

ASSESSMENT OF NUTRITIONAL STATUS OF SCHOOL CHILDREN IN PUBLIC AND PRIVATE SECTOR SCHOOLS BY ANTHROPOMETRY

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ABSTRACT:

BACKGROUND: Malnutrition is globally increasing public health concern among children and Pakistan is no exception. Malnutrition has led to growing problems of morbidity and mortality. Children are an asset to their nation and their health is integral for the progress of any country.

OBJECTIVE: Study was designed to evaluate the nutritional status of primary schools going children of government and private schools in urban area.

MATERIAL & METHODS: The study was conducted from Feb 2017 to March 2017. Two hundred primary school children were randomly selected out of which 100 were taken from government and private sector school each from urban area of Faisalabad. The comparative cross sectional study was carried out in primary school going children and nutritional status was interpreted using CDC growth curves and z scores were evaluated for stunting, wasting and thinness through WHO criteria.

RESULTS: The percentage of stunted children was 25.5% and of this proportion, 71.6% belonged to government school. 20% children were found to be suffering from wasting out of which 57.1% belonged to government school. It was observed that the students from the government school had a slightly higher percentage of students with a normal BMI (56%) as opposed to the students of private school at 54%. There were more underweight students in government school than in private school (69.8% and 30.2% respectively). 64% of the overweight students belonged to private school. The proportion of obese students was found to be highest in private school (94.7%).

CONCLUSION: A significant number of students had malnutrition in the form of stunting and wasting both in government and private sector schools under study. Socio economic status directly affected nutritional status.

KEY WORDS: Malnutrition, Primary School Children, Socioeconomic Status, Faisalabad

INTRODUCTION:

According to National Nutritional Survey 2011 (NNS-2011), 43.7% of children in Pakistan are stunted while 15% children in Pakistan suffer from wasting. The percentage of underweight

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children is about 31.5%.^[1] The ratio of stunting; wasting and underweight children is higher in rural population when compared with urban areas. On the other hand, childhood obesity has also become a public health concern in Pakistan^[2]. This is a chronic condition which affects all age groups beginning from childhood, teenage, adulthood up till old age. Children with low levels of nutrition suffer from development impairments both physically and mentally^[3]. This results in low grades, low school attendance, higher unpunctuality rates and an increased ratio of diseases in school children that often go undiagnosed^[4]. In Pakistan anthropometric status has not changed much over past decade. Forty four percent children < 5 years of age were stunted as compared to 41.6% in 2001 National Nutritional Survey. Fifteen percent were wasted compared to 14.3, which has not changed since 2001^[1].

Objectives:

The study at hand aims to assess the nutritional status of school children with urban background. The study carries the following specific objectives:

1. To determine the association of nutritional strata of the children with their age, sex and socio economic status.
2. To compare the nutritional status of government school children and private school children using anthropometric measures.

MATERIALS & METHODS:

Study design:

It was a comparative cross sectional study.

Setting and duration:

The study was carried out between February and March 2017. It was carried out in two schools.

1. Government School Sargodha Road Faisalabad.
2. School from a chain of private schools System Jail Road Faisalabad.

Ethics:

After permission and approval from parents and school administration the study was conducted.

Study participants:

A total of 200 children, 100 each from both of the above mentioned schools were selected through random sampling technique to collect

the relevant data.

Age:

Children of age group 5-12 years were selected for the study. Age was determined using either the data present in the school record or by asking the respective teacher of the class. The age was divided in two groups:

- I. 5-8 years
- II. 9-12 years

Anthropometric data:

The following anthropometric measurements were made using standardized methods.

- I. Height
- II. Weight
- III. Mid Upper Arm Circumference (MUAC)

Height:

Height of the subject was measured in standing position on a Frankfurt plane. The subject was asked to stand barefooted in fully erected position looking straight ahead and head was positioned in the Frankfurt horizontal plane. The measurements were then noted down. Height was measured in centimeters (cm) to the nearest 0.1 cm. All measurements were taken in light clothing without any shoes.

