

Variations in nutritional status of school going children in four rural districts of Punjab, Pakistan

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Abstract. Childhood is a time when maximum growth in relation to physical, mental, emotional and psychological growth takes place. Diet and nutrition plays a key role for their health and wellbeing. Our main goal was to assess the nutritional status (prevalence of underweight, thinness, and stunting) in the school going children Punjab, Pakistan (district Layyah, Rajanpur, Okara and Bahawalnagar). This cross-sectional study was carried out from April to August 2016 on 399 children (48 female and 351 male) of ages between 9 and 16 years. Anthropometric measurements; weight, height, and age were taken in kilogram (Kg), centimeter (cm), and years correspondingly. According to the results, 23.1%, 17.5%, and 28.1% children were found to be underweight, slimness (thinness) and stunting. Moreover, 22.2% male children was found underweight, 30.8% stunted, and 13.7% was thin. Regarding the female participants 29.2% were underweight, 8.3% stunted, and 45.8% thinness, indicating stunting prevalence is more in male while underweight and thinness prevalence is more in female students. These results will be useful for policy makers while developing nutritional intervention programs.

Keywords: BMI; age; stunting; prevalence of thinness; underweight; rural areas of Pakistan

Introduction

Malnutrition is a major issue in developing countries. Pakistan in particular has a large proportion of children suffering from under-nutrition[1]. This is a multifaceted condition, often reduce productivity, wellbeing, and lead to reduce immunity which again lead to higher rates of mortality and morbidity. There are various known and still to be explored factors that plays key role in developing under nutrition. It adversely affects child growth, reduce cognitive power, and place major burden on health sector. Adolescence is an exciting period from 12-21 years of age where child pass through physical and cognitive transformation. It is most important phase of physical

growth after infancy[2]. Nutritional status of children is evaluated normally through anthropometric measurements[3].

Studies on nutritional status (underweight, stunting, thinness) of children below 5 years, are frequently investigated[4]. However, there is huge gap in research of children having age between 5 to 16 years. The objective of this study was to evaluate the nutritious status of rural school going children, age 9-16 years in four districts of Punjab (Rajan Pur, Bahawalnagar, Layyah, Okara), Pakistan. Two major reasons were identified for this study: one National Nutrition Survey 2011 (Pakistan) indicated 58% Pakistani population is food insecure, which means there will be significant number of under-nourished children because food

food insecure children are at increased risk of developing underweight and stunting growth[5]. Second, selected districts are less vibrant and have the lowest economic activities. The study compared age with weight, height, and BMI to assess the prevalence of underweight, stunting, and thinness. WHO age-specific standard values for weight, height, and BMI were used to evaluate nutritional status[4].

Methods

This was a cross-sectional descriptive study conducted in four districts of Punjab, Pakistan (Layyah, Okara, Bahawalnagar, Rajanpur). Overall 399 students (9-16 years) participated. All were healthy (normal). Data was collected after taking consent from the school principal. The research objective was explained to students before data collection. Date of birth was asked from each student to note age in years. Height was measured in centimeters (cm) through measuring tape. Weight was taken in kilogram (kg) and it was measured by using a weight machine. A standard equation (weight in kg/height in m²) was used to calculate BMI[6]. The data was recorded and analyzed in Microsoft Excel. Statistical analysis was performed by using SPSS version 22.

Results

The sample consisted of the school-aged child with an average age of 12.29 ± 1.90 years. 88% of the sample consisted of male children while only 12 % were females. The majority (80%) of the sample belonged to low socioeconomic status. The average BMI of the sample was found to be 17.84 kg/m². The prevalence of stunting was highest (28.1%) compared to the other two malnutrition indices. About one-quarter of the sample showed some form of undernutrition (Table 1).

Table 2 shows a comparison of nutritional indices for gender, socioeconomic status, and age of the sample. Thinness and stunting were significantly associated with the gender and socio-economic status of children. Male children had a 10 times greater risk of

being stunted compared to females. However, female students showed a higher risk of being thin (OR=0.187 (0.98-0.357)). Students belonging to low socioeconomic status had a significantly higher risk of being stunted. Age also showed significant association with stunting, children who were younger than 12 years of age were 8 times more likely to be stunted than older children.

