Original Article

Evaluation of nutritional deficits among adolescents in Tando Muhammad Khan district via anthropometric measures

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Abstract

Background: Researchers have long struggled to devise adequate measures that can be used to assess nutritional status. Apart from the ongoing debate, the most recommended indicator for identification of nutritional imbalances is anthropometry. The aim of the study was to assess the association of anthropometric measures with nutritional status among the children.

Methodology: This cross-sectional, observational study was conducted from February to September 2018 upon the children from grade 5-8. A total of 264 children were selected via non-probability; consecutive sampling technique from a welfare school of Tando Muhammad Khan District. Data was collected by means of a structured questionnaire inquiring the nutritional status and anthropometric measurements in addition to the demographic details. Informed consent was obtained from the guardians/parents of the respondents. The collected data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0 and Microsoft (MS) Excel 2013.

Results: According to the results, 158 out of 264 subjects were males with the mean caloric intake of 1560 ± 1120 calories while 106 females with a mean caloric intake of 1410 ± 1340 calories. Furthermore, a greater number of females were observed having nutritional deficiencies. The anthropometric indices were found associated with nutritional status i.e. among the deficient group, children with deranged BMI, mid-arm, waist, hip and mid-thigh circumference were common.

Conclusion: It is apparent through the study results that the association of anthropometric measures and nutritional status is well established and it proves to be a remarkable indicator of nutritional status.

Keywords

Nutritional Status, Anthropometry, Malnutrition, Adolescent Health.

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Introduction

Measuring the nutritional status of a population is an important aspect for studying the effects of nutrition on health and wellbeing[1&2]. It may help in identifying the abundance or lack of nutrients in the community[3] moreover, it highlights the risk of deficiencies[4]. The knowledge obtained from these inferences may help devise effective public health policies[5] which further support disease prevention associated with nutritional deficiencies and hence propose a standard for adequate nutrient intake[6].

Literature regarding nutritional status is mostly derived from epidemiologic studies that often provide inappropriate estimates[7], particularly owing to the weak methods employed in assessment and quantification of nutritional status since accurate tools and methods are missing[8]. To address this need, researchers have long struggled to develop adequate and simple measures that can be used for assessment. Further research is required in order to validate the criteria's being utilized for the purpose. Among others, a widely recognized indicator for nutritional status is anthropometry[8]. Anthropometric indices are easily measurable, quantifiable and may serve as ideal indicators of the health and wellbeing among the children[9&10], especially in developing countries where the other methods of assessment and direct quantification of nutritional status are hardly employed due to resource constraints[11].

Among the different anthropometric measurements commonly employed for assessment of nutritional status, height, weight, body mass index (BMI), mid-upper arm, mid-thigh circumference, waist and hip circumference and ratios of the different circumferences are the most widely used parameters[12]. Despite the fact that these indices have been used by many researchers for assessment of child health and nutritional status, it is still under consideration to be entitled as the finest indicator of nutritional status. An appraisal of such sort would yield practically important implications[13].

Malnutrition is a prime concern in South-East Asian countries, with more than half of the children facing severe malnutrition and stunting in most countries of the region mainly Pakistan[14]. It is responsible for most of the child deaths each year in Pakistan15. Current estimates suggest that nearly 47 to 70% of all school going children may have poor nutritional status[15]. It is evident that the nutritional status has a strong impact on the physical and cognitive health of children and also determines the educational achievement of school going children[16]. Research indicates that the fundamentals of lifelong health and socio-economic success are laid down in early stages of life, thus good nutritional status may not only bring immediate benefits but also assures long-term benefits to the children[16].

The aim of the study was to evaluate the association of anthropometric measurements and nutritional status among adolescents in relation to gender and age.

Methodology

A cross-sectional, observational study was conducted over a sample of 264 children selected via non-probability–consecutive sampling technique. The study continued for a duration of 8 months from February to September 2018. Children enrolled in 5th- 8th

Grade at a welfare school of Tando Muhammad Khan District were included in the study while children suffering from any major systemic/metabolic diseases or mal-absorption syndromes were excluded. Moreover, children with a history of illness exceeding a duration of 2 weeks within the past two months were also excluded from the study sample. The study was conducted after attaining ethical approval from the ethical review board of Indus Medical College, T.M.K.

Information regarding socio-demographic and nutritional characteristics was collected using a structured, interview-based questionnaire after receiving written informed consent from the guardians/parents of the respondents. Nutritional status of these children was monitored and broadly divided into two groups, normal and deficient and the deficient group was further categorized into protein-calorie malnutrition and vitamin deficient. The anthropometric measurements including height, weight, waist and hip circumference, mid-thigh circumference, and mid-upper arm circumference were recorded using standard methods. Data obtained was analyzed using SPSS version 21.0 and MS. Excel 2013 and presented as frequency and percentage.

Results

Approximately 3/5th of the study population were males while the rest were females with an estimated mean age of 12.49±1.65 years (male) and 12.86±1.15 years (female). As shown in table 1, males were consuming more calories on average in comparison to females.