The Z score for stunting was used to identify stunting in children. According to the WHO anthropometry classification, Z - score < -2 for Height for Age (HAZ) meant that the child was stunted^[5].

Weight:

Weight was recorded using a weighing machine. The machine was adjusted to remove zero error. After every observation the scale was rechecked for zero adjustment. The subject stood on the scale in light clothes and without shoes to show weight in kilogram. Weight was measured to the nearest 0.5 kg.

Wasting among students aged 5-8 years was assessed according to the weight for height parameter where height was no less than 77 cm and no greater than 121cm while the students aged 9-12 years were assessed according to the weight for age parameter that was standardized by the Centre for Disease and Control (CDC, 2000). Z score was used to assess wasting among children aged 5-8 years and thinness among children aged 9-12 years according to the standard set by WHO. A score of < -2 for Weight for Height (WHZ) meant that the child suffered from wasting.^[5]

Mid Upper Arm Circumference (MUAC):

MUAC was taken using stretchable tapes by placing it at a point mid-way between the tip of acromian and ulnar process with the arm hanging vertically and forearm supinated. The measurement was made without compression of underlying fat.

Determination of malnutrition:

The data was arranged according to the CDC growth curves.^[6] Reference BMI for age was used to calculate BMI which comprised of a sequence of percentile curves that described the distribution of chosen body measurements in children. The percentile of 5th to 85th implied that the child was healthy, while percentile above 85th meant child was at risk for becoming overweight. 90th percentile or above referred to as child being obese. Less than 5th percentile meant child was underweight.

Also, the height for age and weight for age Z scores were used in order to see the frequency of stunting and thinness among children of both the schools

Socio-economic factor:

Socio economic status was also taken as a parameter for determining the nutritional status of the subject. The administration staff of

both the schools provided information about the fee structure. It was found out that the fee of private school began from 16,000 per month and increased annually while that of government school was less than 1000 per month. Thus it was assumed that the subjects from private schools belonged from the higher socio economic background while the subjects from government school had low socio economic status.

Data Analysis:

Data was analyzed using the SPSS version 16. $P < 0.05$ was considered statistically significant. The statistics applied to the data was two ways factorial which helped interpret the data properly.

Results:

The results were derived on the basis of the objectives that were set in order to conduct this research and collect the data accordingly.

Height:

The percentage of stunted children was observed to be 25.5%. Overall mean value for height was 127.88 cm (± 17.87).

Weight:

The weight of the students aged 5-8 years was calculated according to the weight for height

Table 1: Stunting among children according to schools, age and gender

	Government school (n=100)	Private school (n=100)	Age group 5-8 years (n=101)	Age group 9-12 years (n=99)	Girls (n=89)	Boys (n=111)
Stunting	38(71.6%)	15(28.3%)	34(64.1%)	19(35.9%)	22(41.5%)	31(58.4%)

Table 2: Prevalence of wasting among children according to schools, age and gender

	Gov. school (n=52)	Private school (n=47)	Girls (n=49)	Boys (n=50)
Thinness 9-12 years (n=99)	15(100%)	0(0%)	8(53.3%)	7(46.7%)
	Gov. school (n=40)	Private school (n=30)	Girls (n=31)	Boys (n=39)
Wasting (5-8 years) (n=70)	8(57.1%)	6(42.8%)	4(28.6%)	10(71.4%)

parameter where height was no less than 77 cm and no greater than 121cm while the students aged 9-12 years were assessed according to the weight for age parameter that was standardized by the Centre for Disease and Control^[7]. Z score was used to assess wasting among children aged 5-8 years and thinness among children aged 9-12 years and interpreted according to the standard set by WHO^[5].

