COMPARISON OF NUTRITIONAL STATUS IN CHILDREN OF DIFFERENT SOCIO-ECONOMIC STATUSES

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SUMMARY: This cross sectional study was carried out to compare nutritional status amongst children of 5–10 years of age of different socio-economic status. Study was carried out at schools of Faisalabad city for almost 4 months. Height, weight, mid-arm circumference (MAC) and triceps skin fold thickness (TSFT) were measured of children belonging to three socio-economic status (SES). The study revealed significantly ($p<0.05$) lower heights of both male and female children of low SES compared with of high SES at the age of 5–5.9 years and those older than 9 years. Similarly, mean weight of children of low SES was significantly ($p<0.05$) lower than children of middle and high SES. Mid-arm circumference was also significantly ($p<0.05$) lower in both males and females of low SES than high SES. In children of low SES, significantly greater TSFT was observed in females than males at 5–6.9 years and 9–9.9 years of age while in children of middle SES TSFT was observed at 6–6.9 and greater than 8 years of age. The data showed significantly lower values ($p<0.05$) of TSFT in children of low and middle SES than those of high SES in both male and female of all age groups. Pearson correlation statistics revealed significant negative relationship between height and TSFT ($r=-0.496$, $p<0.001$) in children of low SES in contrast with the results in middle and high SES. It may be concluded from the obtained results that the parameters studied are good indicators of nutritional assessment except height as appeared a delayed effect of nutrition, further that height has significant inverse relationship with TSFT in malnourished children but not in well nourished ones.

Key Words: Malnutrition, tricep skin fold thickness, mid-arm circumference.

INTRODUCTION

Malnutrition is still a devastating problem in certain parts of the world although proportion and absolute number of chronically under-nourished people have declined. Under-nutrition remains as a serious problem among poor families and of under-developed nations, resulting from consumption of poor diet over a long period of time (1). Protein energy malnutrition has been a common health problem of the third world. It is much less common and usually less severe in adults as they do not need proteins for growth. Nevertheless, it is of much serious concern among children of school-going age who are deprived of good and ample nutrition on account of their poor socio-economic status, ignorance and lack of health promotional facilities (2). It has been reported that about 13

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Table 1: Distribution of children (male and female) of age 5 to 10 years in 3 different socio-economic groups.

Socio-economic statuses	Male		Female		Total
	Number	Age (%)	Number	Age (%)	
Low income up to Rs. 5.000/-	63	24.7	62	24.3	125
Middle income between Rs. 10.000-15.000	27	10.58	30	11.76	57
High income above Rs. 20.000	37	14.5	36	14.12	73
Total	127	50	128	50	255

million infants and children, less than five years of age, die each year in developing countries and most of these deaths are attributed to under-nutrition (3). Since children at primary school age are in active growth period, deficiency of protein and energy would lead to failure of growth in terms of weight and height. According to WHO criteria, 52% of young children in under-developed countries are considered normal, while 48% of them are malnourished and 10% of them are severely malnourished (4). Assessment of nutritional status of a patient is important and approach of nutritional assessment involves anthropometric observations, biochemical tests, clinical observations and diet evaluation. However, individual nutritional status has been reported to vary on the basis of person's living conditions, available food supply, health and socio-economic status (5). There has been, therefore, a continuous need to make community assessment at regular intervals. Thus an investigation has been conducted to compare nutritional status of 5–10 years old school-going children of the three socio-economic statuses of the population in the developed city of Faisalabad as it might have changed during the last decades. It was expected that data collected in this investigation would provide useful information for the policy makers or planners.

