RESEARCH ARTICLE

Frequency of underweight and stunting among children entering school in a small urban locality and their association with academic performance

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Abstract

Objective: To determine the frequency of underweight and stunting among the children entering first year of school and to assess its associated factors.

Methods: This descriptive, analytical study was conducted at 5 schools of Rabwah, Pakistan, from August to September 2015, and comprised all students who got admission in the selected schools during the study period. Name, father's name, gender, weight, height, status of height, and weight on Z-score charts, and marks obtained in the test were recorded. SPSS 20 was used for statistical analysis.

Results: Of the 478 participants, 212(44.4%) were boys and 266(55.6%) were girls. The overall mean age was 66.6±5.966 months (range: 41-129 months). Overall, 53(11.1%) were underweight, 22(4.6%) were severely underweight, 55(11.5%) had stunting and 12(2.5%) had severe stunting. Median marks (Interquartile Range [IQR]) in admission test for obese, overweight, normal, underweight and severely underweight children were 76.3%(37.2-84.7), 65.9%, 66.7%(56.4-72.3), 64.6%(47-71), and 67%(55.3-78), respectively. Median marks (IQR) in admission test for tall, normal height, stunted and severe stunted children were 24.1%, 67%(57.3-73), 57%(31.1-67.8), and 62.6%(49.7-68.3), respectively. Children with stunting scored significantly fewer marks compared to children of normal height ($p<0.05$).

Conclusion: Stunting and underweight were common problems among children starting school. Stunting was found to be associated with lower marks in admission test.

Keywords: Stunting, Underweight, Schools. (JPMA 68: 28; 2018)

Introduction

Malnutrition is a serious, common and potentially life-threatening condition that can lead to long-term consequences. Weight for age and height for age are important anthropometric nutritional status indices. In recent decades, abnormalities of weight and height have decreased considerably, but still these health issues are of paramount global importance.

According to National Nutrition Survey (NNS) of Pakistan 2011, 43.7% of under-5 children were stunted, and 31.5% of under-5 children were underweight. Among rural under-5 Pakistani children, 46.3% were stunted and 33.3% were underweight. Among urban under-5 children these ratios were 36.9% and 26.6%, respectively.[1] NSS 2011 treated <5-year children as a separate category, but the figures for children >5 years have not been given. Our study included children both above and below 5 years. A study documented stunting and obesity among Pakistani children of 3-16 years age, and showed that the prevalence of stunting in this age group was 14% and the prevalence of obesity was 5%.[2]

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Malnutrition is the most important cause contributing to morbidity and mortality in children under five years of age. It contributes to at least half of all childhood deaths worldwide and it detrimentally affects cognitive, motor, social and emotional development of these children.[3] Association between the above-mentioned growth parameters and motor development, cognitive development, school enrolment, grades in school, scores in different subjects has been extensively studied due to frequent observation of poor school performance among malnourished children. These studies have shown that nutrition is a factor that can affect the learning ability and cognitive skills of children at school.[4-7] It is important to determine the frequency of abnormalities in weight for age and height for age among children starting first year of their school life, and to ascertain whether any association is present between these parameters and academic performance in the admission test because this is the start of academic career.

Our study focussed on the children entering the first year of their school life in a small urban locality. According to the 1998 census, 32.5% of population in Pakistan resided in 515 urban localities around the country. Only 45 urban localities of Pakistan had

population of above 100,000. Small urban localities represent an important section of Pakistan and such localities were the focus of our study. The current study was planned to: determine the frequency of underweight and stunting among the children entering first year of school, and to assess any association between scores in admission test and height and weight at the time of admission.

Subjects and Methods

This descriptive, analytical study was conducted at 5 schools of Rabwah, Pakistan, from August to September 2015, and comprised students. Rabwah in the Punjab province has a population of around 70,000.[8] Five schools, belonging to the largest school system of the town i.e. Nazarat Taleem School System, out of the total 11 schools providing primary level education in Rabwah, were selected for the study. All students who were admitted, after an admission test, in these schools in prep class (first year in school) in 2015 were included. These children took the same admission test conducted by the same group of teachers. One month before the test, parents were advised to prepare the children for the test which was to include English alphabet, Urdu alphabet, initial Urdu reading and whole numbers from 1 to 20. The admission test for prep class comprised two parts; written and oral. In the written test, the candidates solved a test focussing on their capability to identify and recall the English (upper/lower case) and Urdu alphabet. Number counting from 0 to 20 was included in the math's portion. In the oral test, a set of different activities were designed to check the students' memory. Teachers assessed each child with marks from 0 to 100.