Table 1: Details regarding subject demographic characteristics

Parameters	(n=264)	
Gender	Male	Female
	158(59.8%)	106(40.15%)
Mean Age (years)	12.49±1.65	12.86±1.15
Weight (kg)	31.49±4.13	27.11±3.57
Height (cm)	131±13	122±17
BMI (kg/m2)	18.21+0.13	18.1±0.11
Mean Calories Consumed	1560±1120	1410±1340

*values are given as Mean±SD or n(%)

Age and gender related variation in nutritional status were observed among the study subjects. The results showed that protein-calorie malnutrition and vitamin deficiency was commonly observed in both genders with minute fluctuations across different age groups but more prevalent among females in comparison to males.

Table 2: Nutritional Status in relation to age and gender across the study population

Age	Gender	Nutritional status		
		Normal	Deficient	
			Protein-Calorie Malnutrition	Vitamin Deficiency
10 years	Male	2(40)	2(40)	1(20)
	Female	1(50)	1(50)	0(0)
11 years	Male	19(54.29)	11(31.42)	5(14.29)
	Female	7(33.33)	9(42.86)	5(23.81)
12 years	Male	22(57.90)	13(34.21)	3(7.89)
	Female	14(73.68)	5(26.32)	0(0)
13 years	Male	18(50)	14(38.89)	4(11.11)
	Female	11(44)	11(44)	3(12)
14 years	Male	18(46.15)	17(43.59)	4(10.26)
	Female	14(56)	9(36)	2(8)
15 years	Male	3(60)	2(40)	0(0)
	Female	7(50)	7(50)	0(0)

*Values are given as n(%)

The anthropometric measures were dismal among a majority of the respondents. Deranged measurements of mid-upper arm circumference and waist circumferences were greatly associated with poor nutritional status in both genders. While in case of hip circumference, mid-thigh circumference and BMI, deranged measurements were more common in males as compared to the female counterpart.

Table 3: Summary of nutritional status in association with anthropometric indices

Nutritional Status	Gender	Anthropometric Indices									
		Mid Arm Circumference		Waist Circumference		Hip Circumference		Mid-Thigh Circumference		BMI	
		N	D	N	D	N	D	N	D	N	D
Normal	M	54	26	66	14	59	21	63	17	58	22
	F	41	13	39	15	39	15	38	16	41	13
Deficient	M	21	49	23	47	19	51	19	51	17	53
	F	11	41	12	40	18	34	15	37	19	33

*BMI= Body Mass Index; M= Males; F=Females; N= Normal; D= Deranged

Discussion

This comparative gender based study emphasized on the understanding of varying anthropometric measurements between different genders and its association with nutritional status. Locally, no such investigation has been conducted to date therefore, there is a dearth of local literature while plenty of international studies offer comparison. Among the study subjects, males and females were in the ratio of 3:2 (Table 1). Such a disparity between enrolments of different genders in schools is commonly observed at the study site where the female literacy rate and school enrolment rate is less in comparison to males[17].

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The mean BMI of the study sample was 18.21±0.13 kg/m2 (males) and 18.1±0.11 kg/m2 (females) (Table 1) which was slightly greater than the BMI of study subjects in Esimai study[18]. Likewise, other demographic details including height and weight were also comparable[18]. Our research showed that males on average uptake more calories as compared to females (Table 1). A study reported that the caloric requirement of males is greater than females[19]. Moreover, according to a nutritional survey inadequate uptake of vitamins and minerals is a rising health concern among adolescents with increased prevalence among females as compared to males[20]. Normal dietary intake was rarely observed among the study subjects while protein-calorie malnutrition and vitamin deficiency was common among a large proportion of the sample (Table 2). According to world health statistics, globally 186 million children are presented with stunted growth while 20 million cases of acute malnutrition are observed[21].

The anthropometric measures compared to set standards for age were unsatisfactory among a majority of the respondents in our study (Table 3). Deranged measurements of mid-upper arm circumference and waist circumferences were most strongly associated with poor nutritional status among males and deranged measurements of hip circumference, mid-thigh circumference and BMI were most strongly associated with nutritional status among females. Existing literature, although not offering much detail regarding the individual gender specific anthropometric variations with different nutritional status, whereas it does support the connection of healthier anthropometries with better nutrition among children[22].

In order to tackle this challenge, the implementation of fine nutritional strategies with an appropriate plan of action is required while keeping in mind the current nutritional status of our country. Development and modification of nutritional policies and programs at regional and as well as on country level should be taken into account. Although our results indicated that anthropometric methods yield great significance in the assessment of nutritional status but there are certain factors which limit its approval for the local population of Pakistan as the study sample was limited to a specific district. Further research in the field of nutrition is required to validate our findings and in order to declare anthropometric measures as the finest indicator for nutritional assessment among the local population of diverse regions of the country.

Conclusion

It can be concluded that the deranged anthropometric measures are associated with poor nutritional status. Moreover, it is recommended that all children with clear anthropometric shortcoming should be further assessed for nutritional deficiencies. Early assessment and improvement in nutritional status of children is necessary as it brings along long-term health benefits.

Conflicts of Interest

None.

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