MATERIALS AND METHODS

The study was conducted on 255 school children of 5–10 years of age in the selected schools and were grouped into socio-economic statuses 1 to 3. The study is cross sectional and analytical. Pertinent information was obtained from different schools as each school was selected to represent one of 3 socio-economic statuses. The Beacon House Public School and Sherry Public School have most of the students belonging to high socio-economic status. Similarly, Laboratory Girls High School, Laboratory Boys High School, Webster Public School, Little Scholars Public School were selected to represent middle socio-economic status and Government Sabria Sirajia Elementary School, Government M.C. Girls Primary School No. 3 of Faisalabad were selected to represent low socio-economic status. The monthly income of most of the parents of children belonging to high socio-economic status was above 20.000, of the middle it was between 10.000 – 15.000 and of low class it was below 5.000 rupees. The distribution of children selected for the study with respect to socio-economic status and sex has been given in Table 1.

An interviewing schedule was employed to collect the required information which was tested to ensure accuracy and work ability. Socio-economic status of children was also assessed with the help of certificates (salary, etc.) submitted to schools indicating annual income of parents. The nutritional status of children was assessed by the help of anthropometric measurements that included height and weight.

Mid-arm circumference (MAC) was measured half way between the acromian process of the scapula and the tip of the elbow. Triceps skin fold thickness (TSFT) measurements were made at a point over the tricep muscle midway between the acromian and olecranon processes on the posterior aspect of the arm. The data obtained were subjected to analysis of variance technique and means were compared by using Duncan's multiple range test. Pearson correlation statistics was also computed between various parameters to find out the type of relationship between various parameters by using SAS statistical software package (6).

RESULTS

The mean height of children of low, middle and high socio-economic statuses (SES) varied from 102–128, 141–188 and 113 and 145 cm, respectively (Table 2). The height varied significantly between male and female of low SES at the age of 5–5.9 years with higher height in males than females, but statistically non-significant difference was observed between male and female at other ages and in middle and high SES in all age groups. The data also revealed that the height of children of both male and female was significantly lower in children of low SES compared with children of high SES at the age of 5–5.9 years and those greater than 9 years old and in females of low SES.

The mean weight of children of low, middle and high SES varied from 16.5–24, 18.0–33.2 and 25.16–45.57 kg, respectively (Table 2). Mean weight of children showed non-significant difference at all ages between male and female except in age group 5–5.9 of high SES, where higher ($p<0.05$) weight was observed in males than females (Table 2). The weight of children (both male and female) was significantly lower in children of low SES than children of middle and high SES, while it was lower in children of middle than of high SES.

The mean mid-arm circumference varied from 14.4–17.1, 15.8–19.6 and 19.9-22.8 cm, respectively in children of low, middle and high SES of 5–10.9 years of age (Table 2). The data on mid-arm circumference showed non-significant difference between male and female at all ages and in each SES except at age 9–9.9 years of low SES where it was significantly higher in female than male children. The data also revealed that mid-arm circumference was significantly lower in children (both male and female) of low than high SES, however, in majority of age groups non-significant difference was observed between children of low and middle, as well as between children of middle and high SES.

The mean triceps skin fold thickness varied from 4.72–9.5, 7.67–13.95 and 11.5–17.43 mm in children of low, middle and high SES of 5–10.9 years of age (Table 2). In children of low SES, significantly greater TSFT was observed in females than males at 5–6.9 years and 9–9.9 years of age, while in other age groups, this difference was non-significant, though female had relatively higher values of TSFT at all other ages. In children of middle SES, significant difference was observed in TSFT between male and female of 6–6.9 and greater than 8 years of age. It was significantly high in females than males of 6-6.9 years of age, while it was otherwise high in males than females in those of greater than 8 years of age. In children of high SES, non-significant difference was observed between male and female children. The data showed significantly lower values of TSFT in children of low and middle SES than those of high SES in both male and female in all age groups.

Application of Pearson correlation statistics revealed significant positive relationship between height, weight, MAC and TSFT in children of middle and high SES. Similarly, significant positive relationship was observed between weight and MAC ($r=0.769$; $p<0.0001$), height and TSFT ($r=0.659$; $p<0.0001$) and between MAC and TSFT ($r=0.562$; $p<0.005$). However, significant negative relationship was observed between height and TSFT ($r=-0.496$; $p<0.001$), while a non-significant but negative relationship was observed between height and weight as well as between height and MAC in children of low SES.