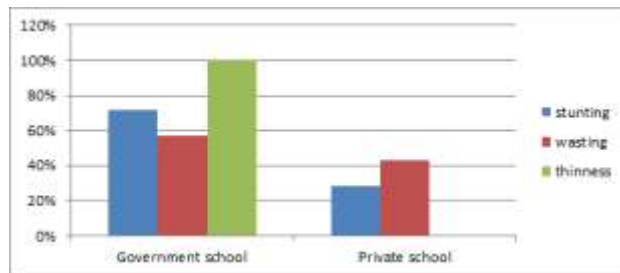


Figure 1. Stunting, wasting and thinness among children studying in government and private school

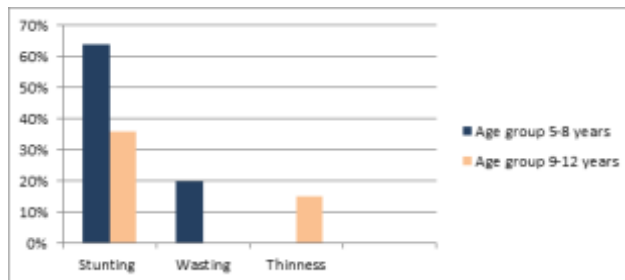


Figure 2. Stunting, wasting and thinness among children of different age groups

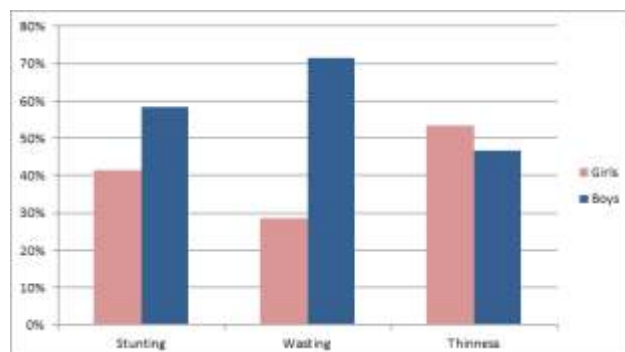


Figure 3. Stunting, wasting and thinness among boys and girls

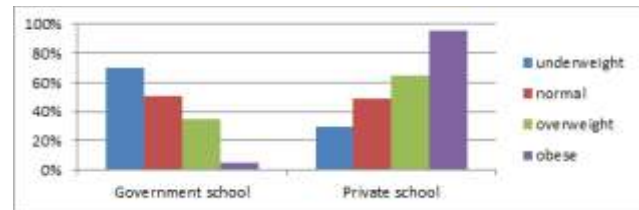


Figure 4. Underweight, normal overweight and obese children of by different age groups

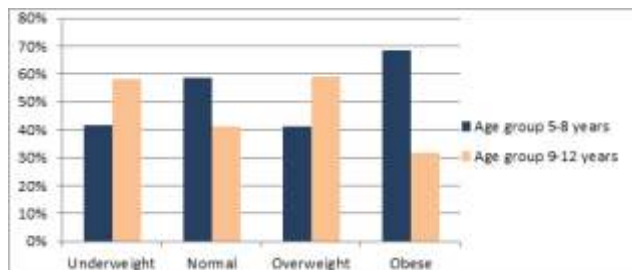


Figure 5. Prevalence of underweight, normal BMI, overweight and obesity among boys and girls by age group

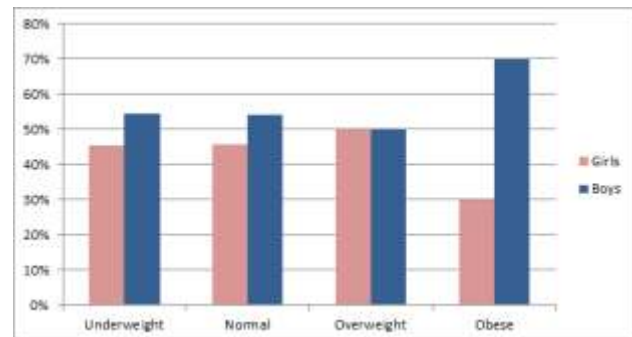


Figure 6. Prevalence of underweight, normal BMI, overweight and obesity among boys and girls

Table 3. Analysis of Variance for Height

Source	DF	SS	MS	F
Age	7	10169.9	1452.84	40.54**
Schools	1	3353.1	3353.07	93.57**
Age*Schoools	7	999.5	142.78	3.98**
Error	184	6593.4	35.83	
Total	199			