Weight and height of these children were checked with a single combined height and weight scale of RE 160 type. These parameters were plotted on World Health Organisation (WHO) Z-score charts for height and weight. The following WHO charts for male and female children of different ages were included in this study: (i) Z-score weight for age chart for boys from birth to 5 years age; (ii) Z-score weight for age chart for boys from 5 to 10 years; (iii) Z-score weight for age chart for girls from birth to 5 years; (iv) Z-score weight for age charts for girls from 5 to 10 years; (v) Z-score height for age chart for boys from birth to 5 years; (vi) Z-score height for age charts for boys from 5 to 19 years; (vii) Z-score height for age chart for girls from birth to 5 years; and (viii) Z-score height for age chart for girls from 5 to 19 years.[9] These charts were used to categorise weight for age and height for age of the children. According to weight for age, children were divided into 5 categories, i.e. obese, overweight, normal, underweight and severely underweight. According to their height for age, children were divided into 5 categories, i.e. very tall, tall, normal, stunted and severely stunted. Informed consent was taken from the parents. One of the parents was present during measurement of height and weight.

Name, father's name, gender, weight, height, status of height and weight on WHO Z-score charts, and marks obtained in the test were recorded on a data sheet. SPSS 20 was used for statistical analysis. Shapiro-Wilk test was used to test normality of the data. Kruskal-Wallis test was used to determine if there are statistically significant differences between more than two groups of an independent variable on a continuous variable. Mann-Whitney U test was used to determine difference between two independent groups when the dependant variable was on continuous scale. As height, weight and marks in admission test showed non-normal distribution, non-parametric tests were used because these tests do not assume that the data follow any specific distribution. Appropriate sample size was calculated using WHO sample size calculator. The calculations of the sample size were based on the given prevalence of stunting in under-5 children of Pakistan, i.e. 43.7%.[1] At level of confidence 95%, at required precision of 5%, the sample size required was at least 372. Ethics committee of Fazl-e-Omar Hospital, Rabwah, approved the study.

Results

Of the 478 participants, 212(44.4%) were boys and

Table-1: Baseline characteristics in male, female, and all subjects.

Variable	Male	Female	All subjects
Number (%)	212 (44.4%)	266 (55.6%)	478
Median age in months (IQR)	66.6 (63-70.7)	66.6 (62-70)	66.6 (63-70)
Median height in cm (IQR)	110 (105.5-114)	109 (105-112)	110(105-113)
Median weight in kg (IQR)	18 (16-19)	17 (15-19)	17(15-19)
Median marks in admission test (IQR)	66.4%(56.8-71.2)	67%(54.5-73.3)	66.55%(55.7-72.3)

Table-2: Mean ranks of marks obtained in different groups according to weight for age.

Group according to weight for age	Mean ranks of marks obtained
Obese	317.38
Overweight	196.83
Normal	241.39
Underweight	210.43
Severe Underweight	267.11

Kruskal-Wallis test was applied to evaluate difference among different groups P=0.302.

Table-3: Mean ranks of marks obtained in different groups according to height for age.

Height for age	Mean rank of marks obtained	b	c	d	e
(a)Very Tall	0				
(b)Tall	28.75	--	0.025	0.118	0.044
(c)Normal Height	250.60	0.025	--	<0.001	0.199
(d)Stunted	173.26	0.118	<0.001	--	0.442
(e)Severely Stunted	199.83	0.004	0.119	0.442	--

Kruskal-Wallis test was conducted to evaluate differences among three levels. If Kruskal-Wallis test was significant Mann-Whitney test was used for pairwise comparison p<0.001.

266(55.6%) were girls. The overall mean age was 66.6±5.966 months (range: 41-129 months) (Table-1). On the Z-score charts, 4(0.8%) children were obese, 3(0.6%) were overweight, 396(82.8%) were of normal weight for age, 53(11.1%) were underweight and 22(4.6%) were severely underweight. As for height, no child was very tall, 2(0.4%) were tall, 409(85.6%) were normal, 55(11.5%) were stunted and 12(2.5%) were suffering from severe stunting.