DISCUSSION

Malnutrition has been reported to be a serious nutritional problem of school-going children in the developing countries including Pakistan and is reported to be serious in families of low socio-economic status (5). The present study was conducted to determine the height, weight, skin fold thickness and mid-arm circumference as indicators of growth and nutritional status of children of low, middle and high socio-economic status. It revealed that mean heights as 108, 110, 118 cm in males, while 102, 108 and 113 cm in females of low, middle and high socio-economic statuses (SES) at the age of 5–5.9 years. These results are almost similar to earlier findings of height of 109–138 cm in the children of Faisalabad (7). The random sampling revealed an estimated increase of 4, 6 and 5 cm/year in height of male, while 4.6, 6.6 and 6 cm/year in height of female children of low, middle and high SES. Earlier, an increase of 4.02 cm/year has been reported in children of Punjab (8). The present findings suggest a slight increase in height/year of children reported earlier, while no association of height with sex even with respect to SES and that effect on height in each SES is similar in both males and females in children up to 9 years of age. However, the present data have showed significantly lower height in both males and females of low SES than children of high SES at age 9–10.9 years. This has indicated that the effect of SES on height becomes evident at later ages of

Table 2: Comparison of means ± SEM of height, weight, mid-arm circumference and triceps skin fold thickness in children (both sexes) of different age groups belonging to 3 socio-economic statuses.

Socio-economic statuses	5–5.9 years		6–6.9 years		7–7.9 years		8–8.9 years		9–9.9 years		10–10.9 years	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Height												
Low	108 A±4.08	102 B±2.31	112±2.31	110±4.62	116±2.31	114±3.46	120±2.31	118 b±1.15	124 b±2.31	120 b±3.46	128 b±1.15	125 b±2.89
Middle	110±3.53	108±2.25	118±5.77	116±5.46	120±3.46	122±2.31	125±2.89	130 a±3.46	132 ab±3.46	133 a±1.73	140 a±2.31	141 a±2.31
High	118±3.26	113±2.98	123±3.46	121±4.04	124±3.46	123±3.46	128±2.30	126 ab±3.45	138 a±2.31	137 a±1.74	143 a±1.73	145 a±2.30
Weight												
Low	16.5 b±0.82	15.9 b±0.82	17.5 c±0.59	17.0 c±0.58	19.5 c±0.59	18.5 c±0.58	20.6 c±0.59	20.0 b±0.58	21.1 c±0.58	23.4 c±0.58	23.3 c±0.59	24.6 c±0.49
Middle	18.5 b±0.82	18.0 b±0.81	21.7 b±0.57	21.2 b±0.57	23.5 b±0.56	21.8 b±0.56	24.0 b±0.56	26.7 a±0.57	29.3 b±0.59	30.4 b±0.47	31.9 b±0.49	33.2 b±0.57
High	29 Aa±0.83	25.5 Ba±0.82	26.3 a±0.58	27 a±0.56	25.5 a±0.57	25.2 a±0.58	28.0 a±0.47	26.3 a±0.49	42.9 a±0.54	42.3 a±0.59	45.6 a±0.51	44 a±0.51
Mid-arm circumference												
Low	14.5 c±0.41	14.4 c±0.58	14.8 b±0.58	14.6 b±0.56	15.2 b±0.56	15.6 b±0.23	15.5 b±0.85	15.5 b±0.14	15.7 Bc±0.29	17.1 Ab±0.06	16.9 b±0.06	16.7 c±0.12
Middle	15.9 b±0.42	16.8 b±0.59	15.8 b±0.56	16.6 b±0.57	16.8 ab±0.59	16.7 ab±0.17	17 ab±0.17	18 ab±0.23	18 b±0.12	18.7 ab±0.12	18.6 ab±0.11	19.6 b±0.17
High	19.9 a±0.41	19.9 a±0.56	18.6 a±0.57	19.6 a±0.58	18.6 a±0.58	17.9 a±1.06	18.9 a±0.18	18.7 a±0.17	22.0 a±0.18	22.8 a±0.19	22.5 a±0.12	22.7 a±0.11
Triceps skin fold thickness												
Low	4.7 Bc±0.01	7.4 Ab±0.01	5.4 Bb±0.08	7.3 Ac±0.23	7.5 c±0.12	8.1 b±0.23	6.7 c±0.07	7.5 b±0.23	7.4 Bc±0.23	9.5 Ab±0.29	8.2 c±0.23	9.4 b±0.17
Middle	9.0 b±0.16	7.7 b±0.06	7.6 Bb±0.10	10.5 Ab±0.28	9.5 b±0.29	9.4 ab±0.29	9.8 Ab±0.17	8.0 Bb±0.21	13.1 Ab±0.29	9.0 Bb±0.28	13.9 Ab±0.24	9.6 Bb±0.19
High	13.5 a±0.31	15.0 a±1.51	13.0 a±2.19	14.0 a±0.23	11.4 a±0.17	11.5 a±0.29	11.5 a±0.44	12.3 a±0.21	17.4 a±0.17	16.4 a±0.23	17.4 a±0.21	16.8 a±0.16