Mean value is 127.88 cm (± 17.87)

**P value is highly significant ($P < 0.001$)

NS: Not significant

Table 4. Analysis of Variance for weight

Source	DF	SS	MS	F
Age	7	10169.9	1452.84	40.54**
Schools	1	3353.1	3353.07	93.57**
Age*Schoools	7	999.5	142.78	3.98**
Error	184	6593.4	35.83	
Total	199			

Mean value is 27.85 kg (± 10.27)

**P value is highly significant ($P < 0.001$)

Out of a total 101 children from the age group 5-8 years, 70 students who fulfilled the criteria were assessed. Twenty percent children were found to be suffering from wasting. Fifty seven percent of the total wasted children belonged to government school and 42.8% were from private school. Out of these children, 71.4% were boys. The percentage of thinness in children aged 9-12 years was observed to be 15.1%. All of these children belonged to the government school. The prevalence was more common among girls (53.3%).

Overall mean value for weight was 27.85 kg (± 10.27)

BMI:

In terms of normal BMI, both the schools had the highest proportion of students. They both had well over 50 students with normal BMI. However, it was observed that the students from the government school had a slightly higher percentage of students with a normal BMI (56%) as opposed to the students of private school at 54%. There were more underweight students in government school than in private school (69.8% and 30.2% respectively) about 64% of the 'at the risk of becoming overweight' students belonged to private school. The proportion of obese

Table 5. Underweight, normal and obese children according to schools, age and gender

	Govt. school (n=100)	Private school (n=100)	Age 5-8 years (n=101)	Age 9-12 years (n=99)	Girls (n=89)	Boys (n=111)
Underweight	37 (70%)	16 (30%)	23 (41.8%)	32 (58.2%)	25 (45.5%)	30 (54.5%)
Normal	56 (51%)	54 (49%)	61 (58.6%)	43 (41.3%)	50 (45.8%)	59 (54.1%)
Overweight	6 (35%)	11 (65%)	7 (41.1%)	10 (58.9%)	8 (50%)	8 (50%)
Obese	1 (5%)	18 (95%)	13 (68.4%)	6 (31.6%)	6 (30%)	14 (70%)

Table 6. Analysis of Variance Table for BMI

Source	DF	SS	MS	F
Age	7	142.14	20.306	2.11*
Schools	1	315.38	315.379	32.81**
Age*Schoools	7	116.16	16.594	1.73 ^{NS}
Error	184	1768.89	9.614	
Total	199			

Mean for BMI is 16.385 (± 3.37)

*P value is simply significant ($P < 0.05$)

**P value is highly significant ($P < 0.001$)

NS: Not significant

Table 7. Analysis of Variance Table for MUAC

Source	DF	SS	MS	F
Age	7	77.774	11.1106	11.96**
Schools	1	86.774	86.7742	93.37**
Age*Schoools	7	9.690	1.3843	1.49 ^{NS}
Error	184	170.993	0.9293	
Total	199			

Mean value is 7.59 inches (± 1.31)

**P value is highly significant ($P < 0.001$)

NS: Not significant

Table 8. Mean Standard Deviation table

Variables	Mean $\pm$ SD	Minimum range	Maximum range
Height	127.8cm $\pm$ 17.87	109.93cm	145.67cm
Weight	27.85kg $\pm$ 10.21	17.64kg	38.6kg
BMI	16.38 $\pm$ 3.37	13.01	19.75
MUAC	7.58 in $\pm$ 1.31	6.25in	8.89 in

students was found to be highest in private school (94.7%).

54.1% boys were of normal weight in comparison to 45.8% girls. 54.5% boys were identified as underweight while the proportion of obese student was also more common among boys (70%). Both the boys and girls had same percentage of 'at the risk of becoming overweight' students at 50%. A greater proportion of children aged 5-8 years were obese while more children from the age group 9-12 years were at the risk of becoming overweight (58.9%).