Median marks (IQR) in the admission test for obese, overweight, normal, underweight and severely underweight children were 76.3%(37.2-84.7), 65.9%, 66.7%(56.4-72.3), 64.6%(47-71), and 67%(55.3-78), respectively. Median marks (IQR) in admission test for tall, normal height, stunted and very stunted children were 24.1%, 67%(57.3-73), 57%(31.1-67.8), and 62.6%(49.7-68.3), respectively.

Kruskal-Wallis test did not show any significant difference between marks obtained in different groups according to weight (p=0.302) (Table-2).

However, Kruskal-Wallis test showed significant difference between mean ranks of marks among children in different groups according to height for age (p<0.001). Mann-Whitney U test was applied for pairwise comparison (Table-3).

Discussion

Malnutrition is a serious and potentially life-threatening condition. Malnourished children suffer from compromised function of immune system that makes them more vulnerable to common infectious diseases. Young children are more vulnerable. If not treated in time, malnutrition can lead to permanently impaired physical growth and mental development. Thus, its high prevalence in Pakistan and other resource-limited countries is a matter of concern. Our study focussed on the children who were entering the first year of schooling. Data showed that 11.1% were underweight and 4.6% were severely underweight. Analysis of height showed that 11.5% were stunted and 2.5% were having severe stunting. These abnormalities of height and weight of the children included in our study were relatively less common as compared with national average. National data of Pakistan shows that 11.6% children were severely underweight and 19.9% were underweight. Severe stunting and stunting were present in 21.9% and 21.8% children, respectively, among under-5 children of Pakistan.[1]

It is well recognised that malnutrition contributes to increased mortality among children.[8,9] The increase in mortality among children with malnutrition can be labelled as the tip of the iceberg.[11] Millions of children under 5 years fail to reach their mental potential due to nutritional problems.[4-7] Nutritional problems in early years of life can lead to impaired brain development.[12-14]

Stunting among children can lead to poor cognitive, motor, and social-emotional development.

Subsequently, these impairments lead to poor school achievement. Many studies have noted associations between concurrent stunting and poor school performance or cognitive ability.[4]

In the first place stunted, wasted and anaemic children are less likely to be enrolled in school.[5] A study by Sarma et al. showed low level of educational performance (marks<40%) in language and mathematics, and the overall subject average was significantly higher (p<0.05) among the stunted children than that of the normal children.[4] Height for age has been found to be associated with score in school examinations.[5]

Our study showed that median score was highest among children with normal height and lowest among tall children, though there were only 2 children who were categorised as tall. The mean ranks of the marks in admission test obtained by the children with normal height were highest among different categories

according to height. Children with stunting had significantly lower mean ranks as compared with children of normal height. Children with severe stunting had lower mean ranks as compared with children with normal height, but the difference was not statistically significant.

Weight for age is an important index to assess nutritional status. Many studies have shown that weight for age is not associated with development of children and school achievement. However, some studies have shown that subnormal weight for age is associated with delayed attainment of developmental milestones and behavioural problems. Kuklina EV et al. found out that weight for age was associated with age of walking.[14] Study by Lasky RE showed that both weight and height are most strongly correlated with behavioural development during initial 2 years of life.[15]

Study by Acham H. et al. showed that height for age, weight for age, and body mass index had significant associations with learning achievement of children ($p<0.05$). Associations were positive particularly for mathematics and English, but negative for life skills and oral comprehension. Height for age showed association for score in mathematics only among boys. Weight for age showed association with scores in both English and mathematics among girls, but in mathematics alone among boys. All the positive associations, however, were observed among children aged 13 years and above. All children who scored above 59% marks were in categories of height for age and weight for age >-2 standard deviation (SD).[16] A study conducted by Mo-suwan L. et al. showed that being overweight during adolescence (grades 7-9) was associated with poor school performance, whereas such association did not exist in children of grades 3-6.[17] Similarly, different studies have shown that newborns with low birth weight are more likely to suffer from visual disturbances, and motor and intellectual impairments later in life. All these factors can contribute to affecting performance in school.[18-21] Our study did not show any significant difference between marks obtained in different groups according to weight for age.

Conclusion

Stunting and underweight were found to be common problems among children getting admission in schools. Children with stunting got significantly low marks in admission test as compared with children with normal height.

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