) = 1.165
 n = Number of children
 % = Percentage of total children
 MUAC = Mid-upper arm circumference

(CS) girls was even slightly higher than the NCHS standards but the differences were non-significant. The data obtained with regard to the body weight of boys and girls of three different school showed the body weight of boys and girls of Campus School (CS) was significantly ($P<0.01$) more as compared to Saraswati Shishu Mandir (SSM) and Primary School (PS) children.

The mid upper arm circumference of boys of Campus School (CS), Saraswati Shishu Mandir (SSM) and Primary School (PS) increased from 18.14 to 19.42, 15.90 to 17.92 and 12.60 to 17.06cm, respectively between the age of 6 to 11 years on comparing the categorization of boys and girls of all the schools selected, boys in general obtained significantly ($P<0.01$) superior categories as compared to girls. Skinfold

thickness at triceps is a most commonly measured fat fold. The skinfold thickness at triceps of boys of Campus school, Saraswati Shishu Mandir (SSM) and Primary School (PS) ranged between 7.24 to 10.7, 6.3 to 7.9 and 5.5 to 7.5 mm, respectively whereas the corresponding measurements of skinfold thickness at triceps of girls for three schools were between 6.85 to 8.99, 5.9 to 7.31 and 5.23 to 7.05mm, respectively between the age group of 6 to 11 years. The mean values of skinfold thickness at triceps of boys were significantly ($P<0.01$) higher than girls of the same school (Table 2).

The boys and girls of three schools were classified under various degrees of malnutrition on the basis of Gomez classification of weight for age. All the boys and girls of three schools were graded as normal with respect

Table 3 : Distribution of children according to Gomez classification on the basis of weight for age

% weight / Age cut of level as % of NCHS median	Type of malnutrition	School											
		CS				SSM				PS			
		Boys		Girls		Boys		Girls		Boys		Girls	
n	%	n	%	n	%	n	%	n	%	n	%		
>90	Normal	25	100	25	100	12	48	9	36	5	20	2	8
75-90	Mild	0	0	0	0	10	40	14	56	3	12	7	28
60-75	Moderate	0	0	0	0	3	12	2	8	16	64	12	48
<60	Severe	0	0	0	0	0	0	0	0	1	4	4	16
Mean % weight for age		96.33		95.32		84.77		83.21		72.39		70.24	

C.D. ($P<0.01$) = 5.339

n = Number of children

% = Percentage of total children

NCHS = National council of health statistics

Table 4 : Distribution of children according to Waterlow classification on the basis of weight for height

Type of malnutrition	% weight for height	School											
		CS				SSM				PS			
		Boys		Girls		Boys		Girls		Boys		Girls	
n	%	n	%	n	%	n	%	n	%	n	%		
Normal	>90	25	100	25	100	14	56	8	32	3	12	2	8
Wasting	80-80	0	0	0	0	9	36	12	48	10	40	13	52
Stunting	70-80	0	0	0	0	2	8	5	20	9	36	6	24
Stunting and wasting	<70	0	0	0	0	0	0	0	0	3	12	4	16
Mean % weight for age		97.18		96.23		88.09		86.56		75.58		73.92	

C.D. ($P<0.01$) = 6.635

n = Number of children

% = Percentage of total children

Table 5 : Correlation between family income and anthropometric parameters of children

Particular		r-values of					
		Height	Weight	MUAC	Skinfold thickness at triceps	Weight for age	Weight for height
Family income	CS	0.764**	0.603**	0.784**	0.382*	0.124	186
	SSM	0.761**	0.758**	0.375**	0.271	0.178	0.13
	PS	0.851**	0.835**	0.670**	0.361**	0.21	0.186

r = Correlation co-efficient * and ** indicate significance of values at $P=0.05$ and 0.01 , respectively

to their weight for age but of the total boys of SSM, 48 per cent were classified as normal, 40 per cent as mild malnourished and 12 per cent moderately. Among the boys of Primary School (PS) 20, 12, 64 and 4 per cent, respectively were graded as normal, mild, moderate and severely malnourished. The corresponding values of malnutrition grades among the girls of Primary School (PS) were 8, 28, 48 and 16, respectively. However 36, 56 and 8 per cent girls of Saraswati Shishu Mandir were graded as normal, mild and moderate malnourished with respect to their weight for age. Where the data obtained with respect to gender were analyzed, it was found that malnutrition among girls were more prevalent as compared to boys (Table 3).

Similar to the weight for age classification all the boys as well as girls of Campus School (CS) were categorized as normal with respect to their weight for height (Table 4). 56, 36 and 8 per cent boys of SSM were classified as normal, wasting and stunting, respectively with respect to their weight for height. The corresponding distribution of boys of PS was 12, 40 and 36 per cent, respectively. About 12 per cent boys of PS were classified as stunting and wasting. The girls of SSM were normal, wasting and stunting to the extent of 32, 48 and 20 per cent on the basis of their weight for height classification whereas the girls of PS were normal, wasting, stunting and wasting and stunting to the extent of 8, 52, 34 and 16 per cent on the basis of their weight for height classification.

The correlation between family income with anthropometry showed that the family income of the children of all three schools had a highly significant correlation ($P < 0.01$) with anthropometric parameters namely height weight and mid-upper arm circumference. Lack of money and food adversely affected anthropometric measurements (Table 5) Agarwal *et al.* (1976) also observed a direct relation of income and anthropometry. A study by Sahu *et al.* (2015) and Kulshrestha (2015) also concluded that factors related with socio-economic inequality for instance poverty, illiteracy, lack of awareness towards the quality of food items, more number of family members and poor sanitary conditions are linked with malnutrition. Similarly, Mashal *et al.* (2008) found in their study that child marriage, low educational status of mothers, lack of maternal autonomy, lack of basic material requirements and internal displacement had negative association with child

health.

Conclusion :

The findings of the study have shaded light on impact of family income on anthropometric measurements of Primary School (PS) children. In this study Primary School (PS) children (6 to 11 years old) of low family income were found moderately malnourished and wasting, a form of malnutrition. A study by Mohammad *et al.* (2013) report that school going children could not meet their nutritional requirements for their better development due to the negligence by their family with low socio-economic status and unhealthy life style. Another study by Abdelaziz *et al.* (2015) stated that the nutritional status of a child is strongly connected with the parental literacy and family size.

As the study showed that underweight, stunting and wasting are still more prevalent among low income family, there is a need for the ministry of education and ministry of health to adopt a more intensive approach to address health and nutrition issues in this age group. Health and nutrition monitoring is essential so that effective intervention can be implemented to alleviate and consequently eliminate the health and nutritional problems among primary school children. Nutrition monitoring and health is must for implementing effective interventions in order to alleviate the nutrition related health issues (Shariff *et al.*, 2000).

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