As shown in Figure 1, grades of students were found to be significantly associated with malnutrition. Malnourished students were reported to have scored lower compared to those having normal nutritional status. 47% underweight students, 24% thin, and 66.9% stunted students had poor scores and grades at school. Highest association was found between grades and stunting (chi sq= 58.47, p=0.000), however, association was significant for thinness (chi sq=17.447, p=0.001) and underweight (chi sq=14.959, p=0.002) as well.

District-wise prevalence of underweight, stunting, and thinness is given (Fig 2) which showed that in district Okara, there were 6%, 32%, and 21% prevalence of stunting, thinness, and underweight respectively. In district Rajanpur, there was 4%, 30%, and 20% prevalence of stunting, thinness, and underweight respectively. In district Bahawalnagar, there were 24%, 7%, 15% prevalence of stunting, thinness, and underweight respectively, while in district Layyah there were 76%, 1%, 15% prevalence of stunting, thinness, and underweight respectively. Overall stunting and underweight was higher in district Layyah while thinness was more prevalent in district Okara

Discussion

Malnutrition (undernutrition) is highly prevalent in developing countries. This is a multifaceted condition, often reduces productivity, wellbeing, and leads to reduce immunity which again leads to mortality and morbidity. There are various known and still to be explored factors that play a key role in developing undernutrition. The present study was conducted in four districts of Punjab, Pakistan (Rajan Pur, Bahawalnagar, Layyah, Okara). These districts were selected based on the less vibrant and lowest economic

Table 1. Descriptive analysis of Socio-demographic characteristics and nutritional status of the sample

Variables		n (%)	M±SD
Age (years)			12.29 ± 1.90
Gender	Male	351 (88%)	
	Female	48 (12%)	
Economic status	Very low	132 (33.1%)	
	Low	187 (46.9%)	
	Middle	78 (19.5%)	
	High	2 (0.5%)	
Student's grade in class	Poor	150 (37.6%)	
	Average	186 (46.6%)	
	Good	53 (13.3%)	
	Excellent	10 (2.5%)	
Weight kg			35.28 ± 12.30
Height cm			139.26 ± 20.09
BMI kg/m ²			17.84 ± 3.86
Thinness	Yes	70 (17.5%)	
	No	329 (82.5%)	
Underweight	Yes	92 (23.1%)	
	No	307 (76.9%)	
Stunted	Yes	112 (28.1%)	
	No	287 (71.9%)	