Overall mean for BMI was 16.385 (± 3.37)

MUAC:

There were different ranges for MUAC in children from both schools as given below:

11.5% had MUAC of 6 inches.

14.5% children had a MUAC of 6.5 inches

21% had 7 inches of MUAC

10% had a MUAC of 7.5 inches

11.5% had a MUAC of around 8 inches

7% had a MUAC of 8.5 inches

9 % had a MUAC of 9 inches

4.5% of the students had a MUAC of 9.5 inches

3.5 % students had MUAC values of 10 inches.

About 5 students from government school had 5.5 inches of MUAC. 2 students from private school students had 10.5 inches of MUAC followed by 5 students with 11 inches of MUAC. Only 2 students had either 12 or 15 inches of Mid Upper Arm Circumference. 2.5% had an MUAC value of 5.5 inches. The lowest values of MUAC were seen in children of 5 to 8 years of age. All children with lowest values belonged to government school. The mean value for MUAC was 7.59 inches (± 1.31).

DISCUSSION:

Malnutrition continues to be common especially among under developed and developing countries. Lack of food security and malnutrition entails many negative consequences including deterioration in health, low chances of survival and low economic progress^[7]. According to a report, out of the 76 countries listed in on global hunger index,

Pakistan stands at number 57 in terms of malnutrition and child mortality^[8]. Moreover, the rate of stunting has only increased among children over the course of 10 years^[9]. Families of children who belong to lower socio economic status adopt feeding practices which negatively affect the nutritional status of children^[10].

According to our study, weight was significantly related to the age of the children ($p < 0.001$). Thinness was more common among children of younger ages as compared to older children which are consistent with the findings of a study conducted in Pakistan, which identified thinness to be more common in school children of ages less than 10 years^[11]. The idea behind older children having healthier weight can be substantiated by a fact that, usually, grown up children have stronger immune system in comparison with younger children. The children who are not fed proper diet become vulnerable to infections^[12].

The socio economic status also played a considerable role in terms of the weight of children ($p < 0.001$). The private school children were better nourished as compared to government school children. Children who studied in government school showed greater proportion of wasting as opposed to children from private school (57.1% and 42.9% respectively). Thinness was common among children who belonged to poor families. The NNS survey also observed the trend of under nutrition to be common among poor families¹. On the other hand, girls had higher prevalence of thinness than the boys at 53.3%. Results of the study carried out in Peshawar also indicated higher prevalence of under nourished girls than boys^[13].

Our study showed that about 26% children were stunted. According to WHO, prevalence of stunting in Pakistan is as high as 45%^[9]. The height had positive association with the age of the children ($p < 0.001$). The results suggest that the phenomenon of stunting and its occurrence is more frequent among children of younger ages which are in similar to another study carried out in Iran where stunting was more common in younger ages^[14]. Stunting rates were higher among boys than girls. These findings can be supported by the report of Pakistan Demographic Health Survey (PDHS)

which also observed stunting as well as wasting to be more common among boys less than 5 years^[15].

The government school children were mainly stunted. Low socio economic factor played a key role in determining the rates of stunting among children. Study conducted in rural and urban areas of Pakistan also showed higher frequency of stunting among poor families of rural and urban population^[16].

The chances for stunting increase if the child is underweight. Poor dietary practices coupled with poor living standards increase the likelihood of malnutrition. Severe malnutrition can cause morbidity and mortality. In another research done in Africa, evaluation of the data confirmed that the chances of death among children who were underweight were more likely than the ones who were well nourished. Whereas, the chances increased 12 times if the child had stunted growth and was wasted^[17].

The results with regard to BMI show that its relationship with age is simply significant ($p < 0.05$). Age to some extent, does affect the nutritional status of children. This is also true in case of another study which reveals that adiposity of the individual changes as he grows thus causing increase in body mass^[18].