In the table capital letters indicate significant difference between male and female in each age group at $p<0.05$, while small letters indicate significant diffenece between SES in each male or female of each age group.

development and is not an immediate effect. Similarly, a study in USA has indicated the low height in children of poor families (9). The data on weight have suggested an immediate effect of SES of families with significantly ($p<0.05$) lower weight in children of low than high SES even at less than 6 years as well as at later ages. Earlier studies also indicate the effect of SES on both height and weight of children (9, 10). Thus it can be stated that the effect of energy intake on height is delayed, while on weight is immediate. The data with reference to body weight suggested a random increase of mean of 1.36, 1.74 kg in males and females of low SES, 2.68, 3.04 of middle and 3.32, 3.7 of high SES. An increase appears in weight with increase in SES, however, the increase in weight of females is relatively higher than males with respect to increase on per year basis. It may be because of lower level of activity in females than males, as females remain most of the time at homes and invariably find more opportunities to eat various foods compared to male children. In an earlier study an increase of 2.87 kg/year in weight has been reported (8). The present results are also in agreement with those earlier reported with highest mean weight in children of urban educated and elite group (10).

Mid-arm circumference increased with the increase of age and with the improvement of SES and was significantly higher in children of high than low SES. However, it did not differ with male and females. It increased at rate of 0.10, 0.46 cm in male and female of low SES, while it increased at rates of 0.54, 0.36 and 0.52, 0.56 cm in males and females of middle and high SES, respectively. It appears that SES has some effect on MAC as well, particularly in male children of poor SES. Similarly, a study in Bangladesh also had similar observation and lower MAC was related with low energy intakes (11). Similar observations were recorded in children of Brazil (12). Triceps skin fold thickness increased at the rate of 0.41, 0.30; 0.98, 0.35 and 0.79, 0.35 cm in males and females of low, middle and high SES, respectively. These results suggest higher increase in TSFT in males and females at yearly basis. The data also showed significant difference in TSFT between males and females at different ages in children of low and high SES and that it was lower in children of low than high SES, while it appears that TSFT in children of high SES is not influenced by sex. Similarly, lower TSFT has been reported from in children suffering from severe malnutrition (13). Hence the results of the study are supportive to earlier studies made with reference to malnutrition of having poor growth parameters in children of low SES (14, 15). The present findings with reference to relationship between these parameters in children of low SES showed significant inverse relationship between height and TSFT, while there was non-significant inverse relationship between height and weight as well as between height and MAC on the contrary to the results in children of middle and high SES. This has suggested that the TSFT in children of low SES is most affected by the increase of height.

CONCLUSIONS

In view of the data discussed it may be concluded that the parameters studied are good indicators of nutritional assessment except height as appeared a delayed effect of nutrition on height, further that height has significant inverse relationship with TSFT in malnourished children while not in well nourished ones. The data have also indicated higher values of TSFT in females than males.

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