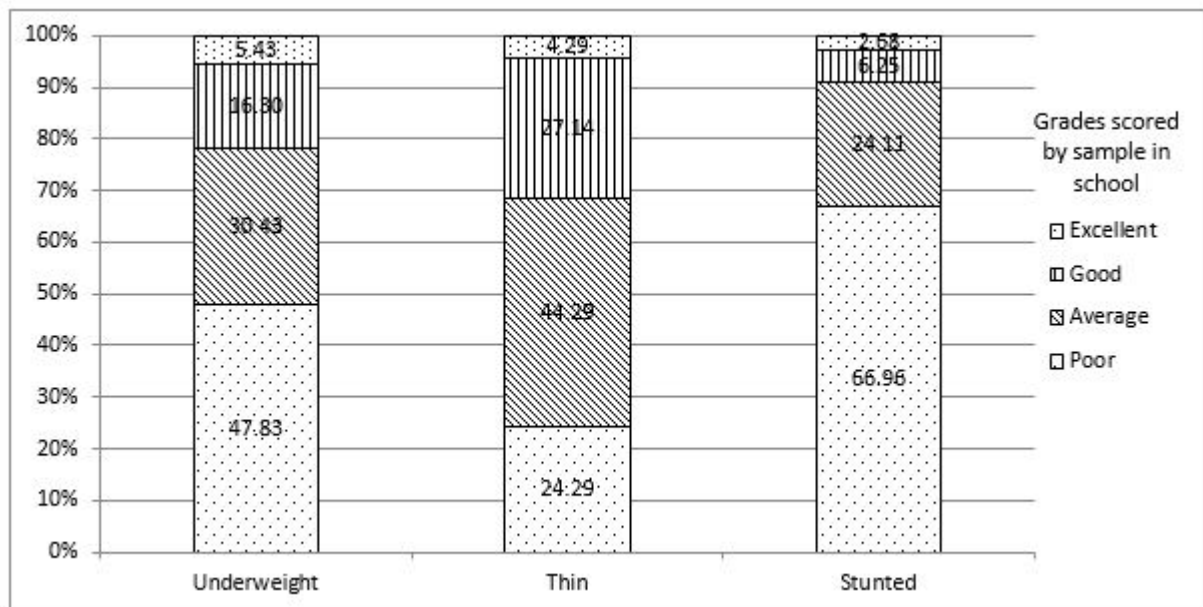
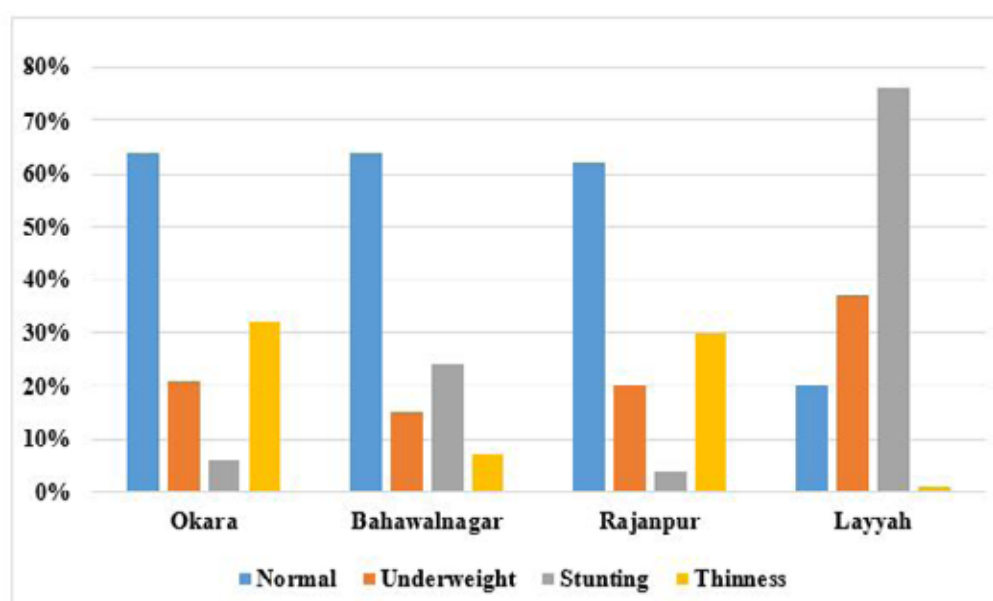


Figure 1. Association of grades scored at school with nutritional status of the sample

Table 2. Comparison of nutritional indices for various demographic characteristics of the sample

Variables		Frequency (%) undernourished	Chi squared test statistic	Odds ratio (95% CI)	P value
Underweight					
Gender	Male	78 (22.2%)	1.148	0.694 (0.355-1.358)	0.284
	Female	14 (29.2%)			
Age	<=12 years	55 (25.2%)	1.278	1.313	0.258
	>12 years	37 (20.4%)			
Low economic status	Yes	73 (22.9%)	0.027	0.953 (0.535-1.697)	0.869
	No	19 (23.8%)			
Thinness for age					
Gender	Male	48 (13.7%)	30.186	0.187 (0.98-0.357)	0.000
	Female	22 (45.8%)			
Age	<=12 years	40 (18.3%)	0.215	1.131(0.672-1.904)	0.634
	>12 years	30 (16.6%)			
Low economic status	Yes	47 (14.7%)	8.686	0.428 (0.241-0.761)	0.003
	No	23 (28.8%)			
Stunted height					
Gender	Male	108 (30.8%)	10.527	4.889 (1.714-13.948)	0.001
	Female	4 (8.3%)			
Age	<=12 years	74 (33.9%)	8.214	1.934	0.004
	>12 years	38 (21.0%)			
Low economic status	Yes	104 (32.6%)	16.182	4.353 (2.022- 9.375)	0.000
	No	8 (10.0%)			

**Figure 2.** District wise prevalence of underweight, stunting, and thinness

activities of these areas. The study has compared the age with weight (underweight), height (stunting), and BMI (thinness) of school-going children[4]. According to the results, there was a significant number of underweight, stunted, and thinness cases in school-going children (age 9-16 years). These findings are in agreement with the previous study in which it was reported that school-going children were under-nourished in Pakistan[5]. Geopolitical factors may contribute well in shaping constant presences of under-nutrition since these areas are far away from the mainstream cities; the contributing factors may involve the following: local residences follow the traditional way of food preparation. It is often noted in our verbal conversation with the locals that they eat single foodstuff and so varieties of food are not included in their diet, especially residents scarcely have access to meat and milk. This can lead to a deficiency of many vital nutrients like zinc, calcium, and phosphorous[7, 8].