Although more students from the government schools were identified as having a normal BMI than the private school children, this happened primarily due to the fact that much of the students from private schools were either overweight or obese. Similarly, results from a study conducted on school going children in Pakistan showed that a higher number of children from low income families had a satisfactory Body Mass Index at 52% than those children who belonged to upper class families at 44.50%^[3]. Through our research, 26.5% were identified as underweight which is considerably lower than the percentage of underweight children (52%) of Karachi, Pakistan. However, in our study frequency of underweight children belonging to lower socio economic status is comparable to the frequency of underweight children which is 69% and 63% respectively^[2]. A similar research carried out in primary schools of Faisalabad also found around 26% of the children to be underweight. The proportion of underweight girls and boys of primary group

was 82% and 17% respectively^[19]. Same trends were observed in case of this study where around 41% of the total underweight children belonged to lower socio economic status^[3]. A possible justification for the high proportion of underweight children from low income families could be that such poor families' compromise on the quality of food by saving money for fuel and by preparing food using poor food preparation techniques^[10].

Obesity has become widespread in Asian countries over the course of 5 years. In China, the proportion of obese and overweight people less than 20 years has risen from 5.7 to 18.8 % while in Pakistan it has also increased from 6.3 to 11% suggesting a need for confronting the problem. According to the Institute for Health Metrics and Evaluation (IHME) in the US, the prevalence of obesity among children aged 2-19 years is increased from 22 to about 28%^[20]. Our study revealed 8.5% and 9% of the children as overweight and obese respectively whereas in another study around 8% children were found to be overweight while 6% were obese. Out of the 6%, 70% belonged to a higher socio economic status^[2]. This is significantly less than our findings (94%). Our study is in line with another research which classified 6% school aged children as obese and 19% as overweight^[21]. The pattern of overweight and obesity was more common in boys than girls which is supported by another study conducted in Karachi, which identified more boys to be overweight and obese than girls^[11]. Our study shows close association of obesity, overweight with socio economic status ($p < 0.001$). This observation is supported by another study conducted in Chennai where it was found out that overweight and obesity was considerably greater in private schools as opposed to government schools^[22]. Study conducted in Karachi, Pakistan showed positive relationship between obesity and socioeconomic background². Similarly, higher trends of obesity were observed among rich families in a study conducted in Africa^[23]. Most of the overweight and obese children as was observed in NNS 2011 belonged to the higher socio economic background as well^[24]. The children who belong to upper class families are more inclined towards eating junk food as opposed to poor

children and physically inactive thus causing obesity^[21].

The age affected the values of MUAC positively according to our result ($P < 0.001$). The greater the age, the higher were the MUAC figurative value. This is true in case of another study which revealed that children with younger ages are at a greater risk of mortality^[25].

Socio economic status affects the availability of food and its quality. The results for MUAC suggest that malnutrition persists in children who belong to poor families. This can be affirmed by the study which indicates that anthropometric failures are more common in poverty stricken areas^[26]. These can lead to severe malnutrition among these children if they are not properly nourished. These children require proper nutritional treatment and other responses that can help increase their survival chance^[17].

CONCLUSION:

According to our findings, more boys were stunted and suffered from wasting as opposed to girls. Thinness, however, was common among girls. The proportion of underweight, obesity and one with normal BMI was higher than girls. Both the sexes had same percentage of overweight children. Malnutrition was more frequent in children who study in government school which implies that socio economic status directly affects nutritional status. However, the rates of under nutrition were common in government school children while the trend for obesity and overweight was prevalent mostly in private school children. Stunting and thinness rates were higher in government school children than private school children.

RECOMMENDATIONS:

There are certain precautionary measures that need to be taken into consideration in order to prevent the growing number of malnutrition among school-aged children of Pakistan.

1. More government health programs need to be implemented in order to alleviate the burden of malnutrition among school going children especially in government schools
2. The Nutritional status of children should be

assessed periodically. The lunch box program should be initiated by the government to ensure children receive proper diet during lunch hours in schools

3. Similar studies with larger sample size may be conducted to evaluate nutritional status in different cities.

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THERE IS NO GREATER WEALTH THAN WISDOM, NO GREATER POVERTY THAN IGNORANCE; NO GREATER HERITAGE THAN CULTURE AND NO GREATER SUPPORT THAN CONSULTATION

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