Reportedly low socioeconomic status and low-quality food intake contribute to malnutrition[9] in children because a low-quality diet has lower energy, zinc, protein, calcium, and phosphorous levels. Based on the past experience and observation, basic health care units in the mentioned areas provided nutrition supplements like plumpy nuts, etc. but those program has faced failure. Various studies have shown that nutrients like zinc deficiency affect taste sensation[10]. Since school-going children are deficient in zinc so they are reluctant to opt for a more nutritious and different diet whenever the basic health care unit is provided to them. Third, anorexia and hypogeusia were noticed in stunted children due to low zinc intake in the diet[11], indicating the dire need for change in behavior that can be accomplished with nutrition education by nutrition experts and implementing basic nutrition education in the curriculum. Another important factor that has been revealed in this study is the limited knowledge of parental awareness and education since it is a casual factor in developing under-nutrition[12]. Reportedly, providing community-based nutrition education improves nutritional status in the children[13].

Fourth, nutrients deficiency during pregnancy has a drastic effect on the neonates that affect their

both physical and mental development during childhood[14]. According to National Nutrition Survey 2011, 58% Pakistani population is food insecure[15]. Food insecure children are at increased risk of stunting and underweight[5]. Reportedly, under-nutrition during infancy decreases brain growth[16]. Population with low socioeconomic status is more prone to underweight than high socioeconomic status[17]. Agricultural activities at the domestic level can increase both physical and economic access to nutritious food[18]. Finally, enrichment of cereal grains with zinc can improve physical and mental development in children[19].

Sanitation and hygienic practices are closely linked with nutritional status. Population without sanitation and hygienic practices are at increased risk of developing diarrheal and other gastrointestinal diseases and higher rates of mortality[20]. Adopting correct water, sanitation, and hygiene (WASH) strategies has resulted in improved wellbeing of the population because these practices result in better nutritional status in children[21]. It is, therefore, important to educate the children in school for WASH so that repeated diarrheal diseases and infection can be prevented. Results of the present study will be useful for nutrition intervention to improve the nutrition status of the most affected area and also will be helpful for health care development programs in Pakistan. Moreover, public health department should conduct community based projects to provide nutritional education to the general population. In this regard nutrition awareness programs can be the key part of long-term policies. Furthermore, subjects with nutrition basics in the curriculum may be included in the education syllabus. It is worth mentioning that media can play a major role in providing nutrition awareness through different ads. It is also important for the government to take a key interest in eradicating unhealthy foods advertisements that have a psychological influence in the selection of such foods especially children are most affected by ads as indicated[22] that reducing unhealthy foods TV advertisements and increasing nutritious food advertisements improve healthy eating practices. In general, nutrition education in school has to be implanted to get desired results.

Limitations of the Study

The authors of the study recognize that the sample selected for this study includes only school-going children, and as such does not include those children who do not attend school for one reason or another. Three out of four are relatively underdeveloped districts of Punjab province and therefore a significant number of children of the study age group are not represented in the study sample. Since poorer households usually do not or are unable to send their children to school, therefore we believe that the prevalence of all three studied parameters may be of higher magnitude.

Conclusion

Based on the results, the underweight and stunting prevalence was higher in male children while thinness was more in female children. Children with low socioeconomic status had more prevalence of stunting,

thinness, and underweight versus the children with high socioeconomic status. These results highlighted the nutritional status of selected rural areas of Pakistan. These

results are very important for the policymakers especially for health care and development departments to focus on the nutrition of the younger population. In Pakistan awareness related to nutrition and its intermediation is very necessary to uplift the status of nutrition in children.

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Rajanpur: Located at 29.10 latitudes, 70.33 longitudes, and situated at elevation 97 meters above sea level; **Bahawalnagar**, is located at 30.00 latitude and 73.25 longitudes and situated at elevation 159 meters



Figure 3. Geographical location of the studied area

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